More than Friends: Beliefs and Peer Effects in the Formation of Social and Academic Skills

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Abstract

This paper shows that peers can influence students' social and academic outcomes via self-confidence. I estimate peer effects using a large-scale field experiment at selective public boarding schools in Peru. I use a new experimental design, generating substantial variation in peer characteristics, by randomizing two types of neighbors into dormitories: (1) less or more central (identified by the friendship network) and (2) lower- or higher-achieving (determined by admission scores). Boys with more central neighbors have more friends, better network position, and higher social skills. There are no effects on girls. Academic peer effects are, on average, a precise zero, with some negative impacts on lower-achieving girls. Differences in how peers affect boys' and girls' beliefs about their abilities explain these findings. By contrast, changes in social interactions are not sufficient to account for the main results. All students are more likely to befriend and study with their new neighbors; yet, estimates of peer effects vary widely across outcomes, student's characteristics, and peers' type.

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1 Introduction

While peers can have a powerful influence on students' outcomes, there is still no consensus on which factors determine the direction and size of peer effects. The extensive literature on the topic[1] shows mixed results of peers on standardized test scores and positive impacts on criminal behaviors, career decisions, and attitudes toward minorities (Boisjoly et al., 2006; Carrell et al., 2015; Rao, 2019). Explanations for these differences —both across studies and outcomes— include nonlinearities and heterogeneous effects (Hoxby and Weingarth, 2006; Carrell et al., 2009), concerns with traditional research designs (Angrist, 2014), and the endogenous formation of friendships (Bramoullé et al., 2009; Calvó-Armengol et al., 2009; Carrell et al., 2013). Another potential explanation, less explored in the literature, is students' self-concept (Marsh and Parker, 1984); beliefs about the abilities that one has may respond in different ways to peer characteristics. Furthermore, these beliefs can have a direct impact on academic and social performance of students (Compte and Postlewaite, 2004).

If peers change beliefs about our abilities, differences in how men and women form these beliefs will lead to heterogeneous peer effects by gender. Existing evidence documents that gender and stereotypes influence the formation of beliefs about oneself and others (Bordalo et al., 2019). A rich literature in psychology and economics emphasizes the tendency of men to be more overconfident than women (Sarsons and Xu, 2016), and there is evidence of gender differences in the updating of beliefs about personal abilities. Men tend to overestimate more positive signals than women (Mobius et al., 2014), and people react more to good news when they arrive in a gender-congruent domain (Coffman and Kulkarni., 2020). In schools, boys and girls could also differ in the set of peers they consider as reference groups. Female students tend to make more upward social comparisons and less downward comparisons than male students (Pulford et al., 2018).

This paper estimates peer effects on social and academic outcomes using a large-scale field experiment at selective boarding schools in Peru —the COAR Network. COAR is a public school model for the most talented low-income students in the country. I use a new experimental design to generate large exogenous variation in peers' skills. I assign students to two cross-randomized treatments in the allocation to beds in a dormitory: (1) less or more sociable neighbors, and (2) lower- or higher-achieving neighbors. The main results show that while only boys benefit from more sociable peers, lower-achieving girls end up performing worse when assigned to higher-achieving neighbors. Both results coincide with differences in how boys' and girls' beliefs in their abilities respond to peer interactions and are inconsistent with changes in the friendship and study networks in the schools.

The first contribution of this paper is to study whether peers can affect the formation of social skills. Recent empirical evidence shows that the labor market increasingly rewards social skills (Deming, 2017), and that social skills are complementary to cognitive skills (Weinberger, 2014). Skills such as teamwork, collaboration, and leadership are among the most demanded by firms in the US (Casner-Lotto and Barrington, 2006; Jerald, 2009) and developing countries

[1] See Epple and Romano (2011), Sacerdote (2011) and Sacerdote (2014) for recent reviews.

(Novella et al., 2019). Despite that social skills are a determinant of individuals' well-being and labor market success, there is little research in economics on how social skills are formed. The direct link between social skills and social interactions makes peer characteristics a natural mechanism to study the formation of social skills in schools.

The second contribution is the experimental design. My design surmounts many of the challenges with traditional approaches to study peer effects. Most studies exploit random assignment to either dormitories or classrooms. Even though this procedure generates exogenous peers, the variation in peer characteristics is weak by construction (Manski, 1993). Moreover, in these designs, multiple attributes of peers (test scores, demographic characteristics, unobservables) vary at the same time. The use of numerous variables and non-linear functional forms in peer effects models aggravate these concerns.[2] The fact that different peer attributes all vary at the same time in a random assignment can also be uninformative towards policy recommendations. For example, Ipshording and Zölitz (2019) estimate the value of a peer and find that while this value is substantial, observable characteristics have no predictive power on it. My experiment ensures substantial differences exclusively on sociability and academic achievement. Hence, my research design alleviates any concern about weak variation and minimizes the impact of other observed and unobserved peer characteristics, which are not part of the treatments.

The experimental design involves three steps: (1) categorize students into types, (2) assign them to treatments, and (3) allocate them to dormitory beds. To classify students by sociability, I collected data on their social networks the year before the intervention. I asked students who were their preferred roommates, their friends, and with whom do they study or play. I construct a general network aggregating the four questions and use the eigenvector centrality as a measure of sociability.[3] To classify students on academic achievement, I use students' admissions tests, which include both math and reading. I perform a stratified randomization of students to the treatments and organize them into groups. The schools use these groups to allocate students to specific beds in the dormitories. This procedure ensures that the type of neighbor coincides with the assigned treatment. I show that schools followed this protocol since the treatments predict the characteristics of students' neighbors. Moreover, this allocation affects social interactions. Students befriend, study, and play more with peers that, based on the original assignment, should be in nearby beds.

The third contribution addresses the question of the determinants of peer effects. I rely on self-reported data of beliefs and social interactions to study the mechanisms underpinning peer effects. While changes in self-reported beliefs are consistent with the magnitude and direction of peer effects, friendships and study partnerships are not sufficient for peers to improve students' outcomes.

My analysis starts by estimating the impact of each treatment on social and academic out-

[2]For example, Angrist (2014) relates weak variation to weak-instrument bias and argues that this can explain the failure of optimal policies based on peer effects estimates (Carrell et al., 2013):"The disappointing Carrell et al. (2013) results seem to me more likely to originate in the spurious nature of econometric estimates of peer effects than in endogenous social stratification."

[3]Eigenvector centrality is a measure of the influence of a student in the social network. A high value of this measure means that a student is connected to many other individuals who themselves have high scores. In my setting, this indicator correlates with other metrics introduced by psychologists to measure social skills.

comes. I consider three different types of social outcomes. First, I use the number of connections and the centrality in the social network after the intervention. Second, a social skills index based on different psychological tests that measure social skills.[4] Third, an index based on the perception of others —the number of peers that perceive the student as a leader, or a popular, friendly, or shy person. To measure academic outcomes, I use grades and standardized tests in math and reading comprehension.

Sociable peers improve the network position and social skills, but only for boys. Those assigned to more sociable neighbors end up with a centrality of 0.100 standard deviations (σ) higher (p-value 0.011). This result is consistent across psychological measures of social skills with an increase of 0.124σ (p-value 0.000) in the social skills index. The less sociable boys drive these positive effects. For them, I find larger estimates (all statistically significant at the 1% level). The treatment effect of more sociable peers is 0.189σ on the centrality and 0.200σ on the social skills index. Furthermore, they end up with 0.8 more connections in the social network after the intervention. Less sociable boys are also perceived to be more sociable by their peers, with an increase of 0.086σ on the peers' perception index of their social skills. These results are robust to multiple checks, including randomization inference and multiple-hypotheses testing.

The positive impact on social skills for less sociable boys translates into lower dropout rates and better college outcomes. The effect on the dropout rate is negative (2.3 p.p., p-value 0.007). For college outcomes, I study the impact on college enrollment and enrollment at a certified[5] and a top 20 college as a measure of quality. While there is no impact on college enrollment, more sociable neighbors increase enrollment at a certified college (5.1 p.p., p-value 0.045), and a top 20 college (4.4 p.p., p-value 0.082) for the less sociable boys. In Peru, higher education institutions use interviews in the admission process. Hence, these positive effects are consistent with the improvement in social skills.

Contrary to the results on social skills, I find that higher-achieving peers have no impact on average academic achievement. The estimates are -0.021σ (s.e. 0.018) on math and -0.021σ (s.e. 0.023) on reading. Heterogeneous effects show that higher-achieving peers harm lower-achieving students and especially lower-achieving girls. For them, I find a negative treatment effect of -0.062σ (s.e. 0.030) on math, and of -0.124σ (s.e. 0.046) on reading. I also find consistent evidence for math grades, and although not significant, also negative estimates for reading grades.

To account for imperfect compliance between the assignment to treatments and actual neighbors in the dormitories, I exploit the experimental variation in a 2SLS model. I consider a linear-in-means peer effects model that jointly estimates the impact of neighbors' sociability and academic achievement on students' outcomes but allows for heterogeneity by baseline characteristics. This model also provides estimates comparable to other peer effects studies. An increase by one standard deviation in the sociability of neighbors increases an index of all so-

[4]These include openness to experience, extraversion and agreeableness of the "Big Five" (McCrae and John, 1992; John and Srivastava, 1999; Almlund et al., 2011), altruism, empathy, leadership, emotional intelligence, intercultural sensitivity, and the "Reading the mind in the eyes test".

[5]After a law in 2014, universities need to fulfill a minimum requirement of quality to receive a certification by the Government. By 2019, only 73 institutions have been certified. I use this certification as a measure of quality.

cial outcomes by 0.337σ for all boys, and 0.470σ for the less sociable boys (both estimates are statistically significant at the 1% level). There are no significant effects on girls. By contrast, academic peer effects are, on average, a precise zero. An increase by one standard deviation in the admission score of neighbors has an effect of -0.035σ (s.e. 0.031) on math and -0.038σ (s.e. 0.040) on reading, ruling out even the small positive peer effects estimates in the literature. The academic effects for lower-achieving girls are negative, with a decrease in math scores of 0.117σ (p-value 0.036) and in reading scores of 0.212σ(p-value 0.008).

Next, I explore what determines the magnitude and direction of the peer effects estimates. I consider two potential mechanisms as drivers of the results: the formation of beliefs in oneself abilities and social interactions. For the formation of beliefs, I consider whether there are gender differences in how students form beliefs about their abilities due to peer interactions. Likewise, as students have more prior information about their academic than their social skills, I test whether this information can explain the differences between peer effects on social and academic outcomes. I also study whether social interactions are a key factor in explaining the main effects. Carrell et al. (2013) show that the magnitude of peer effects depends on whether students are studying or befriending each other. Similarly, Bandiera et al. (2010) find that the productivity of workers is affected more by the ability of coworkers who are their friends. Hence, I explore whether differences in how boys and girls interact with neighbors of different types explain the main findings.

I find evidence suggesting that the formation of beliefs about social and academic skills is a valid mechanism. First, I show that boys are more overconfident than girls in their social and academic abilities. Male students self-report a higher ranking in both popularity and academic skills in their cohorts. They are also more likely to self-nominate among the most skilled and popular students in their class. These gender differences remain after controlling for observable characteristics such as personality, number of connections, and test scores.

Furthermore, the treatment effects on the self-reported measures suggest that boys and girls update their beliefs differently due to peer interactions. The idea that peer interactions can affect these beliefs dates back to research on the big-fish–little-pond effect (Marsh and Parker, 1984) from psychology, whereby equally able students have lower academic self-concepts in high-ability schools than in low-ability schools. Recent evidence also shows that this mechanism might differ by gender due to social comparisons; female students tend to make more upward social comparisons and less downward comparisons than male students on math abilities (Pulford et al., 2018).

My results on beliefs start by showing that while more sociable neighbors increase the self-confidence in the social abilities of the less sociable boys, they decrease this self-confidence for the less sociable girls. Boys are 14.9 points (p-value 0.014) more likely to recognize themselves as a social person. The opposite result holds for girls, with a negative impact of 10 points (p-value 0.031) on this self-recognition. The effect on a self-reported ranking of popularity within the dorm, classroom, and the school show a similar pattern. Less sociable girls report a lower popularity ranking when assigned to more sociable neighbors, but this is not the case for boys.

I also explore whether the formation beliefs can explain the differences in peer effects be-

tween social and academic outcomes. I argue that students have more information about their academics than their social abilities. I present two formal tests for this argument. First, while peers affect students' beliefs about their social skills in the upper cohorts, they do not change their beliefs about academic abilities. Second, the only group that responds to the intervention by changing beliefs in their academic skills are the first-year students. This change is consistent with the fact that first-years have less information about their academic skills relative to their peers than students in the upper cohorts. The formation of beliefs of first-year students also vary by gender. Lower-achieving girls lose self-confidence in their academic abilities when assigned to higher-achieving peers. These changes are consistent with the main results as this group is the one driving the negative peer effects on grades and test scores.

By contrast, I rule out social interactions between students and their neighbors as a driving force of the empirical findings. The analysis of social networks shows that students form friendships and study groups with their new neighbors regardless of gender, student's, and peers' type. I first study whether the formation of friendships between less sociable students and their neighbors depends either on gender or the more sociable peers treatment status. I cannot reject that gender or the treatment affects the formation of friendships. Analogously, I test whether study partnerships between lower-achieving students and their neighbors depend on gender or the higher-achieving peers treatment. Again, I find no evidence that neither of these impact the formation of new study groups. Taken together, this suggests that friendships and study partnerships are not sufficient for peers to influence students' outcomes.

Related literature: This paper builds on and contributes to four strands of the literature: (i) the formation of social skills, (ii) social networks, (iii) the identification and consequences of peer effects, and (iv) gender differences in the formation of beliefs.

My results explore how peer characteristics affect the development of social skills in school, extending the literature on the formation of social skills. While a substantial body of evidence documents positive and increasing returns to social skills in the labor market (Deming, 2017), and their importance for communication within organizations, team productivity, and management practices (Woolley et al., 2010; Adhvaryu et al., 2018; Hoffman and Tadelis, 2018), little is known about how social skills are formed. There are a few exceptions: Rao (2019) shows that rich students are more altruistic and discriminate less when they are exposed to poor peers. Similarly, Falk et al. (2018) find that a mentorship program in Germany increased children's pro-sociality. Adhvaryu et al. (2018) show that an on-the-job soft skills training program in India increased female workers' extraversion and communication.

This paper also builds on the literature on social networks. Previous evidence highlights the role of eigenvector centrality for the diffusion of microfinance (Banerjee et al., 2013) and the monitoring of savings decisions (Breza and Chandrasekhar, 2019). In the economics of education literature, Calvó-Armengol et al. (2009) develop a model that shows that in equilibrium, the outcome of each individual embedded in a network is proportional to eigenvector centrality. (Hahn et al., 2015) find that among randomly formed groups, those that perform betters in group assignments are those whose members have high eigenvector centrality. Furthermore, this measure captures noncognitive skills, especially patience and competitiveness. This paper

extends these findings by showing that eigenvector centrality is highly correlated with social skills (such as extraversion and agreeableness of the Big Five). Moreover, my results show that having more central peers can have a positive effect on social skills, but does not affect academic achievement.

