Inclusive Teaching: Spotting Social Isolation in the Classroom

By Sule Alan, Michela Carlana and Marinella Leone*

We evaluate an intervention aimed at addressing social isolation in classrooms. The treatment provides teachers with their students' social networks and information on developmental risks associated with social exclusion. Using friendship data and incentive-compatible measures, we find that the intervention reduces social isolation and antisocial behavior but does not increase prosocial behavior. Lower antisocial behavior enhances economic efficiency, reflected in higher average student payoffs and reduced inequality. Our findings highlight the personal and communal benefits of addressing social exclusion and antisocial peer dynamics in schools.
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The social environment of a child plays a crucial role in their overall development. While schools are primarily learning institutions, they also serve as social hubs where students interact, play, learn from one another, and form lasting friendships. However, for some students, the social aspects of schooling can be burdensome due to antisocial behaviors from their peers. These behaviors, ranging from subtle exclusion to outright peer violence, can have profound and enduring negative effects on a child's development (Brown and Taylor, 2008; Carrell et al., 2018; Kiessling and Norris, 2023; Lacey et al., 2014; Qualter et al., 2010).[1] Social isolation, often difficult for adults to detect, can lead to serious

* Alan: Cornell University and Bilkent University, salancrossley@gmail.com. Carlana: Harvard Kennedy School, LEAP-Bocconi University, CEPR, and NBER, michela_carlana@hks.harvard.edu. Leone: University of Pavia, LEAP-Bocconi University, marinella.leone@unipv.it. We thank the Editor, Kirabo Jackson, three anonymous referees, seminars and workshops participants at the University of Padova (AIEL Workshop on the Economics of Human Capital), at the University of Naples Federico II (CSEF Workshop on Networks and Development), Bocconi University, University of Barcelona (IEB Workshop on Public Policies), Barcelona School of Economics Summer Forum, Novafrica Economic Development Conference (Nova School of Economics, Lisbon), NBER Children and Families Spring meeting and at the University of Alicante for helpful comments. We thank Luca Calianno, Giuliana Ghia, Marta Magnani, Francesca Rinaldi, and Alvise Scarabosio for excellent research assistance. Lorenzo Alberti, Diva Barisone, Federico Bonfio, Andrea Burro, Giorgia Cascone, Diego Faures, Anna Fiore, Matteo Fossi, Jessica Mancuso, Giulia Monteleone, Michelle Palayill, Alessandro Palucci and Dario Scordamaglia provided excellent support in the field work. We are grateful to the schools that took part in the study for their collaboration, to Annarita Marzullo and Patrizia Falzetti from the Ministry of Education and Invalsi respectively for the access to the administrative and test score data. AER RCT Registry ID: AEARCTR-0009019. The project has obtained IRB approval from Harvard University. We acknowledge financial support from the JPAL-European Social Inclusion Initiative. Marinella Leone also acknowledges financial support from European Union's - Next Generation EU program through the Italian PRIN 2022, grant No.20228W79W3, CUP F53D23002980001

[1] There is a growing literature on the effects of antisocial peer behavior on student outcomes, extending beyond academic performance. Brown and Taylor (2008) show that school bullying negatively affects human capital accumulation and has lasting consequences for labor market outcomes. Carrell et al.

issues for children and adolescents, including low self-esteem, a diminished sense of belonging, chronic expectations of rejection, and even suicidal thoughts (Ayduk et al., 2001; Downey and Feldman, 1996; Leigh-Hunt et al., 2017; Maes et al., 2019; Mendoza-Denton et al., 2002). High-quality, enjoyable learning experiences are compromised in classrooms where some students feel lonely, unwanted, bullied, or excluded. Indeed, research in medical and social psychology indicates that loneliness is associated with poor academic performance and unhealthy behaviors, both of which negatively impact learning and may lead students to disengage from education.[2] Thus, it is essential to create cohesive and supportive school environments where social isolation and segregation based on any characteristics are promptly spotted and addressed.

This study examines the potential for teachers to address and ameliorate socialization issues among their students. We evaluate the effectiveness of an intervention designed to highlight social isolation by providing teachers with detailed maps of the friendship networks in their classrooms. Alongside this feedback, teachers receive information on the detrimental effects of social exclusion on children's cognitive and socioemotional development, as well as its long-term consequences. The intervention emphasizes the critical role of teachers in fostering an inclusive classroom environment. It offers practical strategies for promoting social integration, such as using random group assignments for class activities or assigning isolated students tasks typically reserved for the most popular or outgoing children. The overarching objective of the intervention is to enhance social integration and create an inclusive social environment in schools.

The study was conducted across 46 public primary schools in three regions of Italy, including over 2,200 students and 239 teachers. We collected baseline data in the school year 2021-2022 to create friendship network maps for each classroom to share with the respective teachers. In November 2022, teachers in the 22 treatment schools were invited to an online meeting. The session emphasized the crucial role teachers play in shaping children's social skills and relationships. We revealed that the actual prevalence of social exclusion was significantly higher than the teachers' perceptions and highlighted that isolation was particularly prevalent among children from low socio-economic status or with migrant backgrounds. We also showed that social exclusion was positively correlated with poor mental health status and a negative perception of the school environment. After the meeting, we distributed personalized classroom reports to all teachers in the treatment schools and invited them to join WhatsApp groups to monitor the

(2018) document how exposure to disruptive and antisocial peers harms academic achievement. More recently, Kiessling and Norris (2023) find that being exposed to antisocial peers during school years has long-term mental health consequences. Further motivating our focus on social exclusion in childhood as a form of peer violence, Lacey et al. (2014) show that social isolation in childhood is associated with elevated inflammation in adulthood, which is closely related to mental health.

[2]There is also correlational evidence linking social exclusion to academic disengagement. For example, Buhs et al. (2006) show that chronic peer exclusion and peer abuse are associated with lower classroom engagement and academic achievement. Similarly, Jefferson et al. (2023) document a negative association between loneliness and academic performance.

implementation. Our hypothesis is that by providing teachers with information on social exclusion patterns in their classrooms and emphasizing their ability to address these issues through simple actions, we can reduce antisocial behavior toward vulnerable children and alleviate social exclusion. To test this hypothesis, we collected endline data in May 2023.

We collected a set of indicators that characterize the classroom's relational climate both at baseline and endline. We elicit classroom social networks by asking children to nominate classmates as their best friends and used these data to construct measures of social exclusion, which serve as our primary outcomes. Additionally, we developed an incentivized game to measure antisocial behavior toward peers. The game involves a tournament with an anonymous classmate, followed by a decision on whether to sabotage the classmate's performance to gain an unfair advantage. The sabotage, in this context, involves canceling the opponent's earned output, allowing us to measure economic waste and inequality resulting from antisocial acts within the classroom. To measure prosocial behavior, we implemented a cooperation game and a dictator game. Finally, we implemented item-response questionnaires to evaluate children's mental health, their sense of belonging to school, and their perception of teachers.

We first document that children with lower socioeconomic status and immigrant background are more likely to be socially isolated in the classroom. Social isolation is also associated with lower mental well-being and student's sense of belonging to school, and negatively correlated with academic achievement in our data. Against this background, we find that the treatment reduced social isolation in the classroom. Treated students were 1.5 percentage points less likely to report having "no friends in the classroom," representing a 50% effect relative to the control group, though this relative effect reflects a low base rate of 3% and should be interpreted accordingly. Moreover, treated students received significantly more nominations as friends from classmates, indicating improved inclusivity in the classroom. Specifically, the number of nominations children made and the number of times a child was nominated as a friend increased significantly, compared to the control group.

We also find that the treatment significantly reduced antisocial behavior, measured by our sabotage game: children in treated schools were 7 percentage points less likely to sabotage their opponents' performance, representing a 10% reduction relative to the control group. While we estimate null effects on prosocial behavior, we detect some modest improvement, albeit statistically weak, in children's mental health, sense of belonging, and perception of teachers. Much of the positive impact appears to be driven by students who were socially isolated at baseline and those from lower socioeconomic backgrounds. We suggest that the treatment achieved these positive outcomes by encouraging teachers to adopt more inclusive practices in the classroom. Supporting this interpretation, treated teachers were more likely than control teachers to organize class activities in mixed-ability groups.

We designed our sabotage game to causally demonstrate that antisocial behavior has economic implications for communities. Leveraging the features of our incentivized game, we treat each classroom as a community whose members engage in a competitive output production task. To illustrate the link between antisocial behavior and economic well-being, we simulated payoffs using the empirical distribution of output and sabotage (economic waste) decisions and constructed classroom-level economic aggregates: per-capita payoffs, minimum and maximum payoffs, and the Gini coefficient. We show that treated classrooms achieved higher per-capita payoffs, indicating lower economic waste from sabotage behavior. They also achieved significantly higher minimum payoffs and significantly lower payoff inequality compared to the control classrooms.

Our study makes two key contributions. First, while the detrimental effects of social isolation on children and adolescents are widely acknowledged in social psychology and medical research, limited attention has been devoted in developing policy-relevant interventions to minimize social exclusion in classrooms. To the best of our knowledge, our is the first study to directly target this issue and show that revealing the extent of social isolation to teachers—coupled with information on its risks and prevention strategies—can effectively reduce both social isolation and antisocial behavior. The intervention is cost-effective with 21 US dollars per student and compares favorably to similar school-based interventions that target student behavior (Hunter et al., 2018; Sorrenti et al., 2024). Second, we developed an innovative measure of antisocial behavior through an incentivized game, which allows us to assess the economic cost of such behavior for a community. Through this simple simulation exercise and the randomized implementation of the intervention, we provide causal evidence that complements the existing literature on the relationship between social cohesion and economic well-being (Alesina and La Ferrara, 2005; Easterly et al., 2006). While the intervention is straightforward and promising, scaling it up may present logistical challenges. Nonetheless, given the importance of healthy peer relationships and positive classroom climates, our findings offer a valuable starting point for further exploring and refining such interventions.

