# Popularity and Student Networks:
## Trade-offs in Resolving Social Isolation through Deskmate Assignments

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**Abstract**

Social connections matter for educational, non-cognitive and long run labour market outcomes. Using a sample of 12,842 students from India, I first show that relatively isolated students face a host of socio-emotional and academic disadvantages. I then implement a two-tier randomized deskmate matching intervention, aimed at improving the outcomes of these isolated students. The results reveal a notable trade-off. Within the classroom, matching isolated students with each other improves their social connections with peers, interactions with teachers and social / non-cognitive skills. However, at the classroom level, this comes at the cost of broader classroom level negative externalities. Specifically, deskmate plans which pair a majority of isolated students with the most popular deskmates improve the overall social integration of isolated students, but have no impact on their social and non-cognitive skills. To explain these patterns, I build a model of network formation in which returns to social effort are shaped by both endogenously determined peer interactions and independent sociological mechanisms such as negative social comparisons and proximity effects. Consistent with the empirical findings, the model shows that outcomes for isolated students, in equilibrium, depend on both their immediate deskmate and the overall composition of matches—where the negative externalities of matching more isolated students with each other emerge after a particular threshold. Optimal matching strategies must therefore weigh direct versus group-level impacts, which may move in opposite directions, giving rise to equity-efficiency trade-offs.

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**Keywords:** Social Isolation, Peer effects, Network formation, Non-cognitive skills, Classroom experiences

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# 1 Introduction

From an early age, the strength of social networks is closely linked to a range of positive individual outcomes. Well connected students perform better academically and socio-emotionally, while isolated students struggle (Hall-Lande et al. [2007]). These early childhood factors shape social skills, aspirations and achievements; subsequently influencing long run labour market outcomes (Deming and Silliman [2024]).[1] Recognizing the importance of social capital, teachers around the world strive to enhance student connectedness through strategic social interventions, such as selectively pairing isolated students with more popular peers through deskmate assignments (Tripathi and Raj [2023]). However, the efficacy of such pairings remains uncertain, with little reliable evidence in the literature.

Two key challenges complicate the assessment of their effectiveness. First, the effect of pairing isolated students with popular peers is theoretically ambiguous. Proximity to a popular peer can either foster strong friendships and promote social integration through increased contact and reduced prejudice (Allport [1954]). Alternatively, it can exacerbate feelings of inadequacy, lower effort levels, and result in perverse socio-emotional and academic outcomes due to negative social comparisons (Festinger [1954]).[2] Second, classroom dynamics more broadly can change based on the overall seating plan. Students are not only influenced by their deskmates but also by their relationships with others in the classroom. Changing the composition of deskmate pairs can alter broader social interactions and generate externalities, which themselves may help or harm isolated students. This issue–of within-classroom interventions generating broader general equilibrium effects–has proven to be a challenge in the peer effects literature, as demonstrated by Carrell et al. [2013] in an influential paper on the inability of peer interventions to scale up.

This paper addresses these challenges through a novel two-tiered deskmate matching intervention. Randomizing the deskmate type at the student level addresses the first challenge, while varying the proportion of isolated students paired with popular peers at the classroom level tackles the second. The intervention reveals two key findings that underscore a trade-off. First, at the individual level, matching an isolated student with another isolated peer helps him more over a host of dimensions relative to matching him with a more popular peer. However, at the classroom level, increasing the number of isolated-popular matches beyond a specific threshold leads to greater social cohesion in the class and improves the overall integration of all isolated students with no change in other social skills. Thus, optimal seating plans must consider both direct and group-level effects which can move in opposite directions, creating equity-efficiency tradeoffs.

I begin by documenting the significant deficiencies in human capital among relatively isolated students, which has not been done in a large scale setting. My sample consists of 12,842 students from private schools in India, primarily in grades 3 to 9, across 381 classrooms in 24 schools located in 13 cities and 4 states. Using survey data, I first show that an individual's popularity, measured by how many students nominate them as friends, help, recess or lunch buddies, correlates with various skills, traits and experiences at scale. Compared to medium popularity students, relatively isolated (low-popularity) students report lower academic comfort, more bullying, and reduced levels of extraversion, willingness to socialize, classroom comfort, and teacher interactions.[3] They also perform worse academically and exhibit lower optimism, competitiveness, prosocial behavior, and trust in others. Conversely, high-popularity students report higher levels of all these positive traits and perform better academically

[1] Also see Sorrenti et al. [2020], Alan et al. [2019], Cunha et al. [2010], Sacerdote [2014], Chetty et al. [2022].

[2] These effects draw on two key sociological theories. The proximity/contact hypothesis (Allport [1954]) posits that pairing students of differing popularity can reduce prejudice, foster strong social bonds, and promote better integration. This process may enhance the social skills of relatively isolated students either through improved integration or by exposure to the positive traits of well-connected peers. Conversely, the social comparison hypothesis (Festinger [1954]) suggests that, in the absence of objective external evaluations, individuals tend to compare themselves to their immediate peers, often their assigned deskmates (Dijkstra et al. [2008]). In this context, a well-connected deskmate may serve as a negative reference point for isolated students. The deskmate's superior social and academic performance could trigger feelings of inadequacy, diminish the isolated student's effort, and result in adverse socio-emotional outcomes.

[3] Throughout the document I use the terms "low-popularity" and "relatively isolated" interchangeably.

compared to medium-popularity peers.

Given the stark disadvantages exhibited by low-popularity students, I then implement a two-tiered experiment to assess how changing interactions within the classroom can impact their outcomes. In the first tier, I randomly pair a low-popularity student to a low-popularity deskmate (treatment) or to a medium / high popularity deskmate (control) to observe the impact of different pairings on student outcomes. In the second tier, I vary the number of pairs of low-popularity students who are paired with each other versus those paired with more popular peers across classrooms. This alters the classroom environment and social dynamics, allowing me to assess the broader effects of these interactions on both individual students and the overall classroom setting. I implement two different treatments: Treatment 1 (LopL) classrooms where a majority of low popularity students are matched to each other and Treatment 2 (LopH) classrooms where a majority of low popularity students are matched to high popularity students as deskmates. I evaluate the effect of these classroom-level treatments against the remaining classrooms considered as the control group, where low-popularity students have an equal chance of being matched with low, medium, or high-popularity deskmates.

Results from the first tier of randomization show that controlling for the overall classroom environment, low popularity students benefit more from being paired with another low popularity student instead of medium and high popularity peers. They experience improved social integration (captured by the number of connections they receive) and increase their own socialization effort (captured by the number of connections they send). Specifically, low popularity students matched with low popularity deskmates are 0.04 SD more likely to be seen as friends and 0.05 SD more likely to be preferred as deskmates by the rest of the classroom. These low popularity students also increase their own socialization effort, nominate more individuals from the classroom as friends, and engage with them for social support and enjoyment.[4] This is accompanied with an increase in their interactions with teachers (0.12 SD), higher likelihood of being liked by their classmates (0.12 SD) and increase in optimism, competitiveness levels and willingness to work hard (0.11 SD, 0.08 SD and 0.08 SD respectively). Benchmarked to the gap between low and medium popularity students at baseline, these effect sizes are substantial. Matching low-popularity students with each other as deskmates closes this gap from the baseline by 10-60% depending on the outcome of interest.[5] Finally, in terms of academic performance, there is no difference between low popularity students paired with other low popularity (isolated) deskmates and those paired with non-isolated deskmates.[6]

Moving to the second tier of randomization at the classroom level, I find a conflicting insight. In classrooms where the majority of low-popularity students are paired with high-popularity peers, there is a classroom level increase in social integration, with all low-popularity students receiving an average of 0.09 to 0.16 SD more nominations across a variety of social situations. That is, in these classroom the baseline gap between the level of social integration of low and medium popularity students is reduced almost by 50%.[7]. However, this increased cohesion accompanied does not translate into improvements in non-cognitive skills or classroom experiences.

To understand the underlying mechanisms for these results and provide a unified explanation, I carry out two additional exercises: one empirical and one theoretical. I expand the sample of interest to all students. I find that, in general, negative effects from social comparisons between a student and their more popular deskmate outweigh the positive effects of proximity. As documented before, low

[4] An increase of 0.06-0.1 SD over a variety of social situations

[5] Being paired with low popularity deskmates closes the baseline gap between low popularity students and their medium popularity peers in the level of social integration by 10% and in willingness to socialize by 60%.The gap between them and their medium popularity peers for the level of interaction with teachers and optimism completely disappears and the gap for other non-cognitive skills reduces by 40-60%.

[6] Disaggregating non-isolated deskmates into medium and popularity deskmates reveal that the null effect on academic performance masks heterogeneous effects of being matched to a medium vs high popularity peer. High popularity deskmates, despite being better academically, reduce the academic performance of isolated students in comparison to medium popularity deskmates. Further compared to low popularity deskmates, the effect of high popularity deskmates on the academic performance of isolated students is still negative (although not statistically significant).

[7] Low-popularity students in these classrooms also improve their academic performance marginally by 0.043 SD

popularity students when paired with low popularity deskmates improve their perceptions of self-worth / likeability and exhibit a higher willingness to exert effort – consistent with reduced psychological costs from social comparisons (Dijkstra [2008]). A similar effect is seen amongst more popular students when they are paired with a low popularity deskmate.[8]

Additionally, I see that students model their behavior on the most popular peers and imitate their actions when forming friendships. Even at baseline, isolated students tend to receive more friendship links from the rest of the classroom when a higher proportion of high popularity peers send a friendship link to them.

Taking these two facts along with baseline characteristics of the sample together, I develop a simple model of network formation. The model incorporates proximity effects, peer academic quality, social comparisons, and endogenous returns to link formation. In the model, students benefit from deskmate quality and classroom-level spillovers, but their willingness to exert effort reduces if paired with a peer whose superior performance makes them feel inadequate. Importantly, the model features status returns to friendship: forming a tie with an isolated student becomes more rewarding when many high popularity students are already doing so. This generates clear predictions which are consistent with my empirical findings. Within the classroom, low popularity students matched with each other experience lower negative social comparisons which induces them to exert more effort both socially and academically. This results in higher outgoing friendship ties and since friendships beget friendships, they end up receiving more incoming friendship ties too. However, since isolated peers also tend to be academically weaker, the net academic impact is ambiguous.[9]

At the classroom level, two competing forces shape outcomes. Matching more high popularity students with isolated peers increases high popularity students' self-worth through downward comparisons, prompting greater social effort and outreach. As they form links with their deskmates and other low-popularity peers, others begin to imitate this behavior because the returns to befriending isolated students rise. At the same time, isolated students paired with more popular peers reduce their own effort due to negative social comparisons, which can lower their likelihood of being nominated by others. In equilibrium, this results in a threshold effect: the positive classroom-level impacts of LopH seating plans emerge only once a sufficient number of high popularity students are matched to low popularity peers. In terms of academic outcomes, a similar dynamic arises. As students benefit not only from their deskmates but also from broader peer support, receiving more friendship links from high-performing peers eventually translates into academic gains—again, but only beyond a specific threshold.

Therefore, these findings highlight a trade off. The first tier suggests that pairing low-popularity students with each other enhances the well-being of the low-popularity students across a host of dimensions, while the second tier indicates that matching more low-popularity students with popular deskmates leads to more cohesive social networks and improved academic performance without significantly affecting other traits. Based on our findings, teachers could, therefore, opt to improve the outcomes of all low-popularity students equally by pairing them with each other as deskmates; however, this approach would forgo the positive classroom externalities generated from more low-high popularity pairings. Alternatively, they could match a majority of low-popularity students with high-popularity deskmates, while pairing the remaining low-popularity students with each other. This

[8]The positive effects of contact hypothesis on the other hand are relatively low. While pairing students as deskmates increases the likelihood of a social interaction between them by 2-7%, it doesn't significantly benefit low-popularity students. This is because all students (including less popular ones) are more likely to send a friendship link to a medium or high popularity deskmate in comparison to a low popularity deskmate. All students also report greater satisfaction with their deskmate assignment when paired with more popular peers compared to less popular ones. Therefore, even when a friendship between an isolated student and the more popular deskmate occurs, it is still relatively weak.

[9]In equilibrium, depending on the exact magnitudes, either the positive effects of lack negative social comparisons or the negative effect of weaker deskmate performance should dominate, even if it is marginal. Comparing isolated students matched to other isolated students against those matched to the most popular peers show that positive effects of lack of negative social comparisons dominate marginally. A similar effect can be found if one reanalyzes the data from Wu et al. [2023].

strategy would harness classroom-wide benefits while significantly improving the outcomes of a few low-popularity students (those matched with each other) at the expense of those paired with high-popularity students. Which deskmate plan is optimal depends on the school's objective function, the key outcomes they aim to improve, and which students' outcomes they prioritize.

This paper makes four main contributions, two of which are situated in the burgeoning literature on peer effects and tracking (Duflo et al. [2011], Busso and Frisancho [2023], Sacerdote [2001], Carrell et al. [2013]).[10] From an empirical perspective, I provide important insight into the recent work showing that results from the peer effects literature–which focus on within-classroom variation in peers–were not scalable. This was highlighted in the influential work by Carrell et al. [2013], who document that endogenous patterns of social interactions often interfere with the anticipated results of policies designed based on the effects uncovered through random natural variation or randomized control trials. As a result, findings from several peer effects papers when implemented in practice produce no effects or even backfire. I provide key evidence for one of the underlying reasons behind this inability to scale. From a methodological perspective, I address this issue by adopting a two-tiered randomized intervention design and providing a theoretical framework which disentangles direct effects from group level effects. To the best of my knowledge, this is the first paper to carry out this exercise. In doing so, I marry the literature on peer effects to the literature on network formation and social ties (Bramoullé et al. [2016], Banerjee et al. [2024], Sadler and Golub [2024], Sadler [2022], Jackson et al. [2022]) and emphasize the importance of carefully evaluating changes in social responses, environment and incentives as potential moderators of observed outcomes (List and Uchida [2024]). From a policy perspective, this paper also informs both the optimal way of designing peer matching interventions and the correct strategy to implement the findings from such interventions in practice.

Second, I depart from a bulk of the literature on peer effects that has primarily focused on the effects of sorting and matching individuals based on academic ability (Wu et al. [2023], Keller and Takács [2019], Elwert et al. [2023], Keller et al. [2023]) or demographic characteristics (Rao [2019], Ghosh et al. [2024]). Given that the effects of peer-matching interventions are inherently tied to social interactions, this study is specifically designed to investigate how interactions between students of differing social status unfold. Similar to Zárate [2023], this study examines the effect of peers' social connectedness on an individual's outcomes and is one of the largest, most geographically diverse peer effects studies conducted in a developing country context.

Third, I contribute to the large literature of interdisciplinary analysis on social capital and its impact on social, cognitive and non-cognitive outcomes. Several papers in education, sociology, and psychology have shown qualitative evidence with smaller samples of how student isolation affects academic performance, behavioral traits and classroom experiences (Twenge et al. [2007], Hall-Lande et al. [2007], Smart Richman and Leary [2009], Maner et al. [2008]). However, it's unclear if these findings hold at scale. Using a large, diverse dataset, I demonstrate that lower social capital, indicated by fewer friendship ties, indeed leads to deficiencies in various social skills, traits, and academic outcomes. Additionally, unlike previous studies, I go beyond showing correlations by evaluating cost-effective ways to reduce social isolation. In this regard, my approach aligns with Alan et al. [2024]. While Alan et al. [2024] use targeted teacher interventions to address social isolation, I do so using popularity-based deskmate plans.

Finally, I contribute to the vast literature on development of social skills. While, there is a substantial body of evidence which shows that these skills at an early age impact the socio-economic outcomes of adolescents and adults, the literature so far has placed a greater emphasis on the transmission and cultivation of these traits from parents (Almås et al. [2016], Kosse et al. [2020], Chowdhury et al. [2022]) and external interventions during childhood (Cappelen et al. [2020], Kosse and Tincani [2020],

[10] Also see, Antonovics et al. [2022], Epple and Romano [2011], Sacerdote [2014], Calvó-Armengol et al. [2009], Isphording and Zölitz [2020]

Alan et al. [2020]).[11] Only a few papers have focused on the role of peers and their characteristics in the development of these traits (Rao [2019], Shan and Zölitz [2022], Alan et al. [2021], Zárate [2023], Wu et al. [2023]). Even fewer have taken potential social responses grounded in the literature of sociology seriously to understand the causal mechanisms behind their effects. Apart from Zárate [2023], this is one of the only studies that looks at the role of network based peer interactions in the development of non-cognitive and social skills amongst adolescents. By examining the conflict between proximity effects (Allport [1954]) and social comparisons (Festinger [1954], Dijkstra et al. [2008]), I empirically test sociology-based mechanisms in an economic framework. This also contribute to the literature on aspiration failure (Dalton et al. [2016], Genicot and Ray [2017], Genicot and Ray [2020]) and reference dependence (Langtry [2023], Immorlica et al. [2017], Kőszegi and Rabin [2007]).

The rest of the paper is structured as follows. Section 2 provides details on the setup of the study. Section 3 highlights our descriptive results on the relationship between popularity and student outcomes from the baseline survey data. Section 4 explains our randomization design. Section 5 highlights the main findings of the paper from the deskmate intervention. Section 6 discusses potential mechanisms and lays down the theoretical model to unify all the findings. Section 7 discusses policy and welfare implications. Section 8 concludes.

# 2 Setup

## 2.1 Context

In most Indian schools, the classroom structure and fixed seating plans play a key role in students' educational and overall classroom experiences. This importance arises from the fact that students typically remain in a single classroom for a significant part of the day (approximately 6.5 to 7 hours of instructional time), while teachers rotate between different classes to deliver subject-specific instruction. Breaks between consecutive classes are less than 5 minutes and the mid-day breaks in most schools do not exceed 30 mins. This system means that students spend a large portion of their school time in close proximity to their deskmates.

Given this context, it is unsurprising that teachers and administrators in India view seating arrangements as a pedagogical tool to enhance learning outcomes and social development. While teachers aim to design these seating plans with the intention of balancing various factors, such as academic ability, behavioral considerations and social dynamics, more often than not, these plans are only focused on specific individuals and tend to be quasi-random for the rest of the class. Based on my interactions with teachers from the schools in the sample, the most common use of deskmate pairing was to foster an environment that encourages positive social interactions, promotes inclusivity and supports the holistic growth of all students. The second reason behind forming specific deskmate pairs was to manage classroom dynamics, mitigate conflicts, and ensure discipline in the classroom. On paper, these seating arrangements are supposed to be semi-permanent, changing only a few times a year or when specific needs arise.[12]

Deskmates often sit in pairs and even when individuals rotate through desks within the classroom, they do not break the deskmate pair. The practice of fixing deskmate pairs exists all the way up to grade 9 in most schools and also in grade 10 in a selective set of schools. Given the extensive time spent together and the nature of their interactions, these deskmates can significantly impact each

[11] See Cunha and Heckman [2007], Cunha et al. [2010], Caliendo et al. [2010, 2014], Dohmen et al. [2011], Sutter et al. [2013], Golsteyn et al. [2014], Algan et al. [2022]. Also see the literature on the impact of social skills on long run labour market outcomes (Buser et al. [2014], Flory et al. [2010], Burnette et al. [2023], Piper [2022], Alves-Martins et al. [2002], Deming [2017])

[12] Additionally, due to space limitations in many classrooms, most classroom activities, including group assignments, projects, and discussions, are carried out with deskmates. This means that deskmates not only provide ancillary academic and social support to each other but are also key pedagogical parts of lesson plans and curricula throughout the school day.

other's classroom experiences, and development of coginitive and non-cognitive skills both positively and negatively.

### 2.2 Sample and Recruitment

Given this setup, I recruited 25 schools for the study spread over 13 cities in India. These schools are located in 4 different states/regions: Delhi / NCR, Rajasthan, Uttar Pradesh and Odisha. 5 schools from Odisha are situated in Rourkela and Bhubaneswar, 4 schools from Uttar Pradesh are situated in Kaimganj, Kasganj, Awagarh and Jalesar, 7 schools from Rajasthan are situated in Jaipur, Udaipur, Chittorgarh and Chomu and the remaining 8 schools come from New Delhi, Faridabad, Gurgaon, NOIDA and Tikri Kalan. Recruitment was based on opt in from schools and their ability to give us the classes that they deemed fit.[13]

I ran the program with the help of my implementation partner, Aawaaz Education Services.[14] In the summer of 2023, I and my implementation partner did a roadshow of the project across 16 cities where we met owners and principals of several private schools, briefed them about the relevance and need of this research, held teacher sessions to elicit information on current practices employed within their classes and set up the possibility of carrying out an experiment within their class. We first restricted ourselves to private schools in India to ensure that: students (i) have already achieved foundational literacy and numeracy in every class, (ii) attend classes on a regular basis so that lack of attendance doesn't create impediments in the implementation of our seating plans, and (iii) have most of their social networks within schools and more so their own classrooms and sections. Schools in the sample were recruited from different strata of socio-economic status. The most expensive school in the sample has an annual fee of 700,000 INR per annum (∼8500 USD) and the least expensive school has an annual fee of 12,000 INR per annum (∼150 USD). The median fee in the sample is 105,000 INR per annum (∼1250 USD).[15] The average number of sections per grade in our sample of schools is 2.6 with an average class size of 33 students per class.[16]

While the primary sample comes from grade 3 to 9, one school also wanted to implement the seating plans for grades 1 and 2, and another 5 schools wanted to implement the seating plans for grade 10 as well. I started the project with a total enrollment of 13,717 students from 403 classrooms. By endline surveys, one of the schools with 8 classrooms decided to withdraw and I was unable to survey students from an additional 14 classrooms spread over 6 schools due to a shift in exam timings.[17] The effective sample, therefore, consists of 12,842 students from 381 classrooms. 31% of this sample comes from the Delhi / NCR region, 37% comes from Rajasthan, 14% comes from Uttar Pradesh and 18% comes from Odisha. Distribution of classrooms and number of students by grade and region are plotted in Fig. E1 and E2.

Of the 12,842 students, 94.1% of the students attempted the baseline and 90.9% of the students attempted the endline. 86% of the students attempted both the baseline and endline surveys. Hence, the attrition rate amongst the individuals who attempted the baseline survey was 9.1%.[18]

Schools were recruited over 2 waves. 16 schools started the seating plans in the months of September

[13] Most schools parallelly run several pedagogical practices such as specific courses in zero-th period or soft skill development through other experimental practices currently being piloted by educators in India. In order to avoid programs confounding with each other, schools provided access to only those grades where no other programs were currently being run. Further, they excluded classes from the sample where they feared parental inteference is going to create an issue with deskmate plans.

[14] 50% of the schools in our sample are former clients of Aawaaz. Their prior work and the general social capital in the education sector endowed me with much needed social capital to break into the network of private schools.

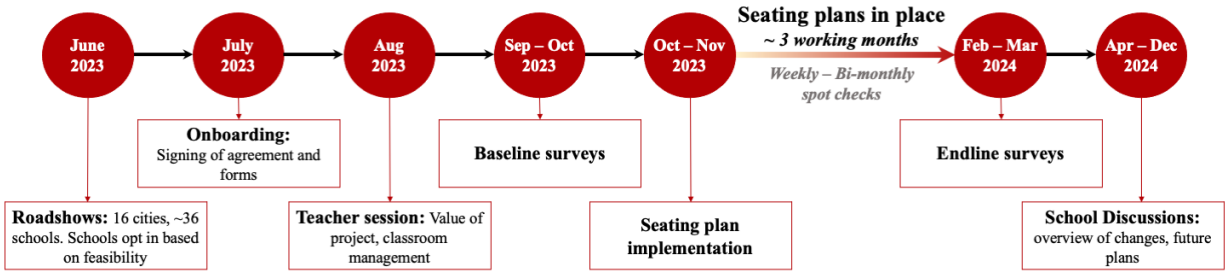
[15] Almost all schools in our sample are oversubscribed and have fairly low dropout rates (less than 5% on an average).

[16] See Fig. A3 for the distribution of class size.

[17] These were mostly grade 10 classrooms who were about to appear for their national board examinations.

[18] The corresponding values for low popularity students are: 4181 low popularity students, 91.2% attempted baseline, 88% attempted endline, 81.5% attempted both. Attrition rate amongst who attempted baseline is 10.6%

Figure 1: Project Timeline




**Note:** Timeline for Fall Recruitment. Spring Recruitment followed a similar timeline with Baseline surveys starting in December 2023.

and October 2023 and kept them in place till the end of February 2024. The other 8 started their seating plan in December 2023 and continued the seating plan into their new session upto April / May 2024. The effective duration of approximately 3 months (excluding breaks and holidays) for the seating plans was decided after several conversations with administrators of schools in the sample and my implementation partner. The duration was finalized to be long enough to see movements and changes in social networks while ensuring both teachers and students do not suffer from research / implementation fatigue.

Before implementing the seating plans, all the teachers in the participating schools went through an information session carried out by the research team. The information sessions included basic dos and don'ts of both the survey and conflict resolution for issues arising from seating plans.

In order to ensure that there is no bias from modified teacher behavior, they were not informed about the exact rationale or the randomization design behind the seating plan. Written consent for the survey and research was obtained both from the school administrators and class teachers. Notices informing parents about the research program were sent out. Every parent / child had the option of declining to fill either of the surveys. Teachers were informed that upon the successful completion of the program and conditional on a compliance rate of over 90%, they would be awarded a participation certificate from the implementation partner.[19] Further, findings from the study would be shared with them and a training session would be conducted to equip them with better practices to improve social inclusion within classrooms.[20]

To ensure compliance, school administrators were appointed to do spot checks on a daily basis. The research team scheduled weekly calls with the administrators and organized bi-monthly random checks to ensure that the proposed seating plans are actually being followed. Before the seating plans fully went into action, a buffer of a week was given to teachers to handle any teething problems.[21] The compliance rate, based on bi-monthly random checks, was over 90%.[22]

[19] This certificate was backed by Columbia University and University of California, San Diego. Researchers from both these universities participated in the bigger project of which this paper is a part of.

[20] Finally, as a part of the project, schools would be provided access to a social network software (www.socionomy.net) designed by the research team for a limited period (Mamas et al. [2023]). The software allows teachers to automate the surveys currently designed and the analysis behind the results to get up to date information about the social dynamics and networks of their students in a user friendly manner.

[21] In case of unavoidable conflicts that arose during the seating plans, teachers were asked to direct the issue to the research team, instead of making changes on their own. The modified pairing proposed followed the same randomization structure.

[22] Post the buffer week, most non-compliance arose from daily absentees within the classroom. To ensure, that students have a partner to work with on their day to day assignments, if two students were absent, their deskmates were paired with each other only for the day.

## 2.3 Data

### 2.3.1 Data Elicitation

The data for this study was primarily collected through surveys that were administered within each classroom during school time. Surveys were implemented twice: once at the beginning of the seating plan and once post completion.[23] The survey was bifurcated into 4 different sections: (i) questions on social networks, (ii) questions on classroom interactions and environment, and perception of academic performance, (iii) questions on social and non-cognitive skills and (iv) questions on demographic characteristics.[24] The last section was included to obtain information on several demographic characteristics that were either absent in school records or the schools were unwilling to provide. Surveys were vetted and approved by school counselors and principals. Data on academic performance was obtained from administrative records.

Due to infrastructural limitations, both baseline and endline surveys for most schools happened on paper. 13 (17) schools of the 24 schools conducted their surveys on paper during baseline (endline) while the remaining conducted these surveys online. All surveys were guided with both the class teacher and an enumerator present to assist students with the interpretation of each question. Both class teachers and the enumerators underwent prior training to ensure that clarifications provided to students do not coerce specific responses. Students were allowed to skip any question they didn't feel comfortable answering.

### 2.3.2 Social Network Outcomes

I elicited information on social connections between individuals within the same classroom both on friendship networks (i.e. who nominates whom as a friend) and action based networks (i.e. nominations for recess buddies, lunch mates or individuals who you seek general help from).[25] I also asked students to report their preferred deskmates and peers who they sought academic help from. For questions related to network nominations, the survey listed out the names of all individuals on the classroom rosters and allowed students to tick as many names as they like.[26] This allowed me to circumvent issues such as ceiling bias highlighted by Griffith [2022].

In order to capture the strength of friendship, I gave students three different options: very good friend, good friend and sort of a friend. For the purpose of my analysis, I club nominations under very

[23] I timed the surveys and the duration of the seating plans in such a way that the beginning and end coincide with key dates in the academic calendar. For example, the seating plans in most schools were implemented after the completion of the term tests; a time when seating plans often undergo a change. The seating plans were concluded either at the end of the academic year or the beginning of summer holidays. Students considered the surveys a part of the regular classroom climate surveys that most schools in our sample carry out sporadically.

[24] To ensure that the students didn't suffer from survey fatigue while still providing information on a breadth of outcomes, the number of questions within each category were limited. During the pilot, the research team did multiple rounds of survey testing and carried out qualitative interviews to ensure that the student population I want to survey understands the meaning behind the questions asked. While one can't ever completely eliminate Hawthorne effects, specific instructions were given to students to mitigate its role. The students were told that these questions are a part of a climate survey that is being conducted within schools. Based on qualitative interviews post survey completion and interactions with students, I received an overwhelmingly positive response stating that these questions actually allowed them to reflect and also convey their emotional well-being. The biggest selling point for them was that information on these dimensions of well-being was rarely collected and hence they never had an avenue to express how they felt. These qualitative interviews were carried out both during pilot and the baseline surveys in the first 8 schools in our sample. We randomly chose 2 students per class to carry out a 5 min debriefing session and elicit responses to validate the surveys.

[25] I do so to capture connections between individuals that result in tangible social interactions separately from mere friendship nominations. Further, allowing individuals to nominate other individuals over multiple dimensions gives us more granularity to rank individuals in terms of their connections.

[26] Choice of individuals who could be nominated as friends was restricted to within classroom peers. Given the setup, individuals spend most of their time within the school with their classmates. Interactions outside the classroom even with peers in the same grade is limited. At baseline, when given an opportunity to nominate individuals outside their classroom, less than 5% individuals nominated atleast one peer who didn't belong to their class.

good friend and good friend as "close friend" and club nominations under any of the three options as "friend".

Information from these nominations was used to construct two sets of outcomes that I finally use in my analysis: (i) Measure of social integration: captured by in-degree connections that an individual receives and (ii) Measure of socialization effort: captured by out-degree connections that an individual sends. Alternatively put, social integration captures how much the rest of the classroom accepts an individual and prefers to form social ties with him / her. Socialization effort (or an individual's willingness to socialize) captures the effort and the willingness of an individual to form ties with the rest of the class. I report treatment effects on both these measures separately by (i) friendship ties, (ii) preferred deskmate nominations, (iii) help, recess and lunch nominations and (iv) academic help nominations.

### 2.3.3 Academic Performance

To obtain measures of academic performance, I rely on test scores maintained in school administrative records. However, this information is only available for $\sim$ 73% of the sample and the granularity varies from school by school.[27,28] For the purpose of my analysis, I only rely on overall test scores instead of a subject-wise breakdown. I take the scores from the last academic test administered to students as a measure of their baseline performance and the first test administered after the conclusion of the seating plan as a measure of their endline performance. To ensure comparability, scores are standardized at the school-grade level separately for baseline and endline.

Additionally, based on the questions asked within the survey, I create an index on academic self-perception (Elwert et al. [2023]) by combining an individual's response to the questions "how well do they do on exams?"[29] and "where do they stand within the classroom?: Top 10% / Top 20% / Top 40% / Top 60% / Not in top 60%".

### 2.3.4 Classroom Experiences

The third set of outcomes I measure relate to the students' experiences and comfort within the classroom. I rely on classroom environment questionnaires available in Micari and Calkins [2021], Whitney and Smith [1993] and Englehart [2009] to construct the variables of interest.[30] I elicit information on an individual's frequency of interaction with teachers, the amount of time spent with classmates for fun and activities, level of comfort in asking doubts within the classroom, excitement to come to class everyday and perception of the level of bullying that exists within the class.[31]

All questions are asked on a likert scale of 1-10. I combine the responses from the last three questions into an index measuring the overall comfort in the classroom.[32] I keep interactions with teachers

[27] Out of the 24 schools in consideration, 3 schools refused to share this data. Additionally, 3 more schools do not conduct any written exams for their lower grade students. Information on academic records of grade 10 students were not available because they appear for centralized exams whose information schools are unwilling to share without prior consent from central board authorities.

[28] This is because some schools do not maintain online records and gave us access to whatever paper records, they could find, others were unwilling to give us a subject wise breakdown and finally some others graded students on letter grades instead of marks. Whenever only letter grades were available, I converted it into appropriate score ranges and assigned the average of the range to the student.

[29] Responses elicited on a scale of 1-10.

[30] These references are review articles and handbook chapters which directed me to specific papers from which questions are obtained. See Appendix G.1 for more details.

[31] I asked students to report their perceptions of bullying instead of directly asking whether or not they are getting bullied to reduce any emotional stress that survey questions may induce (Mamas et al. [2019]).

[32] In order to create indices, I always take the average value over standardized responses for each individual item. I always report our final set of results in standard deviation units, i.e. post creation, indices are further standardized to facilitate comparisons

and time spent with classmates separate to evaluate interactions differently from general classroom comfort indicators. During the endline, I also asked students "how much did they enjoy sitting with their prescribed deskmate?"

### 2.3.5 Social and Non-cognitive skills

In order to elicit information on non-cognitive and social skills, I use a battery of questions from the existing literature in Experimental and Behavioral Economics. I adopt most of the questions from Falk et al. [2018], Jackson et al. [2022], Bhargava et al. [2022], Shan and Zölitz [2022]. I also rely on a series of papers in education and social psychology to modify the questions for a lower age group (**?**). The framing of all questions remains homogeneous to ensure consistency. I use a mix of likert scale responses and hypothetical games to elicit information on our traits of interest. I also adopt the games and questions to local use of language and situations.[33]

I primarily focus on optimism, neuroticism, competitiveness, willingness to work hard, determination, extraversion, prosociality, trust and willingness to participate. In the endline, I also included a measure on perception of likeability / self-worth. Additionally, I collected information on risk tolerance and patience. My motivation to capture information on these outcomes is two-fold. One, I wanted to show how less popular individuals exhibit deficiencies across almost every social and non-cognitive skill documented within the literature. Second, I wanted to focus on a subset of specific outcomes such as optimism, self-worth, willingness to work hard, neuroticism and competitiveness that are more likely to change in the short run through the intervention. For the sake of transparency, I report results on all variables.[34] Most outcomes were measured through self-reported responses on a likert scale of 1-10 unless specified otherwise.

A student's level of optimism was measured through a future reflection exercise about how good their life is going to be 10 years from now (Jackson et al. [2022]). Perception of likeability / self-worth was measured through their response to the prompt: "How much do people in my class like me?". Competitiveness was measured through their response on how competitive they are. Willingness to work hard was measured through their response on how easily they can maintain focus and work hard to solve assignments. Determination was measured through performance on a real effort task detailed in the Appendix G.1. Neuroticism was measured through a series of statement prompts including (i) How easily they get worried / upset with things? (ii) How easily they get nervous? and (iii) How easy is it for them to forgive people?[35] A student's level of trust was captured using the same question as the one used in Global preference survey (Falk et al. [2018]): People around me are good. Extraversion was measured through their willingness to talk to people and participate in discussions and frequency of interactions with friends within the classroom. Prosociality was measured through a hypothetical dictator game (Forsythe et al. [1994]), likert scale question on whether they are willing to go out of their way to help people in need and a hypothetical universal morality game (donation to the NGO at the cost of self gain) (Kirchler et al. [2016]). Patience was measured through a likert scale question but also through the time preference game (Sutter et al. [2013]). Finally, risk preferences were measured through a combination of a likert scale question and the minesweeper game (Crosetto and Filippin [2013]). More details on each likert scale prompt and games are available in Appendix G.1.

across variables.

[33] I first ran a broader set of questions in our pilot and narrowed the list down based on survey responses, qualitative interviews with the children, feedback from education practitioners and the implementation team. Every prompt from the standard scales in the literature was validated through qualitative interviews the research team carried out with students from a wide age range before the implementation of baseline surveys. Prompts that were not clear to more than 75% of the interviewees were dropped.

[34] Even the ones where we didn't expect any movement to take place based on our intervention.

[35] I combine an individual's ability to forgive with other measures of Neuroticism captured under the Gerlitz and Schupp [2005] scale based on the high correlation shown in Brose et al. [2005]

### 2.3.6 Demographic Characteristics

Finally, to control for a student's socio-economic and demographic background, information on their characteristics was obtained using a combination of administrative records, survey responses and name classification algorithms. For my analysis, I utilize information on gender, religion, caste, income / family wealth and disabilities if any. Information on some of these variables such as income is not always readily available within administrative records. This is because either schools don't actively maintain these records, or do not find the information provided by parents reliable, or are unwilling to share records fearing parental backlash. This motivated my reliance on alternative approaches to obtain information on student characteristics. I embedded a series of questions within the survey to elicit information on socio-economic status.[36] I classified names to specific religion and caste based on state and central university admission lists and census records scraped from several public administration websites.[37] I utilized department of education specified income thresholds to classify students into economically weaker sections of the society. Finally, the research team sent every single class list with the corresponding student characteristics to class teachers participating in the study. We asked them to verify those records based on their interactions and knowledge about their students and make manual changes to the classifications whenever necessary. Detailed information on our classification and verification techniques to construct demographic background of students is available in Appendix G.2.

## 2.4 Measure of Popularity

I construct my measure of popularity from the number and strength of in-degree nominations students receive over both friendship networks and action based networks. Specifically, the popularity score of an individual is defined by:

$$\text{Popularity Score} = 2 \times \text{VGF} + \text{GF} + \text{Recess} + \text{Lunch} + 0.75 \times \text{Help} \tag{1}$$

where VGF stands for Very Good Friend, GF stands for Good Friend and Recess, Lunch and Help correspond to a nomination for a recess buddy, a lunch buddy or an individual from whom help is sought in general.

For the analysis, I split the students within the classroom into three bins of popularity: low (L), medium (M) and high (H). By design, within each classroom, 33% of the students fall into each category respectively. My final categorization, therefore, captures isolation and connectedness relative to the classroom.[38]

The choice of weights and the construction of the measure is guided by the following considerations. First, I utilize information from both friendship network nominations and action network nominations to construct the measure of popularity. Friendship networks in my dataset are often denser, one-sided and aspirational, with students nominating others as friends even when the friendship is not necessarily reciprocated.[39] While it's important to include these aspirational ties to capture how

[36] Questions to capture the socio-economic status of an individual include: number of siblings, frequency of vacations in a year, destination of vacations, number of vehicles at home, type of vehicle, choice of transport to come to school and the frequency with which individuals visited their relatives residing outside their city.

[37] In the final specifications, I use the first 5 components of the PCA carried over survey questions capturing socio-economic status of an individual.

[38] This choice of categorization is driven by the fact that students spend more than 90% of their time within school in the assigned classroom they belong to. As a result, capturing an individual's social position relative to the peer group they spend the most amount of time with is the most appropriate choice.