My conclusions also add to the broader literature on peer effects (Epple and Romano, 2011; Sacerdote, 2011). While the literature is not conclusive about peer effects on test scores (Sacerdote, 2014), the research design appears to play a role in explaining the variance of estimates within the literature. Most studies find small positive peer effects when schools randomly allocate students to small groups such as dormitories (Epple and Romano, 2011; Sacerdote, 2001), and sizeable significant estimates in large groups such as classrooms (Duflo et al., 2011), squadrons (Carrell et al., 2009), or large-size dormitories (Garlick, 2018). While my results contradict this evidence, they are consistent with research designs that generate substantial variation in peer characteristics (Abdulkadiroğlu et al., 2014; Duflo et al., 2011). I cannot disentangle whether these differences are due to the context or the research design. However, they highlight the methodological concerns that a random allocation might have, as pointed out by other researchers (Manski, 1993; Angrist, 2014; Caeyers and Fafchamps, 2016). Still, my results are misaligned with (Booij et al., 2016), who manipulate the composition of groups to achieve a wide range of support and find positive peer effects for low- and middle-skilled students in a dutch university.

I also find that, contrary to previous evidence (Carrell et al., 2013; Bandiera et al., 2010), high-skilled peers can harm low-skilled students, even when they are befriending each other. This evidence suggests that further studies are needed to understand the differences between the effects of friends and other peers. Furthermore, even though social relations might be necessary for peer effects to occur, my results suggest that they are not sufficient.

By contrast, my results are consistent with the idea that peers can harm students' outcomes due to rank concerns and social comparisons and that there are differences by gender. For example, recent evidence shows that students have a lower self-concept in higher-achieving schools (Fabregas, 2017). Through this mechanism, high-achieving peers can also affect later-life outcomes; a lower-ranking can reduce high-school completion, college enrollment (Elsner and Isphording, 2017), and earnings (Ribas et al., 2018; De Roux and Riehl, 2019). Cools et al. (2019) find that while high-achiever boys reduce high-school completion and later labor force participation of girls, high-achiever girls have the opposite effect. The results here suggest that even peers of the same gender can have detrimental effects on the human capital of girls.

Lastly, my results relate to the literature on differences by gender in beliefs about personal skills. Gender stereotypes play a role in forming beliefs of oneself and others (Bordalo et al., 2019). Men are less conservative than women when they update their beliefs, as they tend to overestimate more positive signals (Mobius et al., 2014). My results suggest that boys and girls update their beliefs differently due to peer interactions on both academic and social skills. Some evidence from psychology shows that female students tend to make more upward academic social comparisons and less downward academic comparisons than male students (Pulford et al., 2018). The evidence in this paper suggests that this finding also applies to the perception

of social skills. Furthermore, through self-confidence, the formation of beliefs can also affect performance (Compte and Postlewaite, 2004).

The rest of the paper is organized as follows. Section 2 describes the setting of exam schools in Peru. Section 3 presents the experimental design. Section 4 shows the balance of the randomization and the impact of treatments on peer and friends characteristics. Section 5 describes the outcomes and outlines the empirical strategy. Section 6 documents the results on skill formation. Section 7 discusses potential mechanisms for the results. Section 8 concludes.

2 Setting: Exam Schools in Peru

The Peruvian Government operates a series of exam schools, *Colegios de Alto Rendimiento* (the COAR Network), to provide a high-quality education for the most talented low-income students during the last three years of secondary school. The COAR Network is composed of 25 schools spread across every region of Peru and enrolls approximately 3,000 students every year. It is also one of the largest programs in the national budget for education. The first exam school opened near Lima, the capital of Peru, in 2010. As of 2017, there is now a COAR school in each of the country's regions. For every cohort, there are 100 slots per school, except for the school in Lima, which has 300.

The COAR Network meets the standards of elite private high schools in Latin America, where students have access to all the required inputs for a high-quality education. COAR are boarding schools, deliberately located close to the capital city of each region to reduce daily transportation costs for both families and the government. Upon admission, students receive school materials, uniforms, and a personal laptop for school use. All of the schools have a high-quality infrastructure, including a library and excellent scientific laboratories. Students also have the option of obtaining a world-renowned International Baccalaureate (IB) degree. Teachers are hired outside the public school system and receive higher salaries. The government covers all the necessary operating expenses, including laundry service and food.

Applicants are eligible for admission into COAR if they ranked in the top 10 of their public school cohort in the previous academic year. The admissions process consists of two rounds. In the first round, applicants take a written test in reading comprehension and mathematics. The highest-scoring applicants move onto a second round, during which psychologists rate them based on two activities: a one-to-one interview, and the observation of peer interactions during a set of tasks. I refer to these scores as the *interview* and *social fit* scores, respectively. Admissions decisions are determined by a composite score of all three tests, by the region of origin, and by the applicant's school preferences.

Before the experiment, school directors implemented their own individual systems to allocate students to dormitories and classrooms. Most schools attempted to foster multi-cultural diversity by mixing students from different regions within the same dormitory. There was also variation across schools in how they allocated first-year students to classrooms. Classroom assignment for students in the upper cohorts depends on whether students apply for the IB degree and the track they choose for this program.

3 Experimental Design

This section presents the experimental design. The objective of the experiment is to estimate the impact of neighbors' sociability and academic achievement on students' outcomes. To do this, I want to ensure systematic variation in peer characteristics across treatments. I do so by classifying students into types according to sociability and academic achievement, and by randomizing students into groups with systematic variation in the type of peer. Thus, there is by design substantial variation in peer characteristics across these groups, surmounting the weak variation problem pointed out by Angrist (2014) in other peer effects studies.

This section is divided as follows. First, I describe the data that was available before the intervention. Second, I illustrate how I used this data to classify students according to sociability and academic achievement. Third, I explain how students were randomized to groups with different types of peers, and describe how I used this assignment to allocate students to dormitories in the schools. Figure 1 illustrates the timeline of the project.

3.1 Data

3.1.1 Administrative Data

Administrative data on student demographics and baseline scores was collected as part of the admissions process or from existing government databases. For all students enrolled in the COAR Network in 2017, I have data on admissions test scores in three categories: (i) the written test in math and reading comprehension, (ii) the admissions interview, and (iii) the social fit score determined by a team of psychologists.

In addition, I exploit existing government data to describe students' socio-demographic characteristics. The socio-demographic data I use is employed by the Government of Peru to determine households' eligibility for national social programs, and is available for 85% of students. It includes whether a student comes from a household classified as poor or extremely poor, and whether they come from a rural area.

Column 1 of Table 1 reports descriptive statistics for students in the COAR Network. Although these schools target students from the public school system, admitted students have diverse social and economic backgrounds. For example, 35-37% of the students come from poor households, and 20% from extremely poor households. Likewise, 26% of students come from rural households.

For the 2015-16 cohorts, the Ministry of Education also administered psychological tests. Some of these tests incorporate measures of social skills, including emotional intelligence (Law et al., 2004) and the "Reading the Mind in the Eyes" test (Declerck and Bogaert, 2008). Appendix C describes these tests in detail.

3.1.2 Surveys

With the Ministry of Education, we administered an online survey to measure social interactions and non-cognitive skills for students in the 2015 and 2016 cohorts. The survey was conducted

in class and on a computer, with a compliance rate above 95% for each school. A team of psychologists in each school was in charge of monitoring the survey.

The survey asked students to list the names of their peers in four distinct categories of social interactions: (i) roommate preferences (students were told that their answers to this question could affect their dormitory assignment), (ii) friends , (iii) study partners, and (iv) people with whom they interact in social activities such as playing sports or games. Appendix Table A.1 shows three statistics for each category of the network: total degree, mutual degree, and eigenvector centrality. The average mutual degree is half of (or lower than) the average total degree. For example, when we consider a broad social network that aggregates all four questions about social interactions, students report having 7.02 connections on average, of which only 3.24 are mutual.

The survey also included questions on students' perception by their peers. Students were asked to rank up to five peers in the categories of leadership, friendliness, popularity, and shyness. Table A.1 shows descriptive statistics for these variables. On average, a student was named by 3.48 of her peers as a leader, by 3.59 as the most friendly, by 3.21 as the most popular, and by 2.59 as the shyest.

3.2 Classifying Students by Academic and Social Skills

I use data from the admissions process and baseline social networks survey to identify more sociable and higher-achieving students.

I use the test score in the first round of the admissions process—that evaluates students in math and reading comprehension—to characterize students as lower- or higher- achieving at baseline. This test was taken before students interacted at all. For each school-by-grade-by-gender cell, students above the cell-specific median are classified as higher achieving, and those below the median as lower achieving.

To identify more and less sociable students, I rely on the networks survey at baseline described in the previous section. I use the eigenvector centrality of an aggregate undirected social network that groups the four categories of social interactions described above. Banerjee et al. (2013) and Banerjee et al. (2014) perform a similar aggregation. Other studies have shown that in other contexts, individuals with high centrality are better at diffusing information (Banerjee et al., 2014; Beaman and Dillon, 2018), and monitoring savings decisions (Breza and Chandrasekhar, 2019). I use the same strategy as with the classification by academic achievement. Students with an eigenvector centrality above the cell-specific median are classified as more sociable, and those below the cell-specific median as less sociable. Appendix Figure A.1 shows that in the context of this study, centrality, and admissions test scores are positively correlated.

Table A.1 (columns 2 to 5) presents descriptive statistics of the baseline social networks by student type. More sociable students have a better position in the schools' social networks, with a larger average degree, mutual degree, and eigenvector centrality for the four social networks reported (roommate preferences, friends, study mates, and social partnerships). For example, in the general network more sociable students have, on average, 4 more connections and 1.4 more mutual connections than less sociable students. More sociable students are also perceived as

friendly by 4.6 peers on average, while only 2.5 peers perceive less sociable students as friendly.

More interestingly, I also find a large statistically significant correlation of eigenvector centrality and my set of indicators of social skills. Appendix Table A.2 reports standardized coefficients of an OLS regression of social skills measures[6] on the three admissions test scores, and on the eigenvector centrality of the baseline social network controlling for school×grade×gender fixed effects. For most of my social skills indicators, eigenvector centrality has a stronger correlation than admissions test scores. These results confirm that individuals who are assessed as very central in the schools' social networks at baseline also have highly developed social skills.

Since first-year students did not complete the baseline survey in 2016, eigenvector centrality at baseline is not available for this cohort. However, in an attempt to identify *sociable* students in this cohort, I use the *social-fit* test in the admission. In theory, this score comprises measures of empathy, leadership, and teamwork. However, by contrast with the eigenvector centrality, the correlations between the *social-fit* score and more traditional social skills measures are weak. For this reason, I focus on the higher-achieving peers treatment for the first-years. In all the estimations I also include the social-fit treatment, although I do not report the effects in the main Tables.[7]

3.3 Randomization

To estimate the impact of peers' sociability and academic achievement on students' outcomes, I randomized students to two treatments: (1) more sociable peers, and (2) higher-achieving peers. In the previous section, I explained how students were classified into more sociable and higher-achieving students. Here I explain the details of the randomization.

3.3.1 Peer Group Types

By randomizing the type of peer that students have, instead of the simple randomization to groups, I assure that students in my study are exposed to peers with different levels of skills. This is a novel approach and is central to my study. It differs from the more traditional approach that exploits random assignments to groups; where, by virtue of the randomization, peer characteristics are the same in expectation —although there will be small variation across groups in the realized sample.

The experimental design accounts for the fact that a student, not only receives a treatment, but is also a treatment for her peers. Students were allocated to *peer group types* in which they were matched with peers of their respective treatments. In each *peer group type*, half of the peers are of the same type as the student and the other half of the peers are of the type of her assigned treatment.

For exposition, consider the simple case of two types of students: high and low. The researcher is interested in identifying the Average Treatment Effect (ATE) of having high-type peers. With two types of students there are three *peer group types*: two homogenous groups,

[6] Some of these variables were collected before or after the intervention. They are described in detail in section 5.1 and Appendix C.

[7] These results are available upon request.

composed of individuals of a single type, and a heterogeneous group composed of individuals of both types. The following matrix shows the composition of *peer group types*:

	High	Low
High	Group A	Group B
Low	Group B	Group C

In this case, there are three potential *peer group types*:

a) Group A: a group composed of the high type only.

b) Group B: a mixed group, in which half are high-type students and the other half are low-type students.

c) Group C: a group composed of the low type only.

Notice that, conditional on a student's type, she can be assigned to a homogeneous group (Groups A and C), with individuals of her own type, or to a mixed group (Group B), with individuals of both types.

To illustrate how this generates systematic variation across treatments, compare a high-type student in Group A versus a high-type student in Group B. In Group A, all peers are high types, while in Group B half of the peers are high types and the other half are low types. Hence, the difference in the proportion of high-type peers in Group A versus B is equal to 0.5. The Conditional Average Treatment Effect (CATE) of having high-type peers conditional on being a high-type student ($\tau_i = H$)can be identified by the difference between high-type students in group A and high-type students in Group B.

$$CATE_H = \mathbf{E}\left[Y_i|\tau_i = H, A\right] - \mathbf{E}\left[Y_i|\tau_i = H, B\right] \tag{1}$$

Similarly, consider a low-type student in Group B versus a low-type student in Group C. In Group B, half the peers are high types and the other half are low types, while in Group C all peers are low-type students. Hence, the difference in the proportion of high-type peers in Group B versus C is equal to 0.5. The Conditional Average Treatment Effect (CATE) of having high-type peers conditional on being a low-type student ($\tau_i = L$) can be identified by the difference between low-type students in group B and low-type students in Group C.

$$CATE_L = \mathbf{E}\left[Y_i|\tau_i = L, B\right] - \mathbf{E}\left[Y_i|\tau_i = L, C\right] \tag{2}$$

Considering the above, the average treatment effect of high-type peers is a weighted average of the CATE in equations 1 and 2, where weights capture the proportion of high type and low type students in the data, respectively. Since I am using the cell-specific median to classify students, the weights are equal.

$$ATE = 0.5 * CATE_H + 0.5 * CATE_L \tag{3}$$

Notice that the statistical power to estimate this average effect is maximized when all peer group types —Groups A, B and C— are of the same size. The number of students who are

treated (high-type students in Group A and low-type students in Group B) and the number of students who are not treated (high-type students in Group B and low-type students in Group C) would be the same.

The fact that all three groups are the same size implies that students are twice as likely to be assigned to peers of their same type. Hence, high-type students are twice as likely to receive the treatment (high-type peers) than low-type students. Given that the propensity score of receiving the treatment will vary by student type, we need to account for this in the empirical analysis.

The randomization in my field experiment is analogous to this example, with just one difference. In my randomization I use two treatments instead of one, so rather than two types of students, I have four types: (i) more sociable and higher achieving, (ii) more sociable and lower achieving, (iii) less sociable and higher achieving, and (iv) less sociable and lower achieving. This implies that instead of the three *peer group types* A, B and C from my previous example, there are ten potential *peer group types* in my experimental strategy.[8]

Figure 2 shows the ten possible combinations of types of peers and student types. Each row corresponds to the student type, each column to the type of peer to whom she was assigned, and each cell to the combination of a student type-type of peer or *peer group type*.[9] Each group takes a different cell color in the symmetrical matrix of Figure 2.

I performed the randomization stratifying at the school-by-grade-by-gender level and the student's type. The first stratification (school-by-grade-by-gender) is performed because the allocation to dormitories is specific to these strata. The second stratification (student type) is necessary because students were assigned to *peer group types* based on their type as described in the classification above.