Our paper contributes to several strands of literature. First, we add to the growing body of research on the role of school social climate in shaping children's cognitive and socio-emotional development (Alan et al., 2021; Alan and Kubilay, 2023; Shinde et al., 2018, 2020; Sorrenti et al., 2024). This literature highlights how learning is supported by socio-emotional well-being, which in turn is shaped by behavioral norms, peer relationships, and the broader social fabric of the classroom. Recent studies such as Jackson et al. (2020), Alan and Kubilay (2025), and Gutierrez et al. (2025) underscore the central role of peer interactions in both academic performance and emotional outcomes. By showing that teachers' awareness of classroom social dynamics can significantly affect peer networks and reduce social isolation, our paper offers a complementary perspective on how school climate can be actively shaped through low-cost interventions. Second, we

contribute to the literature showing that socio-emotional skills can be developed within the school context (Alan and Ertac, 2018; Alan et al., 2019; Cappelen et al., 2020; Deming, 2009; Kosse et al., 2020). Our findings reinforce the idea that such skills are malleable and responsive to the school environment, particularly through changes in teacher practices and classroom norms.

Second, we build on research examining the role of teachers in shaping children's beliefs, attitudes, and long-term socio-emotional development. Some of this work has focused on how teacher biases—such as gender or ethnic stereotypes—can influence student outcomes and identity formation (Carlana, 2019; Alan et al., 2023; Alesina et al., 2024). While the literature on teachers' influence on socialization is still emerging, it is increasingly seen as central to educational outcomes (Algan et al., 2013; Chetty et al., 2014; Jackson, 2018; Jackson et al., 2020). Our results show that when teachers are equipped to recognize and respond to social exclusion, they can actively foster more inclusive and supportive peer environments, contributing to this growing strand of research (Gradstein and Justman, 2002). Finally, we contribute to the broader literature linking group cohesion and economic prosperity. By documenting reductions in antisocial behavior and improvements in peer inclusion, we highlight how interventions that build classroom cohesion can have broader communal benefits (Alesina and La Ferrara, 2005; Easterly et al., 2006; Gächter et al., 2023).

The remainder of the paper is organized as follows. Section I describes the evaluation design, including the intervention content and timeline. Section II provides a detailed account of the toolkit used to evaluate the intervention, along with the description of data. Section III presents the main results. Section IV discusses heterogeneity in treatment effects and potential mechanisms. Section V concludes.

I. Evaluation Design

A. Context and the Timeline of the Study

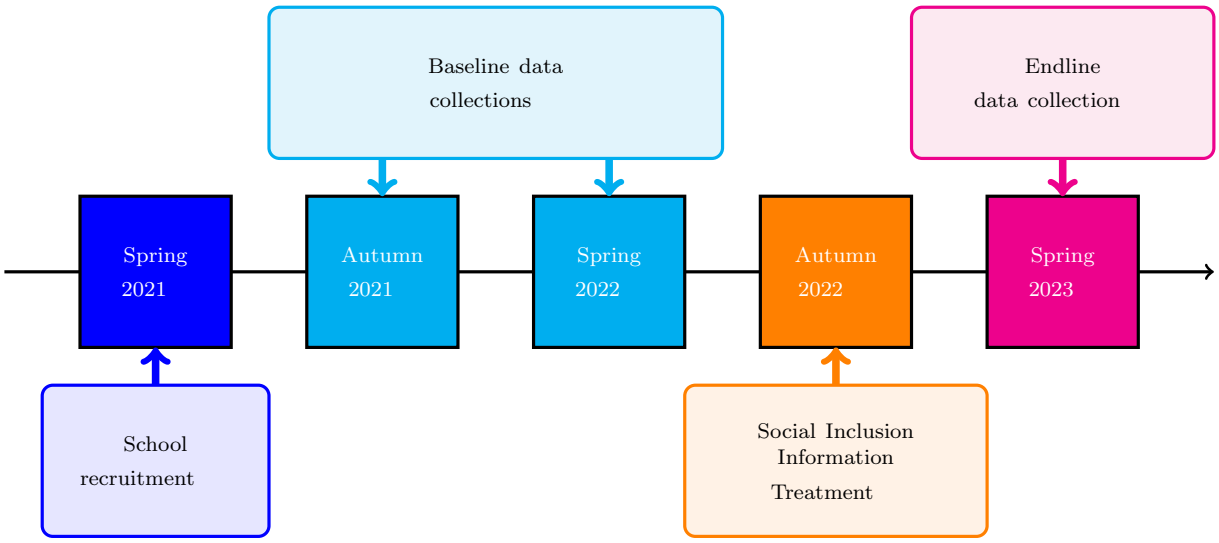
The study was conducted in a sample of Italian elementary schools during the 2022-23 academic year, targeting grade 3 students. Italy provides an ideal context for this research for two reasons. First, the Italian educational system places relatively little emphasis on providing an inclusive learning environment for students. Second, students are generally assigned to classes in grade 1 and remain with the same group of peers and teachers until the end of elementary school in grade 5. Each class may have one or two main teachers responsible for all subjects. This continuity allows teachers to become well acquainted with their students, making it easier to address socialization issues within the classroom.

The intervention was implemented as a clustered randomized control trial (RCT) during the 2022-2023 academic year, with each school as the cluster unit. The sample includes 46 schools across three regions in the North and Center of Italy (Lombardy, Piedmont, and Lazio), comprising 135 classrooms, 239 teachers, and

over 2,500 officially registered students. All schools in our sample initially participated in a training program offered to teachers during the 2021-22 school year, focusing on socio-emotional skills (Development of Social Skills – DeSS) implemented by Professor Zanetti's team at the University of Pavia. Out of 53 DeSS schools, 46 of them chose to participate in our intervention. The randomization for our intervention was conducted at the beginning of the 2022-23 school year, after the DeSS training was completed.

The timeline of the study is as follows: baseline data were collected in October-November 2021, with additional initial information gathered in Spring 2022. The intervention was rolled out from November 2022 to February 2023. Endline data were collected in May 2023. The detailed timeline is presented in Figure 1. Data collection was conducted in person by the research team, with assistance from trained research assistants. Teachers were generally present in the classroom during data collection, but were not involved in the process. We spent two lecture hours in each classroom at baseline (one hour at the beginning and one hour at the end of grade 2) and one hour at endline.

FIGURE 1. TIMELINE OF THE STUDY



B. *Nature of the Intervention*

The intervention implemented in this study is an information treatment with two components. The core component involves providing each teacher with a personalized report, that includes a detailed map of the friendship network within their classroom. To generate these maps, each child was asked at baseline in

grade 2 to discreetly nominate up to three close friends from their classroom. Using these data, we created friendship network maps for each treatment class, which were then shared with the respective teachers in their personalized reports. These reports also contained statistics on social isolation among their students, highlighting the percentage of children who were not nominated as friends by any classmates and those who did not nominate anyone themselves. Additionally, we provided information on how social isolation varied according to parental socioeconomic status and immigrant background.

The second component involves offering general information on the negative effects of social isolation and the importance of preventing it. This included neuroscientific evidence on the impact of social exclusion on the brain (Eisenberger et al., 2003), highlighting that persistent social exclusion can have lifelong effects, with profound negative consequences for an individual's choices and outcomes. We also presented evidence on the correlation between social isolation and children's mental health (Leigh-Hunt et al., 2017). This information was included in the personalized teacher reports and discussed in an online meeting. During this meeting, teachers were also asked about their perceptions of social isolation in their classrooms, and we demonstrated that the actual prevalence was significantly higher than the teachers' perceived prevalence. A generic classroom network map was shown to help teachers interpret these maps accurately. Finally, we encouraged teachers to take proactive steps to prevent persistent social isolation in their classrooms in subtle ways that avoid stigmatization.

We provided practical tips—both in the report and during the online meeting—to promote social inclusion, drawing on strategies grounded in developmental and social psychology. For example, Juvonen et al. (2019) offer a comprehensive rationale for school-based interventions aimed at preventing social isolation and exclusion. In their review of the literature, they show that teacher-led approaches—such as structuring peer interactions, fostering inclusive classroom norms, and training educators to recognize social exclusion—can significantly enhance students' sense of belonging and reduce isolation in elementary school settings. Similarly, Monsen et al. (2014) find that teachers with highly positive attitudes toward inclusion are more likely to adapt their learning, social, and emotional environments to create classrooms that support students with special educational needs.

Research also indicates that cooperative learning practices are linked to increased peer acceptance, liking, and supportive interactions among classmates (Roseth et al., 2008). Strategies such as the jigsaw method and other group-based activities require contributions from all members to achieve both individual and collective goals, thereby fostering positive interdependence and promoting inclusion (Johnson et al., 2013). When teachers deliberately form groups, they can leverage these dynamics to improve intergroup relations and reduce exclusion. However, creating effective cooperative groups first requires that teachers understand the social relationships within their classrooms. In this regard, Farmer

et al. (2019) offer a framework for how teachers can promote social inclusion as part of their routine practice, emphasizing the importance of managing classroom social dynamics to build communities that support the engagement and adjustment of all students. This framework underpins interventions in primary schools that equip teachers to detect and address social exclusion early on through structured peer interactions, inclusive classroom norms, and social-emotional learning. Motivated by these studies, we encouraged teachers to mix students during group activities and to be especially attentive to subtle signs of social exclusion, particularly among vulnerable students.