[39] There is also a cultural component to Indian classrooms where individuals tend to be more generous in their friendship nominations. One potential way of dealing with this issue is to restrict the number of friends you allow an individual to nominate. However, this induces ceiling bias (Griffith [2022]). Another way is to make individuals manually list their friends instead of providing a full class roster and allowing them to tick whichever name they deem fit. This issue makes the survey extremely tedious for younger students and researchers often have to deal with missing information when names can not be easily categorized due

Table 1: Popularity nominations

| | **Popularity Nominations Standardized** | |
|---|---|---|
| | (1) | (2) |
| Low Popularity | -0.968*** | -0.949*** |
| | (0.027) | (0.026) |
| Medium Popularity | -0.676*** | -0.667*** |
| | (0.026) | (0.026) |
| Demo. controls | N | Y |
| Classroom FE | Y | Y |
| Adj. R-sq | 0.248 | 0.250 |
| Obs. | 12842 | 12842 |
| *** p<0.01, **p<0.05, * p<0.1 | | |

**Note:** Omitted category is High Popularity students. Popularity nominations correspond to the number of peers in the classroom that nominate the student in consideration as a popular student. Values are standardized and classroom fixed effects included to ensure interpretation. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

students perceive their social standing, it is equally important to capture ties that involve actual actions and interactions to reflect real social dynamics. Action-based networks, such as those formed during recess and lunch, are more organic. These networks develop naturally as students interact outside of structured classroom time and general teacher supervision. Including these networks in the measure ensures that I account for genuine social interactions. Even though the frequency of outside classroom interactions is limited in Indian schools due to the structured class schedules, capturing these free-space interactions is valuable. For instance, a student considered a very good friend by many but not approached during recess would be seen as less popular than a student who is both considered a very good friend and actively approached during recess.

The measure, therefore, utilizes not just friendship networks but also other types of social interactions, such as help networks, recess interactions, and lunch interactions, to provide a comprehensive view of popularity.

Second, I give twice the weight to in-degree nominations for very good friends compared to in-degree nominations for good friends to better capture the strength of the ties. This weighting reflects the closer, more significant relationships that "very good friends" represent. Additionally, we intentionally exclude the nominations for "sort of a friend" because the networks within Indian classrooms tend to be denser. Some students in the pilot and baseline stages had a higher tendency to nominate everyone in the class as "sort of a friend" if they weren't being nominated as very good or good friends. This widespread nomination diluted the measure of true social connections. I addressed this issue during the endline by clarifying the definitions, which reduced the occurrence of these broad nominations within the sample.

Third, I consider lunch and recess separately since in most schools, students get two breaks. While recess networks tend to be bigger and involve larger group play, lunch networks are more directed and typically show more one-on-one interactions and smaller groups. This distinction reveals two different kinds of organic social ties: broader group associations during recess and more intimate connections during lunch. Hence, including both types of interactions separately in the measure is crucial to capturing the full spectrum of students' social dynamics.

to individual idiosyncrasies in reporting methods. As a result, it is better to weigh multiple dimensions of nominations against one another instead of going with other proposed methods.

Fourth, based on my interactions with the administrators of several schools and the responses from the pilot, I found that nominations for the academic help variable were significantly influenced by the ties teachers tend to form. Teachers often explicitly direct students to seek or provide academic help, thereby shaping these networks. As a result, I decided to exclude academic help nominations from the construction of our popularity measure to avoid this teacher-driven bias. General help nominations on the other hand are more organic since these involve resolution of classroom level conflicts, seeking help in forming new friends, sharing personal worries and woes. Even though I made sure that the interpretation of this dimension is amply clear, to avoid any spillovers from academic help into general help, I reduce the weight I placed on the general help factor.

I finally test the robustness of my measure during the pilot by including and excluding components and tweaking the weights assigned. Correlations with traits and social skills both from the baseline and pilot are pretty robust to the specification due to the additive construction of our measure. As a final test, I also ask students to report who in their opinion are the most popular students in the classroom.[40] My measure of popularity correlates well with normalized in-degree nominations over the popularity question. Table 1 reports the decline in standardized popularity nominations from the classroom for low and medium popularity relative to high popularity students categorized as per my measure. I also pre-registered this measure before carrying out the baseline surveys in my and my implementation partner's IRB protocols.

### 2.5 Sample Characteristics

Tables A1 provide summary statistics on the demographic characteristics of students, bifurcated by the popularity category, within our sample. Of the 12,842 students in the sample, approximately 1.2% fall outside the range of grade 3 to 9. 0.6% of the sample belonging to grade 1 and 2 and 0.6% of the sample belonging to grade 10. The highest proportion of students belong to grade 6 (20% of the sample) followed by grade 7, 8 and 5 (19%, 16.4% and 14.4% respectively). 57% of the sample is male while only 3.7% of the sample is Muslim. 68% of the sample belongs to General Caste, 16% of the sample belongs to other backward castes, 10% of the sample belongs to scheduled castes and scheduled tribes and 5% of the sample's caste is uncategorized. Of the 5513 individuals for whom indicators of socio-economic background were available in the administrative data from schools, 13.4% belong to economically weaker sections of the society. Summary statistics on all the survey variables at baseline and details on demographic differences amongst students belonging to different popularity categories can be found in table E1, E2, A2 and A3.[41]

## 3 Baseline Results - Relationship between popularity and social outcomes

The first set of results I report, provide systematic evidence of differences in experiences and traits of students segmented into categories by their baseline popularity measure. To document differences between low, medium and high popularity individuals, I run the following specification:

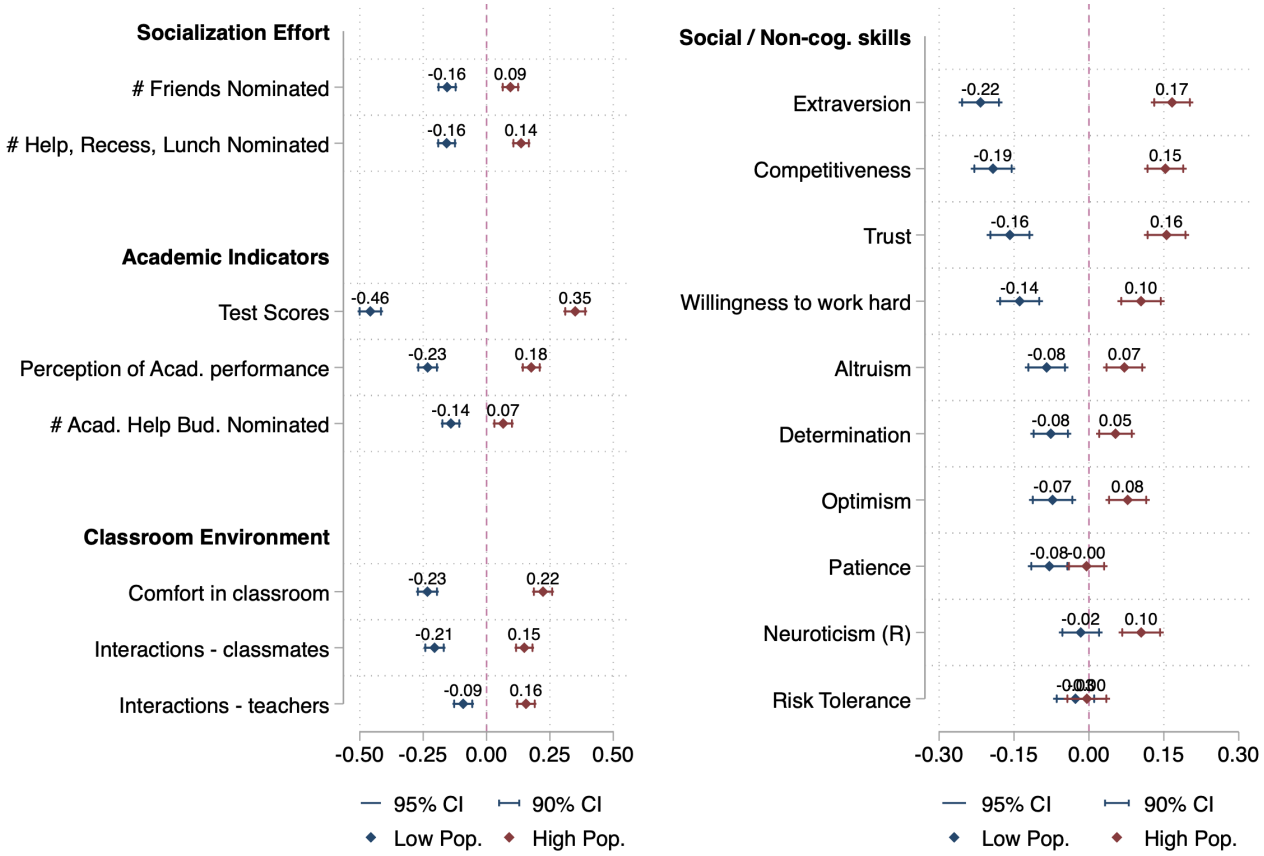
$$y_{ic} = \gamma_1 \text{Low Popularity}_{ic} + \gamma_2 \text{High Popularity}_{ic} + \mathbf{X}_{ic}\Gamma + \eta_c + \epsilon_{ic} \tag{2}$$

where $i$ indexes an individual, $c$ indexes a classroom, $y_{ic}$ is the variable of interest. Low Popularity$_{ic}$ is a dummy indicating a low popularity individual and High Popularity$_{ic}$ is a dummy indicating a high

[40] Even though the instruction for this question set a limit of 3 nominations, students in the survey often chose to nominate more than 3 students. Irrespective, more than 90% of students' answers to popularity nominations coincide with the top ranked popularity students as per our measure.

[41] While the difference in characteristics between students in different popularity bins is not large, it is worthy to note that less popular students are statistically significantly more likely to belong to economically weaker sections and backward castes of the society. This can be seen in coefficients reported in Table A2 and A3.

Figure 2: Baseline characteristics - Differences between low, medium and high popularity students




**Note:** Coefficients obtained from separate regressions run using eq. 2 for each variable of interest. Omitted category is medium popularity students. Standard errors are clustered at the classroom level. # Friends Nominated stands for the number of nominations (out-degrees) a students sends to other peers in the classroom as a very good friend, good friend or sort of a friend. # Help, Recess and Lunch nominated stands for the number of peers a student reaches out to during recess / lunch hours or for general help. # Acad. Help Bud. Nominated corresponds to out-degree nominations for academic help. Perception of Acad. Performance is an index constructed from an individual's self reported academic standing within the class and their ability to do well in exams. Comfort in classroom is an index constructed from an individual's self reported comfort in asking doubts within the classroom, level of excitement to come to class everyday and perception of bullying within the classroom. Scale on Neuroticsm is reverse to facilitate homogenous comparisons. Refer to Section 2.3.5 for details on all social and non-cognitive skills. All variables are standardized to facilitate comparisons.

popularity individual. The omitted category is a Medium Popularity individual. $\mathbf{X}_{ic}$ is a vector of demographic characteristics which includes gender, religion and caste categories, a dummy to indicate whether the student was categorized as a special needs student by the school and indicators of socio-economic status.[42]

I standardize all variables relative to the mean and standard deviation of the full sample to facilitate comparisons across regressions. I cluster the standard errors at the classroom level and also control for classroom fixed effects ($\eta_c$). I run a separate regression for each variable of interest. All coefficients reported for low and high popularity students indicate the standardized differences in their responses / outcomes relative to medium popularity students. Results from eq. 2 are reported in Fig. 2.

The results indicate that while high popularity students relative to medium popularity students fare

[42] Indicators of socio-economic status include a dummy to capture whether the student is flagged as someone from the economically weaker section of the society (EWS category) by the school and the first 5 components from the PCA carried over survey responses capturing information on family background. My choice of including both categorization from school and the PCA components is driven by two factors: (i) the lack of data availability on EWS categorization available for all students across schools, and (ii) the increased granularity in SES categorization provided by the PCA components. Whenever information on EWS categorization is missing, I code the value as missing and use a dummy to indicate the same within the regressions. The first 5 components in the PCA analysis explain 80% of the variation in survey responses.

better on almost all dimensions, low popularity students exhibit disadvantages on all fronts. Low popularity students tend to socialize less, have lower academic comfort and performance levels, worse classroom experiences, lower interaction levels and social skills. High popularity students, on the other hand, report exactly the opposite experiences / effects on all these dimensions.

While popularity is defined by in-degree, i.e. the number of peers within the classroom who nominate you as a friend, recess, lunch or help buddy, low popularity students compared to medium popularity students also exhibit lower willingness to socialize. That is, they send out 0.16 SD lesser ties for friendships and reach out to fewer peers during recess / lunch hours or for help. High popularity students, on the other hand, socialize more, send 0.09 SD higher friendship nominations and are 0.14 SD more likely to reach out to people during recess and lunch hours and ask for help.

In terms of classroom experiences, interactions and academic indicators, low popularity students in comparison to medium popularity students are 0.14 SD less willing to seek out academic help, score 0.46 SD lower on academic tests, exhibit 0.23 SD lower perceptions of academic performance and report 0.23 SD lower comfort in the classroom. They are also 0.21 SD less likely to interact with classmates for fun and activities and 0.09 SD less likely to interact with teachers. High popularity students compared to medium popularity students are 0.07 SD more likely to reach out to peers for academic support, score 0.35 SD higher on academic tests, have 0.18 SD higher perception of academic capabilities, report 0.22 SD higher comfort in the classroom and are 0.15 SD (0.16 SD) more likely to interact with classmates (teachers).

In terms of social and non-cognitive skills, low popularity students are 0.22 SD less extraverted, 0.19 SD less competitive, 0.16 SD less willing to trust people, 0.14 SD less willing to work hard, 0.08 SD less pro-social, 0.08 SD less determined, 0.07 SD less optimistic and 0.08 SD less patient. High popularity students, instead, are 0.17 SD more extraverted, 0.15 SD more competitive, 0.16 SD more likely to trust people, 0.1 SD more willing to work hard, 0.07 SD more altruistic, 0.05 SD more determined, 0.08 SD more optimistic and 0.1 SD less likely to exhibit neurotic behavior. Students do not exhibit any difference by popularity levels on risk tolerance.

The consistently robust disadvantages exhibited by less popular students within a classroom highlights the need for interventions designed to improve not only their academic performance but also their overall well-being, classroom experience and the level of connectedness within the classroom. Improving general interactions and social skills is necessary not only for long run labour market outcomes. It is also important to reduce short and medium run deficiencies in academic performance that arise from the lack of utilization of classroom resources available at hand.

# 4 Randomization Design

Having established the need to focus on low-popularity students, I now turn to the intervention designed to help these less popular students improve their outcomes. Motivated by current teacher practices and the lack of resources in a developing country's classrooms, the intervention relies on deskmate assignments (seating charts) to evaluate the effect of peer popularity on an individual's socio-emotional outcomes.

I implement a two-tier randomized intervention and deploy a comparison of means framework for my analysis. The sub-sample of interest is the set of low-popularity individuals within each classroom.[43] In the lower tier of randomization, the unit of randomization is a low popularity student within a classroom. In the upper tier of randomization, the unit of randomization is a classroom within a

[43] By design, this is the bottom 33% of each classroom w.r.t. popularity score. Therefore, the total number of students for whom the main set of results are reported is 4181.

school-grade group.

Within the classroom, low popularity students are either matched to other low popularity students (treatment) or to medium / high popularity students (control) as deskmates.[44,45] Across classrooms, I vary the proportion of low popularity students that are matched to each other vs more popular peers as deskmates to induce changes in social dynamics at the classroom level.

I categorize classrooms into three different types: LopL classrooms (Treatment 1), LopH classrooms (Treatment 2) and Control classrooms. Within LopL classrooms, a majority of low popularity students are matched to each other as deskmates and within LopH classrooms, a majority of low popularity students are matched to high popularity students as deskmates. These two types of classrooms are evaluated against control classrooms where the match types are fairly balanced. In essence, I implement a treatment saturation design (Crépon et al. [2013], Hudgens and Halloran [2008]) to evaluate both the direct effect emanating from the deskmate type and the classroom level (general equilibrium) effect emanating from the deskmate plan.

Within the classroom, three different types of matches can exist for low popularity students: low-low (LL), low-medium (LM) and low-high (LH). Even though the proportion of matches within LopL (LopH) classes is lopsided towards LL (LH), I retain other types of matches within the classroom to not lose sample for the within-classroom analysis. The LL-LM-LH distribution on average within LopL classes follows the ratio: 56-22-22. That is, in LopL classes, 56% of low popularity students are matched to each other as deskmates, 22% are matched to medium popularity students as deskmates and 22% are matched to high popularity students as deskmates. The corresponding ratio for LL-LM-LH distribution on an average within LopH classes is 16-27-57 and within control classes is 31-36-33.[46,47] Remaining medium and high popularity students who are not matched to low popularity students as deskmates are matched randomly to each other.

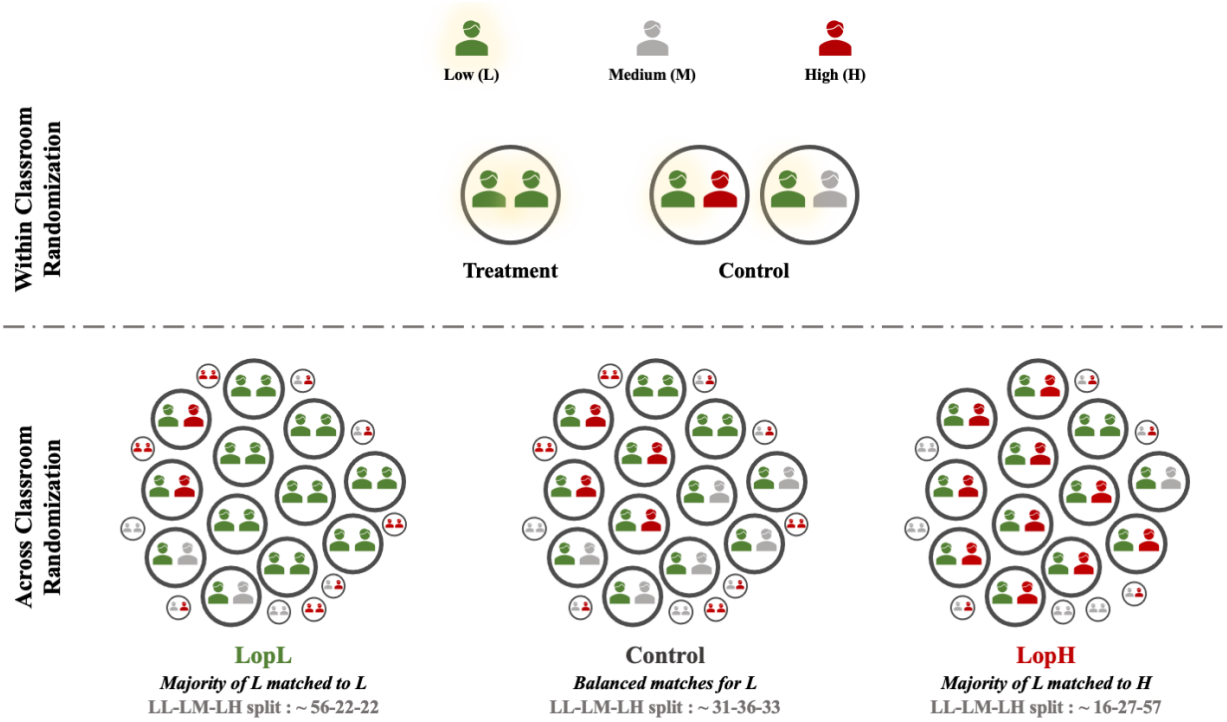
[44] In most of the schools and classrooms in our sample, students are paired in groups of two. However, a small number of classrooms (fewer than 30) form desk groups larger than two due to space constraints. Since the intervention focused on low-popularity students, I ensured that the assignment procedure produces clean treatment and control groups for the low popularity sample. That is, if a low-popularity student was intended to be paired with a high-popularity deskmate but the desk group consisted of three students instead of two, I matched the low-popularity student with two high-popularity deskmates. Whenever a clean assignment to a specific deskmate type is not possible, I report assignment to low vs medium vs high proportionally, i.e. the treatment dummy instead of taking a value 0 vs 1 takes a value between 0 and 1 equivalent to the proportion of deskmates of the student in consideration falling in the assigned treatment category.

[45] The original design specified in the pre-analysis plan classified being matched to low popularity deskmate as treatment 1 and being matched to a high popularity deskmate as treatment 2 with being matched to a medium popularity deskmate as control. To facilitate an easier interpretation of results, I decided to combine assignment to medium and high popularity deskmates as control. This was also motivated by the fact that I didn't see any statistically significant treatment effects of being matched to high popularity deskmates benchmarked against medium popularity deskmates. Additionally, even though non-linear, effects of being matched to low vs medium vs high popularity deskmates within the classroom were mostly monotonic. In Appendix F I report results from the original full specification where I consider the assignment to a high popularity deskmate as the control and being assigned a low or a medium propularity deskmate as two different treatments. Since I employ a comparison of means framework, defining the control group is purely definitional. Both the statistical significance and the coefficients on our estimates remain the same.

[46] As per the pre-analysis plan, I specified that LopL (LopH) classes will follow a ratio of 60-20-20 (20-20-60) for LL-LM-LH matches. Control classes would follow a ratio of 33-33-33 for LL-LM-LH matches. The diversion from the prescribed ratio results from the lumpiness of the popularity score and the fact that the total number of low popularity students in each classroom may not always be divisible by 3. Further, the deskmate plan requires me to utilize an even number of low popularity students to form LL pairs which may not always be feasible. Finally, for a small subset of classes, the algorithm used to assign seating plans had a coding error. Since the deskmate plans had already gone into place, I didn't want to disturb the seating arrangements. The motivation behind the plan was to divide classrooms into three different types of social environment: 1. An environment where I match a majority of low popularity students to each other as deskmates and let the more popular peers be, 2. An environment where I match a majority of low popularity students to high popularity peers to induce interactions between students from opposite tails of popularity and 3. An environment where the match types stay fairly balanced. Therefore, in practice, I use a threshold cut off of 45% to classify classrooms into the three categories. That is, in LopH (LopL) classes more than 45% of low popularity students are assigned a high (low) popularity deskmate and the remaining low popularity students are either assigned to medium or low (medium or high) popularity deskmates. Classrooms where less than 45% of low popularity students are assigned to high popularity deskmates and less than 45% of low popularity students are assigned to each other as deskmates are considered as control classrooms.

[47] Table H1 reports the change in a low popularity student's probability of being matched to a low, medium or high popularity deskmate in a LopL / LopH class relative to the control classrooms.

Figure 3: Randomization Strategy - Illustration




**Note:** Unit of observation is a low popularity student. Within classroom, treatment is defined as a match to a low popularity deskmate. Control is defined as a match to a medium / high popularity deskmate. At the classroom level, two different types of treatments are implemented: *LopL classes* where a majority of low popularity students are matched with each other as deskmates and *LopH classes* where a majority of low popularity students are matched with high popularity students as deskmates. Classroom level treatments are benchmarked against control classroom where the match types for low popularity students is fairly balanced.

## 4.1 Rationale behind the randomization design

To formalize the intuition behind our randomization design, consider an arbitrary skill / outcome production function for a typical student within our classroom.

$$y_{ic} = f(x_{ic}, \text{Peer}_{ic}, \text{Classroom}_c)$$

i.e. the observed skill ($y_{ic}$) of student $i$ in classroom $c$ is determined by their innate abilities and characteristics ($x_{ic}$), the type of the immediate peer they are assigned to ($\text{Peer}_{ic}$) and the overall classroom level common factors that all students share ($\text{Classroom}_c$).

Any randomized intervention that matches individuals to each other as either desk mates, study mates or activity mates not only influences the factor $\text{Peer}_{ic}$ in this production function. It also influences the factor $\text{Classroom}_c$ by altering the peer assignment of all other individuals within the classroom. In my case, while the assigned deskmate can directly impact the student's outcome, the overall deskmate plan can also induce changes in social interactions between all the students within the classroom. This can have an effect on the student independent of who they are assigned to.[48]

Almost all studies in the literature estimating peer effects using random variation are unable to disentangle these classroom level effects from direct effects which match types may produce. Researchers either rely on treating whole classrooms (i.e. match all low types to high types in treated classrooms and take control classrooms as the ones where matches are randomly produced) or they focus on

[48] For e.g. a classroom where all low type individuals are matched to high type individuals can produce very different perceived amicability of high types in comparison to a classroom where only a small percentage of low types are matched to a high type.

direct match effects via comparison of means while controlling for classroom level fixed effects.[49] In the former case, the research design is unable to distinguish direct effects from classroom effects such as changes in classroom environment, increased amicability of all peers etc. and in the latter case, the research design is unable to speak to the overall classroom level effects. Taking estimates from these studies to policy may therefore backfire if the design in practice is not implemented at the correct level or general social responses from the change in the overall environment are not accounted for (Carrell et al. [2013]).

My design resolves this issue by inducing deliberate variation in match types both within classroom and across classrooms to differentially estimate direct effects from classroom level effects. Varying the proportion of match types for low popularity students across classrooms in essence changes the social incentives of all students[50] by changing the incentives of a few key students whose actions everyone else may imitate. By exploiting both within and across classroom variation, this paper takes the first step towards understanding how direct effects and classroom level effects act independently and can not be confounded with each other.

### 4.2 Conceptual Framework

As a precursor to the results from the randomized intervention and the theoretical framework that would follow, I lay down a conceptual framework building on two key theories from the literature in sociology to explain the findings from the prescribed deskmate plans. Within the classroom, when low popularity students are matched to more popular deskmates, two competing effects are at play: positive effect from contact hypothesis (Allport [1954]) and negative effect from social comparisons (Festinger [1954]).

As per contact theory, proximity between individuals from different social classes often results in reduced prejudice, leading to formation of strong friendship bonds. This further results in attributes of one group spilling over to the other. If one is to think about popularity bins as different social classes; contact hypothesis would suggest that proximity to a more popular peer as a deskmate can lead to the formation of a strong social tie and improve a low popularity student's level of integration. Increased integration, in turn, would increase the returns to effort. This would induce the student to exert a higher amount of effort and improve their self-worth which consequently results in improved socio-emotional outcomes. Further, high popularity deskmates, by the virtue of being better academically can also produce positive academic spillovers.

As per social comparison theory, in the absence of objective evaluations, individuals often compare themselves to their peers. More often than not, within classrooms, the immediate reference point for a student is his assigned study mate or desk mate. If the peer acting as a reference point is performing much better than the student socially and academically, feelings of inadequacy and frustration can arise. This in turn would increase the cost of effort, thereby reducing the willingness to exert effort and result in perverse socio-emotional outcomes.

A priori, the literature doesn't provide any robust empirical evidence of which effect would dominate.

[49] Take Wu et al. [2023] vs Zárate [2023] for example. In comparing these two studies, I see different approaches to evaluating the effects of peer matching on student outcomes. In Wu et al. [2023], all low academic ability students in the treatment group were paired with high ability students as deskmates, while in the control group, deskmate pairings were random. The observed positive treatment effects on low ability students, in their study, could be due to several factors. While direct peer effects from the deskmate are likely, the study also suggests that general equilibrium effects—such as changes in the overall classroom environment, increased approachability of high ability students, or easier classroom management—may have contributed to the results. However, the study's design makes it difficult to disentangle the direct effects of having a high ability deskmate from these broader classroom-level effects. In contrast, Zárate [2023] focuses on individual-level treatment, where the effects observed are more likely to reflect direct peer influences from an immediate dormmate. However, this study does not estimate the broader general equilibrium effects, like those in Wu et al. [2023], due to the lack of variation in match types across schools or grades.

[50] irrespective of whether they are linked or not linked to low popularity students as deskmates

Within my setup, at the desk level, the positive effect for low popularity students from contact hypothesis is weak and does not dominate the negative effect from social comparisons in a low - high match. Even though a more popular peer ends up forming a tie with his less popular deskmate, it is not enough to improve the overall social integration and other socio-emotional outcomes of the deskmate. This is because relative to other ties that the popular student has, the social tie with a less popular deskmate is not strong enough. Secondly, since social integration is driven by the actions of many and not a few, the independent effect of just your deskmate supporting you is not enough to improve outcomes.

A low- low match, instead, eliminates the negative social comparisons between deskmates. This leads to a reduction in cost of effort and improved self-worth for the low popularity students and consequently results in them exerting more effort, socializing more and increasing their level of interactions. Since friendship begets friendship, these students are rewarded for their increased socialization by the rest of the classroom. The social links sent out are reciprocated and this results in increased social integration as well.

The effects of the deskmate type on academic outcomes are ambiguous. While more popular deskmates induce negative social comparisons and increase the cost of effort, they are also better academically and hence can generate positive spillovers. The overall effect would therefore depend on the relative strengths of the two opposing forces.

At the classroom level, however, the overall seating plans modify individual responses by changing social incentives (dictated by the actions of the group). Individuals within the classroom, due to social status considerations, follow the actions of their most popular peers.

Matching a majority of low popularity students to high popularity peers result in two things. One, due to positive downward social comparisons, the cost of effort for high popularity peers matched to less popular deskmates goes down. It also leads to an improvement in perception of self-worth amongst these popular students. This results in a general increase in effort and higher levels of socialization from popular students directed towards the rest of the class, including low popularity students. Two, due to proximity effect, a higher number of popular peers form links with their less popular deskmates. Since students imitate more popular peers, the social value of forming a link with a less popular student goes up and this results in an increase in the number of friendship ties less popular students receive from the rest of the classroom. Positive effects from proximity / contact hypothesis, therefore, only manifest when it is implemented at scale.

While changes in social incentives at the classroom level within these classes (where a majority of low popularity students are matched with high popularity deskmates) result in higher social integration for less popular students; at a local level, negative social comparisons are still at play. That is, less popular students who are matched to more popular peers still face a higher cost of effort, reduced self-worth and a lower willingness to socialize. This gives us an ambiguous outcome where you see the rest of the classroom forming more social links with less popular students but the less popular students still not improving their socio-emotional outcomes or reciprocating the friendship links to the rest of the class as enthusiastically. Since the number of friendship connections an individual receives in equilibrium is actually a function of both overall social interactions and his own effort to form friendships, the positive "level" effects trickle in only when a high enough number of isolated-popular matches are formed.

In a similar vein, academic outcomes of isolated students at the classroom level can be improved when these particular thresholds are crossed. This is because students not only benefit from their deskmate but also from the support they receive from the rest of the classroom. With a higher proportion of high popularity (academically better performing) students sending friendship links to isolated students, positive academic spillovers from the rest of the classroom can dominate the reduced effort arising due to negative social comparisons at the individual level.

This conflict in mechanisms, however, at the direct vs classroom level highlights an equity-efficiency trade off. To improve the outcomes of all low popularity students, one can match them to each other as deskmates and let the other students in the class be. These plans, from the perspective of low popularity students will be extremely equitable but not efficient. Alternatively, one can create a classroom where a majority of low popularity students are matched to high popularity students to induce these overall classroom level changes in social response; and simultaneously choose to match the remaining low popularity students with each other to benefit from the positive effects resulting from both contact hypothesis and lack of negative upward social comparisons. Within these classes, while the outcomes would be efficient, they would be highly unequal amongst the group of less popular students.

### 4.3 Balance

I now report balance on baseline observables. To do so, I use the following equations:

$$y^b_{ic} = \gamma_1 \text{Desk. Low}_{ic} + eta_c + \epsilon_{ic} \tag{3}$$

and

$$y^b_{ijg} = \delta_1 \text{LopL}_{ijg} + \delta_2 \text{LopH}_{ijg} + \mathbf{C}_{cjg}\Theta + \Delta_{jg} + \epsilon_{ijg} \tag{4}$$

where $i$ indexes a student, $c$ indexes a classroom, $jg$ indexes a school-grade. Desk. $\text{Low}_{ic}$ corresponds to assignment to a low popularity deskmate within the classroom. $\text{LopL}_{ijg}$ and $\text{LopH}_{ijg}$ correspond to assignments to a LopL and a LopH classroom respectively. $\mathbf{C}_{cjg}$ include classroom level controls which include class size and the first two moments of raw popularity distribution at baseline.

In order to test for balance for treatment assignment within the classroom, I control for classroom fixed effects ($\eta_c$) and in order to test for balance for treatment assignment across classroom, I control for school-grade fixed effects ($\Delta_j g$). Since the randomized intervention was designed with a focus on low-popularity students, I report balances for the same.[51]

Table C1 reports the corresponding coefficients. Column 1 and 2 report balance and corresponding p-values for treatment assignment (low popularity deskmate) benchmarked against control (medium / high popularity deskmate) within the classroom and Column 3-6 report balance and corresponding p-values for treatment assignment (LopL and LopH classes) benchmarked against control across classrooms within a school-grade. Of the 96 comparisons made, treatment assignment is unbalanced at less than 10% level for 12 comparisons. Irrespective, for all the results, I always employ an ANCOVA specification. That is, I always control for the baseline value of the variable of interest. Additionally, I always control for the demographic characteristics of the individuals in our sample.

Attrition is balanced across all treatments.

### 4.4 Do Deskmates have any effect?

Finally, before moving on to the main results from the within and across-classroom randomization, I report results from a pseudo-first stage of the experiment. That is, I evaluate whether seating students next to each other results in any change in the social relationship between them. Answering this question requires me to analyse the effect of being paired as deskmates on the probability of a link being formed between two individuals within the classroom. For this, I run a dyadic regression

[51] Balance for the full sample is available in Appendix Table I18.

Table 2: Effect of being matched as Deskmates - Probability of link in Dyadic Regressions

| | Friendship Network Nominations | | | Other Network Nominations | | |
|---|---|---|---|---|---|---|
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help, Recess, Lunch | (6) Acad. Help |
| **Panel A: Receiver - Any Student** | | | | | | |
| Deskmate | 0.047*** | 0.067*** | 0.068*** | 0.027*** | 0.066*** | 0.063*** |
| | (0.004) | (0.005) | (0.005) | (0.003) | (0.005) | (0.004) |
| Adj. R-sq | 0.312 | 0.395 | 0.501 | 0.280 | 0.365 | 0.302 |
| # Dyads | 391874 | 391874 | 391874 | 391874 | 391874 | 391874 |
| **Panel B: Receiver - Low Popularity Student** | | | | | | |
| Deskmate | 0.037*** | 0.065*** | 0.064*** | 0.019*** | 0.055*** | 0.041*** |
| | (0.005) | (0.007) | (0.007) | (0.004) | (0.007) | (0.005) |
| Adj. R-sq | 0.281 | 0.359 | 0.516 | 0.283 | 0.341 | 0.275 |
| # Dyads | 127875 | 127875 | 127875 | 127875 | 127875 | 127875 |
| **Panel C: Receiver - Medium / High Popularity Student** | | | | | | |
| Deskmate | 0.051*** | 0.068*** | 0.070*** | 0.031*** | 0.071*** | 0.073*** |
| | (0.005) | (0.006) | (0.006) | (0.004) | (0.006) | (0.005) |
| Adj. R-sq | 0.328 | 0.414 | 0.505 | 0.290 | 0.381 | 0.316 |
| # Dyads | 263997 | 263997 | 263997 | 263997 | 263997 | 263997 |
| Receiver FE | Y | Y | Y | Y | Y | Y |
| Sender FE | Y | Y | Y | Y | Y | Y |
| Demo. similar. | Y | Y | Y | Y | Y | Y |
| Base. nomination | Y | Y | Y | Y | Y | Y |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | |

**Note:** Coefficients reported from the dyadic regressions where the dependent variable is a nomination to individual $i$ from individual $j$. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch corresponds to a nomination for either Help, Recess or Lunch buddies. Acad. (Academic) Help corresponds to nominations for individuals from whom academic help is sought respectively. Deskmate is a dummy variable which takes the value 1 if $i$ and $j$ are assigned to each other as deskmates. Regressions control for nomination sender and receiver fixed effects. Demo. similar. stands for controls capturing similarity in demopgraphic characteristics of the sender and the receiver of the nomination. Regressions additionally control for whether a link between the individuals existed at baseline. Panels are split by the popularity type of the receiver of the link. Coefficient Deskmate captures the change in the likelihood of the receiver (student in consideration) receiving a social link from another peer in the classroom if they were assigned to each other as deskmates. Standard errors are clustered at Classroom level.

where the unit of observation is a potential link (0 vs 1) between two individuals within a classroom. I use the following equation:

$$y^e_{ij} = \beta y^b_{ij} + \gamma \text{Desk}_{ij} + \delta \mathbf{1}[x_i = x_j] + \alpha_i + \zeta_j + \epsilon_{ij} \tag{5}$$

where $i$ and $j$ index individuals within a classroom, $e$ indexes endline and $b$ indexes baseline. $y_{ij}$ represents a potential social link (0 vs 1) sent from individual $j$ to individual $i$ over the dimension of interest (for e.g. very good friend, help, recess, lunch etc.). $\text{Desk}_{ij}$ is a dummy variable indicating whether individual $i$ and $j$ are paired as deskmates. $\mathbf{1}[x_i = x_j]$ is a vector corresponding to similarity in demographic characteristics of individual $i$ and $j$. This is included to control for the homophilous effect similarity in demographic characteristics have on link formation.[52] $\alpha_i$ and $\zeta_j$ are individual sender and receiver fixed effects.[53] I cluster standard errors at the classroom level. By design, all potential links can only exist within a classroom.

The coefficient $\gamma$ tells us, conditional on individual $i$ receiving a social link from individual $j$ at baseline, what is the change in probability of receiving a social link at endline if they are matched to each other as deskmates. Table 2 reports coefficients from eq. 5. Panel A reports the results for all students, Panel B reports the results for the sub-sample of low popularity students and Panel C reports the

[52] For example, boys are more likely to be friends with boys. I control for similarity in gender, caste, religion, socio-economic status and special needs categorization.

[53] This captures any unobservable idiosyncratic characteristics that individuals have which make them more likely to send or receive friendship nominations.

results for the sub-sample of medium and high popularity students. I show effects of being matched as deskmates on the probability of receiving a nomination for very good friend, close friend, friend, preferred deskmate, help / recess / lunch buddy and individual from whom academic help is sought. Across all dimensions, one can see that being matched as deskmates increases the probability of two individuals sending links to each other by 3-7%.[54] This implies that pairing students with each other as deskmates does have a significant effect on whether they end up forming a social tie with each other.

# 5 Main Findings

In this section, I first report our findings from within classroom randomization, followed by findings from across-classroom randomization. Since the study focuses on outcomes of low popularity students, all results reported in this section correspond to treatment effects on these low popularity students unless stated otherwise. To facilitate comparisons across different outcomes and different treatment levels, I standardize all variables by survey wave relative to the mean and the standard deviation of the full sample.[55] Across all regressions, standard errors are always clustered at the classroom level.