3.3.2 Assigning Students to Dormitories

This subsection describes how I implement my experimental strategy. After randomizing students into *peer group types*, as described below, I used these groups to allocate students to the dormitories in the COAR Network.

There is vast heterogeneity in the structure of dormitories across the COAR Network. For example, while the school in Lima has dormitories of three to five students, its counterpart in Cusco has a total of four dormitories, with approximately 80 students per dormitory. Appendix Figure 3 shows a picture of the dormitories in the schools in Lima, Piura, and Cusco. To reconcile my *peer group types* with the widely varying number of dorm sizes across schools, I sorted the names of the students on a list based on the 10 *peer group types* mentioned in the previous subsection. This list was later used to allocate students to specific beds in the dormitories. The *peer group types* were randomly ordered on the list[10], and for mixed groups composed of more than one student type, the names of students of different types were alternated. Appendix B describes in detail how the lists determined the allocation to dormitories and classrooms.

[8] With 4 types of students there would be 16 possible combinations, but 6 of them are redundant.

[9] Group 1, for example, is composed of only more sociable and higher-achieving students. Group 3 is composed of less sociable and higher-achieving with more sociable and lower-achieving students.

[10] The order was specific to each school×grade×gender.

The order on the list is directly linked to the physical distance between two students in a dormitory. Students who are adjacent on the list are more likely to be near each other in the dormitories. In small dorms, the assigned peers will likely share the same room. In bigger dorms, students and assigned peers will be either placed in the same bunk bed or in beds next to each other.

Most of the schools (23 out of 25) in the COAR network used my lists to allocate students to dormitories. There were coordination problems in logistics with the other two schools. In some cases, the school directors sent the allocation they used, and I checked whether it was done based on the lists. In most cases, I performed the assignment to dorms using information that the principals sent me about the dorm structure in their schools.

The design protocol was generally followed by school administrators, but in some cases there was not perfect compliance between the order of students on the list and the actual assignment to dormitories. For example, in some schools students were assigned to other beds for health reasons. Likewise, since there is a natural mismatch between the size of dormitories and the size of the peer group types from my randomization, some students did not have their assigned peers as neighbors in the dormitories. I account for this below by considering three relevant groups:

1. Assigned peers: Students assigned to the same *peer group types*.

2. Neighbors: For small dormitories (less than 5 students), I define neighbors as roommates. For larger dormitories (more than 5 students), neighbors are students assigned either to the same or the adjacent bunk bed.

3. Friends: Peers with whom the student reports a social connection after the intervention.

I now show that the distance on the list predicts neighbors and friends. First, schools sent me the exact location in beds of students in the schools, which allows me to test whether they followed the experimental design empirically. Second, I administered two networks surveys after the intervention (as shown in the timeline in Figure 1). The first survey took place four months after the intervention in August 2017. In this survey, students identified their friends, study partners, and people with whom they engaged in social activities such as playing games or dancing. The second survey took place on December 2017, using the same set of questions. I constructed a general network that aggregates the answers from both surveys. I estimate the following equation to test how the distance on the list affects the likelihood of being neighbors and social interactions:

$$y_{ij} = \gamma_0 + \sum_{k=1}^{9} \gamma_k \mathbf{1}_{d=k_{ij}} + \nu_{ij}, \tag{4}$$

where y_{ij} is a dummy variable equal to one when students i and j are neighbors or friends, and $\mathbf{1}_{d=k_{ij}}$ are dummies for a distance k between students i and j on the list. The equation includes nine dummy variables, each of which represents a distance of 1–9 on the list.

Panel A of Figure 4 shows that the distance between students on the list predicts neighbors in dormitories. The plots show the estimates of γ_k with the respective 95% confidence interval.

A distance of one on the list increases the likelihood of being neighbors by 72 percentage points (p-value 0.000). A distance of two and three are also large and statistically significant, with an increase by 62 p.p. (p-value 0.000) and 48 p.p. (p-value 0.000), respectively. Overall, Panel A of Figure 4 shows a monotonous decreasing effect of the distance on the list and the likelihood of being neighbors. From a distance of four onward, all the estimates are weaker, and a very precise zero at a distance of six.

Furthermore, the distance on the list has a substantial effect on social interactions. Panel B of Figure 4 shows the likelihood that two students form a social connection as a function of the position on the list. Being at a distance of one on the list increases the likelihood of becoming friends, engaging in social activities together, or studying together by approximately 22 percentage points (p-value 0.000). I also find a decreasing pattern with distance, showing that the physical location of beds in the dormitories predicts social interactions. Overall, this evidence shows that the implementation of the experimental design was successful.

4 Balance and First Stage

This section shows that the randomization is balanced in characteristics at baseline and that the experiment ensures substantial variation of peer characteristics across treatments. This variation translates into neighbors with different academic skills and sociability at baseline. Furthermore, I also show that the intervention led to the formation of new friendships, influencing the social networks in the schools.

4.1 Balance of Baseline Characteristics

I use the following equation to estimate the correlation of the higher-achieving peers' treatment and the more sociable peers' treatment on students' outcomes and baseline characteristics:

$$y_{i\tau} = \alpha + \lambda_s s_{i\tau} + \lambda_c c_{i\tau} + \gamma_\tau + \nu_{i\tau} \tag{5}$$

Equation 5 explores how the treatment of more sociable peers, $s_{i\tau}$, and the treatment of higher-achieving peers, $c_{i\tau}$, correlate with the characteristic of individual i of type τ, $y_{i\tau}$. We include student type fixed effects, denoted by γ_τ since the propensity score of receiving the treatment varies by the student type. The parameters of interest are λ_s and λ_c, which represent the correlation of more sociable and higher-achieving peers, respectively.

In addition to the type fixed effect, all of my estimations control for the stratification variables of my randomization: the strata corresponds to cells by school-by-grade-by-gender-by-student type. For the 2017 cohort, I used a similar procedure to the one described in section 3.3.2 to assign students to classrooms. To exploit the same type of variation as with dorm assignments, I include a classroom-gender fixed effect for students in their first year when I estimate equation 5. The magnitude of peer effects from roommates could be different to the magnitude of peer effects from classmates. For example, evidence in the literature suggests that teachers change their behavior based on the composition of the classroom (Duflo et al., 2011). Hence, I make sure that the variation in peer characteristics is only coming from the sociability and academic achievement of neighbors in the dormitories.

I estimate equation 5 on social skills and academic outcomes at baseline for all students, and for all subgroups of sociability, academic achievement, and gender. Table 2 reports these estimates. In general, I find that the treatments are not correlated with social skills and academic outcomes at baseline. Furthermore, Tables A.3 and A.4 present balance tests on all other variables available at baseline. Overall, and as expected from an RCT, I do not reject a zero correlation of the treatments with baseline characteristics. The table also reports the F-statistic of multivariate regressions, which show that for both treatments and across all subgroups of students, treatments are not correlated with baseline characteristics.

4.2 First Stage

Next, I explore the impact of the randomization on the number of assigned peers of each type and their average characteristics. First, I estimate equation 5 on the number of more sociable and higher-achieving assigned peers. I also estimate these impacts on the average peer characteristics; this corresponds to the first stage and is depicted in equations 6a and 6b. I also estimate the same set of equations for *neighbors* and *friends* as they were described above.

$$\overline{s}_{p_{i\tau}} = \theta_s + \delta_s s_{i\tau} + \phi_s c_{i\tau} + \gamma_\tau + \xi_{i\tau}, \tag{6a}$$

$$\overline{c}_{p_{i\tau}} = \theta_c + \delta_c s_{i\tau} + \phi_c c_{i\tau} + \gamma_\tau + \nu_{i\tau}, \tag{6b}$$

where δ_s and δ_c are the effects of the more sociable peers treatment on the average sociability and academic achievement of peers, respectively. Likewise, ϕ_s and ϕ_c represent the effects of the higher-achieving peers treatment on the same variables.

As expected from the randomization, the assignment to treatments leads to differences in the type of assigned peers. Table 3 reports the impact of the treatments on the type of peers that students have and on the average characteristics of these peers. Columns 1 and 2 of Table 3 show how each treatment changed the number of assigned more sociable and higher-achieving peers. In general, being assigned to more sociable peers increases the number of more sociable peers in a student's group by three, and equally as much with higher-achieving peers. That is, students have three additional peers associated with the type of treatment.

The design ensures substantial variation in the average characteristics of assigned peers. Columns 3 and 4 of Table 3 show the impact of the treatments on the average characteristics of the assigned peers. The more sociable peers treatment increases the average sociability of the assigned peers by 0.75 standard deviations. Likewise, the higher-achieving peers treatment increases the average academic achievement of the assigned peers by 0.94 standard deviations. The results also show that, because sociability and academic achievement are positively correlated at baseline, having higher-achieving peers increases a student's peers average sociability, and that having more sociable peers increases a student's peers average academic achievement.

In some cases there is no perfect compliance between the randomly assigned peers and actual neighbors. Hence, I estimate the same set of equations on actual neighbors rather than the peers in the peer group types. For small dormitories (less than 5 students), I defined neighbors as roommates. For larger dormitories (more than 5 students), neighbors are students either in the same or in the adjacent bunk bed.

The data shows that the treatments predict neighbors' characteristics confirming that the schools followed the implementation procedures described in the previous section. The impact on the treatments on Columns 5 to 8 of Table 3 show the effect of each treatment on students' actual neighbors. Columns 5 and 6 show the estimation of equation 5 on more sociable and higher-achieving neighbors. Overall, each treatment, more sociable and higher-achieving peers, increases the number of neighbors of their respective type by 1.6. Columns 7 and 8 show the effect on average neighbors' characteristics. Being assigned to more sociable peers increases the average sociability of neighbors by 0.554 standard deviations. Likewise, the higher-achieving peers treatment increases the average academic achievement of neighbors by 0.588 standard deviations. As expected, due to the non-compliance reasons mentioned above, these effects are not as large as those in columns 1 to 4 of Table 3 on assigned peers, but still very strong and highly significant.

As the intervention had an impact on the social network in the schools, I also estimate equation 5 on the number of friends of each type and average friends' characteristics. Columns 9-12 of Table 3 present the results. More sociable neighbors increase by 0.472 the number of more sociable friends, and higher-achieving neighbors by 0.446 the number of higher-achieving friends. These effects translate into an increase of 0.062 and 0.059 standard deviations the average sociability and academic achievement of friends, respectively. All of these estimates are statistically significant at the 1% level.

5 Outcomes and Empirical Strategy

5.1 Outcomes

In this section I describe the outcomes of my study. These are grouped into two broad categories according to the type of skill affected: social skills or academic outcomes. Social skills outcomes are measured using networks, psychological self-reported instruments, and peers' perception of students according to different characteristics. Academic outcomes are measured by school grades and test scores collected by the Ministry of Education.

5.1.1 Social Skills Outcomes

The first set of outcomes corresponds to measures of social skills. Finding reliable measures of social skills is a big challenge. I use three categories of social skills outcomes: network surveys, psychological self-reported tests, and peers' perception measures.

My first outcome is the one that I used to classify students by sociability: the centrality level of the social network after the intervention. I also look at the number of connections. As was described above, I collected two waves of networks surveys the intervention. Students list their friends, their study partners, and their play-mates in sports and games. I construct a global network aggregating all the questions in the two waves. Like other studies in networks (Breza and Chandrasekhar, 2019; Banerjee et al., 2013, 2014), I consider an undirected network, but my results are robust to mutual connections.

I also measure social skills using self-reported psychological tests. My primary outcome is as a social skills index, using the first component of a Principal Component Analysis (PCA)

on the entire set of tests. These tests include extraversion and agreeableness of the "Big Five", altruism, empathy, leadership, emotional intelligence, intercultural sensitivity, and the "Reading the mind in the eyes test". All the details for these tests are described in Appendix C.

To account for potential biases in self-reported answers, I include peers' perception of personal social skills as the third type of social outcome. While self-reported psychological tests are frequently used to measure social skills, they are subject to social desirability bias and can be manipulated by the respondent. Since social skills are important for interactions with peers, we also included questions of how peers perceive students.[11] This is additionally supported by empirical evidence which shows that relying on the perceptions of members of the same community relaxes information asymmetries (Hussam et al., 2017). Students were asked to rank up to five of their peers in four dimensions of social skills: leadership, friendliness, popularity, and shyness (reversed). I construct an index of peers' perception using the number of peers that nominate the student in each category.

I reproduce similar measures of social skills with the available social skills measures at baseline. Panel B in Appendix Figure A.1 displays a scatter-plot of the two general measures of social skills before and after the intervention. There is a large, positive correlation between the two measures. An OLS regression shows that one standard deviation in the social skills index at baseline correlates with a 0.43-standard-deviation increase in the social skills index after the intervention.

5.1.2 Academic Outcomes

Teachers assign grades to students for each subject based on their homework and test scores during the first three quarters of the year. These variables are only available for the 2016–17 cohorts. The Ministry relies on the grades of the International Baccalaureate (IB) degree for the 2015 cohort and I do not have access to the final scores.[12]

Besides, students in the 2016–17 cohorts were also assessed via standardized tests designed by the Ministry of Education. These tests determine the students' grades for their final quarter at school. For the 2015 cohort, these test scores are not available since the Ministry only relies on the IB grades.

As described in section 3, the more sociable peers treatment is only available for the 2015–16 cohorts. Likewise, test scores and grades are only available for the 2016–17 cohorts. Appendix Table A.5 reconciles both sets of information, and indicates which cohorts were used for each treatment–outcome combination. I still use all the cohorts to estimate the impact of the higher-achieving peers treatment on social skills.

5.2 Empirical Strategy

I begin by estimating the effect of my two treatments—more sociable and higher-achieving peers—on the social skills and academic outcomes described in section 5.1. The following equa-

[11] This was also the case in the baseline survey, as described in Appendix A.

[12] I have preliminary scores, but these are unreliable, as the final scores usually do not coincide with these.

tion estimates the impact of each treatment:

$$y_{i\tau} = \alpha + \lambda_s s_{i\tau} + \lambda_c c_{i\tau} + X'_{i\tau}\delta + \gamma_\tau + \varepsilon_{i\tau}. \tag{7}$$

Equation 7 shows how the more sociable peers treatment, $s_{i\tau}$, and the higher-achieving peers treatment, $c_{i\tau}$, affect the outcome, $y_{i\tau}$, of individual i of student type τ. I include student type fixed effects, γ_τ, because the likelihood of receiving the treatments varies by student type. The parameters of interest in this equation, λ_s and λ_c, the causal impact of the more sociable and higher-achieving peers treatments, respectively. The vector $X'_{i\tau}$ is a set of baseline characteristics chosen via the "post-double-selection" Lasso method developed by Belloni et al. (2014a,b). The standard errors are clustered at the student *type*×*group of peer* level, since all the students within this unit share the same treatment peers (Abadie et al., 2017). I also report the randomization inference p-values for my main results (Athey and Imbens, 2017; Young, 2017).

To estimate heterogeneous effects by gender, I also estimate equation 7 including the interaction of the two treatments with a *boy* dummy variable. The following equation describes this model,

$$y_{i\tau} = \alpha + \lambda_s s_{i\tau} + \lambda_c c_{i\tau} + \phi_s s_{i\tau} \times boy_i + \phi_c c_{i\tau} \times boy_i + X'_{i\tau}\delta + \gamma_\tau + \varepsilon_{i\tau}, \tag{8}$$

where ϕ_s and ϕ_c are the differentiated impacts of each treatment for boys.