All teachers in the treatment group received their personalized reports and teachers in 19 out of 22 treatment schools attended the online meeting, representing 60% of all treatment teachers. To monitor the intervention's progress, we created WhatsApp groups with the treatment teachers, encouraging them to share successful activities with the research team. Supplemental Appendix B presents a summary of the intervention report with generic examples and the content of the online meeting.[3]

II. Measurement and Data

A. Descriptive Statistics and Balance

We collected comprehensive baseline data, including demographic information, fluid cognitive ability using Raven's Progressive Matrices (Raven et al., 2004), friendship network data, and measures of prosocial behavior through incentivized cooperation and dictator games (Alan et al., 2025b). The Raven's Progressive Matrices is a widely used test of abstract reasoning and fluid intelligence. While it is known to correlate with academic achievement, it is particularly relevant for our study because it has been shown to predict several socioemotional and behavioral traits and antisocial behavior (Heckman et al., 2006; Rohde and Thompson, 2007; Almlund et al., 2011; Borghans et al., 2016). We collected Raven's scores at baseline primarily to improve statistical precision, anticipating that it would serve as a strong covariate given our limited power.

Additionally, we collected data on teacher characteristics (e.g., years of experience, education), emotional intelligence using the "Reading the Mind in the Eyes Test" (Baron-Cohen et al., 2001) and self-reported inclusive teaching practices. Detailed information on our measurement inventory is provided in Appendix D.[4] We matched the data we collected with administrative data from the Italian Ministry of Education and INVALSI, which include baseline test scores from grade 2, as well as information on gender, and immigration background.

Approximately 15% of students in our sample have an immigrant background, and around one-third have parents with a university degree. The average class

[3]The full intervention package is available upon request.

[4]All data were collected by trained research assistants, extensively trained by the PIs, by visiting the classrooms and spending approximately 2 lecture hour per data collection cycle.

size is 19 students. Most of the teachers in our sample are female (98%); 83% hold tenured contracts; they are, on average, 50 years old, with an average of 19 years of teaching experience.[5] Table 1 presents the balance of baseline characteristics across treatment and control groups, including student demographics (Panel A), baseline network measures (Panels B and C), prosocial games (Panel D), socioemotional and cognitive measures (Panels E and F), classroom and teacher characteristics (Panels G and H). Overall, the randomization was successful; out of 34 tests, only one significant difference was detected at the 5% level (for teachers' eye test).[6] Notably, social isolation is present in our classrooms: approximately 15% of students are socially isolated, meaning that they either stated that they did not have any friend in their classroom or were not nominated as a friend by any of their classmates. However, this high average conceals significant heterogeneity: 31% of immigrant students and 17% of students from low socio-economic backgrounds are socially isolated, compared to 13% of native students and 11% of students from higher socio-economic backgrounds. Additionally, our data corroborate existing evidence that socially isolated children have significantly more negative outcomes in various domains than those who are socially connected.

Using our baseline data, Table 2 presents the correlates of social isolation in the classroom. Socially isolated children have substantially lower mental health and are less likely to feel a sense of belonging at school. Moreover, there is a strong negative correlation between social isolation and ability, measured either with standardized test scores or using Raven's Progressive Matrices. These baseline findings were instrumental in bringing this overlooked issue to teachers' attention and reinforcing the objectives of our intervention, as discussed in Section I.B.

In the next section, we discuss our outcomes of interest, including a detailed account of the incentivized game we designed to measure antisocial behavior.

B. Outcomes

We expect the intervention to influence the way children interact with each other. Given its focus, our primary outcomes center on social isolation and measures of social inclusion. Greater inclusivity may reduce antisocial interactions and/or promote prosocial interactions. Ultimately, stronger social connections

[5]Table A.1 in the Supplemental Appendix compares our sample with the sample of all second-grade students in Italian schools from the year 2022. The data are from the National Evaluation Center (INVALSI). The table shows that our sample aligns very closely with the national sample across all available dimensions.

[6]Imbens and Wooldridge (2009) suggest using the following normalized difference as a scale-free measure of the difference in distributions:

$$\Delta = \frac{\overline{X}_A - \overline{X}_B}{\sqrt{S_A^2 + S_B^2}}$$

where $\overline{X}_A$ and $\overline{X}_B$ are the means of covariates X in groups A and B, and S_A^2 and S_B^2 are the corresponding sample variances of X. We report in the last column of the balance table (Table 1) the normalized difference. For all variables, the normalized difference is well below the threshold of 0.25 suggested by Imbens and Wooldridge (2009).

Table 1—Balance Table

	(1) N	(2) Control Mean	(3) Treatment Mean	(4) Difference (T-C)	(5) SE	(6) p-value	(7) Norm. Diff.
Panel A: Student Demographics							
Female	2536	0.483	0.483	0.001	0.016	0.940	-0.000
Immigrant	2536	0.143	0.163	0.029	0.026	0.274	0.038
Age in months	2482	106.453	106.361	-0.040	0.158	0.801	-0.016
Any learning difficulty/disability	2536	0.206	0.213	0.007	0.021	0.736	0.011
Not autonomous during the survey	2536	0.008	0.010	0.002	0.005	0.766	0.013
Absent at baseline	2536	0.138	0.129	-0.022	0.030	0.470	-0.017
New student in the school	2536	0.014	0.028	0.015*	0.009	0.089	0.070
Father has a university degree	2232	0.286	0.200	-0.083	0.064	0.201	-0.143
Mother has a university degree	2254	0.352	0.284	-0.068	0.063	0.283	-0.103
Panel B: Social Isolation							
Out-Degree (Binary - Reversed)	2176	0.028	0.023	-0.009	0.007	0.178	-0.022
In-Degree (Binary - Reversed)	2176	0.128	0.140	0.004	0.017	0.804	0.025
Total-Degree (Binary - Reversed)	2176	0.149	0.153	-0.007	0.020	0.739	0.008
Panel C: Social Inclusion							
Out-Degree (Continuous)	2482	0.000	-0.006	0.052	0.110	0.641	-0.004
In-Degree (Continuous)	2482	0.000	-0.004	0.034	0.072	0.641	-0.003
Total-Degree (Continuous)	2482	-0.000	-0.005	0.048	0.103	0.641	-0.004
Panel D: Prosocial Games							
Probability of cooperating	2174	0.480	0.494	0.018	0.026	0.489	0.020
Fraction of endowment donated	2176	0.223	0.194	-0.034	0.021	0.119	-0.072
Panel E: Socioemotional Well-being							
Mental Health Index	2173	0.006	-0.029	-0.049	0.048	0.311	-0.024
Belonging to school Index	2175	0.018	-0.011	0.002	0.041	0.965	-0.021
Perception of Teacher Index	2175	0.016	0.086	0.050	0.145	0.734	0.048
Panel F: Cognitive Measures							
Std. Raven score	2176	-0.000	-0.070	-0.043	0.052	0.410	-0.051
Std. Test Score Italian (Invalsi)	2198	0.000	-0.038	-0.005	0.123	0.965	-0.027
Std. Test Score Math (Invalsi)	2172	-0.000	-0.120	-0.115	0.120	0.344	-0.089
Panel G: Classroom Characteristics:							
Classroom Size	135	19.152	19.594	0.418	0.736	0.572	0.099
Immigrant Share	135	0.151	0.164	0.021	0.026	0.416	0.081
Panel H: Teacher Characteristics:							
Female Teacher	239	0.982	0.984	0.001	0.015	0.960	0.015
Teaches Math	229	0.383	0.311	-0.084	0.061	0.174	-0.106
Teaches Italian	229	0.505	0.516	0.012	0.065	0.851	0.017
Fixed Term	235	0.833	0.827	-0.006	0.067	0.930	-0.012
Full time	235	0.880	0.906	0.026	0.048	0.585	0.059
Age	231	50.065	50.669	0.489	1.410	0.730	0.042
Years of experience	233	18.953	19.764	1.278	1.691	0.454	0.050
Has university degree	224	0.505	0.420	-0.121	0.075	0.113	-0.120
Eye test score	228	22.477	23.711	1.268**	0.554	0.027	0.218

Notes: The table presents the randomization balance at baseline. Social inclusion outcomes, cognitive test scores and survey measures are standardized to have a zero mean and a unit standard deviation for the control group. The Difference (T-C), standard errors (SE) and p-values of the equality test are obtained by controlling for randomization strata and clustering standard errors at the school level (unit of randomization). Normalized differences are calculated following Imbens and Wooldridge (2009), and represent scale-free measure of the difference in distributions.

Table 2—Correlation between social isolation and students' characteristics at baseline

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Immigrant	0.186***							
	(0.028)							
Both parents have no university degree		0.051***						
		(0.017)						
Mental well-being			-0.040***					
			(0.008)					
Sense of belonging				-0.042***				
				(0.009)				
Perceived teacher behaviour					-0.007			
					(0.007)			
Std. Test Score Math						-0.040***		
						(0.008)		
Std. Test Score Italian							-0.045***	
							(0.008)	
Std. Raven Score								-0.041***
								(0.008)
Constant	0.125***	0.105***	0.150***	0.151***	0.152***	0.139***	0.137***	0.150***
	(0.008)	(0.012)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Observations	2176	1688	2173	2175	2175	1922	1947	2176
Raw Correlation	0.181	0.071	0.113	0.114	0.019	0.109	0.131	0.112

Notes: The table reports the coefficients from a uni-variate OLS regression of social isolation on respective outcome, all measured at baseline. The social isolation variable is a dummy which takes the value 1 if the student does not nominate a friend or is not nominated by any classmate in the classroom (total-degree isolation). Robust standard errors are in parentheses and raw correlations are presented at the bottom of the table.

within the classroom could enhance students' socio-emotional well-being. To test this hypothesized theory of change, we collected extensive endline data by visiting each classroom in person and spending a lecture hours in each. We detail our outcomes below:

Social Networks. We collected friendship network data to assess social isolation and inclusion. Children were asked to nominate up to three classmates as their best friends in the classroom. Imposing a cap on nominations is a common practice in network data collection (Adams, 2020). We imposed a maximum of three nominations for logistical reasons, including reducing the burden on children. It was made clear to children that they could choose not to nominate anyone if they felt they had no friends in the classroom or could nominate one, two, or three classmates as their best friends. From these nominations, we constructed measures of out-degree and in-degree ties, defined as the number of nominations a student gives and receives, respectively. We report results on: (1) binary measures of out-degree and in-degree ties, indicating whether the child nominates (out-degree) or is nominated (in-degree) by at least one classmate as a best friend. We reversed these measures to reflect social isolation; and (2) normalized continuous out- and in-degree ties that account for class size (measures of social inclusion).[7] We hypothesize that the intervention will reduce the prevalence of social isolation, thereby improve social inclusion in the classroom.