## 5.1 Within Classroom Randomization

The first set of regressions I run, correspond to the effect on low popularity students of getting matched to a low popularity deskmate (treatment) in comparison to a medium / high popularity deskmate within a classroom. To estimate these effects, I use the following specification:

$$y^e_{ic} = \beta_1 y^b_{ic} + \gamma_1 \text{Desk. Low}_{ic} + \mathbf{X}_{ic}\Gamma + \eta_c + \epsilon_{ic} \tag{6}$$

where $i$ indexes an individual, $c$ indexes a classroom, $e$ indexes the endline and $b$ indexes the baseline. $y_{ic}$ refers to the variable of interest. Desk. $\text{Low}_{ic}$ is a dummy capturing assignment to a low popularity deskmate. The omitted category is assignment to medium / high popularity deskmate. Similar to the regressions for baseline correlations, $\mathbf{X}_{ic}$ is a vector of demographic characteristics which includes gender, religion, caste and indicators of socio-economic status.. $\eta_c$ corresponds to classroom level fixed effects.

I run these regressions separately for each variable of interest and report coefficients in standard deviation units for three broad set of outcomes: (i) individual's social connectedness in the classroom, (ii) classroom experience, interactions and academic performance, (iii) social and non-cognitive skills.

The results indicate that controlling for the overall deskmate plan and the classroom environment, matching low popularity students to each other relative to matching them to medium / high popularity peers as deskmates is better for their outcomes. Low popularity individuals matched with each other receive more social nominations and exhibit higher willingness to socialize with other students in the classroom. They increase their frequency of interactions with teachers, display higher levels of optimism, self-worth, competitiveness and willingness to work hard.

Table 3 reports the treatment effects from eq. 6 for low popularity students on social network outcomes. I separately report effects on the level of social integration (Panel A) and the socialization effort

[54] This is independent of whether the deskmate (sender of the link) is a low, medium or a high popularity student. While these probabilities are relative lower for low popularity students (Panel B: receiver of the link is low popularity student), they are still positive and statistically significant nevertheless. Splitting the dyads further by sender-receiver type (ifor e.g. low popularity student (receiver) and a high popularity deskmate (sender)) still shows statistically significant positive coefficients across all dimensions for the 4 potential categories (L student - M/H deskmate, L student - L deskmate, M/H student - L deskmate, M/H student - M/H deskmate). Discussions on differences in the numerical value of these coefficients will be detailed later in Section 6 (Potential Mechanisms).

[55] That is, variables are standardized with respect to the sample that contains low, medium and high popularity students.

Table 3: Local Treatment Effects of Deskmate Type - Network In and Out degrees

| | Sub-sample: Low Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | Friendship Network Nominations | | | Other Network Nominations | | |
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help, Recess, Lunch | (6) Acad. Help |
| **Panel A: In-degrees** | | | | | | |
| Desk. Low | 0.009 | 0.032* | 0.041*** | 0.053** | 0.020 | 0.033* |
| | (0.020) | (0.017) | (0.015) | (0.021) | (0.020) | (0.020) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.460 | -0.451 | -0.294 | -0.432 | -0.440 | -0.446 |
| Adj. R-sq | 0.451 | 0.604 | 0.782 | 0.474 | 0.594 | 0.525 |
| Obs. | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 |
| **Panel B: Out-degrees** | | | | | | |
| Desk. Low | 0.028 | 0.036 | 0.058* | 0.075* | 0.100*** | 0.026 |
| | (0.034) | (0.031) | (0.034) | (0.040) | (0.034) | (0.034) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.169 | -0.187 | -0.154 | -0.119 | -0.175 | -0.124 |
| Adj. R-sq | 0.206 | 0.342 | 0.328 | 0.156 | 0.260 | 0.252 |
| Obs. | 3365 | 3365 | 3365 | 3365 | 3365 | 3365 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch corresponds to a nomination for either Help, Recess or Lunch buddies. Acad. (Academic) Help corresponds to nominations for individuals from whom academic help is sought respectively. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Out-degree nominations corresponds to the number of individuals in the classroom that the student of interest nominates on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree / out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

(Panel B) of the individual. Social integration is measured by the number of in-degree connections an individual receives and socialization effort is measured by the number of out-degree connections an individual sends. In essence, social integration tells us how likely it is for the rest of the classroom to reach out to the individual in consideration to form social ties; and socialization effort tells us how likely it is for the individual to exert effort, reach out and form social ties with the rest of the classroom.[56]

I report results separately over different dimensions of social networks. The first set of variables I look at are nominations over friendship networks. I evaluate the effect of deskmate types both in

[56]The distinction between these two dimensions of social interactions is important to document since they have fairly different implications from the point of view of an individual's social growth. Several papers in the literature use undirected networks, i.e. they assume that friendship link between two individuals exists if either of the two nominates the other as a friend. This aggregation misses a key subtlety highly relevant for our analysis. Whenever looking at the aggregate number of connections of an individual within the network, in-degrees and out-degrees capture fairly different social skills and outcomes. A situation where an individual is highly integrated within the network (captured by in-degrees) but is himself not nominating anyone highlights a key deficiency that a teacher may want to resolve. Since the individual exhibits no interest in forming social links with the classroom he belongs to, the classroom environment may not be stimulating for him. Further this may result in a lack of capabilities of forming links in the future in an outside environment. Similarly, a situation where an individual ends up nominating a fair amount of individuals within the classroom as friends but receives no nomination back is problematic. It highlights a key aspect of isolation which undirected networks would miss. Evaluating both set of outcomes (in and out degrees) independent of each other is important from a policy perspective.

the number of connections and the strength of connections. This is done by looking at the effect separately on friend nomination (very good friend, good friend or sort of a friend) vs a close friend nomination (very good friend or a good friend) vs a very good friend nomination. The second set of variables I look at are nominations over more organic action based networks. More precisely, I look at how many nominations an individual receives as a preferred deskmate and as a recess, lunch and help buddy from the rest of the classroom. Similarly, I evaluate how many peers a student reaches out to for help, interacts with during recess and lunch hours or chooses as a preferred deskmate. The last variable that I evaluate in this set is nominations over academic help. Even though most social ties related to academic help are formed by teachers, a part of them are still formed organically. Changes in nominations for academic help partly can be driven by changes in academic performance of the individual student.

Pairing low popularity students with other low popularity students as deskmates results in improved social integration for them as reflected by an increase of 0.04 SD in in-degree friendship nominations[57] and 0.05 SD in preferred deskmate nominations.[58] They additionally receive 0.03 SD higher nominations for academic help. This pairing also results in these individuals exerting a higher effort to socialize and form links with the rest of the classroom. They nominate 0.06 SD more individuals as friends, 0.08 SD more individuals as preferred deskmates and reach out to 0.1 SD more individuals for help or during recess and lunch hours.[59] Benchmarking these estimates to the baseline differences between low and medium popularity students, these changes imply a reduction of 10.5%, 9.1% and 5.6% in the gap between them for friendship, preferred deskmate and academic help in-degree nominations and a reduction of 38%, 62.5% and 67% in the gap between them for friendship, preferred deskmate and action based networks out-degree nominations.

While matching low popularity students to each other improves their social connectedness, does it also translate into better downstream outcomes such as classroom experiences, academic performance and social / non-cognitive skills? In order to answer this question, I now analyze the effect of the within-classroom randomization on an individual's interactions within the classroom and academic indicators. I look at the effect of being matched to a low popularity deskmate on the amount of time spent with classmates, the frequency of interactions with teachers, a classroom environment index, test scores and self reported perception of academic performance.[60] During the endline, I additionally asked students how much they enjoyed sitting with their prescribed deskmate during the length of our intervention. Table 4 reports coefficients on these variables. I see no statistically significant difference between individuals with different types of deskmates on frequency of interaction with classmates, classroom environment index and self reported perception of academic performance. However, the frequency of interactions with teachers for low popularity students paired with other low popularity students increases by 0.12 SD. That is, the gap from baseline for the frequency of interactions with teachers between these low popularity students and their medium popularity peers completely disappears. In terms of test scores, treatment effects of being assigned to low popularity deskmates are both statistically insignificant and null.[61]

Finally, I evaluate the impact of deskmate type on social and non-cognitive skills of low popularity

[57] And a 0.03 SD increase in close friend nominations.

[58] Coefficient for help, recess and lunch in-degree nominations is positive but not statistically significant

[59] Disaggregating help, recess and lunch into separate categories shows that our results are not driven by any one dimension. Rather low popularity students paired with low popularity deskmate relative to medium / high popularity deskmate report higher out degree nominations over each dimension statistically significantly. Similarly, decomposing nominations under friendship separately into very good friends, good friends and sort of a friend highlights that changes in social integration and socialization effort are driven by increased nominations over good friendships. This doesn't get captured in the close friendship category since there is no movement in nominations over very good friend. Results for the same are reported in Table I15.

[60] Classroom environment index comprises of comfort in asking doubts in the classroom, excitement to come to class everyday and perceptions of bullying. Perception of academic performance comprises of self report on where the individual stands academically within the classroom and how comfortable is he / she in taking exams.

[61] However, this hides significant heterogeneity by the deskmate type in the control group. Matching low popularity students to high popularity deskmates instead of medium popularity deskmates statistically significantly reduces their academic performance by 0.03 SD ($p = 0.1$). A similar story emerges when we compare low popularity students paired to low vs high popularity deskmates, i.e. it is always worse to pair isolated students with high popularity deskmates at a local level.

Table 4: Local Treatment Effects of Deskmate Type - Classroom Experience, Academic Performance and Academic Perception

| | Sub-sample: Low Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | Peer interactions | | Teacher Interactions | | Academic Indicators | |
| | (1) Desk Enjoy | (2) Int. Classmate | (3) Int. Teacher | (4) Class. Comfort | (5) Test Scores | (6) Acad. Perception |
| Desk. Low | -0.061 | 0.027 | 0.119*** | -0.014 | 0.004 | 0.046 |
| | (0.040) | (0.040) | (0.041) | (0.038) | (0.018) | (0.041) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. score | N | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.033 | -0.195 | -0.158 | -0.216 | -0.444 | -0.239 |
| Adj. R-sq | 0.097 | 0.135 | 0.167 | 0.179 | 0.829 | 0.212 |
| Obs. | 3376 | 3088 | 3086 | 3189 | 2981 | 3285 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. Original responses to all questions are based on a likert scale of 1-10. Desk Enjoy corresponds to the extent to which the individual enjoyed sitting with their assigned deskmate. Int. Classmate corresponds to the amount of time spent spent with classmates for fun and activities. Int. Teacher corresponds to the frequency of interactions with teachers. Class. Comfort is an index created from standardized responses pertaining to the level of excitement the individual exhibits to come to class everyday, level of comfort w.r.t. asking doubts in the classroom and an individual's perception of bullying in the classroom (reversed). Test Scores are obtained from administrative records and standardized at the school grade level. Acad. perception is an index created from standardized responses pertaining to academic self-concept and academic comfort. Academic self-concept originally is elicited on a scale of 1-5 where 1 corresponds to the individual believing they are in the top 10% of the class, 2: top 20%, 3: top 40%, 4: top 60% and 5: not in top 60%. Academic comfort corresponds to their response on a scale of 1-10 for the prompt, *I do well on exams.* Both endline and baseline values are standardized by survey wave. Base score corresponds to the baseline value of the variable of interest. Demo. controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table 5: Local Treatment Effects of Deskmate Type - Non-cognitive and Social skills

| | Sub-sample: Low Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | (1) Like perception | (2) Optimism | (3) Neuroticism (R) | (4) Competitiveness | (5) Hardwork | (6) Determination |
| Desk. Low | 0.116*** | 0.105** | 0.021 | 0.076* | 0.080* | -0.004 |
| | (0.042) | (0.043) | (0.039) | (0.045) | (0.045) | (0.035) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. score | N | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.245 | -0.116 | -0.056 | -0.213 | -0.176 | -0.054 |
| Adj. R-sq | 0.060 | 0.142 | 0.109 | 0.126 | 0.111 | 0.365 |
| Obs. | 3372 | 3097 | 3195 | 2958 | 3021 | 3089 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. Like perception corresponds to an individual's assessment of how much do other people in the class like him / her. Neuroticism is an index created from standardized responses to the level of worry, nervousness and the ability to forgive that individuals exhibit. All three components are scaled and reversed to ensure a higher value corresponds to a lower level of neuroticism. All variables apart from Determination are measured on a likert scale of 1-10. Refer to Section 2.3.5 for more details. Hardwork correspond to an individual's willingness to work hard on an everyday basis. Determination is measured by the level of effort put in by an individual in an real effort task where they had to identify as many numbers in a grid with digit 5 in them. Both endline and baseline values are standardized by survey wave. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

students. Table 5 reports the coefficients on an individual's perception of self-worth, optimism, neuroticism, competitiveness, willingness to work hard and determination.[62] Literature in social psychology

[62] An individual's perception of self-worth is evaluated through the question: How much do you think people in your class like you?

and education suggests that in the absence of negative upward social comparisons, an individual's self worth, outlook towards future and willingness to exert effort would increase (Dijkstra et al. [2008]). This is indeed what I find. In line with social comparison theory, a low-low deskmate match results in a 0.12 SD increase in reported self-worth, 0.11 SD increase in optimism and 0.08 SD increase in competitiveness and willingness to work hard and exert effort. This implies that the baseline gap between these low popularity students and their medium popularity peers for optimism completely disappears, and reduces by 42% and 57% for competitiveness and willingness to word hard respectively. I do not see any statistically significant differences by deskmate type on neuroticism, prosociality, risk tolerance, willingness to participate or patience. Results for the same are reported in Table C2.

### 5.2 Across Classroom Randomization

Having discussed the effects of the deskmate type conditional on controlling the overall classroom environment, I now move on to the analysis of the overall deskmate plans. That is, instead of looking within the classroom I now compare individuals across the classrooms and evaluate the effect of inducing different proportions of match types within the deskmate plans. I first highlight the impact on the overall social cohesion within the classroom. I do so by evaluating the effect of LopH and LopL treatments compared against control on the average network density of the classroom. I use the density of the "in-degree" network measured by nominations for very good friend, close friend, friend or help / recess / lunch buddies.[63] I use the following specification:

$$y^e_{cjg} = \beta_1 y^b_{cjg} + \delta_1 \text{LopL}_{cjg} + \delta_2 \text{LopH}_{cjg} + \mathbf{C}_{cjg}\Theta + \Delta_{jg} + \epsilon_{ijg} \tag{7}$$

where $c$ indexes a classroom, $jg$ indexes a school-grade, $e$ indexes the endline and $b$ indexes the baseline. $y_{cjg}$ is the relevant network density measure standardized by survey wave. $\text{LopL}_{ijg}$ and $\text{LopH}_{ijg}$ are dummies indicating whether the classroom in consideration is a classroom where the prescribed deskmate plan matches a majority of low popularity students to each other as deskmates or to high popularity deskmates respectively. The omitted category is classrooms where the deskmate match type for the low popularity students is fairly balanced. $\mathbf{C}_{cjg}$ is a vector of classroom level controls which include the size of the classroom and the first two moments of the classroom's raw popularity score distribution at baseline. $\Delta_{jg}$ corresponds to school-grade level fixed effects. The unit of observation is a classroom.

Table 6 reports the coefficients of interest $\delta_1$ and $\delta_2$ from eq. 7. Our results indicate that controlling for the level of social cohesion that existed at baseline, matching a majority of low popularity students to high popularity students as deskmates further increases the social cohesion in the classroom by endline. This is reflected by an 0.15-0.21 SD increase in average network density in LopH classes over control classrooms. A similar effect is absent for LopL classes (where a majority of low popularity students were matched to each other as deskmates).

To understand how these deskmate plans specifically impact low popularity students, I return to the individual level analysis and run the following specification:

$$y^e_{ijg} = \beta_1 y^b_{ijg} + \delta_1 \text{LopL}_{ijg} + \delta_2 \text{LopH}_{ijg} + \mathbf{X}_{ijg}\Gamma + \mathbf{C}_{cjg}\Theta + \Delta_{jg} + \epsilon_{ijg} \tag{8}$$

where variables are defined as before. $i$ indexes an individual and I additionally control for demographic characteristics similar to the ANCOVA specification under within classroom randomization. Since treatment occurs at the classroom level, I instead control for school-grade fixed effects. Standard errors are still clustered at the classroom level.

(Migacheva and Crocker [2011])

[63] Network density is a quantitative measure of how many connections exist in a network compared to the total number of possible connections. It's calculated by dividing the number of edges in a network by the maximum number of possible edges. The result is a value between 0 and 1, with higher values indicating denser networks and lower values indicating sparser networks

Table 6: Classroom Treatment Effects of match proportions - Network Density (based on in-degree)

| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Help / Recess/ Lunch |
|---|---|---|---|---|
| LopL | 0.028 | 0.034 | 0.041 | 0.022 |
| | (0.087) | (0.072) | (0.070) | (0.079) |
| LopH | 0.205** | 0.153** | 0.147** | 0.098 |
| | (0.081) | (0.067) | (0.065) | (0.073) |
| Sch. Grade FE | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y |
| Base. density | Y | Y | Y | Y |
| Adj. R-sq | 0.687 | 0.784 | 0.803 | 0.752 |
| Obs. | 347 | 347 | 347 | 347 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | |

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Sch. Grade FE stands for School-Grade Fixed Effects. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Any Action based nom. corresponds to a nomination for Help, Recess or Lunch. Network Density is computed based on in-degree measures. Both endline and baseline values are standardized by survey wave. Class controls include the size of class and the first two moments of the raw popularity score distribution.

Similar to the within classroom randomization, I report results from the across-classroom randomization on social network outcomes (Table 7), classroom experiences and academic performance (Table 8) and social / non-cognitive skills (Table 9 and C3). The increased social cohesion observed at the classroom level in LopH classes results in increased social integration for low popularity students within these classrooms. Low popularity students in LopH classes in comparison to control classes receive 0.16 SD higher nominations as a friend, 0.13 SD higher nominations as a preferred deskmate and 0.09 SD higher nominations as lunch, recess or help buddies. The strength of tie as measured by nominations for very good friends or close friends also goes up by 0.12 SD.[64] No such statistically significant effect is observed for individuals in LopL classes.

Low popularity students in these LopH classrooms also increase their own socialization effort but only on the intensive margin. That is, they nominate 0.1-0.13 SD higher number of classmates as close or very good friends.[65] However, they do not report a significantly higher total number of friends or the number of individuals they reach out to during recess and lunch hours or for help. Further, observationally, the magnitudes of the effects of LopH classes on socialization effort are smaller than the magnitudes of the effects on social integration across all dimensions of social nominations. This is in line with the joint effect of negative social comparisons being at play at a local level and gains from proximity hypothesis being at play at the classroom level. Low popularity students also tend to perform 0.043 SD better on academic tests in LopH classes.[66]

Moving further, I see no differential effect of LopH classes on the classroom interactions and experiences of low popularity students (Table 8). Students in LopH classes report a 0.09 SD higher comfort in classroom but a similar effect is seen in LopL classes as well. In both cases, this increase in classroom comfort is driven by a reduction in perceived bullying within the classroom. Results on socio-emotional skills reveal a similar effect. I do not see any statistically significant improvement in the social and

[64] These improvements in terms of reduction of gap between low popularity students and their medium popularity peers with respect to baseline values correspond to 42% for in-degree friendship nominations, 23% for in-degree preferred deskmate nominations and 14% for in-degree actions based network nominations.

[65] In terms of out-degrees, the gap between low popularity students and their medium popularity peers with respect to baseline values is closed by 68% for very good friendships and 47% for close friendships.

[66] This is equivalent to a 10% reduction in the gap between them and medium popularity peers.

Table 7: Classroom Treatment Effects of match proportions - Network In and Out degrees

| | Sub-sample: Low Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | Friendship Network Nominations | | | Other Network Nominations | | |
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help, Recess, Lunch | (6) Acad. Help |
| **Panel A: In-degrees** | | | | | | |
| LopL | -0.029 | 0.004 | 0.020 | -0.010 | -0.040 | -0.023 |
| | (0.053) | (0.052) | (0.066) | (0.055) | (0.053) | (0.038) |
| LopH | 0.120** | 0.124** | 0.160*** | 0.131** | 0.093* | 0.042 |
| | (0.050) | (0.051) | (0.058) | (0.058) | (0.053) | (0.043) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Sch. Grade FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.541 | -0.526 | -0.398 | -0.499 | -0.497 | -0.481 |
| Adj. R-sq | 0.324 | 0.476 | 0.614 | 0.290 | 0.447 | 0.419 |
| Obs. | 4181 | 4181 | 4181 | 4180 | 4180 | 4181 |
| **Panel B: Out-degrees** | | | | | | |
| LopL | 0.047 | 0.041 | 0.015 | -0.043 | -0.031 | -0.017 |
| | (0.049) | (0.045) | (0.047) | (0.051) | (0.048) | (0.045) |
| LopH | 0.127*** | 0.100** | 0.051 | -0.021 | 0.009 | 0.008 |
| | (0.042) | (0.042) | (0.042) | (0.048) | (0.045) | (0.045) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Sch. Grade FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.236 | -0.242 | -0.189 | -0.123 | -0.178 | -0.156 |
| Adj. R-sq | 0.188 | 0.307 | 0.295 | 0.114 | 0.226 | 0.214 |
| Obs. | 3407 | 3407 | 3407 | 3407 | 3407 | 3407 |

*** p<0.01, **p<0.05, * p<0.1

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Sch. Grade FE stands for School-Grade Fixed Effects. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch corresponds to a nomination for either Help, Recess or Lunch buddies. Acad. (Academic) Help corresponds to nominations for individuals from whom academic help is sought respectively. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Out-degree nominations corresponds to the number of individuals in the classroom that the student of interest nominates on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree / out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Class controls include the size of class and the first two moments of the raw popularity score distribution. Standard errors are clustered at Classroom level.

non-cognitive skills of low popularity students in LopH classrooms.[67] If anything, there is a 0.14 SD decrease in optimism and 0.07 SD increase in neuroticism (Table 9).

# 6 Theoretical Framework and Evidence for Potential Mechanisms

What drives these conflicting findings from the two tiers of randomization? As argued in Section 4.2, social connections and academic performance in equilbrium are determined by the interplay of social comparisons, proximity effects and individuals imitating the actions of the most popular peers.

[67] Barring an increase of 0.08 SD in Altruism. This follows directly from a more cohesive and supportive classroom environment resulting from more inter-popularity mingling.

Table 8: Classroom Treatment Effects of match proportions - Classroom Experience, Academic Performance and Academic Perception

| | Sub-sample: Low Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | Peer interactions | | Teacher Interactions | | Academic Indicators | |
| | (1) Desk Enjoy | (2) Int. Classmate | (3) Int. Teacher | (4) Class. Comfort | (5) Test Scores | (6) Acad. Perception |
| LopL | 0.037 | -0.077 | -0.002 | 0.109** | 0.024 | -0.029 |
| | (0.051) | (0.050) | (0.046) | (0.055) | (0.030) | (0.043) |
| LopH | 0.029 | -0.017 | 0.001 | 0.087* | 0.043* | 0.021 |
| | (0.053) | (0.039) | (0.042) | (0.047) | (0.024) | (0.043) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y | Y |
| Base. score | N | Y | Y | Y | Y | Y |
| Sch. Grade FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.070 | -0.175 | -0.106 | -0.242 | -0.479 | -0.236 |
| Adj. R-sq | 0.047 | 0.132 | 0.159 | 0.155 | 0.820 | 0.206 |
| Obs. | 3421 | 3129 | 3127 | 3231 | 3013 | 3325 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | |

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Sch. Grade FE stands for School-Grade Fixed Effects. Original responses to all questions are based on a likert scale of 1-10. Desk Enjoy corresponds to the extent to which the individual enjoyed sitting with their assigned deskmate. Int. Classmate corresponds to the amount of time spent spent with classmates for fun and activities. Int. Teacher corresponds to the frequency of interactions with teachers. Class. Comfort is an index created from standardized responses pertaining to the level of excitement the individual exhibits to come to class everyday, level of comfort w.r.t. asking doubts in the classroom and an individual's perception of bullying in the classroom (reversed). Test Scores are obtained from administrative records and standardized at the school grade level. Acad. perception is an index created from standardized responses pertaining to academic self-concept and academic comfort. Academic self-concept originally is elicited on a scale of 1-5 where 1 corresponds to the individual believing they are in the top 10% of the class, 2: top 20%, 3: top 40%, 4: top 60% and 5: not in top 60%. Academic comfort corresponds to their response on a scale of 1-10 for the prompt, *I do well on exams.* Both endline and baseline values are standardized by survey wave. Base score corresponds to the baseline value of the variable of interest. Demo. controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Class controls include the size of class and the first two moments of the raw popularity score distribution. Standard errors are clustered at Classroom level.

However, before formally providing a unified framework which ties all the results together, I first provide some basic empirical facts tied to these mechanisms which are applicable to the full sample of students. I later use these mechanisms as foundational blocks of the theoretical model.

***Fact 1:*** *In relative terms, being matched to more popular deskmates can induce negative upward social comparisons and being matched to isolated deskmates can induce positive downward social comparisons. These comparisons act as psychological costs (Dijkstra et al. [2008]) and hence alter the returns to effort for an individual.*

Results highlighted in Table 5 showed that when low popularity students are paired with each other their perception of self goes up and willingness to work hard and socialize with the rest of the classroom increases. Amongst several underlying factors that may drive these results, one potential hypothesis is that these are associated to changes in relative psychological costs emanating from social comparisons (Dijkstra et al. [2008]).[68] One way to explore the validity of this claim is to expand the sample to include non-isolated students and analyse the effects on being matched to low popularity deskmates on their outcomes. If any of these positive effects for isolated students emerge from lack of negative upward social comparisons then similar positive effects in similar skills should exist for non-isolated students too due to positive downward social comparisons. That is, when matched with low popularity deskmates, medium and high popularity students should increase their perception of self worth, willingness to work hard and interactions with classmates. This is indeed what we find. Table 10

[68] More so because the socio-emotional effects of being matched to low popularity deskmates is also concentrated in skills such as self-worth, optimism and conscientiousness.

Table 9: Classroom Treatment Effects of match proportions - Non-cognitive and Social skills

| | Sub-sample: Low Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | (1) Like perception | (2) Optimism | (3) Neuroticism (R) | (4) Competitiveness | (5) Hardwork | (6) Determination |
| LopL | 0.015 | 0.001 | 0.019 | 0.010 | 0.016 | -0.020 |
| | (0.048) | (0.047) | (0.042) | (0.047) | (0.048) | (0.070) |
| LopH | 0.041 | -0.143*** | -0.070* | 0.030 | -0.043 | -0.043 |
| | (0.046) | (0.043) | (0.037) | (0.045) | (0.040) | (0.056) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y | Y |
| Base. score | N | Y | Y | Y | Y | Y |
| Sch. Grade FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.231 | -0.085 | -0.023 | -0.183 | -0.158 | -0.009 |
| Adj. R-sq | 0.043 | 0.132 | 0.113 | 0.121 | 0.107 | 0.251 |
| Obs. | 3415 | 3137 | 3235 | 2997 | 3059 | 3125 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | |

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Sch. Grade FE stands for School-Grade Fixed Effects. Like perception corresponds to an individual's assessment of how much do other people in the class like him / her. Neuroticism is an index created from standardized responses to the level of worry, nervousness and the ability to forgive that individuals exhibit. All three components are scaled and reverse to ensure a higher value corresponds to a lower level of neuroticism. All variables apart from Determination are measured on a likert scale of 1-10. Refer to Section 2.3.5 for more details. Hardwork correspond to an individual's willingness to work hard on an everyday basis. Determination is measured by the level of effort put in by an individual in an real effort task where they had to identify as many numbers in a grid with digit 5 in them. Both endline and baseline values are standardized by survey wave. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Class controls include the size of class and the first two moments of the raw popularity score distribution. Standard errors are clustered at Classroom level.

reports the effect of being paired with low popularity deskmates for more popular peers on these variables.[69] Being matched to a low popularity deskmate in comparison to a more popular deskmate, increases their perception of self-worth and likeability of medium and high popularity students by 0.05 SD.[70] It also increases their willingness to work hard and determination by 0.05 SD and frequency of interaction with classmates by 0.05 SD. This in turn results in an increase in the number of social connections they receive from the rest of the classroom for help or as a recess / lunch buddy by 0.03 SD.

***Fact 2:*** *Being assigned as deskmates makes individuals more likely to form social ties with each otber. However, for low popularity students, these social ties are still relatively weak and hence a mere contact with a high popularity deskmate may not be enough to induce higher social integration.*

Recall from Table 2 that linking two students to each other as deskmates increases the chance of them forming a friendship bond by 3-7%. However, these effects are not homogenous across students from different popularity levels. Since popularity and connectedness often take the form of social currency, all individuals (including low popularity students) tend to form stronger ties and prefer to sit with more popular deskmates. This is further corroborated by students' resported satisfaction with the assigned deskmates.

In order to evaluate the efficacy of the treatment within the classroom, I asked students at the endline how much they enjoyed sitting with their prescribed deskmate. Table 11 reports the effect of being paired to a low popularity deskmate compared to a more popular deskmate on the answer to this question. I split the sample by popularity level and report the responses of low (Column 1), medium

[69] Results on all the variables for deskmate effect for more popular students is available in Tables I1, I2, I3, I4. Effects of classroom level treatments on medium and high popularity students are available in Tables I5, I6, I7, I8

[70] Measured by the response to the question: *"How do people in my class like me?"*

Table 10: Local Treatment Effects of Deskmate Type for more popular students

| | **Sub-sample: Medium and High Popularity Students** | | | | |
|---|---|---|---|---|---|
| | (1) Like percept. | (2) Hardwork | (3) Determination | (4) Int. Classmate | (5) Help / Recess / Lunch (in) |
| Desk. Low | 0.055** | 0.053** | 0.048** | 0.051** | 0.026* |
| | (0.023) | (0.022) | (0.021) | (0.022) | (0.015) |
| Demo. controls | Y | Y | Y | Y | Y |
| Base. score | N | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y |
| Adj. R-sq | 0.058 | 0.140 | 0.409 | 0.175 | 0.645 |
| Obs. | 7437 | 6989 | 6921 | 7091 | 8497 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. Like percept. corresponds to an individual's assessment of how much do other people in the class like him / her. Hardwork correspond to an individual's willingness to work hard on an everyday basis. Determination is measured by the level of effort put in by an individual in an real effort task where they had to identify as many numbers in a grid with digit 5 in them. Int. Classmate corresponds to the amount of time spent spent with classmates for fun and activities. Help / Recess / Lunch (in) refers to in-degree nominations received from peers over Help, Recess and Lunch networks. Both endline and baseline values are standardized by survey wave. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table 11: Local Treatment Effects of Deskmate Type - Satisfaction with Prescribed Deskmate

| **Question:** *How much did you enjoy sitting with your assigned deskmate?* | | | |
|---|---|---|---|
| | (1) Low Popularity Student | (2) Medium Popularity Student | (3) High Popularity Student |
| Desk. Low | -0.061 | -0.207*** | -0.166*** |
| | (0.040) | (0.039) | (0.039) |
| Demo. controls | Y | Y | Y |
| Base. score | N | N | N |
| Classroom FE | Y | Y | Y |
| Adj. R-sq | 0.097 | 0.088 | 0.082 |
| Obs. | 3376 | 3669 | 3720 |
| *** p<0.01, **p<0.05, * p<0.1 | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. Values are standardized to facilitate comparisons. Baseline value is not included since this question was not asked at baseline. Column 1 captures responses from low popularity students, Column 2 and 3 capture responses from medium and high populairty students respectively. Demo. controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

(Column 2) and high (Column 3) popularity students separately. Compared to being paired with more popular deskmates, the level of satisfaction with the prescribed deskmate for more popular students goes down by 0.17-0.21 SD if they are paired with less popular deskmates. While this coefficient is not statistically significant for less popular students, it is still negative. That is, even less popular students on an average prefer sitting more with more popular students.

As a second check, I evaluate the likelihood of sending a social link (out-degree nomination) to the prescribed deskmate conditional on the deskmate type. Table C4 reports the results for the same. All students including less popular ones are 5-8% less likely to send a link (across different social

categories) to less popular deskmates in comparison to more popular ones.[71] The relative weakness in the strength of social connection between deskmates for low popularity students highlights the fact that a mere formation of friendship tie is not enough for them to improve their socio-emotional outcomes.

***Fact 3:*** *The number of social ties students of a popularity type receive from the rest of the classroom is an increasing function of the number of ties they receive from the most popular peers. That is, actions of most popular peers determine the returns of linking with different types of students for the rest of the classroom.*

Students model their behavior on the most popular peers and due to social status considerations, individuals within the classroom imitate the actions of most popular students. Empirical evidence for the same is laid out in table C5. Controlling for classroom fixed effects, a 1 SD increase in the number of connections to an individual from high popularity students results in ∼0.2 SD increase in the number of connections from other students at the baseline. This result holds not only for all students but specifically for low popularity students too.[72] Since the social ties often convey information on social acceptability of specific groups, an aggregate analysis by popularity types reveal a similar phenomena. That is, controlling for the school by grade environment and class size, the average number of social links received by low popularity students from other low and medium popularity peers is actually an increasing and convex function of the average number of links they receive from high popularity peers.

***Fact 4:*** *Individuals are more likely to send friendship links to peers from whom they receive friendship links.*[73]

## 6.1 Model - Environment, Payoffs and Outcomes

Building on these 4 established facts, I now propose a simple model of network formation and academic spillovers.

### 6.1.1 Setup

Denote the set of students in a classroom (the relevant set of peers) by $N = \{1, \ldots, n\}$. For the sake of simplicity, Assume there are only two types (popularity level) of students: $\theta \in \Theta := \{L, H\}$. Let $\Pr(\theta_i = L) = \Pr(\theta_i = H) = 1/2$.[74]

Students in the classroom exert effort on two dimensions ($\{(g_{ij})_{1\times N}, e_i\} \in [0,1]^N \times \mathbb{R}_+$): (i) social effort ($g_{ij}$) to form links with specific peers to maximize social gains from network connections and (ii) academic effort ($e_i$) to maximize their test scores.

Let $G = \left(g_{ij}\right)_{n\times n}$ be a directed weighted adjacency matrix capturing the level of effort individual $i$ exerts in a forming a link with individual $j$. Assume $g_{ij} \in [0,1]$ and that there are no self links, i.e. $g_{ii} = 0$ for all $i \in N$.[75]

[71] A similar story emerges if one analyses in-degree nominations from deskmates instead of out-degree nominations to deskmates. That is, low popularity students are not statistically significantly more or less likely to receive stronger or weaker ties from more vs less popular deskmates (Table I16).

[72] Carrying out this exercise with endline nominations instead of baseline nominations gives us similar coefficients (Table I17).

[73] This is one of the most well established facts in networks literature. Within my data, at baseline, controlling for both sender and receiver fixed effects, individuals are more 20-30% more likely to send a friendship link with peer who in turn is trying a for a link with them.

[74] That is, half of the class is considered to be low (isolated) type and the other half is considered to be high (most popular) type. The model can be easily extended to three types as per the original specification in the paper. Although, the computations would become unnecessarily cumbersome.

[75] $g_{ij}$ can also represent the strength of a directed link from $i$ to $j$.

The social planner (i.e. the teacher / principal) imposes a *deskmate plan* which determines within a classroom who gets paired with whom. Students sit in pairs and an individual's prescribed deskmate's type determines both his social and academic effort.

Define the deskmate assignment correspondence as $\alpha : N \implies N$, such that for any student $i$, $\alpha_i = s$ if $s$ is $i$'s assigned deskmate under the deskmate plan. Let $\alpha \in \mathcal{A}$ where $\mathcal{A}$ denotes the set of all possible seating plans (all possible pairings within the classroom).

### 6.1.2 Payoffs

Given a particular deskmate plan ($\alpha$),

***Returns to social effort:*** Define a student $i$'s network specific payoff by:

$$u_i((g_{ij})_{j\in N\setminus\{i\}}; G, \alpha) = \sum_{j\in N\setminus\{i\}} \left[ g_{ij} v_{ij} - \frac{g_{ij}^2}{2} \right] \tag{9}$$

i.e. the cost of social effort is quadratic and the returns to effort are dependent on $v_{ij}$ which is comprised of the following components:

$$v_{ij} = \underbrace{\beta g_{ji}}_{\text{Effects of link reciprocity}} + \underbrace{S_{\theta_j}}_{\text{Type specific social value of linking with } j} + \underbrace{\delta \mathbf{1}[\alpha_i = j]}_{\text{Deskmate / Proximity effects}} + \underbrace{c(\theta_{\alpha_i})}_{\text{Effects of social comparisons}}$$

i.e. Eq. 9 can be written as:

$$u_i((g_{ij})_{j\in N\setminus\{i\}}; G, \alpha) = \sum_{j\in N\setminus\{i\}} \left[ g_{ij} \left( \beta g_{ij} + S_{\theta_j} + \delta \mathbf{1}[\alpha_i = j] + c(\theta_{\alpha_i}) \right) - \frac{g_{ij}^2}{2} \right]$$

where,

- *Link reciprocity* implies if $j$ sends a link to $i$, $i$ is more likely to send a link to $j$.

  **Assumption 1:** $\beta < 1$, i.e. individuals respond by less than one to one in terms of reciprocating links extended towards them.

- *Type specific social value of linking with an individual* is defined by the level of effort an average high popularity individual exerts to form a link with the type of the individual. Assume that this only bites for low-popularity individual, i.e.

  **Assumption 2:** Let $S_{\theta_j}$ be defined as:

  $$S_{\theta_j} = \begin{cases} f(\bar{g}_{HL}) & \text{if } \theta_j = L \\ 1 & \text{if } \theta_j = H \end{cases}$$

  where $\bar{g}_{HL} = \dfrac{\sum_{k,m:\theta_k=H,\theta_m=L} g_{km}}{\#\{k : \theta_k = H\}\#\{m : \theta_m = L\}}$, i.e. $\bar{g}_{HL}$ captures the average number of links an L type will receive from an H type in expectation. In other words, there are type specific status returns of forming a link with an individual and they are a function of *endogenously determined social actions.*

**Assumption 3:** Let $f$ be twice continuously differentiable, $0 < f'(x) < 1$ and $f''(x) > 0$ for all $x \in [0, 1]$. Additionally, assume that $f(1) \leq 1$.[76]

- *Deskmate / Proximity effects* capture the effect of contact hypothesis, i.e. when individual $i$ and $j$ are paired with each other they are more likely to exert effort in linking with each other.

  **Assumption 4:** $\delta > 0$

- Finally, *effects of social comparisons* is captured by $c_i(\theta_{\alpha_i})$. $\theta_{\alpha_i}$ captures the type of the deskmate.