Estimates of equation 7 and equations 6a and 6b are of independent interest. They also are the Reduced Form and the First Stage of an IV estimate of the effect of peers' abilities. I estimate the effect of a one-standard-deviation in peers' average characteristics (i.e. neighbors' sociability and academic achievement) on students' outcomes. I use the experimental variation in my study in a two-endogenous model, and jointly estimate the effect of peers' characteristics on the social skills and academic outcomes of students. The following equation introduces my two-endogenous model:

$$y_{i\tau} = \theta + \beta_s \overline{s}_{n_{i\tau}} + \beta_c \overline{c}_{n_{i\tau}} + X'_{i\tau}\delta + \gamma_\tau + \varepsilon_{i\tau}, \tag{9}$$

where $\overline{s}_{n_{i\tau}}$ and $\overline{c}_{n_{i\tau}}$ denote the average baseline sociability and academic achievement of student i of type τ. For small dormitories (less than 5 students), I define neighbors as peers in the same room. For larger dormitories (more than 5 students), neighbors are defined as having the same or the adjacent bunk bed. The parameters of interest are β_s and β_c; the effect of a one standard deviation in the average sociability and academic achievement of neighbors on students' outcomes. The first stage of this model is depicted in equations 6a and 6b. It represents the impact of the assignment to treatment on neighbors characteristics.

As described in section 4, Columns 7 and 8 of Table 3 display the estimates of equations 6a and 6b. Being assigned to live with more sociable peers increases the average sociability of neighbors by 0.55 standard deviations, and the higher-achieving peers treatment increases the average academic achievement of neighbors by 0.59 standard deviations.

6 Main Results

This section describes the impact of the intervention on students' academic and social skills outcomes. I first present the reduced-form estimates on social skills, then the reduced-form

estimates on academic outcomes. Finally, I present the 2SLS estimates using the experimental variation as an instrument for neighbors' sociability and academic achievement at baseline.

6.1 Social Skills Outcomes

My description of the results starts by reporting the impact of my two treatments—the more sociable peers treatment and the higher-achieving peers treatment—on network measures, social-psychological tests, and peers' perception. Panel A of Table 4 reports the reduced-form estimates of equations 7 and 8 for all students on all of my social outcomes indicators.

The results reveal that having more sociable peers has a positive impact on social outcomes, but only for boys. Columns 1 and 2 in Panel A report the post-intervention effects on the number of connections after the intervention for all the students. The impact of more sociable peers on the number of links for all the students is a precise zero (-0.038, p-value 0.995). However, as shown by column 2, this average impact masks some heterogeneity by gender. While the impact is negative for girls (-0.320, p-value 0.112), the effect is large and positive for boys, who end up having 0.357 (p-value 0.112) more connections after the intervention. The results for the network centrality (columns 3 and 4) reveal that boys end up with a better network position (0.10σ, p-value 0.011). More sociable neighbors reduce the centrality of girls (-0.050, s.e. 0.032) and increase it for boys (0.100, p-value 0.011).

I also find that more sociable neighbors increase the social outcomes of boys only, as captured by their psychological tests (columns 5 and 6) and their peers' perception (columns 7 and 8). Columns 5 and 7 show an average treatment effect of 0.073 s.d. (p-value 0.007) on the psychological tests, and of 0.031 s.d. (p-value 0.126) on peers perception. However, these positive effects are mainly driven by boys. For them, sociable neighbors increase the social skills psychological index by 0.124 s.d. (p-value 0.000), and the peers' perception index by 0.050 s.d. (p-value 0.114).

By contrast, I do not find that higher-achieving peers affect social outcomes neither for boys nor girls. Overall, the estimates for all the students in Panel A are precise zeros. This is true for the network centrality measure (column 3, effect of 0.004σ., s.e. 0.019), the psychological index (column 5, effect of -0.007σ, s.e. 0.021), and the peers' perception (column 7, effect of 0.022σ, s .e. 0.017). For every single social measure both the point estimates and the standard errors are small. I also find no differences by gender when I test for heterogeneous impacts (the even columns of Table 4).

Next, I explore whether these effects are heterogeneous by students' sociability at baseline. To do this I estimate equations 7 and 8 by subgroups: less and more sociable students at baseline (Panels B and C, respectively). I then compare the results for my subgroups to the estimates of equation 7 for all students, presented in Panel A.

The positive effects of the more sociable neighbors on the social skills of boys are mainly coming from the impact on the less sociable students. Comparing the results in Panels A and B of Table 4 shows that the positive effects of more sociable peers on social skills come mostly from boys who were less sociable at baseline. In particular, more sociable peers increase the connections of less sociable students by 0.80 (p-value 0.005). The estimates on network

centrality, psychological tests, and peers' perception are all consistent with this conclusion. All of the point estimates are larger than the ones in Panel A, and the p-values have a range between 0.001 and 0.011. By contrast, I do not find robust evidence that more sociable neighbors affect social outcomes of less sociable girls. Higher-achieving neighbors also appear not to affect social outcomes of less sociable students. There are some marginal negative effects on the peers' perception of less sociable girls. However, I do not over-interpret this result as it is inconsistent with the effect on other social outcomes.

The positive impacts on social skills for the less sociable boys translate into hard outcomes such as dropout rates and college quality. Panel A of Table A.8 shows that the measures of social skills have predictive power on college enrollment and quality. Neither social skills, math scores, or reading scores affect dropouts (column 1). However, social skills and math scores predict both college enrollment (column 3), and college quality (column 5).[13] Furthermore, the results in Panel B show that more sociable neighbors also influence hard outcomes of the less sociable boys. Column 1 shows a negative effect of 2.3 p.p. (p-value 0.007) on the dropout rate. Columns 3 and 4 show an increase by 5.2 p.p. (p-value 0.028) and 4.8 p.p on the likelihood of enrolling at certified or top 20 colleges. This is consistent with the evidence that social skills affect later-life outcomes and the fact that Peruvian universities use interviews as an input in their admissions criteria.

The more sociable peers treatment does not affect the formation of social skills for students assessed as more sociable at baseline. Panel C supports this general conclusion by showing the reverse side of the story. In general, I cannot reject a zero treatment effect for most of the outcomes in this table for both boys and girls. Higher-achieving peers, on the other hand, appear to increase the social perception of lower-achieving girls. As this effect is not consistent with other social outcomes, I refrain from drawing general conclusions from these estimates.

Overall, these results show that more sociable peers can enhance the formation of social skills. However, these positive effects are detected for boys only and especially those with lower sociability at baseline.

6.2 Academic Outcomes

Table 5 reports treatment effects on academic outcomes based on the estimation of equations 7 and 8. Columns 1 and 2 report the effects for grades in math and reading comprehension. Analogously, columns 3 and 4 show the impact of each treatment on math and reading test scores.

Consistent with the peer effects estimates reported by quasi-experimental studies (Angrist and Lang, 2004; Duflo et al., 2011; Abdulkadiroğlu et al., 2014) that generate large variation in peers' skills, I find that the impact of higher-achieving peers on students' academic achievement is a precise zero. The odd columns in Panel A of Table 5 present the ATEs for all students in my sample. This is a well-defined estimate in the context of my study. The 95% confidence interval

[13] By contrast, reading scores do not correlate with college outcomes. A one-standard-deviation in social skills correlates with 1.6 percentage points increase in college enrollment. This is one-quarter of the correlation of college enrollment and math scores. The results are more notorious for college quality, where the correlation of social skills is 36% of the correlation of math scores.

for math test scores ranges between -0.056 and 0.014σ. For reading, it ranges between -0.066 and 0.024σ. Overall, these confidence intervals allow me to rule out positive peer effects on the average student. Likewise, I do not find evidence that having more sociable peers affects the formation of academic achievement for the average student. I also cannot reject homogeneous treatment effects by gender, except for reading test scores. In column 8, I find a negative effect on girls of 0.067 (p-value 0.042).

Next, I examine heterogeneity in treatment effects by academic achievement. I estimate equations 7 and 8 for two subgroups of academic achievement: lower- and higher-achieving students. Panels B and C of Table 5 report the reduced-form estimates for lower- and higher-achieving students at baseline.

I find that higher-achieving peers have heterogeneous treatment effects on academic achievement. Columns 1 and 3 in Panel B of Table 5 show that the higher-achieving peers treatment has a negative effect on grades for both math and reading comprehension. Higher-achieving neighbors decrease students' math grades by 0.084σ (p-value 0.018), and reading grades by 0.072σ (p-value 0.049). I also explore the impact on test scores of lower-achieving students. Columns 5 and 7 of Table 5 show that the effects of higher-achieving peers on lower-achieving students are negative and significant for both math (-0.050 with a p-value of 0.058) and reading comprehension (-0.063 with a p-value of 0.069). For the more sociable peers treatment, there is no consistent evidence that it affects academic performance. I do find a negative impact on math scores in column 5 of Panel B (-0.072, p-value 0.072), though.

The negative academic peer effects on lower-achieving students are starker for girls. The even columns in Panel B, Table 5 reports the estimates of equation 8 for lower-achieving students. Overall, these results show that for lower-achieving girls, the treatment academic effect is particularly negative, as reflected in math grades (column 2, -0.145 s.d., p-value 0.002), math test scores (column 6, -0.062 s.d., p-value 0.036), and reading test scores (column 8, -0.129 s.d., p-value 0.007). For reading grades (column 2), the point estimate is also negative, but it is more negative for boys. This last result is not consistent across other outcomes, and the same applies to the negative effect of more sociable neighbors on math scores in column 6. Overall, this evidence suggests that higher-achieving neighbors can harm the academic performance of lower-achieving girls. For the lower-achieving boys, I cannot generally reject the null hypothesis of a zero impact.

For the higher-achieving students at baseline, I do not find that neither more-sociable or higher-achieving neighbors affect academic performance. Panel C in Table 5 reports these estimates. Overall, in most cases, the estimates are small and fairly precise. This is true for grades and test scores, as well as for boys and girls (even columns in Table 5). In the context of my experiment, the characteristics of neighbors do not to affect the performance of the strongest students.

In summary, higher-achieving peers have, on average, a zero effect on students' academic outcomes. However, they appear to be detrimental to the performance of lower-achieving students, and especially lower-achieving girls.

6.3 2SLS Estimates

To account for imperfect compliance between assigned peers and actual neighbors, and provide more compatible estimates to other peer effects studies, I estimate equation 9. Tables 6 and 7 present the results of the 2SLS two-endogenous model described by equation 9 on social and academic outcomes for different groups.The table reports the estimates of parameters β_s and β_c, the impact of neighbors' average sociability and academic achievement on students' outcomes. There are two endogenous variables: neighbors' sociability and neighbors' academic achievement (both calculated at baseline). I instrument for these variables using indicators for whether the student was assigned to the more sociable or the higher-achieving peers treatment. Table 6 has a social skills index based on all the measures of social outcomes as the dependent variable. Table 7 reports the 2SLS estimates for math scores (Panel A) and reading scores (Panel B).

I find that neighbors' sociability has a positive impact on social skills, but only for boys. Columns 1 to 3 of Table 6 shows the results for all students, boys, and girls. A one-standard-deviation increase in neighbors' sociability has a 0.138σ impact (p-value 0.004) on the social skills index for the average student (column 1). This positive impact comes from the effect on boys in column 2, with an estimate of 0.337σ (p-value 0.000). By contrast, column 3 shows that the social peer effects estimate on girls is small (0.029), and precise (s.e. 0.055).

These positive social peer effects on boys are driven by the impact on the less sociable students in sociability at baseline. Columns 4 to 6 show the results for the less-sociable students. For every group, the estimates are larger than for the combined sample in columns 1 to 3. The most affected group are the less sociable boys. A one-standard-deviation in neighbors' sociability increases the social skills index of the less sociable boys by 0.470σ (p-value 0.000) . Even though the impact on less sociable girls reported in column 6 is positive (0.093), I cannot reject that it is equal to zero.

More sociable neighbors have no impact on the strongest students, except for boys (columns 7 to 9). Column 7 reports an average social peer effect of 0.068σ(p-value 0.302) for the more sociable students at baseline. However, the effect is positive for the more sociable boys, as depicted by column 8 which shows an impact of 0.286σ (p-value 0.038). This estimate is smaller and weaker than the impact on the less sociable boys, though. By contrast, the result for more sociable girls is zero and precise (column 9, -0.032 s.d., p-value 0.685).

Overall, I do not find that the academic achievement of neighbors has an impact on the social skills of students. The general point estimate in column 1 is very close to zero 0.010, and reasonably precise with a standard error of 0.044. When I look into this equation by gender and baseline sociability, I cannot generally reject a zero effect, with the exception of a negative estimate on the more sociable boys (column 8, -0.223 s.d., p-value 0.078). The reduced form estimates in Panel C of Table 4 suggest that the psychological tests are driving this negative effect.

Table 7 reports peer effects estimates of equation 9 on academic outcomes. Panel A presents the results for test scores in math and Panel B for test scores in reading. Overall, column 1 shows a precise zero estimate of average academic peer effects. The impact of one standard deviation in neighbors' academic achievement at baseline is -0.035 (s.e. 0.031) on math and

-0.038 (s.e. 0.040) on reading scores. I also find fairly precise estimates of neighbors' sociability on academic outcomes, and columns 2 and 3 do not reveal differences by gender, except for reading test scores.

The results in columns 4 and 6 of Table 7 show that academic peer effects are negative for lower-achieving students, and in particular for girls. Column 4 reports that a one-standard-deviation increase in the academic achievement of neighbors decreases math scores by 0.087σ (Panel A, p-value 0.063), and reading scores by 0.114σ (Panel B, p-value 0.065). Column 6 shows that academic peer effects are more negative for lower-achieving girls. A one-standard-deviation increase in the admission scores of neighbors decreases math scores by 0.103σ (p-value 0.034), and reading scores by 0.212σ. (p-value 0.006) for lower-achieving girls.

In summary, the conclusions from the 2SLS model are analogous to those arrived by using the reduced-form estimates. The estimates are still precise enough to rule out positive peers on academic performance. However, the sociability of neighbors does favor the development of social skills among less sociable boys. Likewise, the evidence suggests that having higher-achieving neighbors has a detrimental effect on the academic achievement of lower-achieving students, and especially girls.

The 2SLS estimates are also convenient to inform optimal policies, by a social planner, that allocates students to dormitories. As I find heterogeneous peer effects estimates by gender, these policies are gender-specific. To maximize the average level of social outcomes in a group of students, the social planner should mix boys by their initial level of sociability. This solution is explained by the fact that less sociable boys are the ones who benefit the most from more sociable neighbors. We would derive the same conclusion for any policy function that is meant to reduce inequality in social skills within schools. By contrast, as lower-achieving girls are affected the most by higher-achieving neighbors, optimal policies should consider girls' initial levels of academic achievement. Since higher-achieving girls reduce the performance of lower-achieving ones, it would be optimal to separate them in the allocation to dormitories.

These optimal policies are exclusively based on peer effects estimates, and they ignore other potential drivers of the results in this paper. In the next section, I explore whether gender differences in psychological factors and social interactions can explain my findings.

7 Mechanisms

Next, I explore potential mechanisms to explain my results. I consider two mechanisms: the beliefs that students have in their abilities and social interactions.

7.1 Beliefs about Oneself Abilities

In this section, I study whether differences by gender in self-confidence can explain my results.