Antisocial Behavior: Sabotage Game. We designed a novel incentivized game to measure antisocial behavior among children. The game involves a tournament to earn gift tokens, by allowing children to engage in costly sabotage behavior to gain unfair advantage against their opponent. Specifically, pairs of children are randomly formed and anonymously compete in a mathematical task. The player who answers the most questions correctly in two minutes receives one gift token per correct answer, while their opponent receives zero tokens, regardless of their own performance. Tokens can later be exchanged for small gifts, such as toys and colorful stationery items, which are valuable to children of this age. After the competition, before learning their performance outcome, all students receive five bonus tokens (endowment). They can use these tokens to sabotage their opponent by canceling correct answers, at a cost of one bonus token per cancellation. Each player can cancel up to five of their opponent's correct answers, thereby increasing their own chances of winning the tournament.

The experimenter provided several examples and asked questions to ensure that children understood the implications of their decisions, including the option of not canceling any answers, which would allow them to keep all five tokens. The exact wording of the question is: "How many correct answers from your partner do you want to delete?" Following this, they were asked a question with an ethnic twist: "The classmate you are paired with could be someone whose parents are not Italian. How many correct answers from your partner do you want to delete?

[7] We divide the continuous measures of in-degree and out-degree ties by the total number of nodes minus one (Badham, 2013; Azzimonti and Fernandes, 2023).

Indicate your choice on the tablet." We explained that only one of these questions would be used to determine their final payment.[8]

We define antisocial behavior as the propensity to engage in sabotage behavior. To measure this, we construct a binary variable indicating whether a student cancels an opponent's correct answers, and a continuous variable using the fraction of their sabotage endowment used. Note that this sabotage game is a coordination game with multiple personal and social dimensions affecting decision-making. Our goal was not to establish rationality or to study correlates of sabotage behavior, but to assess whether a targeted intervention can reduce antisocial behavior, specifically, the destruction of performance-based payoffs, and thereby improve overall group outcomes. The game structure involves a clear trade-off: sabotage reduces one's own payoff but may increase the chance of winning by harming a potentially stronger opponent. This means sabotage can be seen as instrumentally rational in some belief configurations, but it also entails group-level economic and social costs.

In addition to individual behavior, the game allows us to quantify the economic cost of antisocial actions. In this context, economic waste in the classroom is represented by the total number of canceled correct answers. We assess the intervention's effect on economic waste using familiar economic aggregates considering the classroom as a community. This approach allows us to demonstrate the causal impact of antisocial behavior on economic well-being and inequality within a group.

Prosocial Behavior: Cooperation and Dictator Games. Our cooperation game, a version of a one-shot prisoner's dilemma, involves two participants being anonymously paired. We designed this game so that both participants are endowed with three tokens and must choose a card simultaneously—either green or orange. The payoff depends on both participants' choices. If both choose orange, each retains their initial endowment of three tokens. If they choose different colors, the player who chooses orange triples their tokens to nine, while their partner loses all their tokens. If both choose green, they double their endowments to six tokens. The cooperative action is to choose the green card.

After playing the cooperation game, we implemented a simple donation (dictator) game. For this, students were given four tokens and asked whether they would like to donate any of their tokens to an anonymous child from another school we did not visit so they did not have a chance to get gifts from us. Our outcomes in this game are the probability of donation and the fraction of endowment donated. We expect the treatment to increase the likelihood of cooperation and donation. At endline, the games were played in the following order: the cooperation game, the sabotage game, and finally, the dictator (donation) game. The dictator game was unrelated to the previous two, and children were informed of this.

Both the cooperation and sabotage games could, in principle, be designed as re-

[8]The verbatim instructions are available in the Supplemental Appendix C.

peated games to assess the role of learning. However, we chose to implement them as one-shot games due to limited classroom time and to avoid student fatigue. We also judged that the difference between a repeated and a one-shot game was unlikely to interact meaningfully with treatment status, and thus would not bias the interpretation of treatment effects. Instead, we devoted considerable class time to ensuring that students fully understood the games before making decisions. While it is possible that some students may not have fully grasped the games despite these efforts, we do not expect systematic differences in understanding between the treatment and control groups.

Social and Emotional Well-being. We assessed children's social and emotional well-being through a series of item-response questions. These items were aggregated to measure various dimensions of well-being, specifically mental well-being, sense of belonging at school, and perceived support from math and Italian teachers. We constructed standardized indices for each of these outcome domains, as well as on their overall average. The survey instruments used at baseline and endline are detailed in Appendix Table D.1.

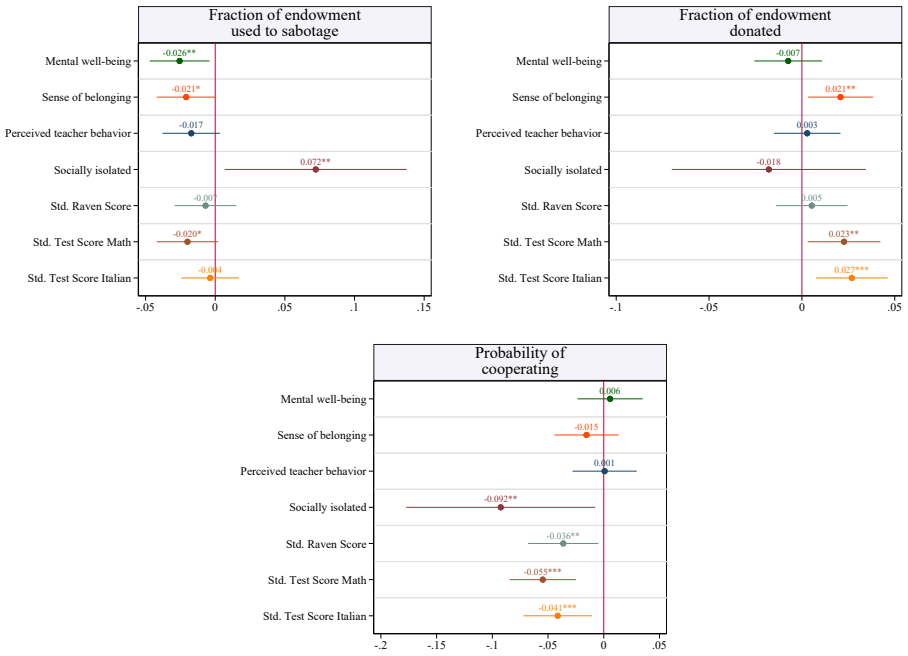
We explore the predictive validity of decisions made in our incentivized games within our context. Figure 2 shows the correlations of these decisions with various indicators of social and emotional well-being. Overall, the decisions in these games capture a range of relevant attributes in children. For example, the sabotage decision is highly predictive of lower mental health, lower sense of belonging to school, negative perception of teachers and social isolation, while not correlated with fluid IQ (Raven score). Similarly, donating is highly correlated with the sense of belonging and with the standardized test scores. The cooperation game has very little predictive validity on indicators of social and emotional well-being relative to the other two games. Choosing the cooperative action is negatively correlated with fluid IQ as in Alan et al. (2021) and with the performance in the standardized test score.

Our hypothesis is that the intervention will reduce antisocial behavior, as measured by sabotage decision in the tournament, and improve prosociality, as measured by decisions in the cooperation and donation games. We acknowledge that neither of the games captures all aspects of the constructs we aim to describe. In the case of sabotage game for example, we aim to capture an aspect of antisocial behavior that involves being insensitive to a friend's effort for own advantage. There are many different forms of antisocial behavior ranging from being insensitive to someone's emotional states to verbal or physical abuse and more.[9] Similarly, there are many forms of prosocial behavior other than cooperation and willingness to donate. Nevertheless, as suggested by the experimental literature

[9]Moreover, it is possible that the intervention made students more optimistic about their own abilities, leading to increased confidence—that is, feeling less need to sabotage, alongside viewing sabotage as an antisocial act. However, we see no strong reason to expect the intervention to meaningfully change beliefs about individual ability, given that it focused solely on classroom social dynamics and the risks of social isolation, without any content related to academic self-assessment. Still, if such a belief-update channel were present, any estimated decline in sabotage behavior could partially reflect these updated beliefs.

and correlations we present in Figure 2, these measures are informative about one's social and emotional health and cognitive capacity, albeit imperfectly (Alan and Kubilay, 2024; Bhat et al., 2022; Krupka and Weber, 2013; Haushofer et al., 2023).[10]

FIGURE 2. PREDICTIVE VALIDITY OF THE INCENTIVIZED MEASURES OF PRO AND ANTI SOCIAL BEHAVIOR



Notes: The figure depicts the predictive power of sabotage, cooperation and donation games, using Raven's scores, standardized test scores, social isolation, mental well-being, sense of belonging, and perception of teacher indices. The sample includes students surveyed at endline and part of the control group. The first panel presents correlations for the fraction of endowment used to sabotage the opponent, the second panel presents correlations for the donation decision, and the third panel presents the correlations for the cooperative decision. Estimates are obtained by regressing the respective decision on each variable shown. 95% confidence intervals are obtained via robust inference.