  **Assumption 5:** Let $c(\theta_{\alpha_i}) = \{c_L, c_H\}$ where $c(\theta_{\alpha_s})$ depends only on the type of the prescribed deskmate. Assume $c_H < c_L$, i.e. being assigned to a low popularity deskmate motivates an individual more to send links to other classmates due to reduced feeling of inadequacy (in a relative sense).[77]

***Returns to academic effort:*** Define a student $i$'s academic outcome by

$$y_i(e_i; G^*(\alpha), \alpha) = 2\left(\left(\sqrt{A_i(G^*(\alpha), \alpha)}\right) e_i - e_i^2\right) \tag{10}$$

where $A_i(G^*(\alpha), \alpha) = x_i + x_{\alpha_i} + x_i x_{\alpha_i} + \dfrac{1}{n-2}\left(\sum_{j \in N \setminus \{i, \alpha_i\}} g^*_{ji}(\alpha) x_j\right) + c(\theta_{\alpha_j})$

That is, an individual's academic performance $y_i$ is an outcome of the effort they exert within the classroom, their intrinsic ability, the support they receive from their deskmate and other peers within the classroom and their level of motivation (determined by the effects of social comparisons).

- $x_i$ is the intrinsic ability (proxied by baseline academic performance) of the student.
- Similarly, $x_{\alpha_i}$ and $x_j$ are the intrinsic abilities of the assigned deskmate and other peers respectively in the classroom.[78]
- $g^*_{ji}$ is the level of effort individual $j$ exerts in equilibrium towards individual $i$, i.e. the spillovers from a peer $j$ (who is not a deskmate) to individual $i$ is dependent on how willing $j$ is to interact with $i$.[79]
- Finally, as before $c(\theta_{\alpha_j})$ determines the returns to effort (which are driven by social comparisons).

Assume $x_i = x_H > 0$ for all $i$ such that $\theta_i = H$ and $x_i = 0$ for all $i$ such that $\theta_i = L$, i.e. normalize the intrinsic academic ability of low types to be 0.

### 6.1.3 Timing

Similar to Sadler and Golub [2024], I assume that the agents do not solve both the stages of the game simultaneously. Instead, they first play the network formation game and then take the network formed in stage 1 as given to determine their equilibrium level of academic effort. Additionally, I assume that the agents do not backward induce.[80]

[76] This ensures that the social value of linking with $L$ type individuals never exceeds the social value of linking with $H$ type individuals. The regularity condition on the first derivative ensures an interior solution.

[77] Incorporating effects of social comparisons either as a cost or a net benefit from each link formed is analogous.

[78] I also assume that the intrinsic ability of the individual and his deskmate can positive interact with each other. However, since I normalize the ability of low type to be 0, it will not come into effect for them.

[79] Unlike other peers in the classroom, I assume that the deskmate's ability has a higher impact on the student's performance. This is because within the deskmate plan, they do spend considerably more time with the assigned deskmate.

[80] i.e. utilities obtained from social links and academic performance are completely orthogonal and do not even enter additively into the decision of the agent.

### 6.2 Equilibrium and Comparative Statics

With the basic description of the model in place, we can now define the Nash equilibrium of stage 1 and with that the academic performance of individuals in equilibrium. Finally, we can carry out the required comparative statics.

**Lemma 1:** Define $g_{ij}$ to be the level of effort individual $i$ exerts towards forming a friendship link with individual $j$, which is equivalent to the weighted out-degree connection from individual $i$ to individual $j$. Additionally, define $\bar{OD}_i$ ($\bar{ID}_i$) as the weighted normalized out (in)-degree centrality of individual $i$. That is $\bar{OD}_i$ captures the average effort exerted by individual $i$ to establish a friendship link with a peer in the classroom (measure of socialization effort) and $\bar{ID}_i$ captures the average effort exerted by peers in the classroom to establish a friendship link with individual $i$ (measure of social integration). Given a deskmate plan, in equilibrium,

$$g^*_{ij} = \frac{1}{1-\beta^2}\Big[(S_{\theta_j} + \beta S_{\theta_i}) + (c(\theta_{\alpha_i}) + \beta c(\theta_{\alpha_j})) + \delta(1+\beta)\mathbf{1}[\alpha_i = j]\Big] \tag{11}$$

$$\bar{OD}^*_i = \frac{1}{n-1}\sum_{j\in N\setminus\{i\}} g^*_{ij} \tag{12}$$

$$= \frac{1}{1-\beta^2}\left[\frac{n}{2(n-1)}S_{\theta_j|\theta_j\neq\theta_i} + \frac{1+2\beta}{2}S_{\theta_i} + c(\theta_{\alpha_i}) + \frac{\beta}{n-1}\left(c(\theta_i) + \sum_{j\neq i, j\neq\alpha_i} c(\theta_{\alpha_j})\right) + \frac{\delta(1+\beta)}{n-1}\right] \tag{13}$$

$$\bar{ID}^*_i = \frac{1}{n-1}\sum_{j\in N\setminus\{i\}} g^*_{ji} \tag{14}$$

$$= \frac{1}{1-\beta^2}\left[\frac{2+\beta}{2}S_{\theta_i} + \frac{\beta n}{2(n-1)}S_{\theta_j|\theta_j\neq\theta_i} + \frac{1}{n-1}\left(c(\theta_i) + \sum_{j\neq i, j\neq\alpha_i} c(\theta_{\alpha_j})\right) + \beta c(\theta_{\alpha_i}) + \frac{\delta(1+\beta)}{n-1}\right] \tag{15}$$

*Proof.* Differentiate eq. 9 to get:

$$g^*_{ij} = v_{ij} = \beta g_{ji} + S_{\theta_j} + \delta\mathbf{1}[\alpha_i = j] + c(\alpha_i) \tag{16}$$

Plug in the value of $g^*_{ji}$ to obtain the closed form solution of $g^*_{ij}$.

For any individual $i$, there are $n/2$ peers of type $\theta_j$ such that $\theta_j \neq \theta_i$ and $(n-1)/2$ peers of type $\theta_j$ such that $\theta_j = \theta_i$. Therefore, the expressions for $\bar{OD}_i$ and $\bar{ID}_i$ can be derived directly by substituting eq. 11 into eq. 12 and 14 respectively. □

**Lemma 2:** In equilibrium, the academic performance of an individual, $y^*_i = A_i(G^*(\alpha), \alpha)$.

*Proof.* Proof directly follows from the first order condition of eq. 10. Since $e^*_i = \sqrt{A}$, $y^*_i = A_i$ □

#### 6.2.1 Comparative Statics - returns to social effort

**Proposition 1** *(Formalizing the results on social networks from within classroom randomization)*:

Let $u, v \in N$ such that $\theta_u = \theta_v = L$. For a given deskmate plan, $\alpha \in \mathcal{A}$ where $\theta_{\alpha_u} = L$, $\theta_{\alpha_v} = H$, $\bar{OD}^*_u > \bar{OD}^*_v$ and $\bar{ID}^*_u > \bar{ID}^*_v$.

That is, for a given deskmate plan, take two $L$ type individuals indexed by $u, v$. If individual $u$ is matched to another $L$ type deskmate and individual $v$ is matched to a $H$ type deskmate; then individual $u$, on an average, has both more in-degree and out-degree nominations than individual $v$ from the rest of the classroom.

*Proof.* Given $\theta_u = \theta_v$, $\bar{OD}^*_u - \bar{OD}^*_v = \dfrac{1}{1-\beta^2}[c_L - c_H]$ and $\bar{ID}^*_u - \bar{ID}^*_v = \dfrac{\beta}{1-\beta^2}[c_L - c_H]$.

Since $c_L > c_H$, $\bar{OD}^*_u - \bar{OD}^*_v > 0$ and $\bar{ID}^*_u - \bar{ID}^*_v > 0$ □

**Proposition 2:** Define $p$ as the proportion of $L$ type individuals matched to $H$ types individuals under a given deskmate plan. The social value of linking with $L$ types is increasing and convex in $p$.

*Proof. See Appendix.* □

**Theorem 1** *(Formalizing the results on social networks from across classroom randomization)*:

Characterize a deskmate plan by $\alpha(p)$. That is, a deskmate plan is defined by the proportion (p) of $L$ types that are matched with $H$ types as a deskmate.

Define the average out-degree connections an individual $i$ of type $\theta_i = L$ sends to his peers (as a function of $p$) in equilibrium by $\mathbf{E}(\bar{OD}_i(p); \theta_i = L)$, and the average in-degree connections an individual $i$ of type $\theta_i = L$ receives from his peers in equilibrium by $\mathbf{E}(\bar{ID}_i(p); \theta_i = L)$ respectively.

1. There exists, $\tilde{p}$ and $\breve{p}$ such that $\dfrac{\partial \mathbf{E}(\bar{ID}_i(p); \theta_i = L)}{\partial p} > 0$ for all $p > \tilde{p}$ and $\dfrac{\partial \mathbf{E}(\bar{OD}_i(p); \theta_i = L)}{\partial p} > 0$ for all $p > \breve{p}$.
2. $\tilde{p} < \breve{p}$, i.e. the effect of the tipping point where increasing returns to more isolated-popular matches come into effect comes earlier for in-degree than out-degree connections.
3. Both $\mathbf{E}(\bar{ID}_i(p); \theta_i = L)$ and $\mathbf{E}(\bar{OD}_i(p); \theta_i = L)$ are convex in $p$. However, $\dfrac{\partial^2 \mathbf{E}(\bar{ID}_i(p); \theta_i = L)}{\partial^2 p} > \dfrac{\partial^2 \mathbf{E}(\bar{OD}_i(p); \theta_i = L)}{\partial^2 p}$ for all $p$. That is the marginal increase in average in-degree connections for $L$ type individuals is greater than marginal increase in average out-degree connections for all $p \geq \breve{p}$.

*Proof. See Appendix.* □

### 6.2.2 Comparative Statics - returns to academic effort

To pin down the comparative statics results of the academic performance of low popularity individuals in equilibrium, we need an additional assumption. Motivated by the comparison between low popularity students matched with each other vs those matched with high popularity deskmates, assume that the independent marginal returns to one's own effort dominate the marginal returns emanating from the positive spillovers from a high type deskmate's academic ability. That is,

**Assumption 6:** Assume $c_L - c_H > x_H$

**Proposition 3:** Let $u, v \in N$ such that $\theta_u = \theta_v = L$. Fix the overall deskmate plan, $\alpha$ and let $\theta_{\alpha_u} = L$, $\theta_{\alpha_v} = H$. Independent of assumption 6, the effect of the deskmate's type on a low popularity student's academic performance is theoretically ambiguous. That is, it is unclear if it is better to match them to a high vs a low type deskmate to generate improvements in academic performance.

However, if assumption 6 holds, then $y_u^* > y_v^*$, i.e. the academic performance of the isolated student who is matched to another isolated student is better than that of the isolated student matched to a high popularity deskmate.

*Proof. See Appendix* □

**Theorem 2:** Let deskmate plans $\alpha(p) \in \mathcal{A}$ be characterized by $p$ as before. Define $\mathbf{E}(y_i^*(p) : \theta_i = L)$ as the average academic performance of $L$ types in a classroom in equilibrium. If assumption 6 holds,

1. There exists $\check{p}$ such that $\dfrac{\partial \mathbf{E}(y_i^*(p) : \theta_i = L)}{\partial p} > 0$ for all $p > \check{p}$
2. $\mathbf{E}(y_i^*(p) : \theta_i = L)$ is convex in $p$

*Proof. See Appendix.* □

### 6.3 Interpretation of the theoretical results

Proposition 1 and Theorem 1, clearly outline the exact results we find in our empirical analysis. Conditional on a fixed deskmate plan (i.e. controlling for classroom fixed effects), isolated students matched to isolated peers as deskmates tend to feel less socially inadequate in comparison to isolated students matched to popular peers as deskmates. This results in them increasing their perceptions of self worth (since $c_L > c_H$) and benefiting from more in-degree and out-degree connections.

However, when one compares the effect of overall deskmate plans against one another, matching more isolated students with most popular peers as deskmates has convex returns. More so, the increasing returns as observed under LopH classes only tend to trickle in after a particular threshold of match proportion $p$. As a matter of fact, the returns to matching more isolated students with popular peers below this threshold should be decreasing. This is because the average in-degree and out-degree connections for isolated students in equilibrium are determined by both their own effort of forming links and the actions of more popular peers. Across classrooms when one evaluates the general equilibrium / "level" effects, one is trading off the positive effect of increased social value of linking with isolated students due to the actions of the most popular peers against the negative effect of increased feelings of inadequacy, resulting in reduced effort to form links by isolated students.

Moreover, the positive classroom level effects on in-degree connections for isolated students as a function of $p$ should start to dominate earlier than the effects on out-degree connections. Mapping this to our results would imply that the magnitudes of level of social integration in LopH classes should be higher than the magnitudes of socialization effort. Statistically significant positive effects of LopL classes on these dimensions compared to control classrooms might not be observable since the exact difference in the proportion of isolated students matched to most popular peers is still small and hence any differences may get subdued due to noise.

A similar story emerges when looking at the academic performance of low popularity students under different deskmate plans. The threshold effect and the convexity of $\mathbf{E}(y_i^*(p) : \theta_i = L)$ in $p$ implies that isolated students in LopH classes, on average, should perform better than the ones in control classrooms. Below the threshold, the effects for matching more isolated students with high popularity peers as deskmates should have decreasing returns. That is, isolated students in LopL classes should also do better than control classes on average. In terms of magnitudes (while not statistically significant), this is exactly what I find in the data.

# 7 Discussion

## 7.1 Policy and Welfare Implications

Therefore, what is the optimal approach for designing deskmate plans based on popularity to improve the outcomes of relatively isolated students? These findings open up an equity-efficiency trade off. Even if I focus only on low popularity students, the correct choice of plan depends both on whose outcomes you want to improve and which outcomes you want to improve.

Results from within classroom randomization suggest that pairing low popularity students to each other improves their social network outcomes, overall well-being and non-cognitive outcomes. Results from across-classroom randomization, on the other hand, suggest that matching a majority of low popularity students to high popularity deskmates improves the overall social cohesion within the classroom. This results in a substantial increase in the social integration of low popularity students along with an improvement in their academic performance but does not lead to improvement on overall well-being or non-cognitive skills.

A teacher could, therefore, go for a deskmate plan similar to the LopH classes where she matches a majority of low-popularity students to high-popularity deskmates for scale effects from contact hypothesis to kick in and matches the remaining low popularity students to each other as deskmates. Compared to a classroom where deskmate matches happen randomly, the aforementioned deskmate plan is more efficient. However, it is also more inequitable. This is because, in a classroom with this plan, low popularity students who are matched to each other gain from the positive effects resulting from the change in classroom dynamics and also gain from the lack of negative upward social comparisons at the desk level. In essence, they get a positive boost from both the treatments and substantially improve their outcomes on multiple dimensions. Low popularity students who are matched with high popularity deskmates, on the other hand, do gain from improved social cohesion but lose out on other dimensions due to negative upward social comparisons at the desk level.[81]

Alternatively, a more equitable plan would propose matching all low popularity students to each other as deskmates. The lack of upward negative social comparisons at the desk level for all these students would result in improvement in outcomes over several dimensions. However, this plan would not be efficient since it doesn't utilize the possible changes in social incentives at the classroom level that inter-popularity matching induce.

Quantifying the welfare implications of these deskmate plans in dollar terms is challenging due to the multi-dimensional changes in outcomes. This difficulty is compounded by the lack of precise estimates for wage returns from standardized improvements in social skills or connectedness. However, to make the trade-offs clearer, let's make some simple assumptions for a rough back of the envelope calculation. Assume that lack of self-worth / lower self perception of likeability maps one to one to a quantitative

[81] If one can utilize findings from the heterogeneous treatment effects then these plans can be further improved by using the demographic characteristics of students while matching them to more vs less popular deskmates. Depending on the distribution of characteristics in the classroom, one could therefore reduce the unequal effect of this deskmate plan.

measure of mental health. Further, assume a unit increase in social connectedness in Bond et al. [2007] is equivalent to a 1 S.D. increase in social integration in my set up. Bond et al. [2007] show that a unit increase in social connectedness leads to a 67% increase in mental health.[82] Now, consider two deskmate plans: Plan 1: All low popularity students are matched to each other as deskmates and Plan 2: 60% of low popularity students are matched to high popularity deskmates and the remaining are matched to each other. Under plan 1, all low popularity students gain 0.11 SD in self-worth and 0.04 SD in social connectedness, resulting in a 0.14 unit increase in mental health ($0.11 \times 1 + 0.04 \times 0.67$). Under plan 2, 60% of low-popularity students gain 0.11 units in mental health ($0.16 \times 0.67$) and 40% of low-popularity students gain 0.24 units in mental health ($0.11 \times 1 + 0.2 \times 0.67$). Assuming monthly cost of therapy is $\sim$ 125 USD (conservative market rate in New Delhi), this translates into a yearly gain of 205 USD per student under plan 1 whereas a yearly gain of 161 USD for 60% of students and a yearly gain of 360 USD for 40% of the students under plan 2. While on an average plan 2 produces a 38 USD higher gain for students, it also creates greater inequality in outcomes.

### 7.1.1 Are teachers doing the right thing?

Following the conflicting approaches my results find, an immediate question pops up: In the absence of our prescribed seating plans, what were teachers doing in their classrooms? Answering this question is difficult due to lack of data availability. While seating plans are a common practice in almost all classes in the sample, they are often ad-hoc. Teachers tend to focus on a few key students and decide with whom and where they sit. For the rest of the classroom, deskmate pairs are made quasi-randomly. Additionally, teachers do not keep any records of the previous deskmate plans that were put in place.

Based on my conversations during the roadshow of the project, an overwhelming majority of teachers told me that the primary focus of deciding who sits with whom is to foster social ties and create an inclusive environment within the classroom. This need was particularly salient after the CoViD pandemic. Once the schools had opened post lockdown, administrators and class teachers repeatedly exhibited disappointment in how little were students interacting with each other (Tripathi and Raj [2023]). As a result, in the recent past, almost all schools within our sample were designing seating arrangements to improve the outcomes of isolated students.

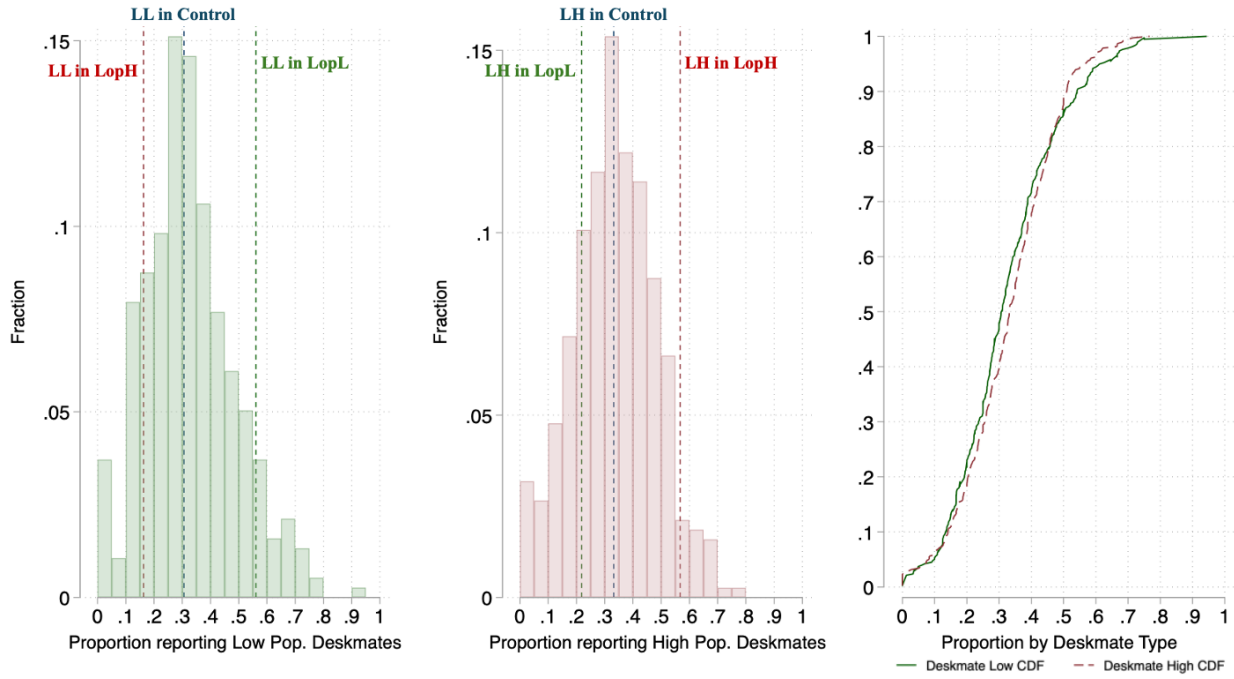
In order to get a sense of what seating arrangements looked like at baseline; I asked the students to report who they generally sit with within the classroom. Fig 4 plots the distribution of proportion of low popularity students within each class reporting a low vs high popularity peer as their prescribed deskmate.[83] I see that less than 5% of the teachers in our sample are going for a deskmate plan that matches a majority of low popularity students to each other or even matches a majority of low popularity students to high popularity students. That is, most plans implemented by teachers at baseline are neither efficient nor equitable.

Based on our qualitative interviews, I find that teachers so far have focused on only a few individuals whose outcomes they want to improve. Directed by the intuition that I also started out with during the pilot, they tend to pair these isolated students with more popular students but unfortunately do not see any gains. This is a common occurrence in practice where findings from studies implemented at one level when taken to reality does not give the same results because the level of implementation

[82] Assume it is measured in the same unit as the measure mapping self worth to mental health.

[83] At baseline, due to the framing of the question, a small subset of students tend to report every single person they sat with up to the time of the survey. This in some cases included classmates who they only sat with when their prescribed deskmate was absent or classmates who they sat with regularly in the previous term but do not sit with anymore. Decomposing student responses to evaluate who was the prescribed deskmate in the most recent seating plan is difficult. To circumvent this issue whenever a student reports more than 1 deskmate, I split the time of the student between deskmates equally. That is, for example. if a student reports that he sat with 2 classmates of differing popularity levels, I split the nomination by the student into into two halves and assume 50% of the student's time is spent with one classmate and 50% of the time is spent with another. The final measure takes the average over all students to compute what proportion of students' time in the classroom is spent sitting with which type of deskmate.

Figure 4: Distribution of proportion of deskmate type for low popularity students within classroom at baseline




**Note:** Figure reports the distribution of the proportion of low popularity students (at the classroom level) who are matched to low vs high popularity deskmates at baseline. Values constructed through self-reports. Dashed lines correspond to the average proportion of match types prescribed in our deskmate plans under LopL, Control and LopH claases. LL corresponds to a low-low match. LH corresponds to a low-high match. Omitted category is a low-medium match.

is misplaced and doesn't account for the endogenous changes in social responses interventions may cause.[84]

## 7.2 Comparisons to the literature

Am I the only one to find such a conflict between direct and group level effects in randomized peer matching interventions? As it turns out, no. Carrell et al. [2013], in their paper find a similar conflict. Taking estimates from random matches occurring due to natural variation, they designed a sorting algorithm to create squadrons in USAFA with an objective of improving academic outcomes of low ability students. However, the groups that were meant to improve the outcomes of low ability students actually ended up impacting them negatively. This happened because within squadrons individuals had a tendency to further sort by their ability level. Put differently, their design didn't account for endogenous social responses to policy changes and this led to a reversal in intended effects.

Thanks to Carrell et al. [2013], I was cognizant of this from the outset. This motivated my choice of a two tiered randomization design. I wanted to explicitly test the impact of a direct interaction between two individuals differently from the interactions that happen at the classroom level. While Carrell et al. [2013] work with squadrons of 30 (similar to a classroom in my case), I work with dyads (pairs of two). Our analysis further opens up the existence of social responses driven by changes in the overall environment instead of just within groups. In Carrell et al. [2013] setup, even though

[84] Take a study analyzing the effects of academic ability matching for instance. Assume, the study was done at the classroom level where the treatment was matching all high ability students to low ability students within the classroom. Findings from this study when taken to practice and implemented within a classroom only a on select set of student will not work. This is because the original study did not only change the relationship between immediate desk / group mates. It also changed the overall social environment of the classroom. When implemented in practice, the teacher by selectively targeting students doesn't change the overall social environment. This in turn can often in unanticipated results.

individuals spend majority of their time with their squadron members, they also talk to peers outside of their squadron. As a result, the existence of different squadron types in the overall cohort could have affected their results.

Secondly, several other papers in the literature have analyzed the effect of deskmates on a student's academic ability and perceptions. While designing the randomization strategy, I reanalyzed the results from two recent papers, one from the field of economics (Wu et al. [2023]) and the other from the field of sociology (Keller et al. [2023]). Wu et al. [2023] implement their randomization at the classroom level and Keller et al. [2023] implement their randomization at the desk level.

In Wu et al. [2023], classrooms where all high ability students were matched to low ability students tended to exhibit academic improvement for low ability students. However, looking within their control classrooms where match types were random, I see that low ability students that were paired with other low ability students tended to perform better in comparison to low ability students that were paired with high ability students. This is exactly in line with the predictions of my theoretical model. This conflict that arises in their sample from my reanalysis highlights the key tension that exists in peer effects studies. Direct effects and classroom level effects (resulting from changes in social incentives) can often move in opposite directions. One needs to be cognizant of both the outcomes a study intends to improve and the level of randomization for replicability. [85]

### 7.3 Relevance of these findings

Why is it important to develop social connections and non-cognitive skills from an early age? While there is an intrinsic value to stronger connections and social skills as part of an individual's human capital, recent advances in the literature have revived interest in this field.[86] Based on my read of the literature, several papers have pointed out a 7-14% gain in long run wages, 0.2-0.3 points gain in medium run academic outcomes and 6.2-11% gain in college outcomes of improving social networks and non-cognitive skills.

Recent papers by Deming and Silliman [2024], Edin et al. [2022] and Izadi and Tuhkuri [2024] have shown systematic evidence of global decline in returns to cognitive skills and an increase in social and non-cognitive skills. From an economic perspective, this finding is easy to rationalize if workers are seen as agents making choices and interacting strategically with each other, instead of factors in a production function (Deming and Silliman [2024]). Using Swedish data, Edin et al. [2022] and Izadi and Tuhkuri [2024] show that a 1 SD increase in non-cognitive skills such as extraversion, emotional stability, conscientiousness, focus and perseverance leads to a 7-14% increase in annual wages. Cognitive behavioral therapy interventions often focusing on self-esteem and self-worth have shown to improve graduation rates 10 years later by 6.2% (Sorrenti et al. [2024]). Alan et al. [2019] show that a 10% increase in perseverance and hard work leads to 0.2 SD increase in academic outcomes even after 3 years. Interventions within schools and colleges focusing on optimism dating as far back as 1982 have shown 0.27-0.3 points gain in GPA over 1-4 years (Wilson and Linville [1982, 1985], Oyserman et al. [2006], Blackwell et al. [2007]) and a 16-20% higher likelihood of being employed in the future (Mohanty [2010]). Buser et al. [2014, 2021] have shown that a one unit increase in

[85] Another example is the work by Keller et al. [2023]. The authors in this paper look at the academic self concept of individuals and analyze whether being matched to a better or a worse performing deskmate changes the same. They find no significant effects. However, restricting the sample to all individuals within the school who are paired with a worse performing deskmate, I see that academic self concept goes up in classes where most students are paired with better performers and the student in consideration is instead paired with a worse performer. This highlights the fact that outcomes related to self worth and perceptions of one's ability can be impacted by changes in local environment (desk pair) but also by changes in a global environment (classroom composed of all desk pairs).

[86] I am fully cognizant of the burgeoning literature in sociology, social psychology and education that highlight the importance of these traits. The papers that I refer to in the following section do their best to assign a dollar / test score value to the stock of these skills. This helps us understand if and how policy makers should assign resources to programs that focus on development of better and more inclusive classrooms and interventions that develop non-cognitive traits at large.

competitiveness leads to a 11% increase in the probability of choosing a more prestigious college tract and a 290 EUR increase in gross monthly income. Similar effects hold for prosociality, patience and risk tolerance (Kosse and Tincani [2020], Sutter et al. [2013])

In terms of social connectedness and teacher support, interventions improving belongingness have shown a 0.24 point rise in GPA over 4 years (Walton and Cohen [2007, 2011]). Hällsten [2017] shows that a unit increase in their measurement of social capital leads to a 6-10% decline in unemployment. Similar effects have been documented by Munshi [2003, 2011]. In a study by Bond et al. [2007], authors show that a one unit increase in school connectedness leads to a 1.3-2 odds ratio decline in drug abuse and mental health problems 4 years later. Allen et al. [2013] show that a 10% rise in teacher interactions in middle school leads to a 3.5% increase in test scores.

Comparing units across these studies and mine is a tedious task. This is because individuals from different age groups and geographies tend to respond differently to the same survey questions. In the absence of raw data, standardizing units across studies for comparison is complicated. Additionally, most social skills enhancing interventions are often doled out as a bundled good. The effect of such interventions is studied on outcomes such as wage or GPA without changes documented in the mediating social skills.

Nevertheless, the effect sizes of the treatments from my intervention are meaningful. They compare well with Shan and Zölitz [2022] and Zárate [2023]. At baseline, low popularity students showed stark deficiencies across all social skills, traits and experiences. The effect of matching a low popularity student to a low popularity deskmate within the classroom by the endline almost completely bridges the gap between these low popularity students and their medium popularity peers. In terms of social connections, it brings them 10-60% closer to each other depending on the variable I choose to evaluate.

A costless intervention such as mine, therefore, is highly relevant for classrooms in developing countries often starved for resources. I ran this experiment for less than 45,000 USD including all expenses. Equipping teachers with the ability to identify social isolation (Alan et al. [2024]) and providing them methods of solving social isolation based on studies such as mine could achieve improvements in the traits of socially isolated students at pennies to a dollar.

# 8 Conclusion

In this study, I carry out three pieces of analyses. First, I highlight the academic and social disadvantages relatively isolated students face. Second, I attempt to resolve those disadvantages by fostering connections between individuals within the classroom through the help of deskmate assignments. And third, I highlight the key trade offs that often exist in peer matching interventions when effects are evaluated at an individual vs a group level. To carry out this exercise, I incorporate two competing theories from the literature of sociology in an economic framework and implement a two-tiered randomized peer matching intervention. In the first step, students within the classroom are paired with deskmates based on their popularity. In the second step, I randomize at the class level by varying the number of pairs of low-popularity students who are paired with each other versus those paired with more popular peers. I focus on low popularity / relatively isolated students. Finally, I build a theoretical framework incorporating endogenous social interactions to unify the conflicting results that different levels of randomization can produce.

Controlling for the overall classroom environment, I see that low popularity students benefit from sitting with other low popularity students instead of sitting with medium and high popularity students. A low-low match results in an absence of negative upward social comparisons between deskmates. This results in improved social network outcomes, higher willingness to socialize, increased self-worth, optimism, competitiveness and willingness to work hard.

Comparing individuals across classrooms with different deskmate plans shows that classroom environments induced by the overall deskmate plans have an independent effect on students different from the direct effect of locally assigned deskmate. In classes where a majority of low-popularity students are paired with high-popularity peers, scale up effects from proximity / contact hypothesis kick in. As a result, I observe an overall increase in social connections and academic performance for all students, including low-popularity individuals. However, this increased social cohesion does not translate into improvements in non-cognitive skills or classroom experiences of low popularity students, since locally negative social comparisons are still at play.

In essence, my study indicates a trade off. The first tier of randomization suggests that outcomes of low-popularity students would be better if they are matched to each other. However, the second tier of randomization suggests that in order to increase the social cohesion of the classroom, I should match a majority of low-popularity students to high-popularity deskmates. Optimality of the deskmate plans based on popularity measures, therefore, depends on the objective function of the school and the key outcomes they want to improve.

These findings reveal several interesting insights. One, I show that peer interactions induced by rewiring deskmate plans can help teachers improve the outcomes of relatively isolated students at no additional costs. Two, I show that designing these plans, however, would require teachers to balance equity-efficiency trade offs. Three, I show that the direct effect of peer matching interventions often differ from group level effects. As a result, several findings from the literature when implemented in practice, either fail or backfire. I, therefore, caution both researchers and teachers to be cognizant of changes both at a direct and a classroom level of rewired deskmate plans. Cherry picking isolated students and matching them to more popular deskmates might be more harmful for them if the overall classroom structure is not changed.

Finally, I note that my program ran for a relatively short period of time. My study is not designed to analyze the long run effects of these deskmate plans. However, if the improvements amongst isolated students persists from these deskmate plans, literature gives us suggestive evidence that this would also result in long run improvements. A robust analysis of long term effects of peer matching interventions based on popularity is left for future research.

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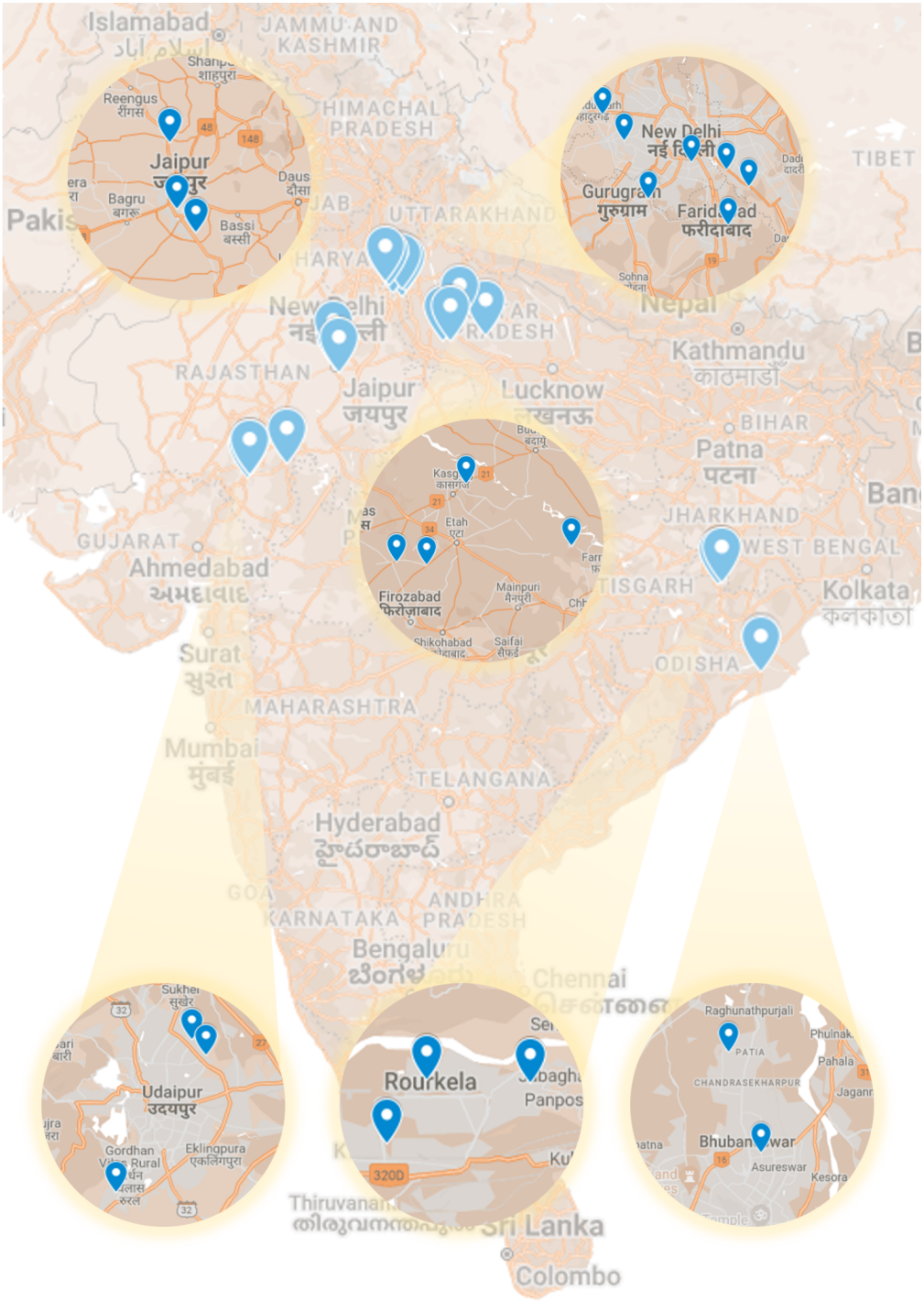
# In Paper Appendix

## A Sample Details

### A.1 Classroom Arrangements and Geographical Diversity

Figure A1: Sample Classrooms in schools with desk structure

Figure A2: Geographical spread of schools in the sample




**Note:** Schools in our study are spread over 13 cities in India. These schools are located in 4 different states/regions: Delhi / NCR, Rajasthan, Uttar Pradesh and Odisha. 5 schools from Odisha are situated in Rourkela and Bhubaneswar, 4 schools from Uttar Pradesh are situated in Kaimganj, Kasganj, Awagarh and Jalesar, 7 schools from Rajasthan are situated in Jaipur, Udaipur, Chittorgarh and Chomu and the remaining 8 schools come from New Delhi, Faridabad, Gurgaon, NOIDA and Tikri Kalan.