There is evidence documenting than men and women differ in how they compare themselves to others, and the formation of beliefs about themselves. For instance, recent evidence in psychology shows that female students tend to make more upward academic social comparisons and less downward comparisons than male students (Pulford et al., 2018). Furthermore, downward

social comparisons have a negative impact on confidence. Likewise, there is an extensive literature in economics showing that men and women differ in their level of confidence (Sarsons and Guo, 2016), how do they respond to feedback (Mobius et al., 2014), preferences for competition (Gneezy et al., 2003; Buser and Yuan, 2019), and self-promotion (Exley and Kessler, 2019). Hence, I study whether differences by gender in how peers affect students' beliefs are driving the results reported above.

I start by studying whether boys and girls report different beliefs in their skills. In the endline survey, we ask students to report their believed ranking in academic skills and popularity (between zero and one hundredth, with higher scores being better). I also measure beliefs by considering whether a student identifies herself as part of the top 5 of the most academically skilled, leadership, friendliness, popularity, and shyness (reversed) in their cohorts.

Figure 6 presents the cumulative distribution of the self-reported rankings by gender. Panel A presents the plot for the academic ranking and Panel B for the popularity ranking. The left column of the figure shows quantile regressions of the gender gap in this self-reports after controlling for observable characteristics such as test scores, number of friends and centrality, and peers' perception of academic skills and popularity.

In general, boys report higher self-confidence in both academic skills and popularity. The left column of both panels shows that the distribution of the self-reported academic and popularity ranking of men has first-order stochastic dominance over the distribution of these variables for women. Furthermore, the estimates of the quantile regressions in the right column show that these differences remain even after controlling for observable characteristics. These estimates suggest that men are more overconfident than women. The men/female gap is positive across the whole distribution, and in most cases, statistically significant at the 95% level. At the median, for example, the difference in the ranking is of approximately five positions: 0.25 standard deviations of the academic ranking and 0.20 standard deviations of the popularity ranking.

Next, I explore whether the beliefs that boys and girls report in their ability changed due to the intervention. In particular, I consider whether more sociable peers affect the self-reported rankings of popularity. Table 8 reports the impact of more sociable neighbors on beliefs in oneself social skills. Panel A presents the results for the less sociable students at baseline and Panel B for the more sociable. The most affected group in Table 4 are the less sociable boys. Hence I focus my description on the results in Panel A. Columns 1 to 3 show the effect of three different self-reported rankings (all of them between 0 and 100): (i) in the dorm[14], (ii) in the classroom, and (iii) in the cohort. Columns 4 to 8 report estimates on whether the student self-nominated when asked to name up to five peers according to different characteristics. Column 4 shows whether the student considers herself a leader, column 5 among the most popular, column 6 among the friendliest, and column 7 among the shyest (reversed). Column 8 presents an index adding up the four categories.

The results show that while the less sociables girls updated the beliefs on their social skills negatively, the less sociable boys believe they are more social after the intervention. Overall, as students now are in dormitories with more sociable neighbors, we should expect a negative

[14]For large dormitories the dorm is defined as the students in bunk beds close by.

report on the popularity ranking in their dorms. However, column 1 shows that we only find this effect on girls. In general, in the dorms, they report a ranking that is 2.9 points lower (p-value 0.049). By contrast, we cannot reject a null effect for men. The interaction term is positive, although not statistically significant.

More interesting, the results show that beyond the negative mechanic effect in the dorm, girls also report a lower ranking in the classroom and in their cohort, when assigned to more sociable peers. Hence, they updated negative the beliefs of their popularity due to the intervention. This result is aligned with previous evidence that women tend to make more upward social comparisons than men. We also find that the impact of the treatment on the self-reported rankings vary by gender. Columns 2 and 3 show that the treatment effect is 5.01 and 5.35 ranking positions higher for men than for women and that this difference is statistically significant at the 95% level. Furthermore, the result in column 3 shows that the treatment effect is positive for men, with an increase in the ranking by 2.6 positions (0.1σ) and marginally significant (p-value 0.106), which suggests that men believe they are more popular after interacting with more sociable neighbors in the dormitories.

More sociable neighbors increase self-recognition as a social person for the less sociable boys but decrease this self-recognition for the less sociable girls. Column 1 in Panel A shows the average impact on the less sociable students at baseline -0.020 (p-value 0.597). However, as it is revealed by column 2, this average effect masks gender heterogeneity. While the self-recognition index decreases by 9.1 points for girls (p-value 0.032), it increases by 13.7 points (p-value 0.026 for boys). By contrast, the results in Panel C show that there are no peer effects on self-recognition as a social person, neither for more sociable boys or girls. The results on the popularity index are similar and consistent. Less sociable girls respond negatively to more sociable neighbors with a self-reported ranking 2.75 (p-value 0.051) positions below. On the contrary, boys react positively with a ranking 2.59 above (p-value 0.101). Remarkably, I can reject the null hypotheses that the effects for boys and girls are the same on both variables.

The estimates in column 8 show that less sociable boys indeed believe of themselves as more social after interacting with more sociable peers. The more sociable peers treatment increases by approximately 0.15 points (p-value 0.014) this self-recognition for boys. By contrast, the effect is negative (-0.10 points, p-value 0.015) for girls. The results in columns 4 to 7 show that the positive impact on the beliefs of the less sociable boys is driven by the self-perception in leadership, popularity, but especially shyness. In general, they are less likely to report themselves among the shyest in the school by 5.1 percentage points (p-value 0.005).

This evidence suggests that more sociable neighbors affect the beliefs that boys and girls have in their ability differently. It is important to point out that I cannot disentangle whether these effects are explained by differences in the updating process or the type of signal that students receive. On the one hand, boys and girls can receive different signals due to gender-specific peer interactions. On the other hand, conditional on receiving the same signal, boys and girls can update differently due to social comparisons or other biases in the belief formation process. As I will discuss later, I cannot reject that social interactions between less sociable students and more sociable neighbors differ by gender. Hence, this is suggestive that less sociable boys and

girls respond differently after having similar interactions with their assigned neighbors.

Changes in beliefs about academic skills are also a valid mechanism for the results of academic peer effects. The evidence in Tables 5 shows that higher-achieving peers decrease academic scores for lower-achieving students, but especially for lower-achieving girls. Furthermore, the results in Table A.9 show that first-year students mainly drive these negative effects. Here I show that consistent with the idea that students have more information about their academic than their social skills, students in the upper cohorts do not change their beliefs about their academic abilities. By contrast, the students that change these beliefs are first-year students who have less information about their abilities relative to their peers.

Students in the upper cohort do not change their beliefs in their academic abilities due to peer interactions. Table A.10 presents these results. Column 1 shows the impact on self-nominations in the top 5 of the most skilled students in the cohort. Columns 2 to 4 report the results on the self-reported academic rankings: in the dorm, classroom, and cohort. Overall, the results show that the higher-achieving peers treatment does not affect the perception that students have about their skills. The only impact statistically different from zero is on the self-nomination for girls (column 1). Although this effect is in both panels, the results are inconsistent with the impact on the self-reported rankings and test scores.

By contrast, first-year students do change their perception after being assigned to higher-achieving peers. Table A.9 presents these results. Column 1 shows the treatment effect on the self-nomination among the most skilled in the cohorts, and columns 2 to 4 present the results on the self-reported rankings. The odd columns present the result with classroom-gender fixed effects and the even columns without them.[15] Overall, the results show that the higher-achieving peers treatment has a negative effect on the perception of academic skills of lower-achieving students, and especially girls. Column 1 shows a negative treatment effect of 5.4 percentage points (p-value 0.040) for girls, with a larger treatment effect for boys of 8.4 percentage points (p-value 0.059). However, I can no reject that the treatment effect is different for men and women. Furthermore, in all the ranking measures only lower-achieving girls respond negatively when assigned to higher-achieving neighbors. In particular, column 4 shows that lower-achieving girls report a ranking of 3.9 positions lower (p-value 0.026) when assigned to higher-achieving neighbors.

My results on social and academic outcomes and the formation of beliefs in social and academic skills are, in general, consistent with a simple extension of the model in Compte and Postlewaite (2004) (Appendix D). Under this framework, success in social or academic outcomes is a function of self-confidence, and self-confidence depends on past successes. Two main forces affect how peer interactions affect confidence: social comparisons and available information on personal skills. Overall, the results are consistent with this model by including gender differences in social comparisons and students having more information about their academics rather than their social skills.

[15] I lose some statistical power by including the classroom-gender fixed effect.

7.2 Social Interactions

Intuitively, peer effects estimates of friends should be different than from other peers. For example, Carrell et al. (2013) find that peers that were supposed to increase the performance of low-skilled students end up harming them due to changes in social and study networks. When low-skilled students are in groups with high skilled peers, there is segregation by academic achievement, and the performance of the low-skilled students is worse. Given this evidence on the importance of social interactions for the direction and magnitude of peer effects, I test whether this is a valid mechanism for my results.

To study the role of social interactions, I go back to the evidence in section 3. I test whether the impact of the distance on the list is different for the most affected groups versus other comparable students. In particular, I estimate the following equation and test for equal effects of distance dummies:

$$y_{ij} = \gamma_0 + \sum_{k=1}^{5} \gamma_k \mathbf{1}_{d=k_{ij}} + \nu_{ij}, \tag{10}$$

where y_{ij} is a dummy variable equal to one when students i or j report being friends, studying, or playing with each other. The variable $\mathbf{1}_{d=k_{ij}}$ denotes a dummy variable equal to one when the distance between students i and j on the list is equal to k. I consider only values for distances between 1 and 5 as it Figure 4 shows that those values have an impact of being neighbors in dormitories.[16]. I estimate equation 10 for the most affected groups with their respective neighbors as well as for comparable students.

Different patterns of social interactions do not explain my estimates of social peer effects. Panel A of figure 7 reports the estimates of equation 10 for less sociable boys with more sociable neighbors, less sociable boys with less sociable neighbors, and less sociable girls with more sociable neighbors. Overall, the impact of distance on social interactions is similar for the three groups. Furthermore, I cannot reject an equal effect of distance dummies on social interactions for the three groups. The p-value of the comparison between less sociable boys with more sociable neighbors and less sociable boys with less sociable neighbors is 0.572. The p-value of heterogeneity of distance on social interactions between less sociable boys and girls with more sociable neighbors is 0.684. In general, all three groups appear to form similar connections. Hence, the fact that sociable neighbors increase social skills of less sociable boys is not explained by social interactions with neighbors.

Social interactions do not explain my estimates of academic peer effects neither. Panel B of Figure 7 reports estimates for lower-achieving girls with higher-achieving neighbors, lower-achieving girls with lower-achieving neighbors, and lower-achieving boys with higher-achieving neighbors. For the three groups, I find that the impact on distance on social interactions is similar. This result is also consistent when I just look at the study networks. In my study, even though lower-achieving girls interact with higher-achieving neighbors, they still experience declines in academic achievement.

[16]Besides, there are only a few observations for distances larger than five.

8 Conclusion

This paper presents the results of a field experiment designed to estimate causal academic and social peer effects. The study was conducted in 23 out of 25 exam schools in Peru, covering a sample of approximately 6,000 students. Students were classified by baseline sociability and academic achievement using centrality measures of social networks and test scores. Unlike previous experimental designs, my experiment guarantees strong variation in peer characteristics by randomizing the type of peer and matching students to peers of their treatment groups.

I found that more sociable peers have a positive impact on the development of social skills, but only for boys. These effects are mainly driven by the impact on those boys who were assessed as less sociable at baseline. My results show that they end up with more friends and a higher centrality or influence in their networks. These results are consistent with the impact on psychological tests and peers' perception of their social skills. Furthermore, I find that some of these effects translate into hard outcomes. More sociable neighbors prevent less sociable boys from dropping out of the COAR Network. They also increase their enrollment at better colleges.

By contrast, I do reject positive academic peer effects on academic achievement. For students who were lower achieving at baseline, the evidence suggests that higher-achieving peers have a negative effect. This result is stronger for lower-achieving girls. My results are not consistent with peer effects estimates from other studies, especially the ones that use random allocation to groups (Sacerdote, 2011; Epple and Romano, 2011). I cannot disentangle whether these differences are due to specific conditions of my context, or methodological differences in the empirical design. However, my conclusions are similar to the evidence on peer effects from quasi-experimental studies (Angrist and Lang, 2004; Abdulkadiroğlu et al., 2014; Duflo et al., 2011), that also ensure substantial variation in peers' skills.

A potential limitation of this paper is that it does not allow for non-linearities in peer effects. However, while the main estimation is based on a linear-in-means peer effects model, I do allow for heterogeneity by gender and baseline characteristics. Furthermore, the main objective of the experimental design was to generate strong variation in peers skills. While it would be possible to estimate non-linearities by including more treatment groups —for example, dividing the sample by terciles—, this can be costly in terms of statistical power.

I also rule out social interactions as a mechanism behind the main effects. The impact on less sociable boys is not because they interact more with their sociable neighbors than other groups. Likewise, although lower-achieving girls are interacting and studying with their higher-achieving neighbors, they experience a decline in academic achievement. This result contradicts previous evidence in the literature, which suggests students only benefit from higher-achieving peers when they are interacting with them (Carrell et al., 2013). Hence, more studies are needed to understand the differences between peer effects from friends and others.

Overall, the results show that the impact of policies that affect peer characteristics do need to account for differences by gender in psychological factors. The beliefs in social skills of less sociable boys and less sociable girls respond differently to interactions with more sociable neighbors. These results are consistent with a broad literature studying how men and women differ in the formation of beliefs about oneself and others. The results on academic peer effects

are also compatible with the evidence showing that women are more discouraged by competition than men.

To answer the motivating question of this study, I find evidence that social skills can be formed by interacting with more sociable people. However, this positive impact depends on how boys and girls respond to peer interactions and form beliefs about their abilities. Further studies are needed to assess whether these results are valid in other contexts.

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TABLE 1: Summary Statistics at Baseline

	All Students	By Sociability		By Academic Achievement	
		Less Sociable	More Sociable	Lower Achieving	Higher Achieving
Variable	(1)	(2)	(3)	(4)	(5)
Sociability	-0.00	-0.64	0.64	-0.04	0.04
(centrality measure)	(1.00)	(0.51)	(0.96)	(0.99)	(1.01)
Academic achievement	0.00	-0.08	0.08	-0.79	0.78
(score in the admission test)	(0.99)	(0.96)	(1.02)	(0.47)	(0.71)
Poor (%)	0.36	0.39	0.35	0.39	0.33
Extremely poor (%)	0.18	0.22	0.18	0.21	0.16
Rural (%)	0.26	0.31	0.23	0.30	0.22
N	6,147	1,832	1,822	3,069	3,078

Notes: This table reports summary statistics by type of student. Column 1 shows statistics for all students, and columns 2 to 5 according to the classification of students by social skills and academic performance. The table includes a set of three demographic characteristics of students, including poverty, extreme poverty, and whether the student comes from a rural household. These demographic variables come from government administrative data.