III. Results

A. *Empirical Strategy*

We estimate the effect of the intervention on outcomes of interest by conditioning on baseline covariates and randomization strata fixed effects using the

[10]We find that the same patterns of predictive validity hold when we replicate the analysis using the full sample (Appendix Figure A.1).

following model:

$$y_{ics} = \alpha_0 + \alpha_1 T_s + X'_{ics}\beta + Z'_{cs}\gamma + \delta_j + e_{ics} \quad (1)$$

where y_{ics} is the outcome for individual i, in classroom c and in school s. T_s is a binary indicator that defines the treatment status, equal to 1 if school s belongs to the treatment group and 0 otherwise. X'_{ics} is a vector of controls for student i, which includes the outcome variable at baseline when available, age, gender, migrant status, Raven's score measured at baseline, parents' education levels, national standardized test scores (INVALSI), and binary indicators for children with learning difficulties, children who were absent at baseline or joined the school in grade 3. Z'_{cs} is a vector of class-level controls, including class size, the share of migrants in the class, teachers' characteristics (e.g., years of experience, level of education, Eyes Test Score, and binary indicators for full-time and fixed-term contracts).

δ_j represents strata fixed effects, which account for (i) participation in the DeSS treatment in the first or second round, and (ii) geographic area (North vs. Center regions). Standard errors are clustered at the school level, which is the unit of randomization. We also provide wild bootstrapped p-values to account for the small number of clusters (Cameron et al., 2008). Given imperfect compliance by teachers, the parameter of interest α_1 should be interpreted as the Intent-to-Treat (ITT) effect.

For robustness, in Appendix Figure A.2, we also report results using a basic set of controls, including strata and experimenter fixed effects, class size, and the share of migrant students. Appendix Figure A.3 reports results using only strata fixed effects. Since not all children present at baseline were available at endline during our classroom visits, Appendix Figure A.4 presents results using inverse probability weights to account for endline attrition, which is independent of treatment status (p-value=0.986), as shown in Appendix Table A.2.

B. Treatment effects on Social Isolation and Social Inclusion

We begin by investigating whether the intervention had any impact on the socialization structure in the classroom. Columns 1 to 3 of Table 3 present the estimated treatment effect on social isolation. Column 1 presents the results for out-degree centrality, where social isolation is measured by whether a student chose the option "I have no friends in the classroom." Column 2 shows in-degree centrality, which reflects whether a student was not nominated by any classmates. Column 3 combines both out-degree and in-degree measures into a total degree centrality, indicating if a student was isolated in either dimension. The last three columns present the effects of the intervention on social inclusion by examining the number of friendship links each student has, using out, in, and total degree measures. Social inclusion measures are standardized to have a mean of zero and

a standard deviation of one for the control group, so the effects are reported in standard deviation units.

In the control group, 3% of untreated children did not nominate any classmates as friends, and about 13% did not receive any nominations. The intervention resulted in a 1.5 percentage point reduction in out-degree isolation, which implies a 50% relative effect. The estimated effects on in-degree and total-degree isolation are smaller—10% and 15% relative effects, respectively—and do not reach statistical significance at conventional levels. Our three-nomination cap may have contributed to the non-significant in-degree isolation results. If there had been no cap, it is possible that some students who received no nominations under the cap might have received some nominations. To the extent that additional nominations would be more likely in treatment classrooms, the cap could lead us to underestimate the treatment effect on in-degree ties. Nevertheless, the positive impact of the intervention on the classroom network structure is further reflected in the measures of social inclusion. We observe statistically significant increases in all metrics: a 0.11 and 0.08 standard deviation increase in, respectively, normalized out-degree ties and in-degree ties and a 0.11 standard deviation increase in total-degree ties, which corresponds to an increase of 0.19 in and out degree ties in a class of 20 students.

These results indicate that the intervention effectively reduced social isolation and increased friendship ties within the classroom.[11]

C. Treatment effects on antisocial and prosocial behaviors

It appears that the intervention was effective in reducing social isolation and increasing friendship ties in the classroom. Our next question is whether this success is accompanied by a reduction in antisocial behavior and/or improvement in prosocial behavior among treated children. Columns 1 and 2 of Table 4 present the estimated treatment effects on the decisions in the sabotage game. In the control group, 71% of children engaged in sabotage behavior, meaning that they canceled at least one correct answer of their opponent. They used 35% of their sabotage endowment, resulting in, on average, approximately 1.75 correct answers canceled. Compared to the control group, the intervention led to a 7.6 percentage point reduction in the likelihood of canceling an opponent's correct answers, which represents an 11% relative treatment effect, and is statistically significant at the 1% level. Additionally, treated students used about 11% less of their sabotage endowment to cancel correct answers. Similar patterns are observed in the version of the game where children were informed that their opponent might have foreign-born parents. The estimated treatment effects are not statistically different from each other (see Appendix Table A.3).

[11] We also examined whether the intervention increased the number of reciprocal ties but did not find a significant effect. An interesting direction for future research would be to assess the impact on friendship intensity; however, we do not have a measure of intensity in our data and leave this question for future work.

Table 3—Treatment Effects on Social Isolation and Inclusion

	Social Isolation			Social Inclusion		
	(1) Out-Degree Binary	(2) In-Degree Binary	(3) Total-Degree Binary	(4) Out-Degree Continuous	(5) In-Degree Continuous	(6) Total-Degree Continuous
Treatment	-0.015*	-0.011	-0.020	0.106*	0.076**	0.102**
	(0.008)	(0.013)	(0.015)	(0.061)	(0.035)	(0.051)
Control Mean	0.03	0.13	0.15	-0.00	0.00	0.00
Observations	2218	2218	2218	2219	2219	2219
Wild bootstrapped p-values	0.066	0.504	0.238	0.142	0.062	0.092

Notes: The table reports the estimated treatment effects on social isolation and social inclusion. Dependent variables in columns 1 and 2 are binary indicators equal to one if, respectively, the Out-Degree and In-Degree are equal to 0. The dependent variable in column 3 is a binary indicator that takes value 1 if at least one of Out-Degree and In-Degree is equal to 0. Dependent variables in columns 4 to 6 are, respectively, the normalized number of Out-Degree ties, In-Degree ties, and Total-Degree ties (In-Degree + Out-Degree) standardized relative to the control group. Regressions (OLS) include strata fixed effects (FE), enumerator FE, the value of the outcome collected at baseline, the share of immigrants in the class, Raven's score, standardized test scores, gender, immigrant status, parental education, age in months, binary variables identifying students with a reported disability or learning disorder, students who were not autonomous during the survey data collection, students with a special teacher support, students who were absent at baseline or new in the school at endline, class size, binary indicators identifying whether the teacher is a math, Italian, or other subject teacher, as well as their gender, age, years of experience, level of education, eye test score, and binary indicators for holding a full-time or fixed-term contract. Standard errors are in parentheses and clustered at the school level (unit of randomization). The last row reports wild cluster bootstrap p-values calculated following Cameron et al. (2008).

In terms of prosocial behavior, around 40% of students chose the cooperative action in our cooperation game, while 56% donated a portion of their donation endowment. We estimate precise null treatment effects for our prosociality outcomes. These findings suggest that the impact of the intervention is primarily evident in reducing antisocial behavior rather than enhancing prosocial acts among treated children. This result is not necessarily contradictory, as reducing antisocial behavior does not inherently lead to an increase in prosocial behavior. The two behaviors may be driven by distinct mechanisms, and changes in one does not automatically trigger changes in the other (Krueger et al., 2001). However, the reverse relationship may hold: increases in prosocial behavior often involve a reduction in antisocial behavior as documented in Alan et al. (2021).

Table 4—Treatment Effects on Antisocial and Prosocial Behaviors

	Antisocial Behaviours		Prosocial Behaviours		
	(1) Probability of Cancelling	(2) Fraction of endowment used	(3) Probability of Cooperating	(4) Probability of Donating	(5) Fraction of endowment donated
Treatment	-0.076***	-0.037**	0.002	-0.000	-0.006
	(0.019)	(0.016)	(0.031)	(0.027)	(0.019)
Control Mean	0.71	0.35	0.40	0.56	0.25
Observations	2217	2217	2218	2218	2218
Wild bootstrapped p-values	0.000	0.032	0.964	0.976	0.756

Notes: The table reports the estimated treatment effects on antisocial behavior, measured using the decisions in the sabotage game, and prosocial behavior, measured using the decisions in cooperation and donation games. The dependent variable in column 1 is a binary indicator that takes value 1 if the child chooses to cancel her opponent's correct answers and zero otherwise; in column 2: is the fraction of sabotage endowment used (out of 5 tokens) for canceling; in column 3: is the binary variable that takes the value 1 if the child chooses the cooperative action in the prisoner's dilemma game; in column 4: is a binary indicator that takes the value 1 if the child chooses to donate at least one of her 4 tokens; in column 5: is the fraction of tokens donated out of 4 tokens. Regressions (OLS) include strata fixed effects (FE), enumerator FE, the value of the outcome collected at baseline (when collected), the share of immigrants in the class, Raven's score, standardized test scores, gender, immigrant status, parental education, age in months, binary variables identifying students with a reported disability or learning disorder, students who were not autonomous during the survey data collection, students with a special teacher support, students who were absent at baseline or new in the school at endline, class size, binary indicators identifying whether the teacher is a math, Italian, or other subject teacher, as well as their gender, age, years of experience, level of education, eye test score, and binary indicators for holding a full-time or fixed-term contract. Standard errors are in parentheses and clustered at the school level (unit of randomization). The last row reports wild cluster bootstrap p-values calculated following Cameron et al. (2008).

Economic Implications of Antisocial Behavior: The consequences of social exclusion and antisocial behavior extend beyond the individuals directly affected. They may also impair learning, which is increasingly understood as a social process. School climate matters not only for fostering individual skills but also

for enabling peer interactions and knowledge spillovers. Disruptive and antisocial behavior can severely hinder these peer learning dynamics (Goulas et al., 2024; Santavirta and Sarzosa, 2019). Recent research supports this view. Jackson et al. (2020) highlights the importance of school climate for academic outcomes. Alan et al. (2025a) provide causal evidence that behavior management interventions improve the performance of high-ability students by strengthening peer academic support networks and enabling knowledge diffusion. These findings suggest that unchecked antisocial behavior may impose substantial social costs by weakening classroom peer networks and disrupting informal learning channels.