## A.2 Summary Statistics

Figure A3: Distribution of class size

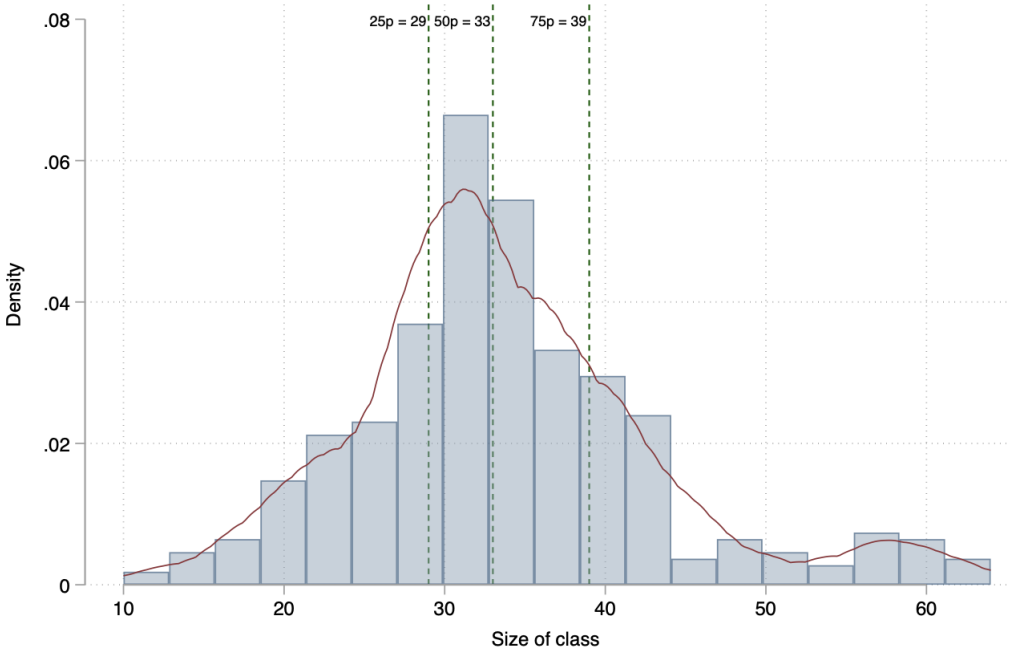



Table A1: Summary Statistics

| Variable | N | All Students | Low Popularity | Medium Popularity | High Popularity |
|---|---|---|---|---|---|
| **Panel A: Demographic Characteristics - Proportions** | | | | | |
| Male | 12842 | 0.568 | 0.524 | 0.540 | 0.636 |
| Muslim | 12842 | 0.037 | 0.042 | 0.039 | 0.031 |
| General | 12842 | 0.686 | 0.666 | 0.688 | 0.703 |
| Uncategorized | 12842 | 0.058 | 0.067 | 0.056 | 0.051 |
| OBC | 12842 | 0.160 | 0.167 | 0.161 | 0.152 |
| SC/ST | 12842 | 0.096 | 0.099 | 0.095 | 0.094 |
| EWS Student | 5513 | 0.134 | 0.170 | 0.128 | 0.105 |
| Special Needs Student | 1142 | 0.028 | 0.056 | 0.011 | 0.018 |
| **Panel B: Survey SES Responses - Mean and Proportions** | | | | | |
| Number of Siblings | 12606 | 1.285 | 1.369 | 1.277 | 1.214 |
| Any Vehicle (0/1) | 12477 | 0.959 | 0.951 | 0.959 | 0.966 |
| Only Two-Wheeler (0/1) | 12477 | 0.207 | 0.222 | 0.206 | 0.195 |
| Number of Bikes | 12468 | 0.757 | 0.723 | 0.760 | 0.785 |
| Number of Cars | 12472 | 1.117 | 1.068 | 1.119 | 1.160 |
| Holiday Destination - Domestic (0/1) | 12525 | 0.648 | 0.653 | 0.642 | 0.647 |
| Holiday Abroad - Domestic (0/1) | 12525 | 0.268 | 0.256 | 0.267 | 0.279 |
| Holiday Frequency | 12519 | 2.386 | 2.384 | 2.398 | 2.377 |
| Relative Visit Frequency | 12411 | 2.936 | 2.933 | 2.953 | 2.922 |
| School Transport - Private (0/1) | 11332 | 0.354 | 0.355 | 0.349 | 0.359 |
| School Transport - School Bus (0/1) | 11332 | 0.452 | 0.441 | 0.458 | 0.457 |
| School Transport - Public (0/1) | 11332 | 0.193 | 0.204 | 0.192 | 0.184 |

**Note:** The table reports summary statistics on demographic variables. Information on Gender, Caste, Economically Weaker Section and Special Needs is obtained from school records. Upon unavailability of school records, information on gender is obtained through survey response and name categorization. Upon unavailability of school records, information on caste is obtained through name categorization. Details on the categorization procedure are available in section TBA. Survey SES responses allow us to proxy the socio-economic standing of the student. Number of siblings is top coded at 4. Number of Bikes / Cars is top coded at 3. Holiday frequency is coded as follows: 0 - Never, 1 - Once in a couple of years, 2 - Atleast once a year, 3 - Atleast once in six months, 4 - Atleast once in 3 months, 5 - Atleast once a month. Relative Visit frequency is coded as follows: 0 - Never, 1 - Once a year, 2 - Twice a year, 3 - Three times a year, 4 - Four times a year, 5 - Every month, 6 - More than once a month.

## A.3 Differences in demographic characteristics by popularity

Table A2: Differences in demographic characteristics by popularity

| | | | | Caste Categories | | | |
|---|---|---|---|---|---|---|---|
| | (1) Male | (2) Muslim | (3) Special Needs | (4) General | (5) OBC | (6) SC / ST | (7) Uncategorized |
| Low pop. | -0.017 | 0.003 | 0.045*** | -0.026*** | 0.009 | 0.005 | 0.011** |
| | (0.013) | (0.004) | (0.016) | (0.010) | (0.008) | (0.006) | (0.005) |
| High pop. | 0.095*** | -0.009** | 0.007 | 0.012 | -0.007 | -0.001 | -0.004 |
| | (0.013) | (0.004) | (0.011) | (0.009) | (0.008) | (0.006) | (0.005) |
| Classroom FE | Y | Y | Y | Y | Y | Y | Y |
| Sample Mean | 0.568 | 0.037 | 0.028 | 0.686 | 0.160 | 0.096 | 0.058 |
| p-val L = H | 0.000 | 0.016 | 0.024 | 0.000 | 0.033 | 0.328 | 0.005 |
| Adj. R-sq | 0.013 | 0.022 | 0.027 | 0.137 | 0.147 | 0.112 | 0.092 |
| Obs. | 12842 | 12842 | 1142 | 12842 | 12842 | 12842 | 12842 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | | |

**Note:** Low pop. refers to a low popularity student. High pop. refers to a high popularity student. Omitted category is a medium popularity student. p-val L = H refers to the p value from the test for equality of coefficients on low and high popularity students. OBC refers to Other Backward Caste. SC / ST refers to Scheduled Caste / Scheduled Tribe. Uncategorized refers to individuals who couldn't be categorized into a particular caste. All dependent variables are binary variables. Standard errors are clustered at Classroom level.

Table A3: Differences in socio-economic status by popularity

| | (1) EWS | (2) # Sibling | (3) Vehicle (1/0) | (4) 2 Wheel. only (1/0) | (5) # 2 Wheelers | (6) # Cars | (7) # Holidays |
|---|---|---|---|---|---|---|---|
| Low pop. | 0.044*** | 0.100*** | -0.008* | 0.021** | -0.030* | -0.057*** | -0.012 |
| | (0.013) | (0.022) | (0.005) | (0.008) | (0.017) | (0.016) | (0.034) |
| High pop. | -0.022** | -0.062*** | 0.007* | -0.011 | 0.028 | 0.039** | -0.020 |
| | (0.009) | (0.021) | (0.004) | (0.008) | (0.018) | (0.016) | (0.033) |
| Classroom FE | Y | Y | Y | Y | Y | Y | Y |
| Sample Mean | 0.134 | 1.285 | 0.959 | 0.216 | 0.757 | 1.117 | 2.386 |
| p-val L = H | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.798 |
| Adj. R-sq | 0.184 | 0.090 | 0.058 | 0.269 | 0.161 | 0.336 | 0.061 |
| Obs. | 5513 | 12606 | 12477 | 11967 | 12468 | 12472 | 12519 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | | |

**Note:** Low pop. refers to a low popularity student. High pop. refers to a high popularity student. Omitted category is a medium popularity student. p-val L = H refers to the p value from the test for equality of coefficients on low and high popularity students. EWS refers to categorization into economically weaker section of the society as per school records. # Sibling refers to number of siblings (top coded at 4). Vehicle (1/0) refers to whether the student's family owns any vehicle (Y=1, N=0). 2 Wheel. only (1/0) refers to whether the student's family only owns a 2 Wheeler and not a car (Y=1, N=0). # 2 Wheelers and # Cars refer number of bikes and cars owned by the student's family respectively. # Holiday refers to the frequency with which the student's family takes a holiday. It is coded as follows: 0 - Never, 1 - Once in a couple of years, 2 - Atleast once a year, 3 - Atleast once in six months, 4 - Atleast once in 3 months, 5 - Atleast once a month. Standard errors are clustered at Classroom level.

# B Additional Proofs

**Proof for proposition 2:**

*Proof.* Recall that $\bar{g}_{HL}$ is defined as the average effort exerted (number of friendship links sent) by an $H$ type individual to an $L$ type individual. Therefore,

$$\bar{g}_{HL} = \frac{4}{n^2} \sum_{i:\theta_i=H} \sum_{j:\theta_j=L} g_{ij} \tag{17}$$

$$= \frac{4}{n^2} \left[ \frac{n^2}{4}(f(\bar{g}_{HL}) + \beta) + \frac{n^2}{4} \left( pc_L + (1-p)c_H + \beta(pc_H + (1-p)c_L) \right) + \delta(1+\beta)p \right] \tag{18}$$

$$= f(\bar{g}_{HL}) + \beta + (\beta + (1-\beta)p)c_L + (1-(1-\beta)p)c_H + \frac{4\delta(1+\beta)p}{n^2} \tag{19}$$

Differentiating eq. 19 by $p$ gives us:

$$\frac{\partial \bar{g}_{HL}}{\partial p} = \frac{(1-\beta)(c_L - c_H) + \frac{4\delta(1+\beta)}{n^2}}{1 - f'(\bar{g}_{HL})}$$

and

$$\frac{\partial^2 \bar{g}_{HL}}{\partial^2 p} = \left( \frac{(1-\beta)(c_L - c_H) + \frac{4\delta(1+\beta)}{n^2}}{(1 - f'(\bar{g}_{HL}))^2} \right) f''(\bar{g}_{HL}) \bar{g}'_{HL}(p)$$

Since $0 < f'(x) < 1$ for all $x$, $\beta < 1$ and $c_L > c_H$, $\frac{\partial \bar{g}_{HL}}{\partial p} = \frac{(1-\beta)(c_L - c_H) + \frac{4\delta(1+\beta)}{n^2}}{1 - f'(\bar{g}_{HL})} > 0$. Since $f''(x) > 0$ for all $x$, $\bar{g}''_{HL}(p) > 0$.

From this, it follows directly that $f(\bar{g}_{HL})$ is increasing in $p$ since $f'(x) > 0$.

To show convexity, note that $\frac{\partial^2 f\left(\bar{g}_{HL}(p)\right)}{\partial^2 p} = f''(\bar{g}_{HL}(p)) \left(\bar{g}'_{HL}(p)\right)^2 + f'(\bar{g}_{HL}(p)) \bar{g}''_{HL}(p)$, which is again positive since each independent term in the expression is positive for all $p$. □

**Proof for theorem 1:**

*Proof.* Recall that

$$\bar{OD}^*_i = \frac{1}{1-\beta^2} \left[ \frac{n}{2(n-1)} S_{\theta_j | \theta_j \neq \theta_i} + \frac{1+2\beta}{2} S_{\theta_i} + c(\theta_{\alpha_i}) + \frac{\beta}{n-1} \left( c(\theta_i) + \sum_{j \neq i, j \neq \alpha_i} c(\theta_{\alpha_j}) \right) + \frac{\delta(1+\beta)}{n-1} \right]$$

Therefore, in expectation, the average out-degree connections (as a function of $p$) an individual $i$ of type $\theta_i = L$ will send to his peers can be written as:

$$\mathbf{E}(\bar{OD}_i(p); \theta_i = L) = \frac{1}{1-\beta^2} \left[ \frac{n}{2(n-1)} + \frac{1+2\beta}{2} f(\bar{g}_{HL}(p)) + \mathbf{E}\left(c(\theta_{\alpha_i}) | p\right) \right] \tag{20}$$

$$+ \frac{\beta}{n-1} \left( c_L + \mathbf{E}\left( \left( \sum_{j \neq i, j \neq \alpha_i} c(\theta_{\alpha_j}) \right) | p \right) \right) + \frac{\delta(1+\beta)}{n-1} \Bigg] \tag{21}$$

where

$$\mathbf{E}\left(c(\theta_{\alpha_i})|p\right) = pc_H + (1-p)c_L$$

To find a closed form expression of $\mathbf{E}\left(\left(\sum_{j\neq i, j\neq \alpha_i} c(\theta_{\alpha_j})\right)|p\right)$, note that there are $n/2$ individuals of each type.

If individual $i$ is matched with a $H$ type deskmate then amongst the remaining (n-2) peers, $(n(1-p)/2)$ $L$ type peers will have a $L$ type deskmate and $(\frac{np}{2}-1)$ $L$ type peers will have a $H$ type deskmate. Similarly, $(\frac{np}{2}-1)$ $H$ type peers will have a $L$ type deskmate and $n(1-p)/2$ $H$ type peers will have a $H$ type deskmate.

If individual $i$ is matched with a $L$ type deskmate then amongst the remaining (n-2) peers, $(\frac{n(1-p)}{2}-2)$ $L$ type peers will have a $L$ type deskmate and $(np/2)$ $L$ type peers will have a $H$ type deskmate. Similarly, $(\frac{np}{2})$ $H$ type peers will have a $L$ type deskmate and $n(1-p)/2$ $H$ type peers will have a $H$ type deskmate. Since individual $i$ is matched with a $H$ deskmate with probability $p$ and with a $L$ type deskmate with probability with $(1-p)$,

$$\begin{aligned}
\mathbf{E}\left(\left(\sum_{j\neq i, j\neq \alpha_i} c(\theta_{\alpha_j})\right)|p\right) =& p\left[\underbrace{\frac{n}{2}(1-p)c_L + \left(\frac{np}{2}-1\right)c_H}_{(n-1)\text{ L type peers}} + \underbrace{\left(\frac{np}{2}-1\right)c_L + \frac{n}{2}(1-p)c_H}_{(n-1)\text{ H type peers}}\right] \\
&+ (1-p)\left[\underbrace{\left(\frac{n}{2}(1-p)-2\right)c_L + \frac{np}{2}c_H}_{(n-2)\text{ L type peers}} + \underbrace{\frac{np}{2}c_L + \frac{n}{2}(1-p)c_H}_{n\text{ H type peers}}\right] \\
=& p\left[(c_L+c_H)\left(\frac{n}{2}-1\right)\right] + (1-p)\left[\frac{n}{2}(c_H+c_L) - 2c_L\right] \\
=& \frac{n}{2}(c_H+c_L) - 2c_L + p(c_L-c_H)
\end{aligned}$$

Plugging this back into eq. 20, we get

$$\mathbf{E}(\bar{OD}_i(p);\theta_i = L) = \frac{1}{1-\beta^2}\left[\frac{n}{2(n-1)} + \frac{1+2\beta}{2}f(\bar{g}_{HL}(p)) + (pc_H + (1-p)c_L)\right. \tag{22}$$

$$\left. + \frac{\beta}{n-1}\left(\frac{n}{2}(c_H+c_L) - c_L + p(c_L-c_H)\right) + \frac{\delta(1+\beta)}{n-1}\right] \tag{23}$$

Since,

$$\bar{ID}_i^* = \frac{1}{1-\beta^2}\left[\frac{2+\beta}{2}S_{\theta_i} + \frac{\beta n}{2(n-1)}S_{\theta_j|\theta_j\neq\theta_i} + \frac{1}{n-1}\left(c(\theta_i) + \sum_{j\neq i, j\neq\alpha_i} c(\theta_{\alpha_j})\right) + \beta c(\theta_{\alpha_i}) + \frac{\delta(1+\beta)}{n-1}\right]$$

$\mathbf{E}(\bar{ID}_i(p);\theta_i = L)$ can be defined analogously as:

$$\mathbf{E}(\bar{ID}_i(p);\theta_i = L) = \frac{1}{1-\beta^2}\left[\frac{\beta n}{2(n-1)} + \frac{2+\beta}{2}f(\bar{g}_{HL}(p)) + \beta(pc_H + (1-p)c_L)\right. \tag{24}$$

$$\left. + \frac{1}{n-1}\left(\frac{n}{2}(c_H+c_L) - c_L + p(c_L-c_H)\right) + \frac{\delta(1+\beta)}{n-1}\right] \tag{25}$$

Therefore,

$$\frac{\partial \mathbf{E}(O\bar{D}_i(p);\theta_i = L)}{\partial p} = \frac{1}{1-\beta^2}\left[\frac{1+2\beta}{2} f'(\bar{g}_{HL}(p))\bar{g}'_{HL}(p) - (c_L - c_H)\left(1 - \frac{\beta}{n-1}\right)\right]$$

and

$$\frac{\partial \mathbf{E}(I\bar{D}_i(p);\theta_i = L)}{\partial p} = \frac{1}{1-\beta^2}\left[\frac{2+\beta}{2} f'(\bar{g}_{HL}(p))\bar{g}'_{HL}(p) - (c_L - c_H)\left(\beta - \frac{1}{n-1}\right)\right]$$

Simplifying these expressions further by plugging in the values of $f'(\bar{g}_{HL}(p))$ and $\bar{g}'_{HL}(p)$, we get,

$$\frac{\partial \mathbf{E}(O\bar{D}_i(p);\theta_i = L)}{\partial p} = \frac{1}{1-\beta^2}\Bigg[\left(\frac{1+2\beta}{2}\right)\left(\frac{f'(\bar{g}_{HL}(p))}{1-f'(\bar{g}_{HL(p)})}\right)\left((1-\beta)(c_L - c_H) + \frac{4\delta(1+\beta)}{n^2}\right) - (c_L - c_H)\left(1 - \frac{\beta}{n-1}\right)\Bigg]$$

and

$$\frac{\partial \mathbf{E}(I\bar{D}_i(p);\theta_i = L)}{\partial p} = \frac{1}{1-\beta^2}\Bigg[\left(\frac{2+\beta}{2}\right)\left(\frac{f'(\bar{g}_{HL}(p))}{1-f'(\bar{g}_{HL(p)})}\right)\left((1-\beta)(c_L - c_H) + \frac{4\delta(1+\beta)}{n^2}\right) - (c_L - c_H)\left(\beta - \frac{1}{n-1}\right)\Bigg]$$

Therefore, $\dfrac{\partial \mathbf{E}(O\bar{D}_i(p);\theta_i = L)}{\partial p} > 0$ if

$$\left(\frac{1+2\beta}{2}\right)\left(\frac{f'(\bar{g}_{HL}(p))}{1-f'(\bar{g}_{HL(p)})}\right)\left((1-\beta)(c_L - c_H) + \frac{4\delta(1+\beta)}{n^2}\right) - (c_L - c_H)\left(1 - \frac{\beta}{n-1}\right) > 0$$

$$\implies f'(\bar{g}_{HL}(p)) > \frac{1}{\frac{\left(\frac{1+2\beta}{2}\right)\left((1-\beta)(c_L - c_H) + \frac{4\delta(1-\beta)}{n^2}\right)}{(c_L - c_H)\left(1 - \frac{\beta}{n-1}\right)} + 1}$$

$$\implies f'(\bar{g}_{HL}(p)) \gtrapprox \frac{1}{\left(\frac{1+2\beta}{2}\right)(1-\beta) + 1}$$

$$\implies p \gtrapprox \bar{g}^{-1}\left(f'^{-1}\left(\frac{1}{\left(\frac{1+2\beta}{2}\right)(1-\beta)+1}\right)\right) \qquad (\because \text{ both } f \text{ and } \bar{g}_{HL} \text{ are convex in } p)$$

$$\implies p > \breve{p} \approx \bar{g}^{-1}\left(f'^{-1}\left(\frac{1}{\left(\frac{1+2\beta}{2}\right)(1-\beta)+1}\right)\right)$$

Similarly, $\dfrac{\partial \mathbf{E}(I\bar{D}_i(p);\theta_i = L)}{\partial p} > 0$ if

$$\left(\frac{2+\beta}{2}\right)\left(\frac{f'(\bar{g}_{HL}(p))}{1-f'(\bar{g}_{HL(p)})}\right)\left((1-\beta)(c_L - c_H) + \frac{4\delta(1+\beta)}{n^2}\right) - (c_L - c_H)\left(\beta - \frac{1}{n-1}\right) > 0$$

$$\implies p > \tilde{p} \approx \bar{g}^{-1}\left(f'^{-1}\left(\frac{1}{\left(\frac{2+\beta}{2}\right)\frac{(1-\beta)}{\beta}+1}\right)\right)$$

To show $\tilde{p} < \breve{p}$, note that,

$$
\begin{aligned}
& \tilde{p} < \breve{p} \\
\implies & \bar{g}^{-1}\left(f'^{-1}\left(\frac{1}{\left(\frac{2+\beta}{2}\right)\frac{(1-\beta)}{\beta}+1}\right)\right) < \bar{g}^{-1}\left(f'^{-1}\left(\frac{1}{\left(\frac{1+2\beta}{2}\right)(1-\beta)+1}\right)\right) \\
\implies & \frac{1}{\left(\frac{2+\beta}{2}\right)\frac{(1-\beta)}{\beta}+1} < \frac{1}{\left(\frac{1+2\beta}{2}\right)(1-\beta)+1} \qquad (\because f(x) \text{ and } \bar{g}_{HL}(x) \text{ are increasing and convex for all } x \in [0,1]) \\
\implies & (1+2\beta) < \frac{2+\beta}{\beta} \\
\implies & \beta^2 < 1
\end{aligned}
$$

which is true by assumption ($\because \beta < 1$)

Finally, to show convexity of $\mathbf{E}(\bar{OD}_i(p); \theta_i = L)$ and $\mathbf{E}(\bar{ID}_i(p); \theta_i = L)$, note that

$$\frac{\partial^2 \mathbf{E}(\bar{OD}_i(p); \theta_i = L)}{\partial^2 p} = \left(\frac{1+2\beta}{2(1-\beta^2)}\right)\left(f''(\bar{g}_{HL}(p))(\bar{g}'_{HL}(p))^2 + f'(\bar{g}_{HL}(p))\bar{g}''_{HL}(p)\right)$$

and

$$\frac{\partial^2 \mathbf{E}(\bar{ID}_i(p); \theta_i = L)}{\partial^2 p} = \left(\frac{2+\beta}{2(1-\beta^2)}\right)\left(f''(\bar{g}_{HL}(p))(\bar{g}'_{HL}(p))^2 + f'(\bar{g}_{HL}(p))\bar{g}''_{HL}(p)\right)$$

Since both $f(x)$ and $\bar{g}_{HL}(x)$ are increasing and convex for all $x \in [0,1]$, $\frac{\partial^2 \mathbf{E}(\bar{OD}_i(p); \theta_i = L)}{\partial^2 p} > 0$ and $\frac{\partial^2 \mathbf{E}(\bar{ID}_i(p); \theta_i = L)}{\partial^2 p} > 0$ for all $p$.

$\frac{\partial^2 \mathbf{E}(\bar{ID}_i(p); \theta_i = L)}{\partial^2 p} > \frac{\partial^2 \mathbf{E}(\bar{OD}_i(p); \theta_i = L)}{\partial^2 p}$ only if $2 + \beta > 1 + 2\beta$ which is always the case, since $\beta < 1$. □

**Proof for proposition 3**

*Proof.* Given eq. 10, $y_i^*$ for $i \in \{u, v\}$ can be written as,

$$
\begin{aligned}
y_u^* =& x_u + x_{\alpha_u} + g^*_{vu}x_v + g^*_{\alpha_v u}x_{\alpha_v} + \frac{1}{n-4}\left(\sum_{j \in N \setminus \{u,v,\alpha_u,\alpha_v\}} g^*_{ju}x_j\right) + c_L \\
=& g^*_{\alpha_v u}x_H + \frac{1}{n-4}\left(\sum_{j \in N \setminus \{u,v,\alpha_u,\alpha_v\}} g^*_{ju}x_j\right) + c_L \qquad (\because x_L = 0)
\end{aligned}
$$

and

$$
\begin{aligned}
y_v^* =& x_v + x_{\alpha_v} + g^*_{uv}x_u + g^*_{\alpha_u v}x_{\alpha_u} + \frac{1}{n-4}\left(\sum_{j \in N \setminus \{u,v,\alpha_u,\alpha_v\}} g^*_{ju}x_j\right) + c_H \\
=& x_H + \frac{1}{n-4}\left(\sum_{j \in N \setminus \{u,v,\alpha_u,\alpha_v\}} g^*_{ju}x_j\right) + c_H \qquad (\because x_L = 0)
\end{aligned}
$$

Therefore, $y_u^* - y_v^* = \underbrace{(c_L - c_H)}_{+} - \underbrace{x_H(1 - g^*_{\alpha_v u})}_{+,\ (\text{Since } g^*_{ji}<1\ \forall\ j,i\in N)}$.

In the absence of Assumption 6, either of the two positive terms can dominate or even cancel each other out. However, if assumption 6 holds, then $y_u^* > y_v^*$ (since $c_L - c_H > x_H$ which implies $c_L - c_H > x_H(1 - g^*_{\alpha_v u})$) □

**Proof for theorem 2**

*Proof.* Recall that,

$$y_i^* = A_i = x_i + x_{\alpha_i}\frac{1}{n-2}\left(\sum_{j\in N\setminus\{i,\alpha_i\}} g^*_{ji}x_j\right) + c(\theta_{\alpha_i})$$

Since $x_L = 0$, the expression above for a $L$ type individual can be written as:

$$y^*_{i;\theta_i=L} = x_H\mathbf{1}[\theta_{\alpha_i} = H] + \frac{x_H}{n-2}\left(\sum_{j\in N\setminus\{i,\alpha_i\}} g^*_{ji}\mathbf{1}[\theta_j = H]\right) + c(\theta_{\alpha_i})$$

In expectation, under a deskmate plan $\alpha(p)$,

$$\mathbf{E}(y_i^*(p) : \theta_i = L) = px_H + \frac{x_H}{n-2}\mathbf{E}\left(\sum_{j\in N\setminus\{i,\alpha_i\}} g^*_{ji}(p)\mathbf{1}[\theta_j = H]\right) + pc_H + (1-p)c_L$$

where $g^*_{ji}(p)\mathbf{1}[\theta_j = H] = \frac{1}{1-\beta^2}\left[f(\bar{g}_{HL}(p)) + \beta + c(\theta_{\alpha_j}) + \beta c(\theta_{\alpha_i})\right]$, since $j \neq \alpha_i$.

To find a closed form expression of $\mathbf{E}\left(\sum_{j\in N\setminus\{i,\alpha_i\}} g^*_{ji}(p)\mathbf{1}[\theta_j = H]\right)$, note that there are $n/2$ individuals of $H$ type.

If the $L$ type individual $i$ is matched to a $H$ type deskmate then, the remaining $\left(\frac{np}{2} - 1\right)$ $H$ type peers are matched with $L$ type deskmates and $\left(\frac{n(1-p)}{2}\right)$ $H$ type peers are matched with $H$ type deskmates.

And if the $L$ type individual $i$ is matched to a $L$ type deskmate then, the $\left(\frac{np}{2}\right)$ $H$ type peers are matched with $L$ type deskmates and $\left(\frac{n(1-p)}{2}\right)$ $H$ type peers are matched with $H$ type deskmates. Since individual $i$ is matched with a $H$ type deskmate with probability $p$ and with a $L$ type deskmate with probability $(1-p)$,

Therefore,

$$\begin{aligned}
&\mathbf{E}\left(\sum_{j\in N\setminus\{i,\alpha_i\}} g^*_{ji}(p)\mathbf{1}[\theta_j = H]\right)\\
&= \frac{p}{1-\beta^2}\left(\left(\frac{n}{2}-1\right)(f(\bar{g}_{HL}(p))+\beta) + \left(\frac{pn}{2}-1\right)c_L + \frac{(1-p)n}{2}c_H + \beta\left(\frac{n}{2}-1\right)c_H\right)\\
&\qquad + \frac{1-p}{1-\beta^2}\left(\frac{n}{2}(f(\bar{g}_{HL}(p))+\beta) + \frac{pn}{2}c_L + \frac{(1-p)n}{2}c_H + \frac{\beta n}{2}c_L\right)\\
&= \frac{p}{1-\beta^2}\left(\left(\frac{n}{2}-1\right)(f(\bar{g}_{HL}(p))+\beta) + \frac{n}{2}(pc_L + (1-p+\beta)c_H) - c_L - \beta c_H\right)\\
&\qquad + \frac{1-p}{1-\beta^2}\left(\frac{n}{2}(f(\bar{g}_{HL}(p))+\beta) + \frac{n}{2}((p+\beta)c_L + (1-p)c_H)\right)
\end{aligned}$$

Therefore, for $n$ large enough,

$$\begin{aligned}
\frac{\partial \mathbf{E}(y^*_i(p):\theta_i = L)}{\partial p} \approx& x_H\left[1 + \frac{1}{2(1+\beta)}(c_L - c_H) + \frac{f'(\bar{g}_{HL}(p))\bar{g}'_{HL}(p)}{2(1-\beta^2)}\right] - (c_L - c_H)\\
\approx& x_H\left[1 + \frac{1}{2(1+\beta)}(c_L - c_H) + \frac{f'(\bar{g}_{HL}(p))(c_L - c_H)}{2(1+\beta)(1-f'(\bar{g}_{HL}(p)))}\right] - (c_L - c_H)
\end{aligned}$$

Therefore, $\dfrac{\partial \mathbf{E}(y^*_i(p):\theta_i = L)}{\partial p} > 0$ if

$$\begin{aligned}
&x_H\left[1 + \frac{1}{2(1+\beta)}(c_L - c_H) + \frac{f'(\bar{g}_{HL}(p))(c_L - c_H)}{2(1+\beta)(1-f'(\bar{g}_{HL}(p)))}\right] - (c_L - c_H) > 0\\
\implies& \frac{f'(\bar{g}_{HL}(p))}{(1-f'(\bar{g}_{HL}(p)))} > \frac{2(1+\beta)}{(c_L - c_H)}\left[(c_L - c_H)\left(\frac{2(1+\beta)-x_H}{2x_H(1+\beta)}\right) - 1\right]\\
\implies& \frac{f'(\bar{g}_{HL}(p))}{(1-f'(\bar{g}_{HL}(p)))} > 2(1+\beta)\left[\frac{1}{x_H} - \frac{1}{c_L - c_H}\right] - 1\\
\implies& f'(\bar{g}_{HL}(p)) > \frac{1}{\frac{1}{2(1+\beta)\left[\frac{1}{x_H} - \frac{1}{c_L - c_H}\right] - 1} + 1}\\
\implies& p > \check{p} \approx g^{-1}\left(f'^{-1}\left(\frac{1}{\frac{1}{2(1+\beta)\left[\frac{1}{x_H} - \frac{1}{c_L - c_H}\right] - 1} + 1}\right)\right)
\end{aligned}$$

To show convexity of $\mathbf{E}(y^*_i(p);\theta_i = L)$ in $p$, note that:

$$\frac{\partial^2 \mathbf{E}(y^*_i(p);\theta_i = L)}{\partial^2 p} \approx \frac{x_H}{1-\beta^2}(f''(\bar{g}_{HL}(p))\bar{g}'_{HL}(p) + f'(\bar{g}_{HL}(p))\bar{g}''_{HL}(p)) > 0$$

(Since both $f(m)$ and $\bar{g}_{HL}(m)$ are increasing and convex for all $m \in [0,1]$) □

# C Additional Tables and Figures

## C.1 Balance

Table C1: Balance Test on Pre-Treatment Variables - Low Popularity Students

| | Within Classroom randomization | | Across Classroom randomization | | | |
|---|---|---|---|---|---|---|
| | Diff. between assignment to L vs M / H type deskmate | p value | Diff. between LopL and Control class | p value | Diff. between LopH and Control class | p value |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **Panel A: Demographic Characteristics** | | | | | | |
| Male | -0.03* | 0.10 | 0.01 | 0.55 | -0.01 | 0.50 |
| Muslim | 0.00 | 0.67 | -0.00 | 0.91 | -0.01 | 0.24 |
| General | 0.00 | 0.98 | -0.01 | 0.66 | -0.02 | 0.36 |
| Uncategorized | 0.01 | 0.15 | 0.00 | 0.66 | -0.01 | 0.27 |
| OBC | -0.01 | 0.45 | 0.02* | 0.07 | 0.02* | 0.08 |
| SC/ST | -0.00 | 0.85 | -0.02** | 0.04 | 0.00 | 0.74 |
| SES PCA 1st component | 0.02 | 0.63 | -0.04 | 0.43 | -0.11** | 0.01 |
| EWS Student | -0.03 | 0.13 | 0.01 | 0.72 | 0.03 | 0.21 |
| Special Needs Student | 0.01 | 0.86 | -0.02 | 0.45 | -0.04 | 0.15 |
| **Panel B: Baseline Network In-degree nominations** | | | | | | |
| Friend | 0.01 | 0.49 | 0.00 | 0.97 | 0.02 | 0.69 |
| Preferred Deskmate | 0.03 | 0.11 | -0.03 | 0.44 | -0.00 | 0.90 |
| Help, Recess or Lunch | 0.02 | 0.25 | 0.08*** | 0.00 | 0.01 | 0.78 |
| Academic Help | 0.03 | 0.19 | 0.01 | 0.61 | 0.03 | 0.24 |
| **Panel C: Baseline Network Out-degree nominations** | | | | | | |
| Friend | 0.02 | 0.64 | -0.04 | 0.41 | 0.03 | 0.45 |
| Preferred Deskmate | 0.00 | 0.97 | -0.03 | 0.51 | -0.01 | 0.81 |
| Help, Recess or Lunch | 0.04 | 0.21 | 0.02 | 0.68 | 0.02 | 0.67 |
| Academic Help | -0.02 | 0.48 | 0.01 | 0.75 | 0.02 | 0.66 |
| **Panel D: Baseline Classroom Experience and Academic Perception** | | | | | | |
| Time with classmates | 0.02 | 0.54 | -0.03 | 0.62 | 0.00 | 0.93 |
| Teacher Interaction | 0.05 | 0.22 | 0.01 | 0.82 | 0.01 | 0.80 |
| Classroom comfort | 0.08** | 0.05 | 0.01 | 0.92 | -0.07 | 0.12 |
| Test Scores | 0.02 | 0.58 | 0.12 | 0.12 | 0.04 | 0.55 |
| Academic Perception | 0.04 | 0.30 | 0.02 | 0.71 | -0.04 | 0.40 |
| **Panel E: Baseline Social Skills and Traits** | | | | | | |
| Optimism | 0.02 | 0.64 | 0.07 | 0.17 | -0.07 | 0.13 |
| Neuroticism (R) | -0.01 | 0.83 | -0.13*** | 0.01 | -0.01 | 0.74 |
| Competitiveness | 0.15*** | 0.00 | -0.05 | 0.29 | -0.09* | 0.08 |
| Hardwork | 0.08** | 0.05 | -0.01 | 0.77 | -0.01 | 0.77 |
| Determination | -0.01 | 0.73 | 0.10 | 0.18 | 0.09 | 0.17 |
| Altruism | 0.02 | 0.56 | -0.00 | 0.96 | -0.07 | 0.12 |
| Trust | 0.05 | 0.16 | 0.04 | 0.48 | 0.01 | 0.74 |
| Extraversion | 0.09** | 0.01 | 0.02 | 0.66 | 0.03 | 0.55 |
| Risk Tolerance | -0.06 | 0.12 | 0.11** | 0.03 | 0.05 | 0.19 |
| Patience | 0.00 | 0.96 | -0.03 | 0.47 | 0.07 | 0.12 |
| **Panel F: Attrition** | | | | | | |
| Attrition | 0.00 | 1.00 | -0.00 | 0.78 | -0.01 | 0.23 |

**Note:** The table reports balance checks on pre-treatment variables and demographic characteristics for Low popularity students. Differences and p-values are obtained by regressing the variable of interest on treatment dummies. Regressions for Columns 1-2 include classroom level fixed effects. Regressions for Columns 3-6 include school-grade level fixed effects and additionally control for size of the classroom and the first two moments of raw popularity score distribution. SES PCA 1st component is obtained from the PCA over responses on the SES questions from the survey. All variables apart from the ones in Panel A are standardized to facilitate comparison. Standard errors are clustered at the classroom level. *** p<0.01, ** p<0.05, * p<0.1

## C.2 Main Findings - Additional Tables

Table C2: Local Treatment Effects of Deskmate Type - Non-cognitive and Social skills (Cont.)

| | **Sub-sample: Low Popularity Students** | | | | |
|---|---|---|---|---|---|
| | (1) Altruism | (2) Trust | (3) Extraversion | (4) Risk | (5) Patience |
| Desk. Low | 0.007 | 0.001 | 0.040 | -0.002 | 0.034 |
| | (0.037) | (0.044) | (0.041) | (0.039) | (0.043) |
| Demo. controls | Y | Y | Y | Y | Y |
| Base. score | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y |
| Control Mean | -0.074 | -0.175 | -0.182 | -0.023 | -0.033 |
| Adj. R-sq | 0.135 | 0.080 | 0.205 | 0.070 | 0.085 |
| Obs. | 3263 | 3026 | 3262 | 3225 | 3249 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. Altruism is an index created from standardized individual responses to the question about their willingness to go out of their way to help someone in need, their response on a hypothetical dictator game and the donation to the NGO at the cost of self game. Extraversion corresponds to an index constructed from their standardized response to the willingness to participate in discussions and talk to people and their frequency of interactions with their friends in the classroom. Risk stands for risk tolerance which is an index constructed from the individual's response to how afraid are they of taking risks and their responses in the Minesweeper game. Measure of Patience is an index constructed from their response to the likert scale question about how patient are they and their responses on the Money earlier or later game. Both endline and baseline values are standardized by survey wave. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table C3: Classroom Treatment Effects of match proportions - Non-cognitive and Social skills (Cont.)

| | Sub-sample: Low Popularity Students | | | | |
|---|---|---|---|---|---|
| | (1) Altruism | (2) Trust | (3) Extraversion | (4) Risk | (5) Patience |
| LopL | 0.037 | -0.037 | 0.000 | -0.024 | -0.012 |
| | (0.049) | (0.047) | (0.041) | (0.047) | (0.048) |
| LopH | 0.081* | -0.012 | -0.031 | 0.013 | 0.021 |
| | (0.044) | (0.041) | (0.039) | (0.045) | (0.042) |
| Demo. controls | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y |
| Base. score | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y |
| Control Mean | -0.103 | -0.144 | -0.156 | -0.032 | -0.049 |
| Adj. R-sq | 0.121 | 0.083 | 0.202 | 0.064 | 0.082 |
| Obs. | 3303 | 3066 | 3304 | 3264 | 3289 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | |

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Sch. Grade FE stands for School-Grade Fixed Effects. Altruism is an index created from standardized individual responses to the question about their willingness to go out of their way to help someone in need, their response on a hypothetical dictator game and the donation to the NGO at the cost of self game. Extraversion corresponds to an index constructed from their standardized response to the willingness to participate in discussions and talk to people and their frequency of interactions with their friends in the classroom. Risk stands for risk tolerance which is an index constructed from the individual's response to how afraid are they of taking risks and their responses in the Minesweeper game. Measure of Patience is an index constructed from their response to the likert scale question about how patient are they and their responses on the Money earlier or later game. Both endline and baseline values are standardized by survey wave. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Class controls include the size of class and the first two moments of the raw popularity score distribution. Standard errors are clustered at Classroom level.