TABLE 2: Balance on Academic Performance and Social Skills at Baseline

Dependent variable:	Social skills index			Math score			Reading score		
	All students	Sociability		All students	Academic achievement		All students	Academic achievement	
		Less sociable	More sociable		Lower-achieving	Higher-achieving		Lower-achieving	Higher-achieving
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Panel A: All students					
More sociable	-0.019	-0.015	-0.024	0.019	0.019	0.019	0.010	0.022	-0.002
	(0.038)	(0.056)	(0.053)	(0.027)	(0.034)	(0.043)	(0.028)	(0.041)	(0.041)
Higher-achieving	0.032	0.062	0.001	0.014	-0.026	0.043	-0.000	-0.010	0.010
	(0.038)	(0.055)	(0.052)	(0.021)	(0.029)	(0.035)	(0.022)	(0.033)	(0.034)
Control mean	-0.06	-0.18	0.12	-0.11	-0.39	0.31	-0.08	-0.31	0.25
N	3,654	1,832	1,822	4,523	2,243	2,268	4,523	2,243	2,268
				Panel B: Boys					
More sociable	-0.071	-0.094	-0.047	-0.004	0.014	-0.022	0.009	-0.019	0.037
	(0.059)	(0.085)	(0.080)	(0.044)	(0.056)	(0.070)	(0.040)	(0.059)	(0.056)
Higher-achieving	-0.102*	-0.072	-0.133	0.028	-0.017	0.076	0.006	0.025	-0.016
	(0.059)	(0.085)	(0.082)	(0.032)	(0.046)	(0.055)	(0.031)	(0.046)	(0.047)
Control mean	-0.05	-0.18	0.16	0.01	-0.31	0.48	-0.16	-0.42	0.22
N	1,490	753	737	2,029	1,013	1,005	2,029	1,013	1,005
				Panel C: Girls					
More sociable	0.016	0.040	-0.007	0.035	0.022	0.048	0.011	0.052	-0.030
	(0.050)	(0.073)	(0.069)	(0.034)	(0.044)	(0.054)	(0.039)	(0.055)	(0.057)
Higher-achieving	0.124**	0.156**	0.093	0.004	-0.032	0.020	-0.005	-0.037	0.030
	(0.049)	(0.072)	(0.067)	(0.027)	(0.037)	(0.046)	(0.031)	(0.046)	(0.047)
Control mean	-0.07	-0.19	0.10	-0.20	-0.46	0.17	-0.01	-0.21	0.28
N	2,164	1,079	1,085	2,494	1,230	1,263	2,494	1,230	1,263

Notes: This table reports balance checks of being assigned to more sociable and higher-achieving peers on social skills and academic performance for all students and subgroups by sociability and academic achievement at baseline. All regressions include strata fixed effects and control for the baseline value of the dependent variable. For the 2017 cohort all regressions include strata-by-classroom fixed effects. Standard errors are clustered at the peer group type-by-type level; *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

TABLE 3: First Stage on Assigned Peers, Neighbors, and Friends

	Assigned peers				Neighbors				Friends			
	Number		Baseline characteristics		Number		Baseline characteristics		Number		Baseline characteristics	
	More sociable	Higher achieving	Sociability	Academic achievement	More sociable	Higher achieving	Sociability	Academic achievement	More sociable	Higher achieving	Sociability	Academic achievement
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
More sociable	3.175***	-0.010	4.425***	0.088***	1.632***	0.004	0.556***	0.081***	0.472***	-0.009	0.062***	-0.009
	(0.107)	(0.105)	(0.078)	(0.017)	(0.051)	(0.049)	(0.019)	(0.020)	(0.107)	(0.095)	(0.011)	(0.010)
Higher-achieving	0.015	2.979***	0.181***	0.943***	-0.046	1.603***	0.017	0.583***	-0.105	0.356***	-0.004	0.055***
	(0.067)	(0.083)	(0.051)	(0.013)	(0.033)	(0.038)	(0.013)	(0.015)	(0.073)	(0.080)	(0.008)	(0.007)
Control mean	0.38	0.93	-2.06	-0.53	0.61	1.38	-0.13	-0.36	2.84	6.28	0.03	-0.06
N	6,068	6,068	6,068	6,068	6,068	6,068	6,068	6,068	6,068	6,068	6,068	6,068

Notes: This table reports the effect of being assigned to more sociable and higher-achieving peers identified at baseline on the number of more sociable and higher-achieving assigned peers, neighbors, and friends, and on the average sociability and academic achievement for each of these groups. Assigned peers are students in the *groups of peers* to which the student was assigned, neighbors are students in the same dormitory for small dorms and students in the same or adjacent bunk bed for large dorms. All regressions include strata fixed effects and control for the baseline value of the dependent variable. For the 2017 cohort all regressions include strata-by-classroom fixed effects. The control group is defined as being assigned to less sociable and lower-achieving peers. Standard errors are clustered at the peer group type-by-type level; *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

TABLE 4: Reduced-Form Estimates on Social Skills

Dependent variable:	Connections		Centrality		Psychological tests		Peers' perception	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Panel A: All students				
More sociable	-0.038	-0.320*	0.011	-0.050	0.073***	0.016	0.031	0.018
	(0.143)	(0.183)	(0.025)	(0.032)	(0.027)	(0.033)	(0.020)	(0.027)
Higher-achieving	0.061	-0.111	0.001	-0.018	-0.008	0.003	0.021	0.042*
	(0.127)	(0.175)	(0.019)	(0.026)	(0.021)	(0.027)	(0.017)	(0.023)
More sociable × boy		0.678**		0.150***		0.140**		0.032
		(0.290)		(0.050)		(0.056)		(0.041)
Higher-achieving × boy		0.396		0.044		-0.027		-0.047
		(0.252)		(0.039)		(0.043)		(0.035)
mean control	14.55	14.55	-0.05	-0.05	-0.01	-0.01	-0.05	-0.05
p-val ms boys		0.112		0.011		0.000		0.114
p-val ha boys		0.115		0.378		0.472		0.834
N	5,818	5,818	6,068	6,068	6,068	6,068	6,068	6,068
				Panel B: Less sociable students at baseline				
More sociable	0.237	-0.171	0.035	-0.073*	0.105***	0.039	0.035	0.000
	(0.195)	(0.260)	(0.033)	(0.041)	(0.039)	(0.048)	(0.022)	(0.028)
Higher-achieving	-0.094	-0.192	-0.025	-0.047	0.024	-0.022	-0.068***	-0.061**
	(0.192)	(0.251)	(0.033)	(0.042)	(0.038)	(0.046)	(0.023)	(0.030)
More sociable × boy		0.971**		0.263***		0.161**		0.085*
		(0.389)		(0.066)		(0.078)		(0.044)
Higher-achieving × boy		0.220		0.052		0.111		-0.017
		(0.381)		(0.066)		(0.077)		(0.044)
mean control	11.65	11.65	-0.25	-0.25	-0.25	-0.25	-0.31	-0.31
p-val ms boys		0.006		0.000		0.001		0.013
p-val ha boys		0.924		0.918		0.154		0.021
N	1,749	1,749	1,832	1,832	1,832	1,832	1,832	1,832
				Panel C: More sociable students at baseline				
More sociable	-0.288	-0.441*	-0.010	-0.026	0.040	-0.007	0.030	0.038
	(0.203)	(0.252)	(0.036)	(0.046)	(0.037)	(0.044)	(0.033)	(0.042)
Higher-achieving	0.301	0.302	0.056	0.045	-0.005	0.067	0.113***	0.143***
	(0.207)	(0.263)	(0.036)	(0.047)	(0.037)	(0.044)	(0.033)	(0.042)
More sociable × boy		0.373		0.040		0.117		-0.020
		(0.421)		(0.074)		(0.076)		(0.067)
Higher-achieving × boy		-0.007		0.027		-0.179**		-0.074
		(0.427)		(0.074)		(0.076)		(0.069)
mean control	14.68	14.68	0.27	0.27	-0.01	-0.01	0.19	0.19
p-val ms boys		0.841		0.821		0.077		0.732
p-val ha boys		0.378		0.203		0.073		0.203
N	1,785	1,785	1,822	1,822	1,822	1,822	1,822	1,822

Notes: This table reports the effect of being assigned to more sociable and higher-achieving peers on social skills outcomes. All regressions include strata fixed effects and control for the baseline value of the dependent variable. For the 2017 cohort all regressions include strata-by-classroom fixed effects. The control group is defined as being assigned to less sociable and lower-achieving peers. Standard errors are clustered at the peer group type-by-type level; *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

TABLE 5: Reduced-Form Estimates on Academic Performance

Dependent variable:	Grades				Test scores			
	Math		Reading		Math		Reading	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: All Students							
More sociable	0.012	0.010	0.043	0.052	-0.027	-0.013	0.020	-0.009
	(0.034)	(0.042)	(0.036)	(0.049)	(0.024)	(0.030)	(0.032)	(0.044)
Higher-achieving	-0.010	-0.034	-0.014	0.005	-0.021	-0.015	-0.021	-0.067**
	(0.022)	(0.029)	(0.024)	(0.031)	(0.018)	(0.021)	(0.023)	(0.031)
More sociable × boy		0.003		-0.021		-0.033		0.067
		(0.069)		(0.072)		(0.048)		(0.065)
Higher-achieving × boy		0.054		-0.044		-0.014		0.105**
		(0.045)		(0.048)		(0.037)		(0.045)
mean control	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
p-val ms boys		0.801		0.564		0.229		0.219
p-val ha boys		0.565		0.281		0.326		0.247
N	4,404	4,404	4,407	4,407	4,412	4,412	4,434	4,434
	Panel B: Lower-achieving students at baseline							
More sociable	-0.008	-0.025	0.079	0.074	-0.048	-0.072*	0.024	0.017
	(0.048)	(0.061)	(0.051)	(0.070)	(0.032)	(0.040)	(0.045)	(0.060)
Higher-achieving	-0.084**	-0.145***	-0.072**	-0.054	-0.050*	-0.062**	-0.063*	-0.124***
	(0.036)	(0.046)	(0.037)	(0.048)	(0.026)	(0.030)	(0.035)	(0.046)
More sociable × boy		0.040		0.012		0.055		0.016
		(0.099)		(0.102)		(0.066)		(0.089)
Higher-achieving × boy		0.137*		-0.042		0.027		0.136*
		(0.072)		(0.074)		(0.055)		(0.069)
mean control	-0.26	-0.26	-0.20	-0.20	-0.29	-0.29	-0.10	-0.10
p-val ms boys		0.845		0.250		0.746		0.624
p-val ha boys		0.883		0.092		0.450		0.816
N	2,180	2,180	2,181	2,181	2,182	2,182	2,195	2,195
	Panel C: Higher-achieving students at baseline							
More sociable	0.049	0.059	0.015	0.035	0.002	0.046	0.018	-0.033
	(0.049)	(0.060)	(0.052)	(0.070)	(0.035)	(0.044)	(0.048)	(0.065)
Higher-achieving	0.028	0.054	0.051	0.065	-0.010	0.011	0.009	-0.021
	(0.033)	(0.043)	(0.037)	(0.049)	(0.028)	(0.035)	(0.035)	(0.048)
More sociable × boy		-0.023		-0.045		-0.103		0.119
		(0.098)		(0.103)		(0.071)		(0.096)
Higher-achieving × boy		-0.060		-0.032		-0.048		0.070
		(0.068)		(0.074)		(0.057)		(0.070)
mean control	0.26	0.26	0.18	0.18	0.32	0.32	0.05	0.05
p-val ms boys		0.645		0.892		0.300		0.224
p-val ha boys		0.909		0.564		0.407		0.330
N	2,212	2,212	2,214	2,214	2,218	2,218	2,227	2,227

Notes: This table reports the effect of being assigned to more sociable and higher-achieving peers identified at baseline on grades and test scores. All regressions include strata fixed effects and control for the baseline value of the dependent variable. For the 2017 cohort all regressions include strata-by-classroom fixed effects. The control group is defined as being assigned to less sociable and lower-achieving peers. Grades are standardized at the school-by-grade level and test scores at the grade level. Standard errors are clustered at the peer group type-by-type level; *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

TABLE 6: 2SLS Estimates on Social Skills

Group:	All students			Less sociable			More sociable		
	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Neighbors' sociability	0.138***	0.337***	0.029	0.223***	0.470***	0.086	0.068	0.286**	-0.032
	(0.049)	(0.094)	(0.055)	(0.075)	(0.133)	(0.090)	(0.063)	(0.139)	(0.065)
Neighbors' achievement	0.010	-0.061	0.040	0.006	0.071	-0.055	0.007	-0.223*	0.125*
	(0.044)	(0.082)	(0.051)	(0.062)	(0.107)	(0.075)	(0.062)	(0.126)	(0.069)
F sociability	857.33	236.43	709.60	381.72	94.59	341.37	492.22	142.96	412.59
F achievement	942.96	366.97	586.85	449.01	231.39	240.21	515.59	157.20	371.36
N	3,572	1,487	2,085	1,792	752	1,040	1,780	735	1,045

Notes: This table reports 2SLS estimates of average sociability and academic achievement of neighbors on students' social outcomes, using treatment assignment as instruments. All regressions include strata fixed effects and control for the dependent variable at baseline. For the 2017 cohort, all regressions include strata-by-classroom fixed effects. Standard errors are clustered at the group of peers-by-type level; *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

TABLE 7: 2SLS Estimates on Academic Achievement

Group:	All students			Lower-achieving			Higher-achieving		
	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Dependent variable math scores									
Neighbors' sociability	-0.043	-0.086	-0.021	-0.065	-0.008	-0.093	0.005	-0.108	0.060
	(0.043)	(0.076)	(0.051)	(0.054)	(0.099)	(0.061)	(0.068)	(0.120)	(0.080)
Neighbors' achievement	-0.035	-0.043	-0.018	-0.087*	-0.064	-0.103**	-0.017	-0.044	0.032
	(0.031)	(0.055)	(0.036)	(0.047)	(0.088)	(0.049)	(0.046)	(0.077)	(0.056)
F sociability	.	148.45	.	.	115.44	.	.	47.02	145.41
F achievement	.	496.72	.	.	184.42	.	.	250.38	271.01
N	4,412	1,990	2,422	2,182	991	1,191	2,218	990	1,228
Panel B: Dependent variable reading scores									
Neighbors' sociability	0.042	0.096	0.001	0.059	0.052	0.056	0.033	0.191	-0.055
	(0.059)	(0.094)	(0.075)	(0.075)	(0.122)	(0.094)	(0.096)	(0.154)	(0.121)
Neighbors' achievement	-0.038	0.072	-0.117**	-0.114*	0.019	-0.212***	0.013	0.086	-0.036
	(0.040)	(0.062)	(0.052)	(0.062)	(0.101)	(0.077)	(0.059)	(0.089)	(0.080)
F sociability	466.17	149.88	340.59	304.92	121.52	187.05	167.91	46.43	144.53
F achievement	1,064.03	510.86	575.13	395.03	186.83	216.42	526.56	261.49	278.15
N	4,434	1,999	2,435	2,195	997	1,198	2,227	993	1,234

Notes: This table reports 2SLS estimates of average sociability and academic achievement of neighbors on students' academic outcomes, using treatment assignment as instruments. All regressions include strata fixed effects and control for the dependent variable at baseline. For the 2017 cohort, all regressions include strata-by-classroom fixed effects. Standard errors are clustered at the group of peers-by-type level; *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