Although these broader social learning costs are difficult to quantify in our context, our sabotage game allows us to simulate and measure the economic and social justice consequences of antisocial behavior within a classroom community. In our context, a classroom can function as a community and correct answers represent the output generated by the efforts of its members. It follows then that the sabotage behavior leads to economic waste (destruction of output) for the community: the more prevalent the anti-social behavior the more economic waste the community incurs. To show this quantitatively and in a causal manner, we perform a simulation exercise. Using the empirical distribution of actual decisions, we simulate expected payoffs for each student by randomly matching them with classmates multiple times (with replacement). Using these payoffs, we calculate key economic aggregates to measure classroom wealth and inequality relative to other classrooms. We focus on the following aggregates: per-capita payoffs, minimum and maximum payoffs, and the Gini coefficient as measures of economic well-being and inequality. We obtain these aggregates under two scenarios: one where sabotage is not possible, termed the "Ideal World," and another where sabotage is allowed, referred to as the "Actual World."

Figure 3 illustrates the average simulated payoffs in both scenarios across treatment groups. As expected, in the "Ideal World," where payoffs are calculated before sabotage decisions, all aggregate outcomes are similar across treatment groups, as randomization ensures balanced task performance. However, when sabotage is allowed, average, minimum, and maximum payoffs are significantly lower due to the economic waste created by output destruction (i.e., canceled correct answers). Specifically, in the control classrooms, per-capita payoffs decrease by 22%, and the Gini coefficient increases by 12% when sabotage is permitted. Nevertheless, treated classrooms achieve significantly higher per-capita payoffs in this scenario and exhibit lower inequality. This improvement in equality in treated classrooms is largely due to higher minimum payoffs compared to untreated classrooms. Treated classrooms have a 26% higher minimum payoff than untreated classrooms while we detect no treatment effect on maximum payoffs. Panel A of Appendix Table A.4 provides classroom-level regression results.[12]

The design of the sabotage game allows participants to undermine their op-

[12]Panel C of Appendix Table A.4 reports the same effects for the outcome that has the immigrant reference.

ponents' performance, creating economic waste. Therefore, the lower prosperity and elevated inequality in such a scenario are expected. Admittedly, antisocial behavior within a group can negatively impact individual productivity in multiple ways, not just through direct performance sabotage. Nevertheless, this exercise, while straightforward, provides causal evidence that reducing antisocial behavior and fostering a more inclusive environment can enhance the well-being of a community in a broader context. This is particularly important as most evidence on the link between social cohesion and economic well-being is correlational (Easterly et al., 2006).

In sum, the intervention lowered the prevalence of social isolation in the classroom and reduced anti-social behavior without any notable effect on prosocial behavior. These findings are supported, albeit weakly, by our survey results. Table 5 presents the estimated effects on three indices described in Section II.B: mental well-being, sense of belonging to school, and perception of teacher behaviour (columns 1 to 3). Column 4 reports the estimate of an average index comprising all three indices. While all coefficients are positive, suggesting improvements ranging from 0.04 to 0.1 standard deviations, estimates lack precision. Notably, the largest estimated effect is observed for the sense of belonging to school, indicating that treated students feel less lonely at school, which is consistent with the results on social inclusion.

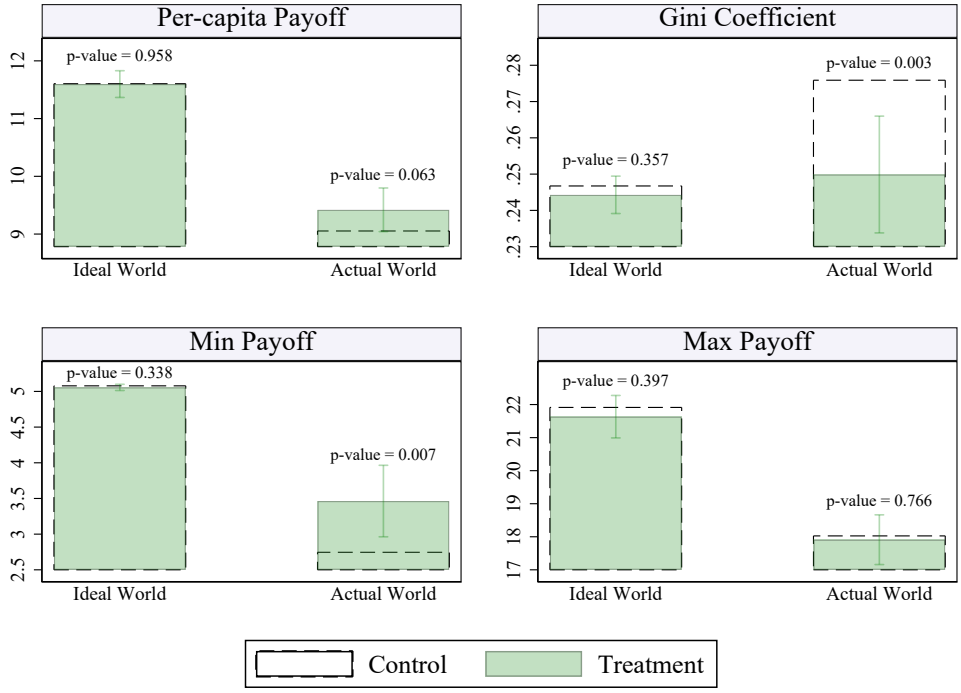
Table 5—Treatment Effects on Socio-emotional Well-being

	(1) Mental well-being	(2) Sense of belonging	(3) Perceived teacher behavior	(4) Wellbeing Index
Treatment	0.049	0.103	0.038	0.074
	(0.046)	(0.065)	(0.060)	(0.061)
Control Mean	0.00	0.00	0.00	0.00
Observations	2216	2213	2216	2216
Wild bootstrapped p-values	0.352	0.204	0.622	0.316

Notes: The table reports estimated treatment effects on the indices of mental well-being, sense of belonging, and perceived teacher behavior of students. The average index in column (4) is the average of the nonstandardized indices in columns (1) to (3), standardized relative to the control group. Regressions (OLS) include strata fixed effects (FE), enumerator FE, the value of the outcome collected at baseline, the share of immigrants in the class, Raven's score, standardized test scores, gender, immigrant status, parental education, age in months, binary variables identifying students with a reported disability or learning disorder, students who were not autonomous during the survey data collection, students with a special teacher support, students who were absent at baseline or new in the school at endline, class size, binary indicators identifying whether the teacher is a math, Italian, or other subject teacher, as well as their gender, age, years of experience, level of education, eye test score, and binary indicators for holding a full-time or fixed-term contract. Standard errors are in parentheses and clustered at the school level (unit of randomization). The last row reports wild cluster bootstrap p-values calculated following Cameron et al. (2008).

To summarize our main results and to account for multiple hypothesis inference, we constructed four distinct indices that capture the key domains targeted by the

Figure 3. Treatment effects on classroom-level economic aggregates



Notes: The figure depicts differences in classroom aggregates between treatment and control, with white bars representing control means and green bars representing treatment means. In all four panels, the first set of bars corresponds to the assumption that sabotage was not allowed, referred to as the "Ideal World." The second set of bars represents the scenario where sabotage was allowed, referred to as the "Actual World." To calculate the aggregates, we first calculated expected payoffs for each student by randomly pairing them with a classmate (with replacement). A student's payoff was determined based on their performance, sabotage decision, and that of their pair. This procedure was repeated 500 times. We then calculated aggregate quantities for each classroom, including per-capita payoff, Gini coefficient, maximum payoff, and minimum payoff. The bars in the figure are derived through OLS regression, controlling for strata fixed effects (FE), enumerator FE, the share of immigrants in the class, Raven's score, standardized test scores, gender, parental education, age in months, binary variables identifying students with a reported disability or learning disorder, students who were not autonomous during the survey data collection, students with a special teacher support, students who were absent at baseline or new in the school at endline, class size, binary indicators identifying whether the teacher is a math, Italian, or other subject teacher, as well as their gender, age, years of experience, level of education, eye test score, and binary indicators for holding a full-time or fixed-term contract. Since the regressions are conducted at the class level, individual-level controls are averaged at the class level. P-values are clustered at the school level (unit of randomization).

intervention: (i) social isolation, based on in- and out-degree ties and binary measures derived from friendship networks; (ii) antisocial behavior, based on decisions in the sabotage game; (iii) prosocial behavior, based on decisions in the cooperation and dictator games; and (iv) a well-being index, as discussed above. Figure 4 presents the estimated treatment effects on these composite indices.[13] Consistent with our earlier discussion, we find a significant reduction in antisocial behavior (a 0.15 standard deviation decline, significant at the 1% level) and a significant increase in the social inclusion index (a 0.11 standard deviation increase, significant at the 5% level). In the next section, we examine these effects in greater depth and explore whether the treatment had differential impacts across student subgroups.