## C.3 Potential Mechanisms - Additional Tables

Table C4: Local Treatment Effects of Deskmate Type - Out degree nomination to deskmate

| | Friendship Network Nominations | | | Other Network Nominations | | |
|---|---|---|---|---|---|---|
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help, Recess, Lunch | (6) Acad. Help |
| **Panel A: All Students** | | | | | | |
| Desk. Low | -0.045*** | -0.055*** | -0.062*** | -0.049*** | -0.060*** | -0.076*** |
| | (0.008) | (0.009) | (0.009) | (0.007) | (0.009) | (0.008) |
| Adj. R-sq | 0.182 | 0.240 | 0.268 | 0.089 | 0.208 | 0.157 |
| Obs. | 10837 | 10837 | 10837 | 10837 | 10837 | 10837 |
| **Panel B: Low Popularity Students** | | | | | | |
| Desk. Low | -0.029** | -0.036* | -0.031 | -0.043*** | -0.024 | -0.044*** |
| | (0.014) | (0.018) | (0.019) | (0.012) | (0.017) | (0.015) |
| Adj. R-sq | 0.166 | 0.215 | 0.246 | 0.072 | 0.185 | 0.159 |
| Obs. | 3353 | 3353 | 3353 | 3353 | 3353 | 3353 |
| **Panel C: Medium and High Popularity Students** | | | | | | |
| Desk. Low | -0.050*** | -0.062*** | -0.075*** | -0.049*** | -0.075*** | -0.086*** |
| | (0.010) | (0.012) | (0.012) | (0.009) | (0.012) | (0.010) |
| Adj. R-sq | 0.192 | 0.250 | 0.278 | 0.096 | 0.220 | 0.161 |
| Obs. | 7482 | 7482 | 7482 | 7482 | 7482 | 7482 |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. Nom. | Y | Y | Y | Y | Y | Y |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to medium or high popularity deskmate. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch corresponds to a nomination for either Help, Recess or Lunch buddies. Acad. (Academic) Help corresponds to nominations for individuals from whom academic help is sought respectively. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Out-degree nomination to the deskmate refers to the student of interest nominating the assigned deskmate on the dimensions mentioned above. Both endline and baseline values a dummy values taking the value 1 or 0 depending on whether the individual nominates the deskmate or not. Base. nom. corresponds to the nomination at baseline in the dimension of interest. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table C5: Probability of receiving links from non-high popularity peers (baseline)

| Social Nominations received from non-high popularity peers (baseline) | | | | |
|---|---|---|---|---|
| | Low Popularity Students | | All Students | |
| | (1) Friendship | (2) Help, Recess, Lunch | (3) Friendship | (4) Help, Recess, Lunch |
| Nominations from High pop. | 0.248*** | 0.082*** | 0.229*** | 0.205*** |
| | (0.045) | (0.024) | (0.025) | (0.015) |
| Demo. controls | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y |
| Adj. R-sq | 0.838 | 0.630 | 0.790 | 0.532 |
| Obs. | 4180 | 4180 | 12841 | 12841 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | |

**Note:** Nominations from High pop. refers to the standardized value of in-degree nominations an individual receives from high popularity peers at baseline. Dependent variable is the standardized value of in-degree nominations received from non-high popularity peers at baseline. Coefficients reported separately for low popularity students and for all students. Coefficients reported for both friendship networks and action based networks (recess, lunch and help). Demo. controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table C6: Local Treatment Effects of Deskmate Type - Network In degree (from Low popularity students)

| | Friendship Networks | | | | Action based Networks | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help | (6) Recess | (7) Lunch | (8) Acad. Help |
| **Panel A: All Students** | | | | | | | | |
| Desk. Low | 0.052*** | 0.064*** | 0.067*** | 0.072*** | 0.051*** | 0.058*** | 0.039** | 0.096*** |
| | (0.017) | (0.015) | (0.012) | (0.017) | (0.018) | (0.017) | (0.018) | (0.018) |
| Adj. R-sq | 0.347 | 0.496 | 0.657 | 0.342 | 0.311 | 0.363 | 0.324 | 0.372 |
| Obs. | 12612 | 12612 | 12612 | 12612 | 12612 | 12612 | 12612 | 12612 |
| **Panel B: Low Popularity Students** | | | | | | | | |
| Desk. Low | 0.062** | 0.059** | 0.062*** | 0.092*** | 0.038 | 0.054** | 0.054* | 0.071*** |
| | (0.028) | (0.026) | (0.022) | (0.027) | (0.029) | (0.027) | (0.030) | (0.025) |
| Adj. R-sq | 0.307 | 0.442 | 0.634 | 0.308 | 0.285 | 0.320 | 0.279 | 0.337 |
| Obs. | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 |
| **Panel C: Medium and High Popularity Students** | | | | | | | | |
| Desk. Low | 0.053** | 0.062*** | 0.071*** | 0.065*** | 0.069*** | 0.072*** | 0.046** | 0.105*** |
| | (0.022) | (0.019) | (0.015) | (0.021) | (0.022) | (0.020) | (0.021) | (0.023) |
| Adj. R-sq | 0.372 | 0.519 | 0.672 | 0.366 | 0.329 | 0.395 | 0.359 | 0.387 |
| Obs. | 8497 | 8497 | 8497 | 8497 | 8497 | 8497 | 8497 | 8497 |
| Classroom FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Demo. controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y | Y | Y |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to medium or high popularity deskmate. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch and Acad. (Academic) Help corresponds to nominations for Help, Recess, Lunch buddies and individuals from whom academic help is sought respectively. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table C7: Local Treatment Effects of Deskmate Type - Network Out degree (to Low popularity students)

| | Friendship Networks | | | | Action based Networks | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help | (6) Recess | (7) Lunch | (8) Acad. Help |
| **Panel A: All Students** | | | | | | | | |
| Desk. Low | 0.062*** | 0.058*** | 0.048*** | 0.046** | 0.084*** | 0.042** | 0.066*** | 0.084*** |
| | (0.018) | (0.017) | (0.017) | (0.019) | (0.020) | (0.019) | (0.020) | (0.018) |
| Adj. R-sq | 0.142 | 0.254 | 0.273 | 0.097 | 0.129 | 0.155 | 0.171 | 0.169 |
| Obs. | 12612 | 12612 | 12612 | 12612 | 12612 | 12612 | 12612 | 12612 |
| **Panel B: Low Popularity Students** | | | | | | | | |
| Desk. Low | 0.043 | 0.059** | 0.086*** | 0.080** | 0.123*** | 0.067** | 0.126*** | 0.066** |
| | (0.030) | (0.027) | (0.030) | (0.034) | (0.035) | (0.030) | (0.032) | (0.032) |
| Adj. R-sq | 0.147 | 0.230 | 0.244 | 0.103 | 0.116 | 0.136 | 0.170 | 0.170 |
| Obs. | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 |
| **Panel C: Medium and High Popularity Students** | | | | | | | | |
| Desk. Low | 0.075*** | 0.057** | 0.030 | 0.038 | 0.061** | 0.046* | 0.050* | 0.097*** |
| | (0.025) | (0.025) | (0.023) | (0.025) | (0.026) | (0.026) | (0.026) | (0.026) |
| Adj. R-sq | 0.148 | 0.268 | 0.285 | 0.093 | 0.133 | 0.166 | 0.180 | 0.176 |
| Obs. | 8497 | 8497 | 8497 | 8497 | 8497 | 8497 | 8497 | 8497 |
| Classroom FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Demo. controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Base. Degree | Y | Y | Y | Y | Y | Y | Y | Y |

*** p<0.01, **p<0.05, * p<0.1

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to medium or high popularity deskmate. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch and Acad. (Academic) Help corresponds to nominations for Help, Recess, Lunch buddies and individuals from whom academic help is sought respectively. Out-degree nominations corresponds to the number of individuals in the classroom that the student of interest nominates on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

## C.4 Interaction Effects between the two randomization levels

The within-classroom randomization results show that matching low popularity students to each other improves their outcomes and across randomization results show that matching a majority of low popularity students to high popularity deskmates improves overall social cohesion within the classroom. This opens up a trade-off: should I match all low popularity students to each other to benefit the whole group or should I match only a few of them together and match the rest to high popularity deskmates to benefit a few?

Discussing the policy and welfare implications of this trade-off, first requires us to ensure that the results for low popularity students in the within-classroom randomization are not driven in particular by LopH classrooms. That is, it is not the case that the benefits of matching low popularity students to each other only occur when the overall classroom environment is conducive enough due to the LopH configuration. In essence, I need to test for the interaction effect between the local treatment of being matched to a low popularity deskmate and the classroom level treatment of being present in a LopH classroom. To do so, I run the following specification[87]:

$$y^e_{ic} = \beta_1 y^b_{ic} + \gamma_1 \text{Desk. Low}_{ic} + \gamma_2 \text{Desk. Low}_{ic} \times \text{LopH}_i c + \mathbf{X}_{ic}\Gamma + \eta_c + \epsilon_{ic} \tag{26}$$

i.e. I retain classroom fixed effects to control for the overall classroom level changes resulting from the different deskmate plans but include an interaction term where the local treatment is interacted with the classroom level treatment. Our coefficient of interest $\gamma_2$ captures the differential effect of being in a LopH classroom amongst low popularity students who are matched to low popularity deskmates. If the local treatment and the classroom level treatment operate independent of each other, the coefficient of interest ($\gamma_2$) should be statistically insignificant for all specifications. This is exactly what I find. Table C8, C9, C10 and C11 report results from eq. 26 for all variables analysed in our study so far. In none of the specifications, is the coefficient on Desk. $\text{Low}_{ic} \times \text{LopH}_{ic}$ significant, i.e. there are no interaction effects between the local and the classroom level treatments.

## C.5 Heterogeneity by Individual and Classroom characteristics

Do specific classroom attributes or individual characteristics among low-popularity students make them more likely to benefit from being paired with other low-popularity deskmates or from broader deskmate plans that match most low-popularity students with high-popularity peers? To answer this, I explore the heterogeneity of treatment effects both within and across classrooms by key characteristics: (i) student grade level (a proxy for age), (ii) baseline classroom network cohesion, (iii) gender, and (iv) caste.

For this analysis, I focus on a smaller set of variables. I restrict myself to only those variables where I saw significant treatment effects either in the within-classroom randomization or the across-classroom randomization. Specifically, I analyze the effect of the deskmate type, interacted with our key characteristics, on friendship and action-based network nominations, teacher interactions, self-worth perception, optimism, and willingness to work hard. At the classroom level, I analyze the effect of classroom type (LopH vs non-LopH) interacted with key characteristics on friendship and action-based network nominations.[88,89]

I use the following empirical specifications:

$$y^e_{ic} = \beta_1 y^b_{ic} + \gamma_1 \text{Desk. Low}_{ic} + \gamma_2 \text{Desk. Low}_{ic} \times \text{Category}_i c + \mathbf{X}_{ic}\Gamma + \eta_c + \epsilon_{ic} \tag{27}$$

[87] I suppress the classroom level LopL treatment due to the absence of any significant differences between individuals in LopL classrooms and control classrooms.

[88] As before, I suppress the classroom level LopL treatment due to the absence of any significant differences between individuals in LopL classrooms and control classrooms.

[89] Our primary goal behind this exercise is to analyse which sub-group of individuals drive our results.

Table C8: Local Treatment Effects of Deskmate Type interacted with Classroom Type - Network In and Out degrees

| | Sub-sample: Low Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | Friendship Network Nominations | | | Other Network Nominations | | |
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help, Recess, Lunch | (6) Acad. Help |
| **Panel A: In-degrees** | | | | | | |
| Desk. Low | 0.013 | 0.025 | 0.030* | 0.048** | 0.015 | 0.023 |
| | (0.022) | (0.019) | (0.017) | (0.023) | (0.021) | (0.021) |
| Desk. Low × LopH | -0.023 | 0.035 | 0.051 | 0.025 | 0.026 | 0.052 |
| | (0.050) | (0.043) | (0.040) | (0.055) | (0.058) | (0.053) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.460 | -0.451 | -0.294 | -0.432 | -0.440 | -0.446 |
| Adj. R-sq | 0.451 | 0.604 | 0.782 | 0.474 | 0.594 | 0.525 |
| Obs. | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 |
| **Panel B: Out-degrees** | | | | | | |
| Desk. Low | 0.052 | 0.054 | 0.074** | 0.098** | 0.122*** | 0.032 |
| | (0.037) | (0.034) | (0.035) | (0.046) | (0.037) | (0.040) |
| Desk. Low × LopH | -0.117 | -0.087 | -0.075 | -0.112 | -0.106 | -0.032 |
| | (0.086) | (0.079) | (0.095) | (0.092) | (0.089) | (0.076) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.169 | -0.187 | -0.154 | -0.119 | -0.175 | -0.124 |
| Adj. R-sq | 0.207 | 0.342 | 0.328 | 0.156 | 0.260 | 0.252 |
| Obs. | 3365 | 3365 | 3365 | 3365 | 3365 | 3365 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. LopH refers to the classroom where a majority of low popularity students are matched to high popularity deskamtes. Control (omitted category) is assignment to high or medium popularity deskmate. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch corresponds to a nomination for either Help, Recess or Lunch buddies. Acad. (Academic) Help corresponds to nominations for individuals from whom academic help is sought respectively. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Out-degree nominations corresponds to the number of individuals in the classroom that the student of interest nominates on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree / out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

And

$$y^e_{ijg} = \beta_1 y^b_{ijg} + \delta_1 \text{LopH}_{ijg} + \delta_2 \text{LopH}_{ijg} \times \text{Category}_{ijg} + \mathbf{X}_{ijg}\Gamma + \mathbf{C}_{cjg}\Theta + \Delta_{jg} + \epsilon_{ijg} \tag{28}$$

Where, as before, I control for the demographic characteristics of the student and the baseline value of the variable of interest. Within-classroom randomization regressions include classroom fixed effects and across-classroom randomization regressions include school-grade fixed effects. Across-classroom randomization regressions additionally control for classroom characteristics such as class size and the first two moments of the raw popularity score at baseline. Standard errors are always clustered at the classroom level.

Grade is divided into two categories: lower (grades 5 and below) and upper (grades 6 and above). Classroom network cohesion is measured by baseline in-degree close friendships network density, split into less cohesive (below median) and more cohesive (above median). Caste is categorized into general and non-general caste groups.

Table C9: Local Treatment Effects of Deskmate Type interacted with Classroom Type - Classroom Experience and Academic Perception

| | Sub-sample: Low Popularity Students | | | | |
|---|---|---|---|---|---|
| | Peer interactions | | Teacher Interactions | | |
| | (1) Desk Enjoy | (2) Int. Classmate | (3) Int. Teacher | (4) Class. Comfort | (5) Acad. Perception |
| Desk. Low | -0.051 | 0.044 | 0.111** | -0.017 | 0.045 |
| | (0.044) | (0.043) | (0.045) | (0.044) | (0.046) |
| Desk. Low × LopH | -0.048 | -0.082 | 0.038 | 0.014 | 0.003 |
| | (0.105) | (0.108) | (0.107) | (0.086) | (0.098) |
| Demo. controls | Y | Y | Y | Y | Y |
| Base. score | N | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y |
| Control Mean | -0.033 | -0.195 | -0.158 | -0.216 | -0.239 |
| Adj. R-sq | 0.096 | 0.135 | 0.167 | 0.179 | 0.212 |
| Obs. | 3376 | 3088 | 3086 | 3189 | 3285 |

*** p<0.01, **p<0.05, * p<0.1

**Note:** Desk. Low refers to assignment to a low popularity deskmate. LopH refers to the classroom where a majority of low popularity students are matched to high popularity deskamtes. Control (omitted category) is assignment to high or medium popularity deskmate. Original responses to all questions are based on a likert scale of 1-10. Desk Enjoy corresponds to the extent to which the individual enjoyed sitting with their assigned deskmate. Int. Classmate corresponds to the amount of time spent spent with classmates for fun and activities. Int. Teacher corresponds to the frequency of interactions with teachers. Class. Comfort is an index created from standardized responses pertaining to the level of excitement the individual exhibits to come to class everyday, level of comfort w.r.t. asking doubts in the classroom and an individual's perception of bullying in the classroom (reversed). Acad. perception is an index created from standardized responses pertaining to academic self-concept and academic comfort. Academic self-concept originally is elicited on a scale of 1-5 where 1 corresponds to the individual beleiving they are in the top 10% of the class, 2: top 20%, 3: top 40%, 4: top 60% and 5: not in top 60%. Academic comfort corresponds to their response on a scale of 1-10 for the prompt, *I do well on exams.* Both endline and baseline values are standardized by survey wave. Base score corresponds to the baseline value of the variable of interest. Demo. controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table C12 and C13 report heterogeneous effects of deskmate-level treatment on social network outcomes and classroom experiences / social skills respectively. Table C14 reports heterogeneous effects of classroom level treatment on social network outcomes.

Within the classroom, I see that the increase in social integration for low-popularity students paired with a low-popularity deskmate is driven primarily by male students, non-general caste students and students from upper grades (Table C12 Panel A (In Degree - Friendship Nominations)). For willingness to socialize, I see that the positive effects from being paired with low popularity deskmates is driven by upper grade students, general caste students, and those in more cohesive classrooms (Table C12 Panel B). There is no significant difference in willingness to socialize between low-popularity males and females paired with low-popularity deskmates.

Regarding teacher interactions (Table C13), I see no statistically significant differences in treatment effects by individual or class characteristics apart from caste. For caste, the positive effect of being paired with low popularity deskmates is completely driven by general caste students with the effect on non-general caste students being null.

For self-worth, pairing with a low-popularity deskmate benefits low-popularity students who are male, from the general caste, or from higher grades or more cohesive classrooms. Similar patterns emerge for optimism and willingness to work hard.[90]

At the classroom level, in the original specifications, I saw that matching a majority of low-popularity

[90] Apart from the effect on optimism which is driven by females instead of males.

Table C10: Local Treatment Effects of Deskmate Type interacted with Classroom Type - Non-cognitive and Social skills

| | Sub-sample: Low Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | (1) Like perception | (2) Optimism | (3) Neuroticism (R) | (4) Competitiveness | (5) Hardwork | (6) Determination |
| Desk. Low | 0.129*** | 0.112** | 0.019 | 0.089* | 0.061 | -0.002 |
| | (0.048) | (0.048) | (0.045) | (0.052) | (0.052) | (0.039) |
| Desk. Low × LopH | -0.059 | -0.038 | 0.009 | -0.066 | 0.087 | -0.008 |
| | (0.105) | (0.105) | (0.088) | (0.104) | (0.101) | (0.087) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. score | N | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.245 | -0.116 | -0.056 | -0.213 | -0.176 | -0.054 |
| Adj. R-sq | 0.060 | 0.142 | 0.109 | 0.126 | 0.111 | 0.364 |
| Obs. | 3372 | 3097 | 3195 | 2958 | 3021 | 3089 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. LopH refers to the classroom where a majority of low popularity students are matched to high popularity deskamtes. Control (omitted category) is assignment to high or medium popularity deskmate. Like perception corresponds to an individual's assessment of how much do other people in the class like him / her. Neuroticism is an index created from standardized responses to the level of worry, nervousness and the ability to forgive that individuals exhibit. All three components are scaled and reversed to ensure a higher value corresponds to a lower level of neuroticism. All variables apart from Determination are measured on a likert scale of 1-10. Refer to Section Variable definitions for more details. Hardwork correspond to an individual's willingness to work hard on an everyday basis. Determination is measured by the level of effort put in by an individual in an real effort task where they had to identify as many numbers in a grid with digit 5 in them. Both endline and baseline values are standardized by survey wave. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

students to high-popularity deskmates (LopH classrooms) improved the overall social cohesion and the level of social integration for low-popularity students. Analyzing the heterogeneous effects of the LopH classrooms reveal that this gain in the level of social integration is primarily driven by individuals in upper grades and more cohesive classrooms at baseline (Table C14). While the overall effect of LopH classes on an individual's level of willingness to socialize was insignificant at the extensive margin, the effect on low-popularity students who are females or belong to the non-general caste is positive and significant.[91] That is, in LopH classroom female and non-general caste low popularity students increase their willingness to socialize.

Three key facts emerge from this heterogeneity analysis. First, most positive effects for low-popularity students from both within- and across-classroom treatments are driven by upper-grade classrooms. This is crucial from a policy perspective, as issues of social isolation become more pronounced in middle school, where negative effects of social comparisons also intensify with age (Dijkstra et al. [2008]). My intervention thus produces meaningful effects for a critical age group more vulnerable to social isolation. Second, low-popularity males and general caste students are more likely to benefit from being paired with low-popularity deskmates while females and non-general caste students are more likely to benefit from classrooms where more isolated-popular pairs exist. This implies that an optimal deskmate configuration can utilize these differential effects to improve the outcomes of all students. And third, benefits from the overall deskmate plan and deskmate type treatments are more pronounced for classrooms with a higher level of baseline cohesion. This seems to suggest that rewiring deskmate plans to induce changes in social links and improve the non-cognitive outcomes of isolated students depends on how primed the underlying social network is to support the efforts of isolated students and help them grow. This also suggests that repeated interventions to address social isolation could create a compounding effect. As isolated students become more integrated into the

[91] In our original specification, I saw an increase in the willingness to socialize at the intensive margin. That is, low popularity students were more likely to nominate more individuals as very good friend or good friend without particularly increasing the number of people they nominated as friends.

Table C11: Local Treatment Effects of Deskmate Type interacted with Classroom Type - Non-cognitive and Social skills (Cont.)

| | **Sub-sample: Low Popularity Students** | | | | |
|---|---|---|---|---|---|
| | (1) Altruism | (2) Trust | (3) Extraversion | (4) Risk | (5) Patience |
| Desk. Low | -0.004 | 0.013 | 0.061 | -0.004 | 0.042 |
| | (0.041) | (0.051) | (0.046) | (0.044) | (0.049) |
| Desk. Low × LopH | 0.055 | -0.059 | -0.100 | 0.010 | -0.040 |
| | (0.093) | (0.100) | (0.099) | (0.093) | (0.096) |
| Demo. controls | Y | Y | Y | Y | Y |
| Base. score | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y |
| Control Mean | -0.074 | -0.175 | -0.182 | -0.023 | -0.033 |
| Adj. R-sq | 0.135 | 0.080 | 0.205 | 0.069 | 0.085 |
| Obs. | 3263 | 3026 | 3262 | 3225 | 3249 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. LopH refers to the classroom where a majority of low popularity students are matched to high popularity deskamtes. Control (omitted category) is assignment to high or medium popularity deskmate. Altruism is an index created from standardized individual responses to the question about their willingness to go out of their way to help someone in need, their response on a hypothetical dictator game and the donation to the NGO at the cost of self game. Extraversion corresponds to an index constructed from their standardized response to the willingness to participate in discussions and talk to people and their frequency of interactions with their friends in the classroom. Risk stands for risk tolerance which is an index constructed from the individual's response to how afraid are they of taking risks and their responses in the Minesweeper game. Measure of Patience is an index constructed from their response to the likert scale question about how patient are they and their responses on the Money earlier or later game. Both endline and baseline values are standardized by survey wave. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

classroom, overall social cohesion improves. If the effects are stronger in already cohesive classrooms, it indicates that future efforts to reduce social isolation could be even more impactful, amplifying positive outcomes over time.

Table C12: Heterogenous Local Treatment Effects of Deskmate Type - Network In and Out degrees

| | Sub-sample: Low Popularity Students | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Friendship Nominations | | | | | Help, Recess and Lunch Nominations | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| **Panel A: In-degrees** | | | | | | | | | | |
| D Low | 0.041*** | 0.070*** | 0.042* | 0.015 | 0.027 | 0.020 | 0.039 | 0.016 | -0.020 | 0.015 |
| | (0.015) | (0.020) | (0.022) | (0.020) | (0.019) | (0.020) | (0.026) | (0.030) | (0.027) | (0.025) |
| D Low × Lower Grade | | -0.087*** | | | | | -0.054 | | | |
| | | (0.031) | | | | | (0.041) | | | |
| D Low × Lower Cohesion | | | -0.002 | | | | | 0.008 | | |
| | | | (0.031) | | | | | (0.041) | | |
| D Low × Male | | | | 0.051 | | | | | 0.079** | |
| | | | | (0.032) | | | | | (0.036) | |
| D Low × Caste Non-Gen | | | | | 0.040 | | | | | 0.015 |
| | | | | | (0.031) | | | | | (0.039) |
| p-val D L + Int. Term | | 0.468 | 0.067 | 0.005 | 0.009 | | 0.630 | 0.382 | 0.027 | 0.344 |
| Control Mean | -0.294 | -0.294 | -0.294 | -0.294 | -0.294 | -0.440 | -0.440 | -0.440 | -0.440 | -0.440 |
| Adj. R-sq | 0.782 | 0.782 | 0.782 | 0.782 | 0.782 | 0.594 | 0.594 | 0.594 | 0.594 | 0.594 |
| Obs. | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 |
| **Panel B: Out-degrees** | | | | | | | | | | |
| D Low | 0.059* | 0.059 | 0.119** | 0.056 | 0.087** | 0.081*** | 0.111*** | 0.143*** | 0.092** | 0.106*** |
| | (0.032) | (0.042) | (0.049) | (0.041) | (0.040) | (0.031) | (0.040) | (0.054) | (0.042) | (0.038) |
| D Low × Lower Grade | | 0.002 | | | | | -0.088 | | | |
| | | (0.062) | | | | | (0.060) | | | |
| D Low × Lower Cohesion | | | -0.113* | | | | | -0.118* | | |
| | | | (0.064) | | | | | (0.062) | | |
| D Low × Male | | | | 0.006 | | | | | -0.020 | |
| | | | | (0.058) | | | | | (0.061) | |
| D Low × Caste Non-Gen | | | | | -0.083 | | | | | -0.073 |
| | | | | | (0.063) | | | | | (0.068) |
| p-val D L + Int. Term | | 0.179 | 0.895 | 0.168 | 0.931 | | 0.600 | 0.424 | 0.110 | 0.555 |
| Control Mean | -0.154 | -0.154 | -0.154 | -0.154 | -0.154 | -0.175 | -0.175 | -0.175 | -0.175 | -0.175 |
| Adj. R-sq | 0.264 | 0.263 | 0.264 | 0.263 | 0.264 | 0.222 | 0.222 | 0.222 | 0.222 | 0.222 |
| Obs. | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | | | | | |
| Demo. controls | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

**Note:** D Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. p-val D L + Int. Term refers to the p value from the test of joint significance for the coefficients D Low and D Low interacted with the Variable of interest. Lower Grade refers to individuals from Grade 5 and below. Lower Cohesion refers to classrooms where the baseline network density measured over in-degree close friend nominations was below the median value. Caste Non-Gen refers to individuals from Non-General Caste. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Friend corresponds to a nomination in either of the three categories. Help, Recess, Lunch corresponds to a nomination for either Help, Recess or Lunch buddies. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Out-degree nominations corresponds to the number of individuals in the classroom that the student of interest nominates on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree / out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table C13: Heterogenous Local Treatment Effects of Deskmate Type - Experiences and Skills

| | Sub-sample: Low Popularity Students | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| | **Panel A** | | | | | | | | | |
| | **Interaction with teachers** | | | | | **Perception of Self-worth** | | | | |
| D Low | 0.119*** | 0.096** | 0.133** | 0.086 | 0.174*** | 0.116*** | 0.143*** | 0.140** | 0.076 | 0.141*** |
| | (0.041) | (0.046) | (0.057) | (0.052) | (0.047) | (0.042) | (0.049) | (0.061) | (0.059) | (0.050) |
| D Low × Lower Grade | | 0.071 | | | | | -0.081 | | | |
| | | (0.094) | | | | | (0.094) | | | |
| D Low × Lower Cohesion | | | -0.028 | | | | | -0.047 | | |
| | | | (0.081) | | | | | (0.084) | | |
| D Low × Male | | | | 0.067 | | | | | 0.081 | |
| | | | | (0.075) | | | | | (0.081) | |
| D Low × Caste Non-Gen | | | | | -0.174** | | | | | -0.077 |
| | | | | | (0.084) | | | | | (0.083) |
| p-val D L + Int. Term | | 0.042 | 0.073 | 0.009 | 0.995 | | 0.440 | 0.111 | 0.007 | 0.365 |
| Control Mean | -0.158 | -0.158 | -0.158 | -0.158 | -0.158 | -0.245 | -0.245 | -0.245 | -0.245 | -0.245 |
| Adj. R-sq | 0.167 | 0.167 | 0.167 | 0.167 | 0.168 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 |
| Obs. | 3086 | 3086 | 3086 | 3086 | 3086 | 3372 | 3372 | 3372 | 3372 | 3372 |
| | **Panel B** | | | | | | | | | |
| | **Optimism** | | | | | | **Willingness to work hard** | | | |
| D Low | 0.105** | 0.033 | 0.145*** | 0.120** | 0.104** | 0.080* | 0.097* | 0.134** | 0.040 | 0.079 |
| | (0.043) | (0.051) | (0.055) | (0.058) | (0.053) | (0.045) | (0.052) | (0.063) | (0.059) | (0.054) |
| D Low × Lower Grade | | 0.221** | | | | | -0.053 | | | |
| | | (0.092) | | | | | (0.099) | | | |
| D Low × Lower Cohesion | | | -0.082 | | | | | -0.111 | | |
| | | | (0.086) | | | | | (0.088) | | |
| D Low × Male | | | | -0.032 | | | | | 0.081 | |
| | | | | (0.083) | | | | | (0.085) | |
| D Low × Caste Non-Gen | | | | | 0.001 | | | | | 0.002 |
| | | | | | (0.086) | | | | | (0.084) |
| p-val D L + Int. Term | | 0.001 | 0.334 | 0.147 | 0.129 | | 0.603 | 0.704 | 0.061 | 0.241 |
| Control Mean | -0.116 | -0.116 | -0.116 | -0.116 | -0.116 | -0.176 | -0.176 | -0.176 | -0.176 | -0.176 |
| Adj. R-sq | 0.142 | 0.144 | 0.142 | 0.142 | 0.142 | 0.111 | 0.111 | 0.111 | 0.111 | 0.110 |
| Obs. | 3097 | 3097 | 3097 | 3097 | 3097 | 3021 | 3021 | 3021 | 3021 | 3021 |
| | *** p<0.01, **p<0.05, * p<0.1 | | | | | | | | | |
| Demo. controls | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

**Note:** D Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. p-val D L + Int. Term refers to the p value from the test of joint significance for the coefficients D Low and D Low interacted with the Variable of interest. Lower Grade refers to individuals from Grade 5 and below. Lower Cohesion refers to classrooms where the baseline network density measured over in-degree close friend nominations was below the median value. Caste Non-Gen refers to individuals from Non-General Caste. Baseline value is included for all regressions apart from the ones for perception of self-worth. Perception of self-worth is captured by the question: How much do people in my class like me? Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree / out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table C14: Heterogenous Treatment Effects of Classroom Type - Network In and Out degrees

| | Sub-sample: Low Popularity Students | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Friendship Nominations | | | | | Help, Recess and Lunch Nominations | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| **Panel A: In-degrees** | | | | | | | | | | |
| LopH | 0.153*** | 0.156*** | 0.218*** | 0.155*** | 0.133** | 0.107** | 0.122** | 0.202*** | 0.126** | 0.100** |
| | (0.055) | (0.060) | (0.083) | (0.057) | (0.055) | (0.051) | (0.055) | (0.077) | (0.055) | (0.050) |
| LopH × Lower Grade | | -0.009 | | | | | -0.050 | | | |
| | | (0.141) | | | | | (0.133) | | | |
| LopH × Lower Cohesion | | | -0.133 | | | | | -0.195** | | |
| | | | (0.104) | | | | | (0.087) | | |
| LopH × Male | | | | -0.004 | | | | | -0.037 | |
| | | | | (0.048) | | | | | (0.047) | |
| LopH × Caste Non-Gen | | | | | 0.065 | | | | | 0.023 |
| | | | | | (0.057) | | | | | (0.056) |
| p-val LopH + Int. Term | | 0.240 | 0.198 | 0.015 | 0.006 | | 0.544 | 0.894 | 0.128 | 0.085 |
| Control Mean | -0.309 | -0.309 | -0.309 | -0.309 | -0.309 | -0.447 | -0.447 | -0.447 | -0.447 | -0.447 |
| Adj. R-sq | 0.614 | 0.614 | 0.615 | 0.614 | 0.614 | 0.446 | 0.446 | 0.448 | 0.446 | 0.446 |
| Obs. | 4181 | 4181 | 4181 | 4181 | 4181 | 4180 | 4180 | 4180 | 4180 | 4180 |
| **Panel B: Out-degrees** | | | | | | | | | | |
| LopH | 0.037 | 0.019 | 0.017 | 0.119** | -0.019 | 0.013 | -0.012 | 0.005 | 0.035 | -0.074* |
| | (0.035) | (0.043) | (0.049) | (0.049) | (0.038) | (0.039) | (0.047) | (0.059) | (0.047) | (0.039) |
| LopH × Lower Grade | | 0.058 | | | | | 0.082 | | | |
| | | (0.078) | | | | | (0.097) | | | |
| LopH × Lower Cohesion | | | 0.042 | | | | | 0.017 | | |
| | | | (0.071) | | | | | (0.074) | | |
| LopH × Male | | | | -0.159** | | | | | -0.043 | |
| | | | | (0.066) | | | | | (0.069) | |
| LopH × Caste Non-Gen | | | | | 0.183*** | | | | | 0.282*** |
| | | | | | (0.070) | | | | | (0.076) |
| p-val LopH + Int. Term | | 0.220 | 0.258 | 0.408 | 0.010 | | 0.389 | 0.660 | 0.890 | 0.005 |
| Control Mean | -0.154 | -0.154 | -0.154 | -0.154 | -0.154 | -0.163 | -0.163 | -0.163 | -0.163 | -0.163 |
| Adj. R-sq | 0.242 | 0.242 | 0.242 | 0.243 | 0.243 | 0.195 | 0.195 | 0.195 | 0.195 | 0.199 |
| Obs. | 4181 | 4181 | 4181 | 4181 | 4181 | 4180 | 4180 | 4180 | 4180 | 4180 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | | | | | |
| Demo. controls | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Sch. Grade FE | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

**Note:** LopH refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. p-val LopH + Int. Term refers to the p value from the test of joint significance for the coefficients LopH and LopH interacted with the Variable of interest. Lower Grade refers to individuals from Grade 5 and below. Lower Cohesion refers to classrooms where the baseline network density measured over in-degree close friend nominations was below the median value. Caste Non-Gen refers to individuals from Non-General Caste. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Friend corresponds to a nomination in either of the three categories. Help, Recess, Lunch corresponds to a nomination for either Help, Recess or Lunch buddies. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Out-degree nominations corresponds to the number of individuals in the classroom that the student of interest nominates on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree / out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Sch. Grade FE stands for School Grade Fixed effects. Standard errors are clustered at Classroom level.

# D Reanalysis of Wu et al. [2023]

Table D1 lays down the results from the reanalysis of the data in Wu et al. [2023]. In the original study two different types of treatments existed: MS and MSR at the classroom level. MS classrooms were complete "mixed seating" classrooms where all high academic ability individuals are matched to low academic ability individuals as deskmates. MSR classrooms were also complete "mixed seating" classrooms where all high academic ability individuals are matched to low academic ability individuals as deskmates but high ability individuals are also offered a financial reward if their low ability deskmates improve their academic performance. Deskmates are randomly allocated in control classrooms. Row 1 and 2 report the original treatment effects on low ability individuals from the paper.[92] To understand the force that drives positive effects in their paper, I selectively restrict the sample in control classrooms to low ability individuals who are either matched to each other (rows 3 and 4) or to high ability individuals (row 5 and 6) as deskmates. I use the same specification as the authors to rerun the analysis. Results suggest that the positive coefficients associated to MS and MSR classrooms are driven not by differences in performance between low ability individuals who are matched to high ability individuals in treatment classrooms vs low ability individuals who are matched to each other in control classrooms. Instead it is driven by difference in performance between low ability individuals who are matched to high ability individuals in treatment classrooms vs low ability individuals who are matched to high ability individuals again in control classrooms. A further analysis via comparison of means using the sample in control classrooms (last row under Class-level effects) reveal that low ability individuals matched to high ability individuals tend to do worse at a local level. I.e. the peer effects in their paper are primarily driven by classroom level changes instead of changes in the direct deskmate type.

[92] As a further robustness check, I categorized students by baseline performance instead of last year's perofrmance which yield fairly similar results.

Table D1: Comparing different subsamples with the original specification in Wu et al. [2023]

| **Dependent Variable →** | Average score *(HSCO)* | Chinese *(HSCO)* | Math *(HSCO)* | Average *(Median)* | Chinese *(Median)* | Math *(Median)* |
|---|---|---|---|---|---|---|
| | | | **Grade-level effects** | | | |
| **Different sample comparisons** | | | | | | |
| MS vs Control | 0.013 | -0.020 | -0.004 | 0.003 | 0.026 | -0.012 |
| | (0.085) | (0.070) | (0.106) | (0.088) | (0.069) | (0.111) |
| MSR vs Control | 0.139* | -0.009 | 0.242** | 0.133+ | 0.037 | 0.239** |
| | (0.080) | (0.060) | (0.097) | (0.083) | (0.066) | (0.100) |
| MS vs Control (1-0) | -0.076 | -0.124+ | -0.112 | -0.089 | -0.032 | -0.116 |
| | (0.073) | (0.074) | (0.095) | (0.081) | (0.075) | (0.104) |
| MSR vs Control (1-0) | 0.049 | -0.108+ | 0.128 | 0.041 | -0.016 | 0.129 |
| | (0.073) | (0.070) | (0.091) | (0.081) | (0.078) | (0.100) |
| MS vs Control (1-1) | 0.063 | -0.014 | 0.027 | 0.100 | 0.078 | 0.107 |
| | (0.086) | (0.076) | (0.108) | (0.105) | (0.080) | (0.131) |
| MSR vs Control (1-1) | 0.187** | -0.006 | 0.272** | 0.228** | 0.083 | 0.358*** |
| | (0.082) | (0.067) | (0.102) | (0.099) | (0.074) | (0.123) |
| | | | **Class-level effects - match to high vs match to low** | | | |
| **Between match comparisons, different fixed effects** | | | | | | |
| Grade FE (1-0) | -0.068+ | -0.141** | -0.067 | -0.085+ | -0.067 | -0.071 |
| | (0.045) | (0.056) | (0.056) | (0.055) | (0.062) | (0.066) |
| Class FE (1-0) | -0.130*** | -0.154** | -0.185*** | -0.134*** | -0.086 | -0.161*** |
| | (0.047) | (0.064) | (0.062) | (0.044) | (0.073) | (0.038) |
| Class FE (Control class only) (1-0) | -0.118** | -0.125* | -0.165** | -0.132** | -0.074 | -0.171*** |
| | (0.049) | (0.068) | (0.058) | (0.053) | (0.077) | (0.044) |

**Note:** ***p<0.01, **p<0.05, *p<0.1, +p<0.15. MS denotes "mixed seating" classrooms where all high academic ability individuals are matched to low academic ability individuals as deskmates. MSR denotes "mixed seating" classrooms where all high academic ability individuals are matched to low academic ability individuals as deskmates but high ability individuals are also offered a financial reward if their low ability deskmates improve their academic performance. Deskmates are randomly allocated in control classrooms. Sample resctricted to low ability individuals. HSCO categorization corresponds to the original categorization in Wu et al. [2023] (it was equivalent to a median split albeit some differences. See the original paper). Median categorization corresponds to academic performance of individuals split by median academic test score. 1 refers to a low ability individuals paired with a high ability individual, 1 refers to a low ability individuals paired with another low ability individual. Therefore, 1-0 would refer to a comparison between low ability individuals who are matched with high ability deskmates vs low ability deskmates.