TABLE 8: Self-confidence in Social Skills

Dependent variable:	Popularity Ranking			Self-nomination (in the top 5)				
	Dorm	Classroom	Cohort	Leader	Popular	Friendly	No shy	Sum
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Less sociable students at baseline								
More sociable	-2.881**	-3.208**	-2.765**	-0.072***	-0.020	0.014	-0.007	-0.100**
	(1.458)	(1.388)	(1.402)	(0.023)	(0.025)	(0.017)	(0.016)	(0.041)
Higher-achieving	0.047	0.637	-0.873	0.022	0.026	-0.001	0.021	0.040
	(1.474)	(1.441)	(1.450)	(0.022)	(0.025)	(0.016)	(0.016)	(0.040)
More sociable × boy	3.752	5.010**	5.352**	0.112***	0.072*	0.009	0.051**	0.249***
	(2.304)	(2.171)	(2.119)	(0.038)	(0.038)	(0.032)	(0.022)	(0.073)
Higher-achieving × boy	2.262	2.344	1.518	-0.078**	-0.066*	0.006	-0.049**	-0.141**
	(2.266)	(2.149)	(2.125)	(0.037)	(0.038)	(0.031)	(0.022)	(0.070)
mean control	67.29	64.85	58.77	0.28	0.22	0.14	0.91	0.51
p-val ms boys	0.625	0.284	0.106	0.174	0.071	0.406	0.005	0.014
p-val ha boys	0.181	0.062	0.679	0.062	0.164	0.842	0.078	0.081
N	1,663	1,667	1,666	1,681	1,681	1,681	1,681	1,832
Panel B: More sociable students at baseline								
More sociable	0.940	1.257	0.837	-0.002	-0.010	0.006	0.011	-0.000
	(1.366)	(1.160)	(1.260)	(0.023)	(0.025)	(0.019)	(0.014)	(0.046)
Higher-achieving	-1.044	-0.051	-0.781	0.036	0.011	-0.011	0.004	0.053
	(1.346)	(1.154)	(1.228)	(0.025)	(0.024)	(0.020)	(0.013)	(0.047)
More sociable × boy	0.017	-0.007	0.121	-0.033	-0.020	-0.008	-0.016	-0.077
	(2.064)	(1.870)	(1.950)	(0.038)	(0.038)	(0.032)	(0.021)	(0.074)
Higher-achieving × boy	1.700	-0.539	-0.517	0.002	-0.013	0.009	0.030	0.003
	(2.015)	(1.858)	(1.885)	(0.040)	(0.038)	(0.032)	(0.021)	(0.076)
mean control	72.22	70.75	65.26	0.30	0.25	0.16	0.92	0.58
p-val ms boys	0.536	0.395	0.521	0.243	0.287	0.943	0.783	0.180
p-val ha boys	0.663	0.688	0.367	0.220	0.943	0.914	0.033	0.346
N	1,701	1,700	1,702	1,710	1,710	1,710	1,710	1,822

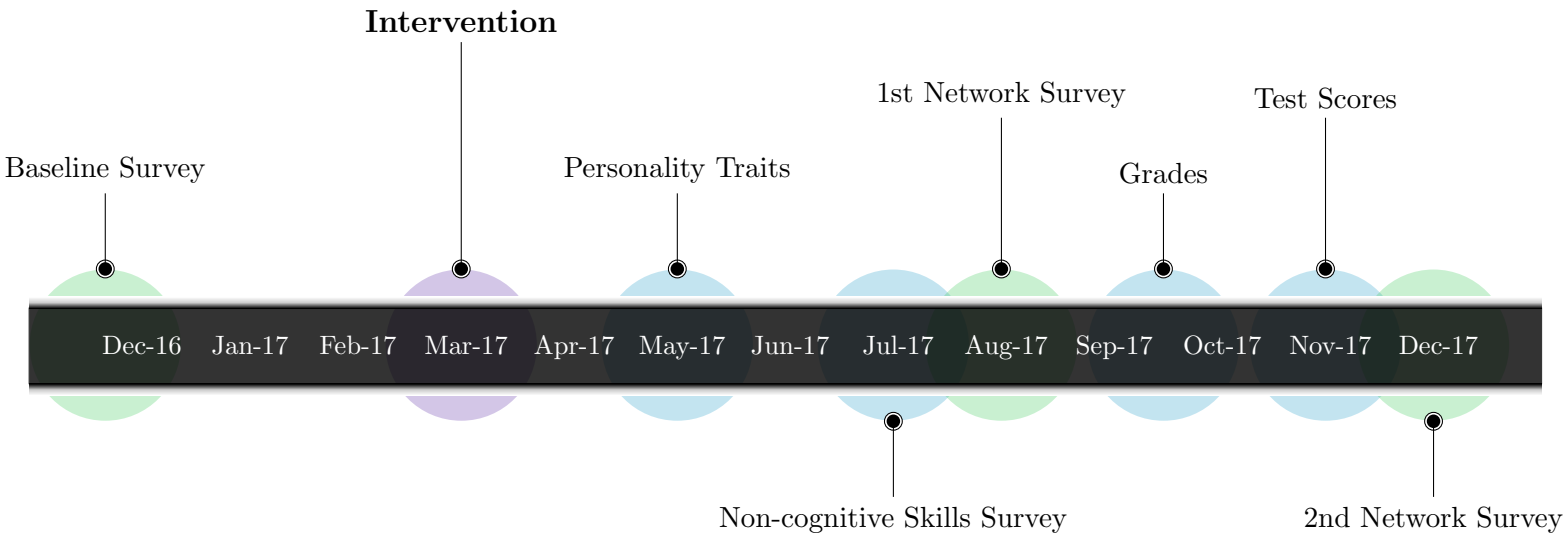
Notes: This table reports the effect of being assigned to more sociable and higher-achieving peers identified at baseline on self-confidence in social skills. All regressions include strata fixed effects and control for the dependent variable at baseline. For the 2017 cohort, all regressions include strata-by-classroom fixed effects. The control group is defined as being assigned to less sociable and lower-achieving peers. Standard errors are clustered at the group of peers-by-type level; *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

TABLE 9: Self-confidence in Academic Skills (First-years)

Dependent variable:	Self-nomination	Academic Ranking		
	(top 5) skilled	Dorm	Classroom	Cohort
	(1)	(2)	(3)	(4)
Panel A: Lower-achieving students at baseline				
Higher-achieving	-0.055**	-3.277	-3.004*	-3.854**
	(0.026)	(2.232)	(1.630)	(1.719)
Higher-achieving × boy	-0.029	3.901	3.975	3.443
	(0.051)	(3.265)	(2.848)	(2.732)
mean control	0.16	71.70	68.97	64.63
p-val ha boys	0.059	0.793	0.680	0.846
N	1,132	1,119	1,119	1,119
Panel B: Higher-achieving students at baseline				
Higher-achieving	0.006	-0.176	-0.981	-0.696
	(0.036)	(1.589)	(1.624)	(1.344)
Higher-achieving × boy	0.033	1.144	1.833	2.430
	(0.055)	(2.633)	(2.430)	(2.140)
mean control	0.22	74.90	73.42	69.03
p-val ha boys	0.371	0.647	0.638	0.298
N	1,157	1,153	1,154	1,153

Notes: This table reports the effect of being assigned to more sociable and higher-achieving peers identified at baseline on self-confidence in social skills. All regressions include strata fixed effects and control for the dependent variable at baseline. For the 2017 cohort, all regressions include strata-by-classroom fixed effects. The control group is defined as being assigned to less sociable and lower-achieving peers. Standard errors are clustered at the group of peers-by-type level; *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

FIGURE 1: Timeline of the Project



Notes: This figure presents the timeline of the project. The green circles represent data collection with surveys, the blue circles collection of administrative data through the Ministry of Education, and the purple circle the implementation of the intervention.

FIGURE 2: Groups of Peers in the Experimental Design

Type of Peers

Student Type	higher-achieving more sociable	higher-achieving less sociable	lower-achieving more sociable	lower-achieving less sociable
higher-achieving more sociable	Group 1	Group 2	Group 3	Group 4
higher-achieving less sociable	Group 2	Group 5	Group 6	Group 7
lower-achieving more sociable	Group 3	Group 6	Group 8	Group 9
lower-achieving less sociable	Group 4	Group 7	Group 9	Group 10

Notes: this figure shows the ten *groups of peers* in my experimental design. It represents all possible combinations between student type and type of peers. Rows are described by student types, and columns illustrate the types of peers to which they were randomly assigned. The diagonal of the matrix is composed by groups of a single type. The matrix is symmetric by virtue of the fact that students are matched with peers of the assigned type.

FIGURE 3: Figure Appendix: Dorm Structure

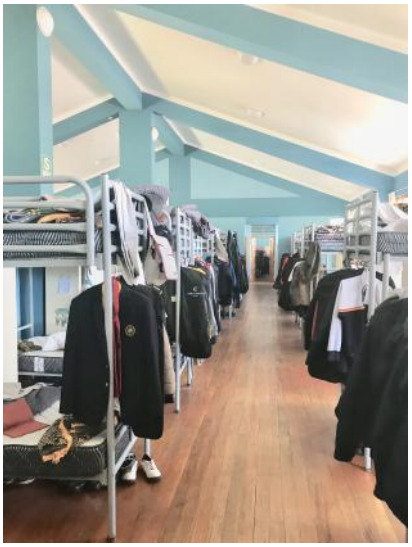
School in Lima



School in Piura

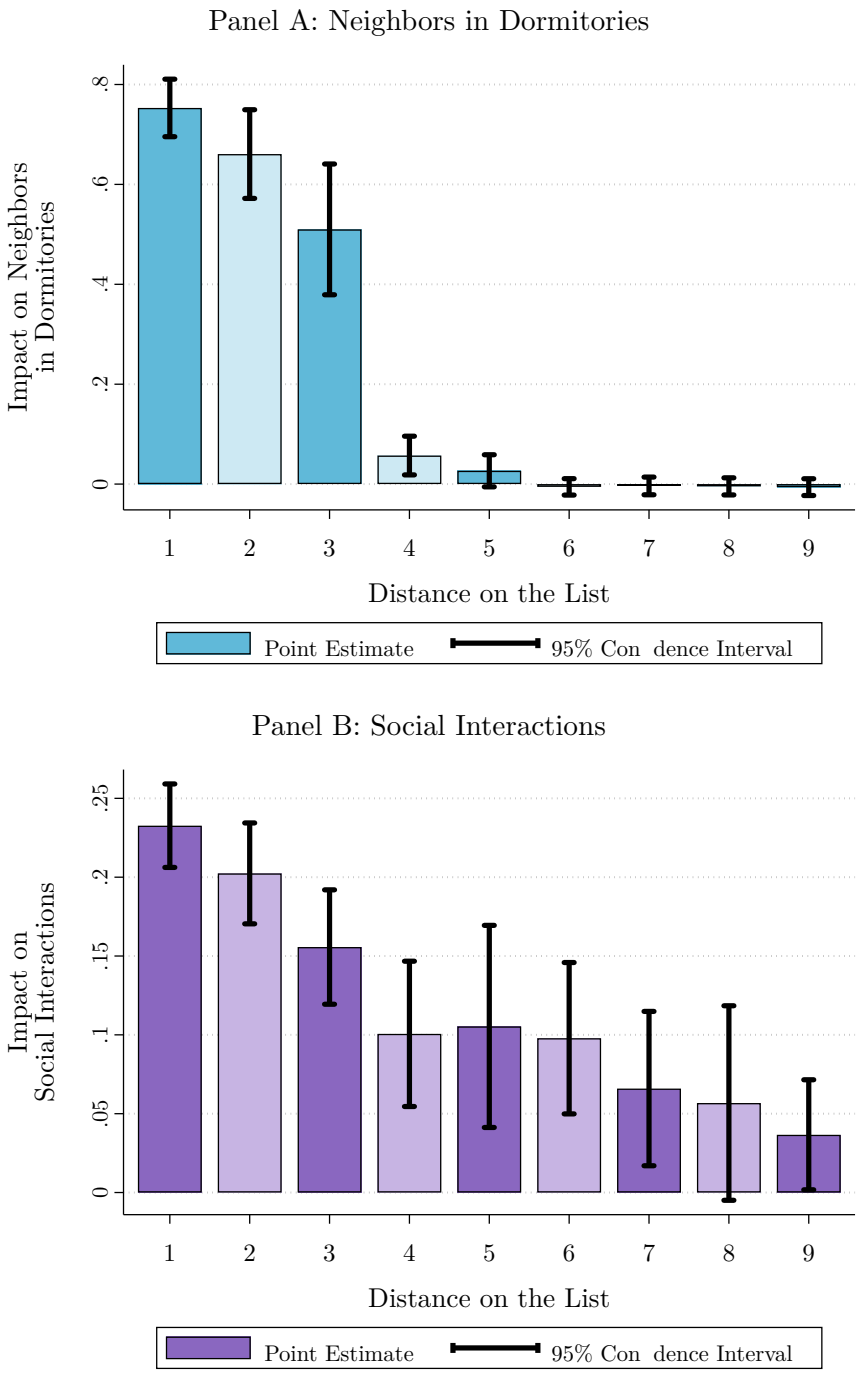


School in Cusco



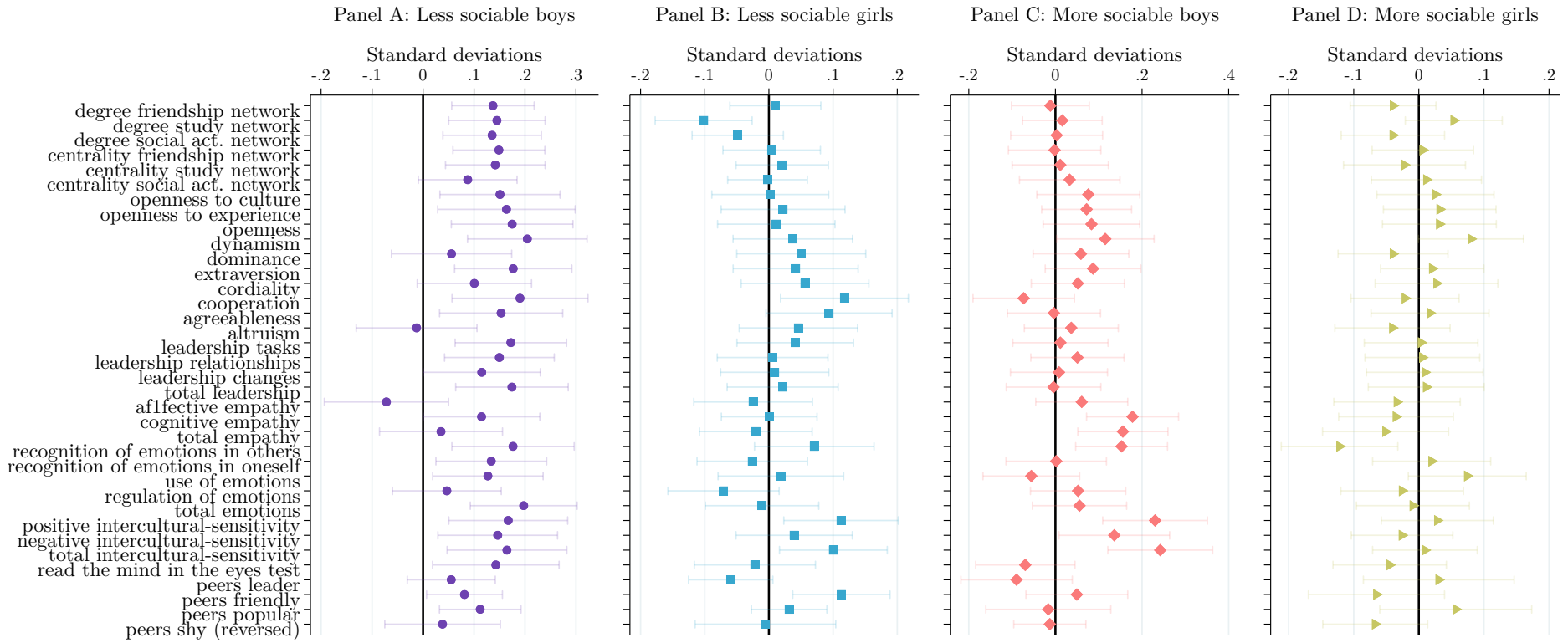
Notes: This figure displays pictures of the dorms for the schools in Lima, Piura, and Cusco. It illustrates the vast heterogeneity in the type of rooms across the schools.