IV. Heterogeneity in Treatment Effects and Potential Mechanisms

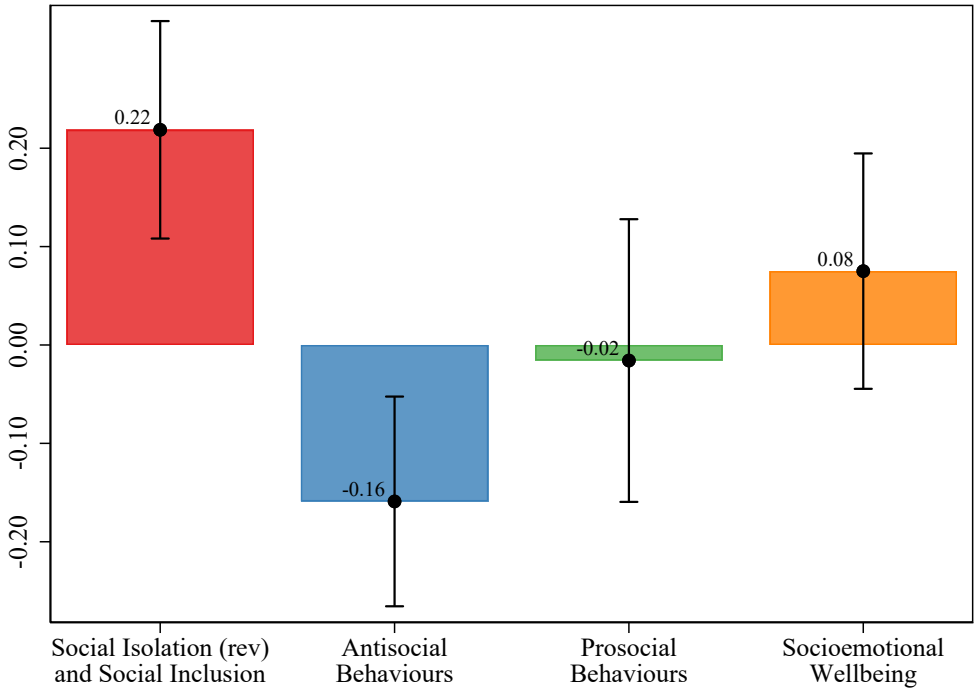
A. Heterogeneity in Treatment Effects

The intervention we evaluated provided teachers with detailed insights into the social dynamics of their classrooms, specifically identifying socially isolated children and highlighting the potential risks associated with social exclusion. Since the main objective was to help integrate socially isolated students into daily classroom life and reduce feelings of rejection and loneliness, we estimate heterogeneous treatment effects based on baseline social isolation, migrant background, and socioeconomic status. For this analysis, we use the composite indices presented in Figure 4 to conserve space. Disaggregated heterogeneity analyses can be found in Supplemental Appendix A.

Figure 5 presents our first set of heterogeneity results. The figure plots the estimated treatment effects for each subgroup, along with their 95% confidence intervals. Between each pair of estimates, we report the p-value for the difference in treatment effects between the two groups. We find that the effects on social isolation and antisocial behavior are notably stronger for students who were socially isolated at baseline and for those from low socioeconomic backgrounds. While we also observe reductions in antisocial behavior among students with an immigrant background, we do not see corresponding improvements in social inclusion for this group. In fact, the intervention was more effective at reducing social isolation among native students, though we cannot reject the equality of the effects across immigrant status.

[13]For each of the first three bars in Figure 4, we first standardized all component measures within each construct relative to the control group. We then took the average of these standardized values and standardized the resulting composite index again relative to the control group. Specifically: the first bar (social isolation and inclusion) uses reverse-coded measures of social isolation and direct measures of social inclusion; the second bar (antisocial behavior) combines the standardized probability of canceling and the standardized fraction canceled in the sabotage game; the third bar (prosocial behavior) includes the standardized probability of cooperating, donating, and the fraction donated; the fourth bar represents socio-emotional well-being. For this index, we first summed responses within each subdimension (mental health, sense of belonging, and perceived teacher support), create an aggregate average index across these three dimensions, and then standardized the resulting index relative to the control group.

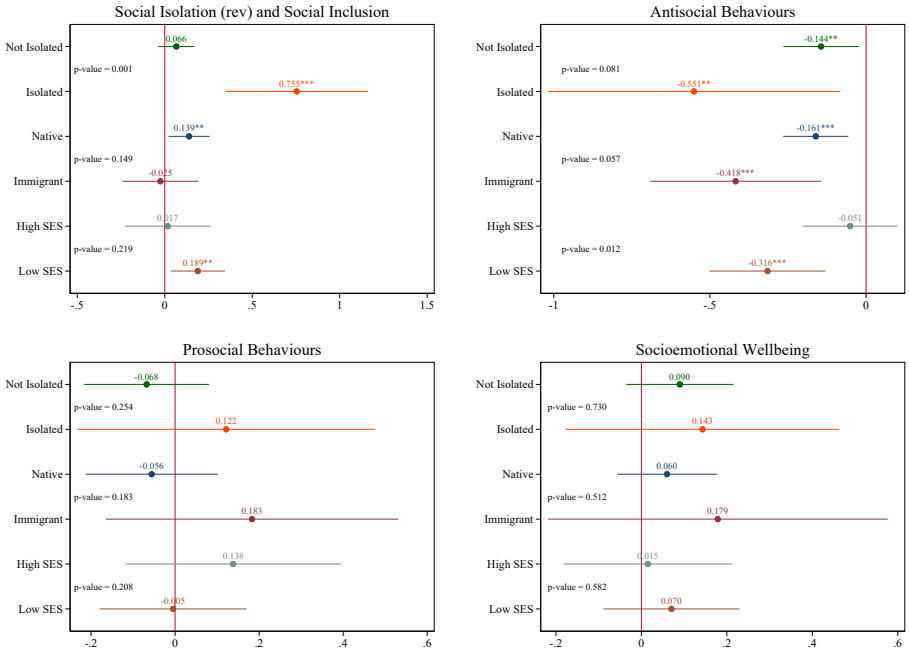
Figure 4. Estimated Treatment Effects - Composite Outcome Indices



Notes: The figure presents the estimated treatment effects on the average indices for each construct. For each of the first three bars, we first standardized all component measures within each construct relative to the control group. We then took the average of these standardized values and standardized the resulting composite index again relative to the control group. Specifically: the first bar (social isolation and inclusion) uses reverse-coded measures of social isolation and direct measures of social inclusion; the second bar (antisocial behavior) combines the standardized probability of canceling and the standardized fraction canceled in the sabotage game; the third bar (prosocial behavior) includes the standardized probability of cooperating, donating, and the fraction donated; the fourth bar represents socio-emotional well-being. For this index, we first summed responses within each subdimension (mental health, sense of belonging, and perceived teacher support), create an aggregate average index across these three dimensions, and then standardized the resulting index relative to the control group. Regressions (OLS) include strata fixed effects (FE), enumerator FE, the value of the outcome collected at baseline, the share of immigrants in the class, Raven's score, standardized test scores, gender, immigrant status, parental education, age in months, binary variables identifying students with a reported disability or learning disorder, students who were not autonomous during the survey data collection, students with a special teacher support, students who were absent at baseline or new in the school at endline, class size, binary indicators identifying whether the teacher is a math, Italian, or other subject teacher, as well as their gender, age, years of experience, level of education, eye test score, and binary indicators for holding a full-time or fixed-term contract. Standard errors are clustered at the school level (unit of randomization).

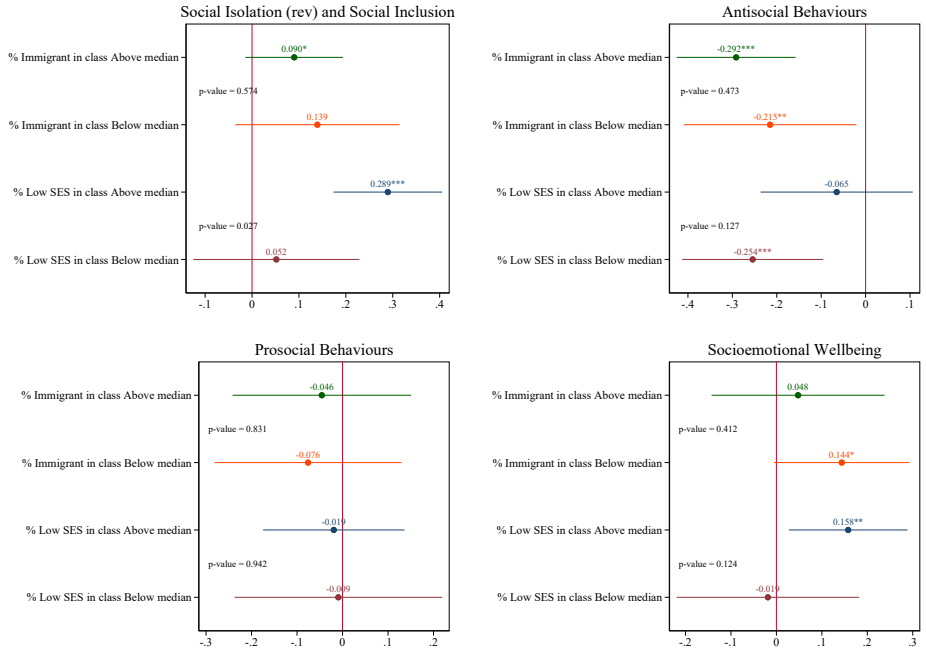
This pattern may reflect the added challenges of fostering cohesion in inter-ethnic environments, even when classroom language barriers are reduced. Social connections are shaped not only by in-school interactions but also by out-of-school opportunities, which are often mediated by parental networks. If immigrant families are more socially segregated, their children may have fewer opportunities to build on classroom connections outside of school. This may help explain why the intervention's effects on social inclusion were more limited for immigrant students, despite gains observed in other groups.

FIGURE 5. HETEROGENEOUS TREATMENT EFFECTS



Notes: The figure shows the treatment effects on the outcome reported on top of each panel. Each coefficient is from a different regression for subgroups of students based on social isolation status, native vs. migrant, and low vs. high SES. High SES is a binary indicator equal to one if at least one parent has a university degree. We include the 95 percent confidence interval calculated with standard errors clustered at the school level (unit of randomization). We report the p-value testing whether the treatment effect is different across subgroups in a fully saturated regression. Regressions (OLS) include strata fixed effects (FE), enumerator FE, the share of immigrants in the class, Raven's score, standardized test scores, gender, immigrant status and parental education controls (when relevant in the model), age in months, binary variables identifying students with a reported disability or learning disorder, students who were not autonomous during the survey data collection, students with a special teacher support, students who were absent at baseline or new in the school at endline, class size, binary indicators identifying whether the teacher is a math, Italian, or other subject teacher, as well as their gender, age, years of experience, level of education, eye test score, and binary indicators for holding a full-time or fixed-term contract.