# Online Appendix

## E More details on Sample - Distribution and Summary Statistics

Figure E1: Distribution of students by grade and region

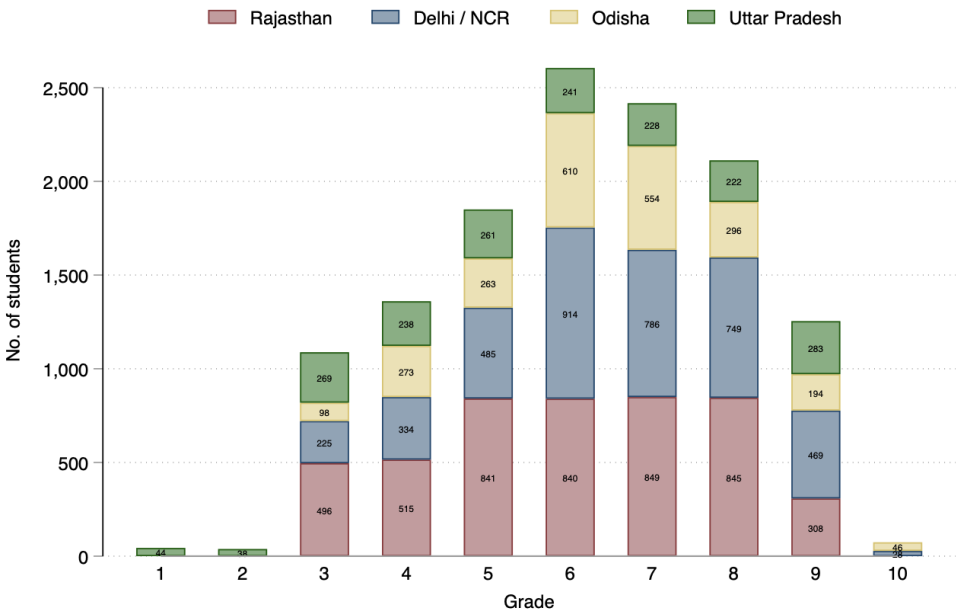



Table E1: Summary Statistics - Social network nominations at baseline

| Variable | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| **Panel A: In-degree nominations** | | | | | |
| Very Good Friend | 4.285 | 3.045 | 0 | 23 | 12842 |
| Close Friend | 8.884 | 5.103 | 0 | 37 | 12842 |
| Friend | 13.685 | 7.200 | 0 | 52 | 12842 |
| Academic Help | 4.087 | 3.469 | 0 | 29 | 12842 |
| Help | 3.530 | 2.808 | 0 | 21 | 12842 |
| Recess | 4.322 | 3.185 | 0 | 24 | 12842 |
| Lunch | 3.763 | 2.737 | 0 | 20 | 12594 |
| Preferred Deskmate | 3.270 | 2.522 | 0 | 17 | 12841 |
| **Panel B: Out-degree nominations** | | | | | |
| Very Good Friend | 4.626 | 4.124 | 0 | 56 | 12082 |
| Close Friend | 9.534 | 7.137 | 0 | 64 | 12082 |
| Friend | 14.646 | 11.837 | 0 | 64 | 12082 |
| Academic Help | 4.378 | 4.567 | 0 | 52 | 12082 |
| Help | 3.791 | 4.410 | 0 | 46 | 12082 |
| Recess | 4.639 | 4.998 | 0 | 49 | 12082 |
| Lunch | 4.036 | 4.058 | 0 | 43 | 11843 |
| Preferred Deskmate | 3.498 | 4.164 | 0 | 53 | 12082 |

Figure E2: Distribution of classes by grade and region

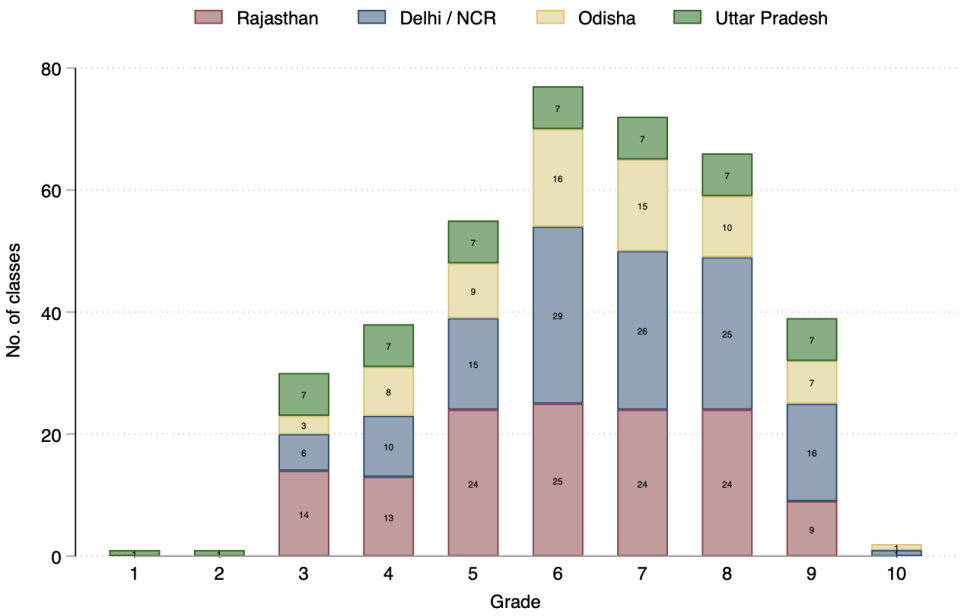



Table E2: Summary Statistics - Classroom experiences and social skills at baseline

| Variable | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| **Panel A: Classroom experience and Academic Performance** | | | | | |
| Time with classmates | 6.873 | 2.805 | 1 | 10 | 11581 |
| Interactions with teachers | 5.594 | 2.822 | 1 | 10 | 11618 |
| Excited | 7.427 | 2.905 | 1 | 10 | 11521 |
| Comfort in classroom | 6.323 | 2.891 | 1 | 10 | 11322 |
| Bullying Perception | 4.131 | 3.110 | 1 | 10 | 11136 |
| Academic category | 1.973 | 1.142 | 1 | 5 | 11536 |
| Comfort in exams | 7.448 | 2.279 | 1 | 10 | 11605 |
| **Panel B: Social and Non-cognitive skills** | | | | | |
| Optimism | 8.319 | 2.003 | 1 | 10 | 11605 |
| Worried | 5.552 | 3.093 | 1 | 10 | 11603 |
| Nervous | 5.512 | 3.049 | 1 | 10 | 11210 |
| Ability to forgive | 5.966 | 3.209 | 1 | 10 | 11290 |
| Competitiveness | 6.914 | 2.765 | 1 | 10 | 11447 |
| Willingness to work hard | 7.266 | 2.525 | 1 | 10 | 11592 |
| Determination | 2.444 | 1.129 | 0 | 5 | 11531 |
| Trust | 6.703 | 2.733 | 1 | 10 | 11613 |
| Altruism | 7.430 | 2.665 | 1 | 10 | 11340 |
| Dictator Game | 4.437 | 2.312 | 0 | 10 | 11519 |
| Morality | 4.448 | 2.361 | 1 | 7 | 11311 |
| Interaction with friends | 7.007 | 2.781 | 1 | 10 | 11745 |
| Willingness to participate | 6.451 | 2.921 | 1 | 10 | 11624 |
| Patience | 5.713 | 3.059 | 1 | 10 | 11202 |
| Time Preferences | 6.158 | 2.969 | 0 | 10 | 11642 |
| Risk | 4.737 | 3.107 | 1 | 10 | 11093 |
| Risk Game | 5.339 | 2.928 | 0 | 10 | 11647 |

# F Within classroom randomization - Full specification

Table F1: Local Treatment Effects of Deskmate Type - Network In and Out degrees

| | Sub-sample: Low Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | Friendship Network Nominations | | | Other Network Nominations | | |
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help, Recess, Lunch | (6) Acad. Help |
| **Panel A: In-degrees** | | | | | | |
| Desk. Low | 0.025 | 0.046** | 0.045** | 0.046** | 0.010 | 0.035 |
| | (0.023) | (0.020) | (0.017) | (0.023) | (0.023) | (0.021) |
| Desk. Medium | 0.034 | 0.031 | 0.008 | -0.015 | -0.023 | 0.003 |
| | (0.022) | (0.020) | (0.017) | (0.022) | (0.020) | (0.019) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.467 | -0.452 | -0.286 | -0.418 | -0.434 | -0.449 |
| Adj. R-sq | 0.451 | 0.605 | 0.782 | 0.474 | 0.594 | 0.525 |
| Obs. | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 |
| **Panel B: Out-degrees** | | | | | | |
| Desk. Low | 0.047 | 0.047 | 0.066* | 0.081* | 0.098** | 0.039 |
| | (0.037) | (0.034) | (0.037) | (0.044) | (0.041) | (0.038) |
| Desk. Medium | 0.041 | 0.024 | 0.016 | 0.012 | -0.004 | 0.028 |
| | (0.037) | (0.033) | (0.036) | (0.039) | (0.044) | (0.031) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.174 | -0.189 | -0.152 | -0.123 | -0.177 | -0.128 |
| Adj. R-sq | 0.206 | 0.342 | 0.327 | 0.156 | 0.260 | 0.252 |
| Obs. | 3365 | 3365 | 3365 | 3365 | 3365 | 3365 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | |

**Note:** Desk. Low (Medium) refers to assignment to a low (medium) popularity deskmate. Control (omitted category) is assignment to high popularity deskmate. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch corresponds to a nomination for either Help, Recess or Lunch buddies. Acad. (Academic) Help corresponds to nominations for individuals from whom academic help is sought respectively. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Out-degree nominations corresponds to the number of individuals in the classroom that the student of interest nominates on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree / out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table F2: Local Treatment Effects of Deskmate Type - Classroom Experience and Academic Perception

| | Sub-sample: Low Popularity Students | | | | |
|---|---|---|---|---|---|
| | Peer interactions | | Teacher Interactions | | |
| | (1) Desk Enjoy | (2) Int. Classmate | (3) Int. Teacher | (4) Class. Comfort | (5) Acad. Perception |
| Desk. Low | -0.073* | 0.051 | 0.084* | -0.009 | 0.039 |
| | (0.044) | (0.048) | (0.045) | (0.044) | (0.046) |
| Desk. Medium | -0.027 | 0.053 | -0.075* | 0.010 | -0.014 |
| | (0.042) | (0.043) | (0.041) | (0.044) | (0.040) |
| Demo. controls | Y | Y | Y | Y | Y |
| Base. score | N | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y |
| Control Mean | -0.036 | -0.239 | -0.135 | -0.218 | -0.242 |
| Adj. R-sq | 0.096 | 0.135 | 0.168 | 0.179 | 0.212 |
| Obs. | 3376 | 3088 | 3086 | 3189 | 3285 |

*** p<0.01, **p<0.05, * p<0.1

**Note:** Desk. Low (Medium) refers to assignment to a low (medium) popularity deskmate. Control (omitted category) is assignment to high popularity deskmate. Original responses to all questions are based on a likert scale of 1-10. Desk Enjoy corresponds to the extent to which the individual enjoyed sitting with their assigned deskmate. Int. Classmate corresponds to the amount of time spent spent with classmates for fun and activities. Int. Teacher corresponds to the frequency of interactions with teachers. Class. Comfort is an index created from standardized responses pertaining to the level of excitement the individual exhibits to come to class everyday, level of comfort w.r.t. asking doubts in the classroom and an individual's perception of bullying in the classroom (reversed). Acad. perception is an index created from standardized responses pertaining to academic self-concept and academic comfort. Academic self-concept originally is elicited on a scale of 1-5 where 1 corresponds to the individual beleiving they are in the top 10% of the class, 2: top 20%, 3: top 40%, 4: top 60% and 5: not in top 60%. Academic comfort corresponds to their response on a scale of 1-10 for the prompt, *I do well on exams.* Both endline and baseline values are standardized by survey wave. Base score corresponds to the baseline value of the variable of interest. Demo. controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table F3: Local Treatment Effects of Deskmate Type - Non-cognitive and Social skills

| | Sub-sample: Low Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | (1) Like perception | (2) Optimism | (3) Neuroticism (R) | (4) Competitiveness | (5) Hardwork | (6) Determinism |
| Desk. Low | 0.121** | 0.094* | 0.035 | 0.056 | 0.075 | -0.004 |
| | (0.047) | (0.048) | (0.046) | (0.051) | (0.050) | (0.039) |
| Desk. Medium | 0.011 | -0.023 | 0.029 | -0.042 | -0.009 | -0.002 |
| | (0.043) | (0.049) | (0.047) | (0.044) | (0.046) | (0.037) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. score | N | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.253 | -0.106 | -0.058 | -0.216 | -0.174 | -0.059 |
| Adj. R-sq | 0.060 | 0.142 | 0.109 | 0.126 | 0.111 | 0.364 |
| Obs. | 3372 | 3097 | 3195 | 2958 | 3021 | 3089 |

*** p<0.01, **p<0.05, * p<0.1

**Note:** Desk. Low (Medium) refers to assignment to a low (medium) popularity deskmate. Control (omitted category) is assignment to high popularity deskmate. Like perception corresponds to an individual's assessment of how much do other people in the class like him / her. Neuroticism is an index created from standardized responses to the level of worry, nervousness and the ability to forgive that individuals exhibit. All three components are scaled and reverse to ensure a higher value corresponds to a lower level of neuroticism. All variables apart from Determination are measured on a likert scale of 1-10. Refer to Section 2.3.5 for more details. Hardwork correspond to an individual's willingness to work hard on an everyday basis. Determination is measured by the level of effort put in by an individual in an real effort task where they had to identify as many numbers in a grid with digit 5 in them. Both endline and baseline values are standardized by survey wave. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table F4: Local Treatment Effects of Deskmate Type - Non-cognitive and Social skills (Cont.)

| **Sub-sample: Low Popularity Students** | | | | | |
|---|---|---|---|---|---|
| | (1) Altruism | (2) Trust | (3) Extraversion | (4) Risk | (5) Patience |
| Desk. Low | 0.045 | 0.006 | 0.012 | -0.038 | 0.039 |
| | (0.043) | (0.050) | (0.047) | (0.046) | (0.046) |
| Desk. Medium | 0.081* | 0.010 | -0.062 | -0.076* | 0.011 |
| | (0.042) | (0.045) | (0.040) | (0.045) | (0.041) |
| Demo. controls | Y | Y | Y | Y | Y |
| Base. score | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y |
| Control Mean | -0.101 | -0.179 | -0.187 | 0.016 | -0.045 |
| Adj. R-sq | 0.136 | 0.080 | 0.205 | 0.070 | 0.085 |
| Obs. | 3263 | 3026 | 3262 | 3225 | 3249 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | |

**Note:** Desk. Low (Medium) refers to assignment to a low (medium) popularity deskmate. Control (omitted category) is assignment to high popularity deskmate. Altruism is an index created from standardized individual responses to the question about their willingness to go out of their way to help someone in need, their response on a hypothetical dictator game and the donation to the NGO at the cost of self game. Extraversion corresponds to an index constructed from their standardized response to the willingness to participate in discussions and talk to people and their frequency of interactions with their friends in the classroom. Risk stands for risk tolerance which is an index constructed from the individual's response to how afraid are they of taking risks and their responses in the Minesweeper game. Measure of Patience is an index constructed from their response to the likert scale question about how patient are they and their responses on the Money earlier or later game. Both endline and baseline values are standardized by survey wave. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

# G Details on Survey Variables

## G.1 Variables capturing classroom experiences, academic comfort and non-cognitive skills

This subsection outlines the questions and hypothetical games used to assess students' socio-emotional outcomes. The measures, detailed in Table G1, draw from a broad range of studies in education, social-psychology, and economics literature. The language of the questions borrowed from these validated scales is adapted to the Indian context and simplified for students of all ages. Further, to ensure the rigor, relevance, and safety of the survey, the research team conducted extensive validation through qualitative interviews with 45 students (across 2 classrooms), 6 teachers, and 2 administrators outside our sample (Creswell [2021]). Each group was asked to review the survey, and then they participated in a semi-structured debrief with the research team. This process was designed not only to contextualize the questions but also to ensure that they did not actively cause harm to students (Pietilä et al. [2020]). During the pilot phase, I further refined and tailored the questions based on real-world feedback from participants in schools from Delhi, UP and Rajasthan. Redundant and irrelevant variables were removed to reduce survey fatigue, leaving only those that provided meaningful insights into the social challenges faced by students and educators. I also conducted surveys with teachers and administrators to confirm that the questions resonated with classroom realities. Finally, during baseline and pilot both in-sample and out-of-sample interviews were conducted, further solidifying the validity and applicability of the final questionnaire across diverse educational contexts. Snapshots of some specific games used are detailed below.

## G.2 Variables capturing demographic characteristics

In my final analysis, I use the following demographic characteristics of each individual: Gender, Religion, Caste and indicators of socio-economic background. In the following subsections, I lay down the availability of data on these variables from administrative records and our approach to obtaining information on the same if missing.

### G.2.1 Gender

I obtained administrative data on gender from 10 of the 24 schools in the sample. In the surveys, I also included a question that asked students to list their gender: Male / Female / Other / Prefer not to say. For the schools where administrative information was not available, I relied on the students' responses from the survey. As a secondary check, I classified every first name in the database into different genders based on a classifier trained with the Bihar SECC data. In the case where the gender reported by the student did not match the classified gender or the gender available in administrative records, I assigned the final gender after manual verification. I finally sent a list of all names that were either unclassified or required a manual verification to the respective class teachers and asked them to provide me with the necessary information.

### G.2.2 Religion

While only 4 out of 24 schools provided me with administrative data on religion, I was able to obtain a sample copy of admission forms from each school to understand the categories under which student information is classified. Almost all schools in the dataset provide students with two options: Hindu

Table G1: Survey Variables capturing classroom experiences, academic comfort, and social and non-cognitive skills

| Variable | Components: Questions / Prompts | Measurement | References |
|---|---|---|---|
| | **Classroom Experiences** | | |
| Interaction with classmates | How often do you spend time with your classmates for fun and activities? | Likert (1-10) | Alivernini and Manganelli [2016], Melo [2014] |
| Interaction with teachers | How often do you interact with your teachers? | Likert (1-10) | Endo and Harpel [1982] |
| Classroom Comfort | How excited are you to meet your classmates everyday? | Likert (1-10) | Nur [2019], Şeker [2011], Duru [2016] |
| | How comfortable are you asking questions in the classroom? | Likert (1-10) | Ryan et al. [2001], Ryan and Pintrich, Ryan et al. [1998] |
| | How common is bullying in your classroom? | Likert (1-10) | Paluck et al. [2016], Dumitru [2019], Whitney and Smith [1993] |
| | **Academic Comfort** | | |
| Perception of academic ability | I do well on my exams | Likert (1-10) | Keller et al. [2023], Musu-Gillette et al. [2015] |
| | I am in the ___ percentage of my class in studies: Top 10 / 20 / 40 / 60 / Not in top 60 | Likert (Modified) | |
| | **Social and non-cognitive skills** | | |
| Self-worth and Perception of Likeability | People in my class like me | Likert (1-10) | Migacheva and Crocker [2011] |
| Optimism | Ladder Scenario, reflection about future (See Fig. G1) | Likert (1-10) | Jackson et al. [2022] |
| Neuroticism | I get worried / upset by things happening in my life | Likert (1-10) | Gerlitz and Schupp [2005], Shan and Zölitz [2022] |
| | I get nervous | Likert (1-10) | |
| | I forgive people easily | Likert (1-10) | Brose et al. [2005] |
| Competitiveness | I am competitive | Likert (1-10) | Buser et al. [2021] |
| Willingness to work hard | I can maintain focus and work hard to solve assignments | Likert (1-10) | Miller et al. [1996], Wong and Csikszentmihalyi [1991] |
| Determination | Performance on unincentivized real effort task (See Sec abc) | Game | Carpenter and Huet-Vaughn [2019] |
| Altruism | I will go out of my way to help someone in need | Likert (1-10) | Philippe Rushton et al. [1981] |
| | Hypothetical Dictator Game (See Fig. G3) | Game | Forsythe et al. [1994] |
| | Hypothetical Donation Game (Universal Morality) (See Fig. G4) | Game | Kirchler et al. [2016] |
| Trust | People around me are good | Likert (1-10) | Falk et al. [2018] |
| Extraversion | I like talking to people and participating in discussions | Likert (1-10) | Gerlitz and Schupp [2005], Shan and Zölitz [2022], Ladd [1990] |
| | I speak with my friends often in the classroom | Likert (1-10) | |
| Risk Tolerance | I am afraid of taking risks | Likert (1-10) | Falk et al. [2018] |
| | Hypothetical Minesweeper game (See Fig. G5) | Game | Crosetto and Filippin [2013] |
| Patience | I am patient | Likert (1-10) | Falk et al. [2018] |
| | Hypothetical Time Preference game (See Fig. G6) | Game | Sutter et al. [2013] |

/ Muslim on the admission form, with the remaining religions categorized as "other". Most schools in the sample do not save this information but when they do, they code religion as Muslim / Non-muslim.

To ensure homogeneity between school records and my assignment of religion, I follow the same approach. For all the students in the database, I classify their full names into Muslim vs Non-muslim using a classifier trained on Bihar SECC data. I adopt a threshold of 70%; whenever the classifier reports a probability of 70% or more for a particular religion, I assign the corresponding religion to the individual. I then check whether the assigned religion matches the religion on records of the 4 schools who gave me administrative information. I also pick a random subsample of 20% from the full sample and manually verify the assigned religion. I create a list of all names for which the classifier was unable to assign a religion or in cases where the manual verification/school records conflicted with the classifier's assigned religion. I send this list to the respective class teachers and take their report as the final assignment.

### G.2.3 Caste

The caste system in India is a form of social stratification that has existed for more than 3500 years, characterised by endogamous and hereditary division of individuals into lower or upper castes. Individuals belonging to specific castes (defined over a set of different ethnic groups) have historically been denied access to resources, opportunities and general social dignity. Despite the formal abolition of caste, practices of caste-based discrimination and even untouchability continue to govern social interaction in Indian society (Srinivas [2000]). I can identify four broad categories of castes. The Indian Constitution formally recognises two categories of historically oppressed castes: the Scheduled Castes and Scheduled Tribes, accounting for affirmative action policies for both (Srinivas [1979]). State governments, at their discretion, can also provide reservations for a third category of oppressed castes identified as the Other Backward Castes (Srinivas [1979]). The remaining castes, colloquially identified as "upper castes" fall under the "General Category". While highly contested, a good indicator of an individual's caste is a combination of their surname and their state of residence. As per state or central government policies for reservation for SCs, STs or OBCs, all admission lists in central and state universities which are publicly available release the name of individuals along with the caste category in which they sought admissions. I use these lists for assigning caste to individuals in the sample.

5 out of the 24 schools in the sample stored and shared administrative records with me on caste. For the remaining individuals, I adopted the following approach: (i) I scraped the admissions lists from state universities located in Rajasthan, Odisha, Uttar Pradesh, Haryana and the central universities located in Delhi / NCR for the last 10 years. (ii) I employed a frequentist approach to create a dictionary where surnames are matched to a corresponding caste for each state. To do so, I counted the number of times each surname in the publicly available lists is categorised in a particular category. In cases of clear majority, I assigned the most frequently occurring caste to the given surname. In cases where assignments could not be done based on clear majorities, I referred to additional dictionaries of castes maintained in several Indologist texts and used those to assign the caste of the individual. I always exercised caution; in case of conflicting categorizations, I left the surname uncategorized. (iii) I then matched individuals in our data to these state-specific dictionaries based on their surnames and the state where their school was located. As a final check, I cross-verified our classification with the administrative records provided by the 5 schools. I took a subset of 5 individuals from each class and sent the list to class teachers to elicit their opinions. Overall, based on qualitative checks and conversations with class teachers, the categorization does reflect functionality. The opinion of the class teacher is an important validation since discrimination or restricted access to opportunities in schools based on caste often happens on the basis of the perceived caste instead of the actual caste of an individual. To the extent I want my variable to capture these deficiencies, I find the categorization reliable.

### G.2.4 Socio-economic background

Obtaining data on socio-economic backgrounds is one of the toughest endeavours. While schools in India are supposed to reserve 25% of their seats for economically weaker sections (EWS) of society, there are multiple caveats that exempt the schools from following these practices. For example, if a school is relatively new then there is a buffer period available to the school to grandfather in the EWS reservation rule. On the other hand,, if there are no students from the economically weaker sections (EWS) in a 2km radius around the school then the school is not required to extend the reservation to EWS students outside this radius. Additionally, most of the schools do not maintain any income records for parents and inferring the socio-economic status of the student from their parents' occupation is unreliable. A subsample of schools also caution us from using any information on parental income since they themselves do not believe in the credibility of such information. As a result, even though information is available on administrative records, these schools do not feel comfortable sharing the information. Therefore, to obtain information on the socio-economic standing of a student's family in the dataset, I rely on multiple measures. I used administrative data whenever available and reliable and I supplemented it with information elicited through responses to questions I embedded in our survey.

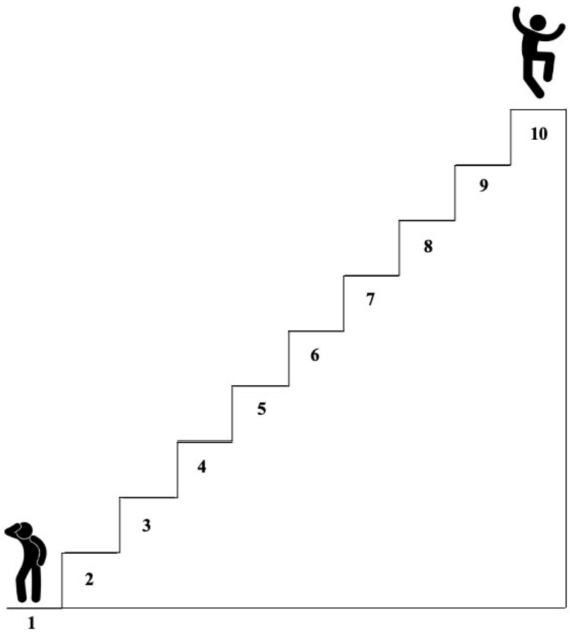
8 out of the 24 schools in the sample shared information on the EWS category of the student or the parental income after obtaining parental consent. These were the schools that were confident about the validity of the data stored in their administrative records. Whenever this information is available I use it to create a categorical variable that takes the value 1 when the student is flagged as an EWS student or if the household income is less than 240,000 INR per annum and 0 otherwise. For all the schools that do not provide us with this information, I code this value as missing.[93]

I append this information with responses I obtained from students through several questions I embedded in the survey. After consulting several school administrators, teachers and my implementation team, I use the following set of questions to capture an individual's socio-economic background: (i) How many siblings do you have? (ii) Does your family own a bike / car? If yes, how many? (iii) How often do you take vacations in a year? (iv) Where do you go for vacations? Destinations within India or Abroad? (v) How often do you visit your relatives staying outside your city? (vi) Do you take the school bus / your private car / public transport to come to school? Questions (i) and (ii) are top-coded at 3 to reduce noise in thr data. Based on the responses from students, I condense this information using PCA and use the first 5 components (which explain 80% of the variation) in the empirical analysis.

[93] In my specification, I use a dummy indicator to categorize missing values so that I do not lose observations in the analysis.

### G.2.5 Snapshots from survey - Hypothetical Games / Situation based questions

Figure G1: Question on optimism




2. Imagine a ladder, with steps numbered from **1 at the bottom** to **10 at the top**. The **top** of the ladder means that your life will be **amazing** and the **bottom** of the ladder means your life will **not be good**. By your best guess, at which step do you think you will be standing at in 10 years?

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Figure G2: Question on determination

You have 30 seconds to circle as many numbers as you can that have a 5 in them.

*We do not expect you to identify all the numbers! Your best effort is okay! Geniuses like Albert Einstein took forever to complete this task.*

36518 36777 89116 05542 29705 83775 21564 81639 27973 62413 85652 62817 57881
46132 81380 75635 19428 88048 08747 20092 12615 35046 67753 69630 10883 13683
31841 77367 40791 97402 27569 90184 02338 39318 54936 34641 95525 86316 87384
84180 93793 64953 51472 65358 23701 75230 47200 78176 85248 90589 74567 22633
78435 37586 07015 98729 76703 16224 97661 79907 06611 26501 93389 92725 68158
41859 94198 37182 61345 88857 53204 86721 59613 67494 17292 94457 89520 77771
13019 07274 51068 93129 40386 51731 44254 66685 72835 01270 42523 45323 63481
82448 72430 29041 59208 95266 33978 70958 60017 39723 00606 17956 19024 15819
25432 96593 83112 96997 55340 80312 78839 09815 16887 22228 06206 54272 83516
69226 38655 03811 08342 47863 02743 11547 38250 58140 98470 24364 99797 73498
25837 68821 66426 20496 84843 18360 91252 99134 48931 99538 21160 09411 44659
38914 82707 24769 72026 56813 49336 71767 04474 32909 74162 50404 68562 14088
04070 60681 64290 26905 65617 76039 91657 71362 32246 49595 50663 47459 57072
01674 14751 28637 86980 11951 10479 41454 48527 53868 37846 85912 15156 00865
70294 35450 39982 79503 34382 43186 69890 63222 30110 56004 04879 05138 57476
73903 98066 52136 89925 50000 96334 30773 80571 31178 52799 41050 76298 43995
87789 56408 77107 88452 80975 03406 36114 64549 79244 82044 00202 45727 35709
92320 95929 58545 70699 07679 23296 03002 63885 54677 55745 52540 62154 33314
46391 60276 92061 43591 42118 73094 53608 58949 42927 90993 46795 05947 01934
67090 45063 84584 66022 48268 74971 94861 61749 61085 81758 89640 39437 90044
11666 99916 35165 29420 73213 15275 62532 47319 39842 62273 94980 23415 64668
40910 59068 04594 94576 51187 54796 17411 56123 66545 82163 61868 22752 40101
41169 37965 47578 92180 05257 19143 77486 02457 00985 31960 39033 44374 28352
76418

**Based on your work, approximately, how many numbers have the digit 5 in the grid?: _____**

**Note:** I measured Determination based on the number of correct numbers highlighted in this question. Student responses were scanned and scored on a scale of 5 with the following categories: 0 - No attempt, 1 - Attempted but barely, 2: Attempted and less than 25% correct numbers identified, 3: Attempted and 25-50% correct numbers identified, 4: Attempted and 50-75% correct numbers identified, and 5: 3: Attempted and more than 75% correct numbers identified.

Figure G3: Dictator Game

5.

Imagine, we gave you 1000 rupees but another student did not get any money.

Would you choose to share some of your money? If yes, how much?

| 0 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 |
|---|---|---|---|---|---|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**Note:** Measure of altruism through the dictator game: Amount shared with / given to partner.

Figure G4: Universal Donation Game

6. Imagine you have a choice:

**Option 1:** We give some money to you.

**Option 2:** We donate 1000 rupees to an NGO that helps hungry people around the world.

**You can only pick one option for each scenario listed below. If we donate to the group, you won't get any money. If you take the money, we won't donate to the group.**

Just answer honestly. Your response is private, and there's no right or wrong answer.

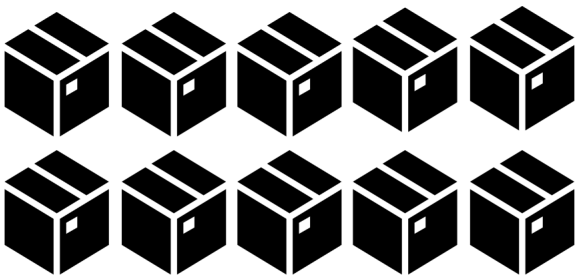
*For each line choose one of the following two options:*

| | | I get the money | I want the NGO to get the money instead |
|---|---|---|---|
| 1 | I get 200 rupees or the NGO gets 1000 rupees | ☐ | ☐ |
| 2 | I get 400 rupees or the NGO gets 1000 rupees | ☐ | ☐ |
| 3 | I get 600 rupees or the NGO gets 1000 rupees | ☐ | ☐ |
| 4 | I get 800 rupees or the NGO gets 1000 rupees | ☐ | ☐ |
| 5 | I get 1000 rupees or the NGO gets 1000 rupees | ☐ | ☐ |
| 6 | I get 1200 rupees or the NGO gets 1000 rupees | ☐ | ☐ |

**Note:** Ideally one should take the first row where the student switches from donation to the NGO to donation to self as the morality score. However, a fair number students do not follow a monotonic ordering in their response and I see students switching back and forth. As a result, I adopt a similar approach to (Terrier et al. [2022]) and (Bhargava et al. [2022]) and instead, measure universal morality as the number of times the student chooses to donate to NGO at the cost of self.

Figure G5: Risk Tolerance - Minesweeper Game

4.



There are 10 boxes. In 9 boxes, you get 100 rupees ( ) each, but in one box, there is a shark ( ). You do not know where the shark is.

Now, you get to choose how many boxes you want to open.

If you picked a box with the shark, you get no money. If you picked boxes without the shark, you get 100 rupees for each box you open.

**So, how many boxes do you want to open?**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**Note:** Measure of risk tolerance: Number of boxes opened.

Figure G6: Patience - Time Preference Game

3.

Imagine, you have 1000 rupees. You can choose to keep all the money or invest some of it. **You will get double the amount you have invested after two months.**

For e.g. if you invested 400 rupees, you will get 800 rupees after two months while keeping 600 rupees right now.

How much money would you choose to invest?:

| 0 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 |
|---|---|---|---|---|---|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**Note:** Measure of patience through the time preference game: Amount Invested.

# H Randomization design - match proportions

Table H1: Classroom Treatment Effects of match proportions - Probability of being matched to low vs medium vs high popularity Deskmate

| | **Sub-sample: Low Popularity Students** | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| | Deskmate Low | Deskmate Medium | Deskmate High |
| LopL | 0.255*** | -0.141*** | -0.114*** |
| | (0.011) | (0.011) | (0.010) |
| LopH | -0.143*** | -0.093*** | 0.235*** |
| | (0.012) | (0.012) | (0.009) |
| Control | 0.306*** | 0.362*** | 0.332*** |
| | (0.007) | (0.007) | (0.006) |
| Adj. R-sq | 0.101 | 0.017 | 0.078 |
| Obs. | 4115 | 4115 | 4115 |
| *** p<0.01, **p<0.05, * p<0.1 | | | |

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Control row reports the probability of being matched to a low vs medium vs high popularity deskmate for low popularity students in control classrooms. Coefficients on LopL and LopH indicate relative to the control mean, what is the increase / decrease in the probability of a match type for low popularity students in LopL and LopH classrooms respectively. Class controls include the size of class and the first two moments of the raw popularity score distribution. Standard errors are clustered at Classroom level.

# I Additional Tables and Figures

## I.1 Treatment effects - Medium / High Popularity Students

## I.2 Within Classroom Randomization

Table I1: Local Treatment Effects of Deskmate Type - Network In and Out degrees

| | Sub-sample: Medium/High Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | Friendship Network Nominations | | | Other Network Nominations | | |
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help, Recess, Lunch | (6) Acad. Help |
| **Panel A: In-degrees** | | | | | | |
| Desk. Low | -0.014 | -0.006 | 0.014 | 0.018 | 0.026* | 0.026 |
| | (0.018) | (0.014) | (0.011) | (0.017) | (0.015) | (0.017) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | 0.205 | 0.189 | 0.114 | 0.180 | 0.183 | 0.173 |
| Adj. R-sq | 0.544 | 0.700 | 0.808 | 0.506 | 0.645 | 0.588 |
| Obs. | 8497 | 8497 | 8497 | 8497 | 8497 | 8497 |
| **Panel B: Out-degrees** | | | | | | |
| Desk. Low | 0.025 | -0.003 | -0.019 | -0.000 | -0.011 | 0.029 |
| | (0.025) | (0.021) | (0.021) | (0.025) | (0.021) | (0.025) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | 0.072 | 0.083 | 0.066 | 0.044 | 0.069 | 0.038 |
| Adj. R-sq | 0.244 | 0.389 | 0.385 | 0.156 | 0.313 | 0.262 |
| Obs. | 7512 | 7512 | 7512 | 7512 | 7512 | 7512 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch corresponds to a nomination for either Help, Recess or Lunch buddies. Acad. (Academic) Help corresponds to nominations for individuals from whom academic help is sought respectively. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Out-degree nominations corresponds to the number of individuals in the classroom that the student of interest nominates on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree / out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table I2: Local Treatment Effects of Deskmate Type - Classroom Experience and Academic Perception

| | Sub-sample: Medium/High Popularity Students | | | | |
|---|---|---|---|---|---|
| | Peer interactions | | Teacher Interactions | | |
| | (1) Desk Enjoy | (2) Int. Classmate | (3) Int. Teacher | (4) Class. Comfort | (5) Acad. Perception |
| Desk. Low | -0.183*** | 0.051** | 0.001 | 0.009 | 0.026 |
| | (0.028) | (0.022) | (0.023) | (0.024) | (0.021) |
| Demo. controls | Y | Y | Y | Y | Y |
| Base. score | N | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y |
| Control Mean | 0.081 | 0.073 | 0.050 | 0.083 | 0.091 |
| Adj. R-sq | 0.086 | 0.175 | 0.191 | 0.168 | 0.228 |
| Obs. | 7392 | 7091 | 7063 | 7246 | 7371 |

*** p<0.01, **p<0.05, * p<0.1

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. Original responses to all questions are based on a likert scale of 1-10. Desk Enjoy corresponds to the extent to which the individual enjoyed sitting with their assigned deskmate. Int. Classmate corresponds to the amount of time spent spent with classmates for fun and activities. Int. Teacher corresponds to the frequency of interactions with teachers. Class. Comfort is an index created from standardized responses pertaining to the level of excitement the individual exhibits to come to class everyday, level of comfort w.r.t. asking doubts in the classroom and an individual's perception of bullying in the classroom (reversed). Acad. perception is an index created from standardized responses pertaining to academic self-concept and academic comfort. Academic self-concept originally is elicited on a scale of 1-5 where 1 corresponds to the individual beleiving they are in the top 10% of the class, 2: top 20%, 3: top 40%, 4: top 60% and 5: not in top 60%. Academic comfort corresponds to their response on a scale of 1-10 for the prompt, *I do well on exams.* Both endline and baseline values are standardized by survey wave. Base score corresponds to the baseline value of the variable of interest. Demo. controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table I3: Local Treatment Effects of Deskmate Type - Non-cognitive and Social skills

| | Sub-sample: Medium/High Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | (1) Like perception | (2) Optimism | (3) Neuroticism (R) | (4) Competitiveness | (5) Hardwork | (6) Determinism |
| Desk. Low | 0.055** | -0.017 | 0.009 | -0.005 | 0.053** | 0.048** |
| | (0.023) | (0.024) | (0.026) | (0.022) | (0.022) | (0.021) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. score | N | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | 0.074 | 0.048 | 0.010 | 0.074 | 0.050 | 0.013 |
| Adj. R-sq | 0.058 | 0.135 | 0.145 | 0.162 | 0.140 | 0.409 |
| Obs. | 7437 | 7067 | 7214 | 6894 | 6989 | 6921 |

*** p<0.01, **p<0.05, * p<0.1

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. Like perception corresponds to an individual's assessment of how much do other people in the class like him / her. Neuroticism is an index created from standardized responses to the level of worry, nervousness and the ability to forgive that individuals exhibit. All three components are scaled and reverse to ensure a higher value corresponds to a lower level of neuroticism. All variables apart from Determination are measured on a likert scale of 1-10. Refer to Section 2.3.5 for more details. Hardwork correspond to an individual's willingness to work hard on an everyday basis. Determination is measured by the level of effort put in by an individual in an real effort task where they had to identify as many numbers in a grid with digit 5 in them. Both endline and baseline values are standardized by survey wave. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table I4: Local Treatment Effects of Deskmate Type - Non-cognitive and Social skills (Cont.)

| **Sub-sample: Medium/High Popularity Students** | | | | | |
|---|---|---|---|---|---|
| | (1) Altruism | (2) Trust | (3) Extraversion | (4) Risk | (5) Patience |
| Desk. Low | 0.007 | 0.025 | -0.019 | 0.032 | 0.005 |
| | (0.024) | (0.024) | (0.023) | (0.026) | (0.024) |
| Demo. controls | Y | Y | Y | Y | Y |
| Base. score | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y |
| Control Mean | 0.029 | 0.063 | 0.077 | -0.005 | 0.008 |
| Adj. R-sq | 0.166 | 0.123 | 0.230 | 0.089 | 0.138 |
| Obs. | 7318 | 7015 | 7350 | 7248 | 7303 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. Altruism is an index created from standardized individual responses to the question about their willingness to go out of their way to help someone in need, their response on a hypothetical dictator game and the donation to the NGO at the cost of self game. Extraversion corresponds to an index constructed from their standardized response to the willingness to participate in discussions and talk to people and their frequency of interactions with their friends in the classroom. Risk stands for risk tolerance which is an index constructed from the individual's response to how afraid are they of taking risks and their responses in the Minesweeper game. Measure of Patience is an index constructed from their response to the likert scale question about how patient are they and their responses on the Money earlier or later game. Both endline and baseline values are standardized by survey wave. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

## I.3 Within Classroom Randomization

Table I5: Classroom Treatment Effects of match proportions - Network In and Out degrees

| | Sub-sample: Medium/High Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | Friendship Network Nominations | | | Other Network Nominations | | |
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help, Recess, Lunch | (6) Acad. Help |
| **Panel A: In-degrees** | | | | | | |
| LopL | 0.033 | 0.043 | 0.039 | -0.022 | 0.004 | -0.048 |
| | (0.055) | (0.062) | (0.064) | (0.058) | (0.057) | (0.045) |
| LopH | 0.157*** | 0.153*** | 0.147*** | 0.081 | 0.063 | 0.065 |
| | (0.053) | (0.052) | (0.052) | (0.061) | (0.052) | (0.046) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Sch. Grade FE | Y | Y | Y | Y | Y | Y |
| Control Mean | 0.149 | 0.131 | 0.054 | 0.165 | 0.167 | 0.178 |
| Adj. R-sq | 0.461 | 0.604 | 0.684 | 0.391 | 0.547 | 0.525 |
| Obs. | 8661 | 8661 | 8661 | 8661 | 8661 | 8661 |
| **Panel B: Out-degrees** | | | | | | |
| LopL | -0.011 | 0.002 | 0.004 | -0.013 | 0.006 | -0.063* |
| | (0.040) | (0.043) | (0.043) | (0.036) | (0.041) | (0.033) |
| LopH | 0.055 | 0.069* | 0.084** | 0.077** | 0.065* | 0.024 |
| | (0.037) | (0.036) | (0.036) | (0.037) | (0.037) | (0.033) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Sch. Grade FE | Y | Y | Y | Y | Y | Y |
| Control Mean | 0.043 | 0.038 | 0.015 | 0.021 | 0.039 | 0.041 |
| Adj. R-sq | 0.223 | 0.357 | 0.350 | 0.134 | 0.283 | 0.248 |
| Obs. | 7657 | 7657 | 7657 | 7657 | 7657 | 7657 |

*** p<0.01, **p<0.05, * p<0.1

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Sch. Grade FE stands for School-Grade Fixed Effects. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch corresponds to a nomination for either Help, Recess or Lunch buddies. Acad. (Academic) Help corresponds to nominations for individuals from whom academic help is sought respectively. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Out-degree nominations corresponds to the number of individuals in the classroom that the student of interest nominates on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree / out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Class controls include the size of class and the first two moments of the raw popularity score distribution. Standard errors are clustered at Classroom level.

Table I6: Classroom Treatment Effects of match proportions - Classroom Experience and Academic Perception

| | Sub-sample: Medium/High Popularity Students | | | | |
|---|---|---|---|---|---|
| | Peer interactions | | Teacher Interactions | | |
| | (1) Desk Enjoy | (2) Int. Classmate | (3) Int. Teacher | (4) Class. Comfort | (5) Acad. Perception |
| LopL | -0.001 | -0.061* | -0.016 | 0.059* | 0.046 |
| | (0.036) | (0.036) | (0.027) | (0.034) | (0.029) |
| LopH | -0.063 | -0.043 | 0.003 | 0.049 | 0.011 |
| | (0.040) | (0.035) | (0.029) | (0.033) | (0.023) |
| Demo. controls | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y |
| Base. score | N | Y | Y | Y | Y |
| Sch. Grade FE | Y | Y | Y | Y | Y |
| Control Mean | 0.025 | 0.116 | 0.097 | 0.067 | 0.106 |
| Adj. R-sq | 0.055 | 0.147 | 0.185 | 0.147 | 0.221 |
| Obs. | 7539 | 7230 | 7202 | 7387 | 7516 |

*** p<0.01, **p<0.05, * p<0.1

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Sch. Grade FE stands for School-Grade Fixed Effects. riginal responses to all questions are based on a likert scale of 1-10. Desk Enjoy corresponds to the extent to which the individual enjoyed sitting with their assigned deskmate. Int. Classmate corresponds to the amount of time spent spent with classmates for fun and activities. Int. Teacher corresponds to the frequency of interactions with teachers. Class. Comfort is an index created from standardized responses pertaining to the level of excitement the individual exhibits to come to class everyday, level of comfort w.r.t. asking doubts in the classroom and an individual's perception of bullying in the classroom (reversed). Acad. perception is an index created from standardized responses pertaining to academic self-concept and academic comfort. Academic self-concept originally is elicited on a scale of 1-5 where 1 corresponds to the individual beleiving they are in the top 10% of the class, 2: top 20%, 3: top 40%, 4: top 60% and 5: not in top 60%. Academic comfort corresponds to their response on a scale of 1-10 for the prompt, *I do well on exams.* Both endline and baseline values are standardized by survey wave. Base score corresponds to the baseline value of the variable of interest. Demo. controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Class controls include the size of class and the first two moments of the raw popularity score distribution. Standard errors are clustered at Classroom level.

Table I7: Classroom Treatment Effects of match proportions - Non-cognitive and Social skills

| | Sub-sample: Medium/High Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | (1) Like perception | (2) Optimism | (3) Neuroticism (R) | (4) Competitiveness | (5) Hardwork | (6) Determination |
| LopL | 0.006 | -0.036 | -0.010 | 0.015 | 0.023 | -0.018 |
| | (0.034) | (0.030) | (0.032) | (0.032) | (0.035) | (0.080) |
| LopH | -0.010 | -0.052* | 0.053* | -0.002 | 0.028 | -0.104* |
| | (0.032) | (0.030) | (0.028) | (0.029) | (0.030) | (0.062) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y | Y |
| Base. score | N | Y | Y | Y | Y | Y |
| Sch. Grade FE | Y | Y | Y | Y | Y | Y |
| Control Mean | 0.105 | 0.066 | 0.022 | 0.107 | 0.065 | 0.091 |
| Adj. R-sq | 0.042 | 0.125 | 0.134 | 0.149 | 0.127 | 0.259 |
| Obs. | 7590 | 7208 | 7357 | 7032 | 7125 | 7055 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | |

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Sch. Grade FE stands for School-Grade Fixed Effects. Like perception corresponds to an individual's assessment of how much do other people in the class like him / her. Neuroticism is an index created from standardized responses to the level of worry, nervousness and the ability to forgive that individuals exhibit. All three components are scaled and reverse to ensure a higher value corresponds to a lower level of neuroticism. All variables apart from Determination are measured on a likert scale of 1-10. Refer to Section 2.3.5 for more details. Hardwork correspond to an individual's willingness to work hard on an everyday basis. Determination is measured by the level of effort put in by an individual in an real effort task where they had to identify as many numbers in a grid with digit 5 in them. Both endline and baseline values are standardized by survey wave. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Class controls include the size of class and the first two moments of the raw popularity score distribution. Standard errors are clustered at Classroom level.

Table I8: Classroom Treatment Effects of match proportions - Non-cognitive and Social skills (Cont.)

| Sub-sample: Medium/High Popularity Students | | | | | |
|---|---|---|---|---|---|
| | (1) Altruism | (2) Trust | (3) Extraversion | (4) Risk | (5) Patience |
| LopL | 0.000 | 0.021 | 0.035 | -0.115*** | -0.108** |
| | (0.042) | (0.030) | (0.033) | (0.037) | (0.044) |
| LopH | 0.011 | -0.029 | -0.014 | 0.027 | 0.007 |
| | (0.034) | (0.031) | (0.028) | (0.033) | (0.035) |
| Demo. controls | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y |
| Base. score | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y |
| Control Mean | 0.055 | 0.095 | 0.105 | 0.038 | 0.029 |
| Adj. R-sq | 0.137 | 0.114 | 0.219 | 0.070 | 0.112 |
| Obs. | 7462 | 7153 | 7494 | 7391 | 7448 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | |

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Sch. Grade FE stands for School-Grade Fixed Effects. Altruism is an index created from standardized individual responses to the question about their willingness to go out of their way to help someone in need, their response on a hypothetical dictator game and the donation to the NGO at the cost of self game. Extraversion corresponds to an index constructed from their standardized response to the willingness to participate in discussions and talk to people and their frequency of interactions with their friends in the classroom. Risk stands for risk tolerance which is an index constructed from the individual's response to how afraid are they of taking risks and their responses in the Minesweeper game. Measure of Patience is an index constructed from their response to the likert scale question about how patient are they and their responses on the Money earlier or later game. Both endline and baseline values are standardized by survey wave. Demographic controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Class controls include the size of class and the first two moments of the raw popularity score distribution. Standard errors are clustered at Classroom level.

## I.4 Additional Tables: Treatment effects - Social Connections (to / from popularity type)

### I.4.1 Within classroom randomization

Table I9: Local Treatment Effects of Deskmate Type - Network In degree (from Medium/High popularity students)

| | Friendship Networks | | | | Action based Networks | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help | (6) Recess | (7) Lunch | (8) Acad. Help |
| **Panel A: All Students** | | | | | | | | |
| Desk. Low | -0.040*** | -0.019 | -0.005 | -0.005 | -0.011 | -0.006 | -0.014 | -0.008 |
| | (0.014) | (0.012) | (0.010) | (0.014) | (0.015) | (0.013) | (0.014) | (0.014) |
| Adj. R-sq | 0.543 | 0.671 | 0.759 | 0.487 | 0.503 | 0.573 | 0.551 | 0.578 |
| Obs. | 12612 | 12612 | 12612 | 12612 | 12612 | 12612 | 12612 | 12612 |
| **Panel B: Low Popularity Students** | | | | | | | | |
| Desk. Low | -0.017 | 0.014 | 0.019 | 0.019 | -0.011 | 0.008 | -0.000 | 0.009 |
| | (0.019) | (0.018) | (0.017) | (0.020) | (0.020) | (0.021) | (0.021) | (0.020) |
| Adj. R-sq | 0.443 | 0.577 | 0.749 | 0.441 | 0.416 | 0.466 | 0.457 | 0.492 |
| Obs. | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 |
| **Panel C: Medium and High Popularity Students** | | | | | | | | |
| Desk. Low | -0.046** | -0.035** | -0.016 | -0.013 | -0.002 | 0.001 | -0.016 | -0.013 |
| | (0.018) | (0.014) | (0.012) | (0.018) | (0.019) | (0.016) | (0.017) | (0.017) |
| Adj. R-sq | 0.530 | 0.682 | 0.783 | 0.478 | 0.495 | 0.590 | 0.558 | 0.564 |
| Obs. | 8497 | 8497 | 8497 | 8497 | 8497 | 8497 | 8497 | 8497 |
| Classroom FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Demo. controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y | Y | Y |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to medium or high popularity deskmate. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch and Acad. (Academic) Help corresponds to nominations for Help, Recess, Lunch buddies and individuals from whom academic help is sought respectively. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

### I.4.2 Across classroom randomization

Table I10: Local Treatment Effects of Deskmate Type - Network Out degree (to Medium/High popularity students)

| | Friendship Networks | | | | Action based Networks | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help | (6) Recess | (7) Lunch | (8) Acad. Help |
| **Panel A: All Students** | | | | | | | | |
| Desk. Low | 0.002 | -0.009 | -0.002 | 0.005 | 0.023 | 0.006 | 0.007 | 0.005 |
| | (0.018) | (0.016) | (0.017) | (0.018) | (0.017) | (0.016) | (0.016) | (0.017) |
| Adj. R-sq | 0.249 | 0.351 | 0.336 | 0.175 | 0.210 | 0.275 | 0.285 | 0.248 |
| Obs. | 12612 | 12612 | 12612 | 12612 | 12612 | 12612 | 12612 | 12612 |
| **Panel B: Low Popularity Students** | | | | | | | | |
| Desk. Low | 0.001 | 0.027 | 0.054* | 0.046 | 0.043 | 0.042 | 0.045* | 0.003 |
| | (0.029) | (0.029) | (0.032) | (0.032) | (0.031) | (0.029) | (0.027) | (0.029) |
| Adj. R-sq | 0.208 | 0.298 | 0.274 | 0.155 | 0.153 | 0.215 | 0.248 | 0.218 |
| Obs. | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 | 4115 |
| **Panel C: Medium and High Popularity Students** | | | | | | | | |
| Desk. Low | 0.000 | -0.028 | -0.030 | -0.013 | -0.002 | -0.003 | -0.016 | 0.004 |
| | (0.023) | (0.021) | (0.021) | (0.022) | (0.022) | (0.021) | (0.021) | (0.024) |
| Adj. R-sq | 0.253 | 0.361 | 0.360 | 0.184 | 0.225 | 0.291 | 0.294 | 0.259 |
| Obs. | 8497 | 8497 | 8497 | 8497 | 8497 | 8497 | 8497 | 8497 |
| Classroom FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Demo. controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Base. Degree | Y | Y | Y | Y | Y | Y | Y | Y |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to medium or high popularity deskmate. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch and Acad. (Academic) Help corresponds to nominations for Help, Recess, Lunch buddies and individuals from whom academic help is sought respectively. Out-degree nominations corresponds to the number of individuals in the classroom that the student of interest nominates on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table I11: Classroom Treatment Effects of match proportions - Network In degree (from Low popularity students)

| | Friendship Networks | | | | Action based Networks | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help | (6) Recess | (7) Lunch | (8) Acad. Help |
| **Panel A: All Students** | | | | | | | | |
| LopL | 0.049 | 0.058 | 0.037 | -0.040 | -0.033 | -0.040 | -0.020 | -0.012 |
| | (0.052) | (0.052) | (0.065) | (0.057) | (0.051) | (0.048) | (0.048) | (0.046) |
| LopH | 0.136*** | 0.104** | 0.053 | -0.007 | -0.104** | 0.026 | 0.049 | 0.030 |
| | (0.049) | (0.051) | (0.059) | (0.061) | (0.047) | (0.050) | (0.046) | (0.050) |
| Adj. R-sq | 0.274 | 0.409 | 0.515 | 0.220 | 0.237 | 0.280 | 0.252 | 0.297 |
| Obs. | 12841 | 12841 | 12841 | 12841 | 12841 | 12841 | 12841 | 12841 |
| **Panel B: Low Popularity Students** | | | | | | | | |
| LopL | 0.052 | 0.039 | 0.014 | -0.025 | -0.044 | -0.044 | -0.028 | -0.001 |
| | (0.058) | (0.054) | (0.066) | (0.052) | (0.052) | (0.049) | (0.050) | (0.047) |
| LopH | 0.131** | 0.067 | 0.028 | 0.011 | -0.116** | 0.019 | 0.054 | -0.015 |
| | (0.054) | (0.054) | (0.060) | (0.060) | (0.050) | (0.049) | (0.049) | (0.048) |
| Adj. R-sq | 0.213 | 0.347 | 0.481 | 0.187 | 0.209 | 0.236 | 0.211 | 0.245 |
| Obs. | 4180 | 4180 | 4180 | 4180 | 4180 | 4180 | 4180 | 4180 |
| **Panel C: Medium and High Popularity Students** | | | | | | | | |
| LopL | 0.050 | 0.068 | 0.048 | -0.047 | -0.026 | -0.035 | -0.015 | -0.018 |
| | (0.055) | (0.057) | (0.067) | (0.065) | (0.057) | (0.054) | (0.055) | (0.052) |
| LopH | 0.139** | 0.121** | 0.065 | -0.017 | -0.099* | 0.027 | 0.046 | 0.051 |
| | (0.055) | (0.056) | (0.062) | (0.068) | (0.052) | (0.058) | (0.054) | (0.057) |
| Adj. R-sq | 0.291 | 0.420 | 0.524 | 0.229 | 0.244 | 0.297 | 0.270 | 0.304 |
| Obs. | 8661 | 8661 | 8661 | 8661 | 8661 | 8661 | 8661 | 8661 |
| Sch. Grade FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Demo. controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y | Y | Y |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | | | |

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Sch. Grade FE stands for School-Grade Fixed Effects. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch and Acad. (Academic) Help corresponds to nominations for Help, Recess, Lunch buddies and individuals from whom academic help is sought respectively. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Class controls include the size of class and the first two moments of the raw popularity score distribution. Standard errors are clustered at Classroom level.

Table I12: Classroom Treatment Effects of match proportions - Network Out degree (to Low popularity students)

| | Friendship Networks | | | | Action based Networks | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help | (6) Recess | (7) Lunch | (8) Acad. Help |
| **Panel A: All Students** | | | | | | | | |
| LopL | -0.014 | 0.010 | 0.016 | -0.013 | 0.004 | -0.005 | -0.007 | -0.022 |
| | (0.033) | (0.035) | (0.037) | (0.032) | (0.028) | (0.030) | (0.033) | (0.030) |
| LopH | 0.070** | 0.073** | 0.079** | 0.073** | 0.048* | 0.036 | 0.081** | 0.030 |
| | (0.032) | (0.034) | (0.033) | (0.034) | (0.029) | (0.032) | (0.032) | (0.033) |
| Adj. R-sq | 0.121 | 0.223 | 0.240 | 0.073 | 0.115 | 0.130 | 0.146 | 0.142 |
| Obs. | 12841 | 12841 | 12841 | 12841 | 12841 | 12841 | 12841 | 12841 |
| **Panel B: Low Popularity Students** | | | | | | | | |
| LopL | 0.038 | 0.024 | 0.002 | -0.018 | -0.035 | -0.036 | -0.020 | -0.002 |
| | (0.044) | (0.040) | (0.040) | (0.038) | (0.039) | (0.036) | (0.039) | (0.040) |
| LopH | 0.096** | 0.047 | 0.013 | 0.006 | -0.088** | 0.015 | 0.040 | -0.010 |
| | (0.040) | (0.040) | (0.037) | (0.044) | (0.038) | (0.037) | (0.038) | (0.042) |
| Adj. R-sq | 0.122 | 0.202 | 0.217 | 0.079 | 0.106 | 0.119 | 0.144 | 0.138 |
| Obs. | 4180 | 4180 | 4180 | 4180 | 4180 | 4180 | 4180 | 4180 |
| **Panel C: Medium and High Popularity Students** | | | | | | | | |
| LopL | -0.038 | 0.003 | 0.023 | -0.009 | 0.022 | 0.009 | -0.002 | -0.033 |
| | (0.037) | (0.039) | (0.043) | (0.037) | (0.033) | (0.036) | (0.039) | (0.035) |
| LopH | 0.058 | 0.086** | 0.109*** | 0.103*** | 0.112*** | 0.046 | 0.098*** | 0.047 |
| | (0.037) | (0.040) | (0.039) | (0.038) | (0.033) | (0.036) | (0.037) | (0.037) |
| Adj. R-sq | 0.123 | 0.233 | 0.247 | 0.069 | 0.117 | 0.136 | 0.149 | 0.144 |
| Obs. | 8661 | 8661 | 8661 | 8661 | 8661 | 8661 | 8661 | 8661 |
| Sch. Grade FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Demo. controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Base. Degree | Y | Y | Y | Y | Y | Y | Y | Y |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | | | |

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Sch. Grade FE stands for School-Grade Fixed Effects. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch and Acad. (Academic) Help corresponds to nominations for Help, Recess, Lunch buddies and individuals from whom academic help is sought respectively. Out-degree nominations corresponds to the number of individuals in the classroom that the student of interest nominates on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Class controls include the size of class and the first two moments of the raw popularity score distribution. Standard errors are clustered at Classroom level.

Table I13: Classroom Treatment Effects of match proportions - Network In degree (from Medium/High popularity students)

| | Friendship Networks | | | | Action based Networks | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help | (6) Recess | (7) Lunch | (8) Acad. Help |
| **Panel A: All Students** | | | | | | | | |
| LopL | -0.005 | 0.021 | 0.037 | -0.022 | 0.004 | 0.008 | -0.014 | -0.059 |
| | (0.045) | (0.051) | (0.064) | (0.046) | (0.041) | (0.046) | (0.042) | (0.036) |
| LopH | 0.109** | 0.128*** | 0.169*** | 0.120** | 0.143*** | 0.047 | 0.108*** | 0.054 |
| | (0.043) | (0.045) | (0.055) | (0.047) | (0.040) | (0.041) | (0.042) | (0.038) |
| Adj. R-sq | 0.483 | 0.597 | 0.631 | 0.404 | 0.445 | 0.503 | 0.490 | 0.523 |
| Obs. | 12841 | 12841 | 12841 | 12841 | 12841 | 12841 | 12841 | 12841 |
| **Panel B: Low Popularity Students** | | | | | | | | |
| LopL | -0.060 | -0.008 | 0.025 | -0.021 | 0.020 | -0.006 | -0.012 | -0.047 |
| | (0.047) | (0.048) | (0.067) | (0.052) | (0.043) | (0.043) | (0.046) | (0.037) |
| LopH | 0.082* | 0.124** | 0.194*** | 0.153*** | 0.159*** | 0.067 | 0.130*** | 0.060 |
| | (0.046) | (0.049) | (0.060) | (0.052) | (0.043) | (0.042) | (0.044) | (0.040) |
| Adj. R-sq | 0.320 | 0.457 | 0.573 | 0.268 | 0.297 | 0.357 | 0.345 | 0.377 |
| Obs. | 4180 | 4180 | 4180 | 4180 | 4180 | 4180 | 4180 | 4180 |
| **Panel C: Medium and High Popularity Students** | | | | | | | | |
| LopL | 0.020 | 0.032 | 0.042 | -0.023 | 0.006 | 0.014 | -0.008 | -0.066 |
| | (0.052) | (0.059) | (0.064) | (0.051) | (0.049) | (0.054) | (0.049) | (0.043) |
| LopH | 0.117** | 0.126** | 0.156*** | 0.103* | 0.133*** | 0.037 | 0.103** | 0.049 |
| | (0.049) | (0.049) | (0.054) | (0.052) | (0.046) | (0.049) | (0.048) | (0.044) |
| Adj. R-sq | 0.457 | 0.595 | 0.661 | 0.388 | 0.428 | 0.505 | 0.485 | 0.504 |
| Obs. | 8661 | 8661 | 8661 | 8661 | 8661 | 8661 | 8661 | 8661 |
| Sch. Grade FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Demo. controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y | Y | Y |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | | | |

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Sch. Grade FE stands for School-Grade Fixed Effects. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch and Acad. (Academic) Help corresponds to nominations for Help, Recess, Lunch buddies and individuals from whom academic help is sought respectively. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Class controls include the size of class and the first two moments of the raw popularity score distribution. Standard errors are clustered at Classroom level.

Table I14: Classroom Treatment Effects of match proportions - Network Out degree (to Medium/High popularity students)

| | Friendship Networks | | | | Action based Networks | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help | (6) Recess | (7) Lunch | (8) Acad. Help |
| **Panel A: All Students** | | | | | | | | |
| LopL | 0.016 | 0.024 | 0.022 | -0.023 | -0.000 | -0.004 | -0.009 | -0.038 |
| | (0.032) | (0.036) | (0.036) | (0.031) | (0.028) | (0.031) | (0.028) | (0.029) |
| LopH | 0.089*** | 0.091*** | 0.088*** | 0.049 | 0.046* | 0.028 | 0.065** | 0.047 |
| | (0.030) | (0.030) | (0.030) | (0.032) | (0.025) | (0.029) | (0.027) | (0.029) |
| Adj. R-sq | 0.232 | 0.327 | 0.309 | 0.151 | 0.199 | 0.256 | 0.268 | 0.232 |
| Obs. | 12841 | 12841 | 12841 | 12841 | 12841 | 12841 | 12841 | 12841 |
| **Panel B: Low Popularity Students** | | | | | | | | |
| LopL | 0.026 | 0.037 | 0.019 | -0.039 | -0.022 | -0.030 | -0.016 | -0.015 |
| | (0.039) | (0.038) | (0.041) | (0.044) | (0.037) | (0.035) | (0.036) | (0.037) |
| LopH | 0.101*** | 0.085** | 0.052 | -0.009 | -0.053 | 0.020 | 0.037 | 0.046 |
| | (0.037) | (0.036) | (0.038) | (0.044) | (0.033) | (0.037) | (0.035) | (0.040) |
| Adj. R-sq | 0.194 | 0.278 | 0.253 | 0.117 | 0.150 | 0.199 | 0.226 | 0.193 |
| Obs. | 4180 | 4180 | 4180 | 4180 | 4180 | 4180 | 4180 | 4180 |
| **Panel C: Medium and High Popularity Students** | | | | | | | | |
| LopL | 0.013 | 0.018 | 0.023 | -0.016 | 0.010 | 0.008 | -0.003 | -0.050 |
| | (0.036) | (0.041) | (0.040) | (0.034) | (0.032) | (0.037) | (0.035) | (0.033) |
| LopH | 0.080** | 0.089*** | 0.101*** | 0.072** | 0.091*** | 0.028 | 0.078** | 0.043 |
| | (0.034) | (0.034) | (0.034) | (0.035) | (0.030) | (0.034) | (0.033) | (0.033) |
| Adj. R-sq | 0.234 | 0.334 | 0.329 | 0.160 | 0.212 | 0.266 | 0.272 | 0.243 |
| Obs. | 8661 | 8661 | 8661 | 8661 | 8661 | 8661 | 8661 | 8661 |
| Sch. Grade FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Demo. controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Class controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Base. Degree | Y | Y | Y | Y | Y | Y | Y | Y |

*** p<0.01, **p<0.05, * p<0.1

**Note:** LopL refers to classrooms where more than 45% of Low popularity students are matched to each other as deskmates. LopH refers to classrooms where more than 45% of low popularity students are matched to high popularity students. Remaining classrooms are treated as control (balanced) classrooms. Sch. Grade FE stands for School-Grade Fixed Effects. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch and Acad. (Academic) Help corresponds to nominations for Help, Recess, Lunch buddies and individuals from whom academic help is sought respectively. Out-degree nominations corresponds to the number of individuals in the classroom that the student of interest nominates on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Class controls include the size of class and the first two moments of the raw popularity score distribution. Standard errors are clustered at Classroom level.

## I.5 Other Tables

Table I15: Local Treatment Effects of Deskmate Type - Network In and Out degrees (Split into components)

| | Sub-sample: Low Popularity Students | | | | | |
|---|---|---|---|---|---|---|
| | Friendship Network Nominations | | | Action Network Nominations | | |
| | (1) V Good Friend | (2) Good Friend | (3) Sort of a Friend | (4) Help | (5) Recess | (6) Lunch |
| | **Panel A: In-degrees** | | | | | |
| Desk. Low | 0.009 | 0.052** | 0.024 | 0.003 | 0.023 | 0.020 |
| | (0.020) | (0.022) | (0.020) | (0.021) | (0.021) | (0.022) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.460 | -0.283 | 0.123 | -0.427 | -0.402 | -0.415 |
| Adj. R-sq | 0.451 | 0.475 | 0.697 | 0.455 | 0.495 | 0.475 |
| Obs. | 4115 | 4115 | 4115 | 4115 | 4115 | 4040 |
| | **Panel B: Out-degrees** | | | | | |
| Desk. Low | 0.028 | 0.043 | 0.066* | 0.077** | 0.068** | 0.082** |
| | (0.034) | (0.034) | (0.038) | (0.037) | (0.033) | (0.032) |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. degree | Y | Y | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Control Mean | -0.169 | -0.124 | -0.050 | -0.149 | -0.184 | -0.206 |
| Adj. R-sq | 0.206 | 0.244 | 0.161 | 0.172 | 0.219 | 0.263 |
| Obs. | 3365 | 3365 | 3365 | 3365 | 3365 | 3292 |
| | *** p<0.01, **p<0.05, * p<0.1 | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to high or medium popularity deskmate. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Column 1-3 correspond to nominations for each category separately. Help, Recess and Lunch nominations are defined analogously. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. Out-degree nominations corresponds to the number of individuals in the classroom that the student of interest nominates on the dimensions mentioned above. Both endline and baseline values are standardized by survey wave. Base. Degree corresponds to the standardized value of baseline in-degree / out-degree. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table I16: Local Treatment Effects of Deskmate Type - In degree nomination from deskmate

| | Friendship Network Nominations | | | Other Network Nominations | | |
|---|---|---|---|---|---|---|
| | (1) V Good Friend | (2) Close Friend | (3) Friend | (4) Pref. Deskmate | (5) Help, Recess, Lunch | (6) Acad. Help |
| **Panel A: All Students** | | | | | | |
| Desk. Low | -0.030*** | -0.025*** | -0.029*** | 0.004 | -0.028*** | -0.005 |
| | (0.008) | (0.009) | (0.009) | (0.007) | (0.009) | (0.008) |
| Adj. R-sq | 0.179 | 0.237 | 0.265 | 0.086 | 0.203 | 0.151 |
| Obs. | 10986 | 10986 | 10986 | 10986 | 10986 | 10986 |
| **Panel B: Low Popularity Students** | | | | | | |
| Desk. Low | -0.017 | -0.016 | -0.012 | 0.011 | 0.010 | 0.016 |
| | (0.013) | (0.018) | (0.019) | (0.011) | (0.017) | (0.013) |
| Adj. R-sq | 0.129 | 0.183 | 0.232 | 0.071 | 0.152 | 0.119 |
| Obs. | 3583 | 3583 | 3583 | 3583 | 3583 | 3583 |
| **Panel C: Medium and High Popularity Students** | | | | | | |
| Desk. Low | -0.038*** | -0.033*** | -0.043*** | 0.002 | -0.047*** | -0.020* |
| | (0.011) | (0.012) | (0.012) | (0.010) | (0.012) | (0.011) |
| Adj. R-sq | 0.190 | 0.254 | 0.277 | 0.090 | 0.219 | 0.160 |
| Obs. | 7402 | 7402 | 7402 | 7402 | 7402 | 7402 |
| Classroom FE | Y | Y | Y | Y | Y | Y |
| Demo. controls | Y | Y | Y | Y | Y | Y |
| Base. Nom. | Y | Y | Y | Y | Y | Y |
| *** p<0.01, **p<0.05, * p<0.1 | | | | | | |

**Note:** Desk. Low refers to assignment to a low popularity deskmate. Control (omitted category) is assignment to medium or high popularity deskmate. The survey asked students to nominate classmates as friends in three different categories: Very Good Friend (V Good Friend), Good Friend, Sort of a Friend. Close Friend corresponds to a nomination in either V Good Friend or Good Friend category. Friend corresponds to a nomination in either of the three categories. Pref. Deskmate corresponds to a nomination for whether a student would like to sit with the individual in consideration as a deskmate. Help, Recess, Lunch corresponds to a nomination for either Help, Recess or Lunch buddies. Acad. (Academic) Help corresponds to nominations for individuals from whom academic help is sought respectively. In-degree nominations corresponds to the number of individuals in the classroom nominating the student of interest on the dimensions mentioned above. In-degree nomination from the deskmate refers to the assigned deskmate nominating the student of interest on the dimensions mentioned above. Both endline and baseline values a dummy values taking the value 1 or 0 depending on whether the individual is nominated by the deskmate or not. Base. nom. corresponds to the nomination at baseline in the dimension of interest. Demo. (Demographic) controls include indicators for Gender (Male / Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table I17: Probability of receiving links from non-high popularity peers (endline)

| Social Nominations received from non-high popularity peers (endline) | | | | |
|---|---|---|---|---|
| | Low Popularity Students | | All Students | |
| | (1) Friendship | (2) Help, Recess, Lunch | (3) Friendship | (4) Help, Recess, Lunch |
| Nominations from High pop. | 0.218*** | 0.202*** | 0.234*** | 0.191*** |
| | (0.023) | (0.024) | (0.016) | (0.014) |
| Demo. controls | Y | Y | Y | Y |
| Classroom FE | Y | Y | Y | Y |
| Adj. R-sq | 0.730 | 0.501 | 0.718 | 0.492 |
| Obs. | 4181 | 4181 | 12842 | 12842 |
| *** p<0.01, **p<0.05, * p<0.1 | | | | |

**Note:** Nominations from High pop. refers to the standardized value of in-degree nominations an individual receives from high popularity peers at endline. Dependent variable is the standardized value of in-degree nominations received from non-high popularity peers at endline. Coefficients reported separately for low popularity students and for all students. Coefficients reported for both friendship networks and action based networks (recess, lunch and help). Demo. controls include indicators for Gender (Male/ Female), Religion (Muslim / Hindu), Caste category (General, OBC, SC/ST, Uncategorized), indicator for whether the student is flagged as a person from economically weaker section of the society as per school records, indicator for whether the student is a special needs student and the first 5 components obtained from the PCA carried out on responses elicited from survey questions capturing socio-economic background. Standard errors are clustered at Classroom level.

Table I18: Balance Test on Pre-Treatment Variables - All Students

| | Within Classroom randomization | | Across Classroom randomization | | | |
|---|---|---|---|---|---|---|
| | Diff. between assignment to L vs M / H type deskmate | p value | Diff. between LopL and Control class | p value | Diff. between LopH and Control class | p value |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **Panel A: Demographic Characteristics** | | | | | | |
| Male | -0.01 | 0.39 | -0.00 | 0.70 | -0.03*** | 0.01 |
| Muslim | 0.00 | 0.91 | -0.00 | 0.41 | -0.01 | 0.11 |
| General | 0.01 | 0.34 | 0.01 | 0.60 | -0.00 | 0.78 |
| Uncategorized | -0.00 | 0.93 | -0.00 | 0.97 | -0.01 | 0.17 |
| OBC | 0.00 | 0.85 | 0.00 | 0.92 | 0.01 | 0.29 |
| SC/ST | -0.01* | 0.08 | -0.01 | 0.33 | 0.00 | 0.71 |
| SES PCA 1st component | 0.03 | 0.28 | 0.02 | 0.56 | 0.01 | 0.69 |
| EWS Student | -0.01 | 0.30 | 0.01 | 0.53 | 0.01 | 0.46 |
| Special Needs Student | 0.00 | 0.89 | -0.01 | 0.21 | -0.01 | 0.19 |
| **Panel B: Baseline Network In-degree nominations** | | | | | | |
| Friend | 0.01 | 0.37 | -0.04 | 0.53 | 0.02 | 0.70 |
| Preferred Deskmate | 0.02 | 0.13 | -0.02 | 0.72 | 0.01 | 0.79 |
| Help, Recess or Lunch | 0.02* | 0.05 | 0.05* | 0.09 | 0.03 | 0.31 |
| Academic Help | 0.02 | 0.17 | 0.01 | 0.77 | 0.01 | 0.60 |
| **Panel C: Baseline Network Out-degree nominations** | | | | | | |
| Friend | -0.01 | 0.39 | -0.02 | 0.56 | 0.01 | 0.69 |
| Preferred Deskmate | 0.00 | 0.81 | -0.01 | 0.84 | 0.01 | 0.67 |
| Help, Recess or Lunch | -0.00 | 0.86 | 0.03* | 0.09 | 0.02 | 0.31 |
| Academic Help | 0.01 | 0.69 | 0.01 | 0.67 | 0.02 | 0.46 |
| **Panel D: Baseline Classroom Experience and Academic Perception** | | | | | | |
| Time with classmates | 0.03* | 0.07 | -0.03 | 0.39 | 0.01 | 0.73 |
| Teacher Interaction | 0.02 | 0.27 | -0.02 | 0.54 | -0.02 | 0.58 |
| Classroom comfort | 0.02 | 0.26 | -0.06 | 0.10 | -0.08*** | 0.01 |
| Academic Perception | 0.04* | 0.06 | 0.01 | 0.79 | -0.01 | 0.68 |
| **Panel E: Baseline Social Skills and Traits** | | | | | | |
| Optimism | 0.00 | 0.84 | 0.03 | 0.29 | -0.01 | 0.77 |
| Neuroticism (R) | -0.02 | 0.28 | -0.02 | 0.61 | 0.00 | 0.88 |
| Competitiveness | 0.05** | 0.02 | 0.01 | 0.74 | -0.04 | 0.22 |
| Hardwork | 0.03 | 0.18 | 0.02 | 0.60 | -0.03 | 0.38 |
| Determination | -0.00 | 0.98 | 0.13* | 0.06 | 0.04 | 0.46 |
| Altruism | 0.02 | 0.47 | -0.09** | 0.01 | -0.07** | 0.02 |
| Trust | 0.04** | 0.04 | -0.02 | 0.49 | -0.03 | 0.19 |
| Extraversion | 0.05*** | 0.01 | -0.02 | 0.65 | 0.02 | 0.54 |
| Risk Tolerance | -0.00 | 0.91 | 0.06 | 0.11 | 0.00 | 0.91 |
| Patience | 0.01 | 0.44 | -0.00 | 0.96 | 0.09*** | 0.01 |

**Note:** The table reports balance checks on pre-treatment variables and demographic characteristics for all students. Differences and p-values are obtained by regressing the variable of interest on treatment dummies. Regressions for Columns 1-2 include classroom level fixed effects. Regressions for Columns 3-6 include school-grade level fixed effects and additionally control for size of the classroom and the first two moments of raw popularity score distribution. Since randomization was stratified by popularity level, we additionally control for popularity category of the student at baseline. SES PCA 1st component is obtained from the PCA over responses on the SES questions from the survey. All variables apart from the ones in Panel A are standardized to facilitate comparison. Standard errors are clustered at the classroom level. *** p<0.01, ** p<0.05, * p<0.1