FIGURE 6. HETEROGENEOUS TREATMENT EFFECTS



Notes: The figure shows the treatment effects on the outcome reported on top of each panel. Each coefficient is from a different regression for subgroups of students based on the above/below median percentage of immigrant classmates and the above/below median percentage of low SES in the class. We include the 95 percent confidence interval calculated with standard errors clustered at the school level (unit of randomization). We report the p-value testing whether the treatment effect is different across subgroups in a fully saturated regression. Regressions (OLS) include strata fixed effects (FE), enumerator FE, the share of immigrants in the class, Raven's score, standardized test scores, gender, immigrant status and parental education controls (when relevant in the model), age in months, binary variables identifying students with a reported disability or learning disorder, students who were not autonomous during the survey data collection, students with a special teacher support, students who were absent at baseline or new in the school at endline, class size, binary indicators identifying whether the teacher is a math, Italian, or other subject teacher, as well as their gender, age, years of experience, level of education, eye test score, and binary indicators for holding a full-time or fixed-term contract.

As with the overall results, we do not find significant treatment effects on prosocial behavior or socio-emotional well-being, nor do we detect heterogeneity in these domains.[14]

As a second set of heterogeneity analyses, we explore whether the ethnic and socio-economic composition of the classroom influences the size of the treatment effects. There are a few reasons why one can expect heterogeneity based on classroom composition. First, classrooms with a higher share of marginalized

[14]Appendix Figures A.5, A.6 and A.7 reports for completeness the heterogeneity results on each variable used to construct the indexes, suggesting overall a similar pattern.

students, such as those from immigrant or low-SES backgrounds, may have weaker baseline peer ties or higher levels of social exclusion. In such contexts, exclusion may be harder for teachers to detect or more normalized. Revealing these patterns through our intervention may therefore be more salient and more likely to prompt change in teacher or student behavior.

Second, research in social psychology and education highlights the role of social identity and group dynamics in peer relationships. In more homogeneous classrooms, students may more easily form inclusive ties. In contrast, in more diverse classrooms, subtle biases or weaker shared norms may hinder integration. As a result, the effectiveness of an inclusion-focused intervention may vary depending on baseline cohesion and classroom diversity. Third, behavioral norms around cooperation and prosociality may differ by classroom composition. If behaviors like sabotage are more tolerated, or less noticed, in certain settings, the intervention may have more scope to reset expectations and norms in those classrooms. While these explanations are speculative, they are consistent with findings in the literature on peer effects, social preferences, and identity in classrooms (e.g., Akerlof and Kranton (2002); Carrell et al. (2013); Bayer et al. (2019).

Figure 6 presents estimated treatment effects separately for classrooms with below- and above-median shares of immigrant students and of low-SES students, using the same composite indices introduced earlier.

Regarding immigrant composition, we observe a significant decline in antisocial behavior in both below- and above-median immigrant share classrooms, with the decline being somewhat larger in the latter. Both types of classrooms also exhibit greater improvements in social inclusion with no statistically differential effects. We find stronger and more consistent treatment effects in social inclusion, as well as in socio-emotional well-being outcomes, in classrooms with an above-median share of low-SES students.

Overall, while the results comparing classrooms with different immigrant shares do not provide consistent evidence of treatment effect heterogeneity, the patterns by classroom-level SES composition appear more salient. That said, as emphasized by Szaszi et al. (2022), Conaway et al. (2024), and Tipton (2021), findings from heterogeneity analyses under limited statistical power, especially when based on cluster-level variables such as classroom composition, should be interpreted with caution. We view these results as exploratory and suggestive, offering possible directions for future research in interdisciplinary education studies.[15]

B. Potential Mechanisms

Given the results discussed above, our next question is: what specific actions did teachers take to reduce social isolation and address antisocial behavior in their classrooms after receiving the treatment? One plausible strategy may have been

[15]Appendix Figures A.8, A.9 and A.10 reports the heterogeneity results on each variable used to construct the indexes.

deliberately mixing students for group work, rather than allowing them to self-select into groups. Self-selection often results in ability-based clustering, which is frequently associated with factors such as migrant status and socioeconomic background in primary schools (Juvonen et al., 2019). Our conjecture is that treated teachers made extra effort to include isolated children into the collective classroom activities. Our teacher survey data support this hypothesis. At the endline, we asked teachers about their inclusivity practices through the following questions: "I allow students to choose their own friends for group activities", "I group students by ability level and assign different tasks to each group based on their ability", and "Even if some students don't understand a specific topic, I must continue with the program with the rest of the class." Appendix Figure A.11 reports the treatment effect on these items, as well as on an Inclusivity Index we constructed by reversing and averaging the responses.

The results suggest that treated teachers were more likely than control teachers to mix students with different ability levels during group work. Given that academic ability is strongly (negatively) correlated with social isolation, migrant status, and socioeconomic status, this practice likely encouraged the inclusion of students from diverse backgrounds in group activities, thus promoting inclusivity.[16]

Social isolation is often accompanied by exposure to antisocial acts and bullying at school (Matthews et al., 2022; Pavri, 2015). Similarly, students who anticipate antisocial behavior from peers may become defensive and, in turn, display antisocial tendencies themselves. The treatment may have reduced social isolation by curbing these antisocial tendencies rather than directly increasing prosocial acts. Consistent with this, we find no evidence supporting an increase in prosocial behavior. However, our main findings suggest a reduction in antisocial behavior. This effect might be attributed to teachers closely monitoring socially isolated students and shielding them from negative interactions. More likely, though, the reduction in antisocial behavior resulted from inclusive practices, such as creating mixed-ability groups and integrating socially isolated students into general classroom activities. These practices likely reduced opportunities for antisocial behavior by fostering contact and inclusion among socially isolated children. Once an isolated child becomes part of a group, they are less likely to engage in or be the target of antisocial behavior.

In summary, while we cannot conclusively rule out all alternative explanations for our results, our data suggest that specific teacher practices — shaped by the awareness generated through the intervention — played a significant role in

[16]Out of 239 teachers involved in the study, only 163 participated in our endline survey. Our attrition analysis reveals that teachers with temporary teaching contracts and those with lower eye test scores (emotional intelligence) are more likely to be non-responsive to endline surveys. The attrition, however, is balanced across treatment status (p-value=0.557). Panel H of Appendix Table A.2 shows the balance of baseline characteristics of teachers who participated in endline surveys, with no notable imbalance. Appendix Figure A.11 presents the results obtained using inverse probability weighting to account for this attrition.

reducing social isolation and antisocial behavior in the classroom.

V. Conclusions

This paper evaluates a unique intervention designed to increase teachers' awareness of social dynamics within their classrooms, with a particular focus on socially isolated children. The intervention provided teachers with detailed network maps of their classrooms and highlighted the risks associated with social exclusion in schools. Our findings indicate that the intervention effectively reduces social isolation and curbs antisocial behavior, as measured by a novel incentive-compatible game. These positive results likely stem from teachers adopting more inclusive classroom practices in response to the information provided.

The intervention is highly cost-effective. The staff cost for generating teacher reports, online meetings and WhatsApp monitoring was 18,500 dollars, travel cost was 1900 US dollars, PI time for teacher training was 6670 US dollars, resulting in a total cost of 27,070 US dollars. With 1315 children participating (the total number, not just those surveyed), the cost per child was 21 US dollars. This compares favorably with recent educational interventions aimed at improving school climate (Alan and Kubilay, 2024; Dinarte-Diaz and Egana-delSol, 2024; Sorrenti et al., 2024).

However, there are three important caveats to note. First, the intervention consists of two components: providing teachers with detailed friendship network maps of their classroom and offering general information on the risk of social isolation and strategies for its prevention. As a result, we cannot disentangle the individual effects of each component on the observed results. Nonetheless, our findings suggest that even a basic feedback mechanism— giving teachers insights into their classroom's social dynamics and highlighting the importance of addressing social exclusion— can serve as a cost-effective approach to reducing social isolation and antisocial behavior in schools. The second caveat concerns the scalability of the intervention. The intervention was implemented and monitored by researchers. While such involvement is impractical at scale, alternative approaches could include training teachers to independently assess their classroom's social networks using simple templates, allowing them to identify social isolation on their own.

Finally, our study was conducted in Italy, which raises questions about the external validity of our findings given institutional differences. In particular, Italian primary schools typically maintain classroom continuity, with students remaining in the same class and often having the same teacher for multiple years. One might expect that in settings where students are assigned new teachers each year, the intervention may be less effective. However, this practice is not unique to Italy. It is also common in many other OECD countries, including Germany, Japan, Finland, South Korea, and Turkey, though less prevalent in the United Kingdom and the United States. That said, we believe the external validity of our findings remains strong. While classroom continuity may enhance teachers' ability

to detect and address socialization issues over time, we believe the intervention can still be beneficial in systems where teachers change annually—particularly if teachers are given the tools and training to identify social isolation early in the school year.[17]

Our study shows that a straightforward intervention—informing teachers about the social structure within their classrooms and the potential consequences of social isolation—can meaningfully reduce social exclusion among young children. Given the critical role that positive social environments and healthy peer relationships play in children's development, it is essential to continue exploring and refining such interventions. While our outcome measures capture a range of observed and reported behaviors, we acknowledge the absence of administrative behavioral outcomes (e.g., disciplinary referrals or attendance) as a limitation. We hope future studies will be able to incorporate such measures to provide additional evidence on longer-run impacts.

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[17]It is also important to note that levels of social isolation may have been particularly high in 2021, as schools were transitioning out of the pandemic period. This context should be taken into account when considering the external validity of our results. However, in Italy, elementary school students had returned to in-person learning by 2021, and classroom interactions were largely normalized, aside from continued hygiene measures such as hand-washing and adult masking. It is also worth noting that in many contexts—including ours—social isolation among children was, and remains, a persistent challenge (Almotairi et al., 2023).

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