FIGURE 4: Effects of Proximity on the List on Neighbors and Social Interactions



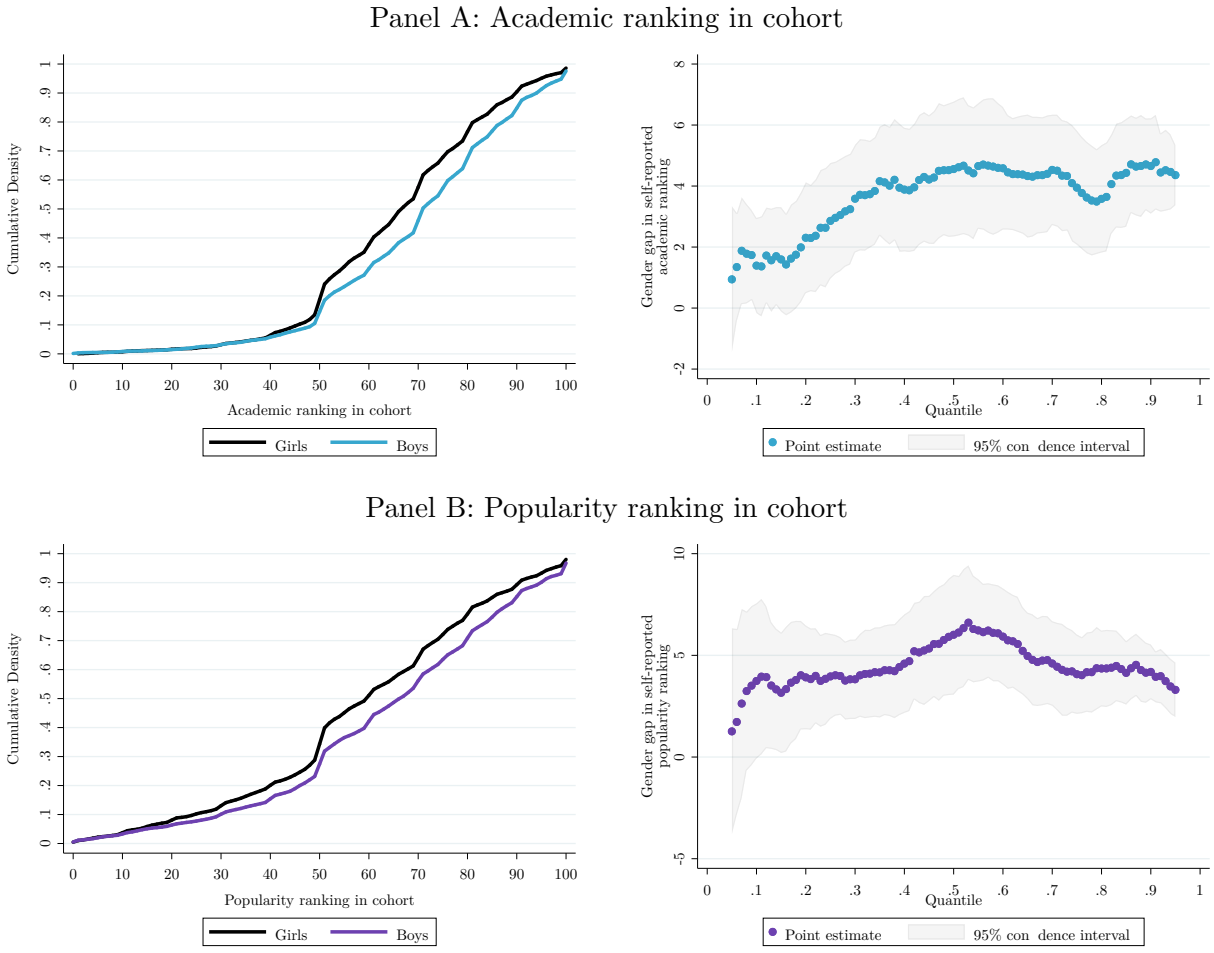
Notes: This figure shows the impact of distance between a pair of students on the likelihood of being neighbors and social interaction (friends, study, and playing games or sports). Distance is captured by nine distance dummies, and 95% confidence intervals are displayed for all proximity effects. Students are at an odd distance from their treatment peers, and at an even distance from the peers of their type, by construction of the experimental design. All estimations control for strata fixed effects. Standard errors are clustered at the school-by-cohort level.

FIGURE 5: Effects of More Sociables Peers on Social Skills



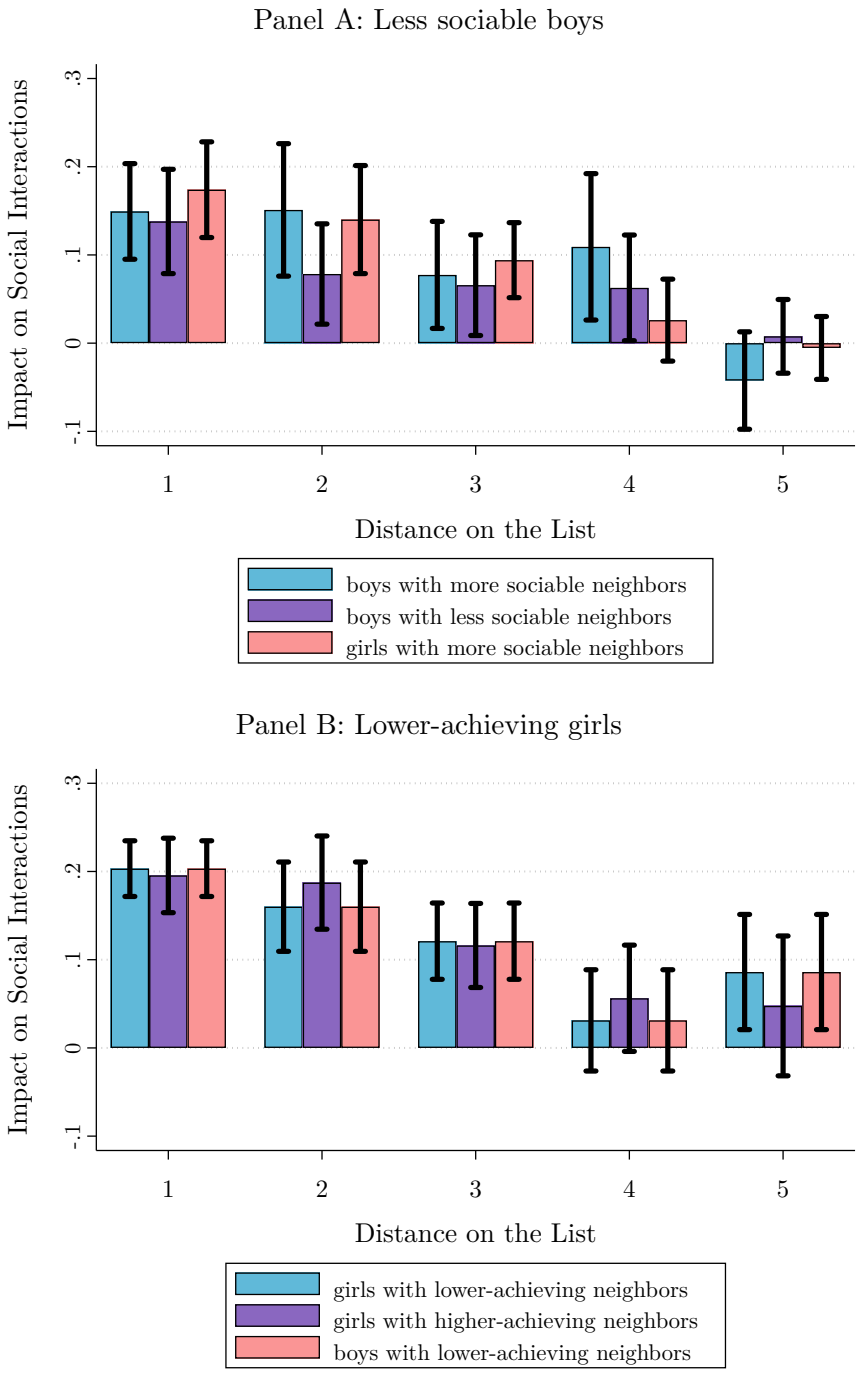
Notes: This figure reports treatment effects and 90% confidence intervals of being assigned to more sociable peers on social skills outcomes. All regressions include strata fixed effects and control for the baseline value of the dependent variable. The control group is defined as being assigned to less sociable peers. Standard errors are clustered at the peer group type-by-type level.

FIGURE 6: Gender Differences in Self-reported Rankings



Notes: This figure plots differences by gender in self-reported academic and popularity ranking within the cohort. The left column presents the cumulative distribution function and the right column estimates from quantile regressions of the gender gap after controlling for observable characteristics. These covariates include scores in mathematics and reading tests, network degree and centrality, and peers' perception of social and academic skills. Standard errors are clustered at the school-by-cohort level.

FIGURE 7: Social Interactions of Most Affected vs. Comparable Groups



Notes: This figure shows the impact of distance between a pair of students on the likelihood of social interactions(friends, study, and playing games or sports). Distance is captured by nine distance dummies, and 95% confidence intervals are displayed for all proximity effects. Students are at an odd distance from their treatment peers, and at an even distance from the peers of their type, by construction of the experimental design. All estimations control for strata fixed effects. Standard errors are clustered at the school-by-cohort level.

A Supplementary Material

TABLE A.1: Summary Statistics for the Networks Survey at Baseline

	All Students	By Sociability		By Academic Achievement	
		Less Sociable	More Sociable	Lower Achieving	Higher Achieving
Variable	(1)	(2)	(3)	(4)	(5)
Dorm preferences degree	6.49	5.16	7.83	6.27	6.71
	(3.47)	(2.67)	(3.66)	(3.52)	(3.41)
Dorm preferences mutual degree	1.69	1.35	2.04	1.57	1.82
	(1.54)	(1.27)	(1.69)	(1.49)	(1.57)
Dorm preferences centrality	-0.00	-0.23	0.23	-0.03	0.03
	(1.00)	(0.75)	(1.14)	(0.97)	(1.02)
Friendships degree	7.87	5.67	10.10	7.62	8.12
	(5.11)	(2.75)	(5.91)	(5.11)	(5.10)
Friendships mutual degree	2.10	1.65	2.55	1.98	2.23
	(1.68)	(1.37)	(1.83)	(1.70)	(1.65)
Friendships centrality	-0.00	-0.51	0.51	-0.06	0.06
	(1.00)	(0.57)	(1.07)	(0.98)	(1.00)
Study partnerships degree	4.76	3.71	5.82	4.54	4.98
	(2.66)	(1.94)	(2.86)	(2.52)	(2.77)
Study partnerships mutual degree	1.11	0.92	1.29	1.04	1.18
	(1.08)	(0.95)	(1.18)	(1.05)	(1.12)
Study partnerships centrality	0.00	-0.37	0.37	-0.07	0.07
	(1.00)	(0.66)	(1.13)	(0.92)	(1.06)
Social partnerships degree	5.67	4.44	6.90	5.61	5.73
	(3.13)	(2.29)	(3.36)	(3.20)	(3.05)
Social partnerships mutual degree	1.23	1.00	1.46	1.21	1.25
	(1.23)	(1.05)	(1.36)	(1.24)	(1.23)
Social partnerships centrality	0.00	-0.37	0.37	-0.01	0.01
	(1.00)	(0.69)	(1.11)	(1.01)	(0.98)
Any partnership degree	11.07	8.23	13.92	10.78	11.35
	(5.66)	(3.19)	(6.15)	(5.61)	(5.70)
Any partnership mutual degree	3.34	2.60	4.07	3.20	3.48
	(2.18)	(1.66)	(2.38)	(2.19)	(2.16)
Any partnership centrality	0.00	-0.71	0.71	-0.05	0.05
	(1.00)	(0.44)	(0.89)	(0.97)	(1.01)
Peers who named the student as a leader	2.63	1.54	3.73	1.91	3.35
	(5.16)	(3.31)	(6.32)	(4.21)	(5.86)
Peers who named the student as friendly	2.71	1.91	3.50	2.61	2.80
	(2.81)	(1.91)	(3.31)	(2.76)	(2.86)
Peers who named the student as popular	2.43	1.51	3.35	1.99	2.86
	(5.32)	(3.44)	(6.58)	(4.48)	(6.02)
Peers who named the student as skilled	2.62	1.80	3.45	1.20	4.04
	(6.45)	(5.97)	(6.80)	(3.14)	(8.32)
Peers who named the student as shy	2.00	2.52	1.49	2.18	1.83
	(4.67)	(5.16)	(4.04)	(4.62)	(4.71)
N	3,654	1,832	1,822	1,822	1,832

Notes: This table reports summary statistics for the social networks survey at baseline. Information is presented by categories of student student. Standard errors are reported in parentheses. Column 1 shows statistics for all the students and columns 2 to 5 according to the classification of students by social skills and academic achievement. The dorm preferences network is based on the question: "who would you like to have as roommates?". The friendship network is based on the question: "who are your friends?". The study partnerships network is based on the question: "with whom have you studied?". The social partnerships network is based on the question: "with whom have you engage in social activities with such as playing or dancing?". The any partnership network aggregates the four questions.

Table A.2: Correlation of Sociability and Social Skills Outcomes

	Big Five Personality Traits					Peers' Perception				Other measures of social skills	Social Skills Index Before the Intervention	Social Skills Index After the Interventipn
	Openness	Conscientiousness	Emotional Stability	Extraversion	Agreeableness	Leadership	Friendliness	Popularity	Shyness			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Academic achievement at baseline	0.090***	-0.001	0.064***	-0.014	-0.013	0.217***	0.042**	0.105***	-0.066***	0.047***	0.064***	0.042**
	(0.021)	(0.022)	(0.022)	(0.019)	(0.020)	(0.020)	(0.016)	(0.022)	(0.019)	(0.016)	(0.017)	(0.016)
Sociability at baseline	0.103***	0.061**	0.032*	0.142***	0.120***	0.230***	0.359***	0.215***	-0.103***	0.099***	0.139***	0.142***
	(0.024)	(0.025)	(0.017)	(0.021)	(0.017)	(0.021)	(0.020)	(0.029)	(0.021)	(0.018)	(0.018)	(0.018)
Social-fit score	0.072***	0.022	0.001	0.063***	0.027	0.137***	0.073***	0.104***	-0.113***	0.027	0.066***	0.046**
	(0.018)	(0.020)	(0.020)	(0.019)	(0.020)	(0.015)	(0.016)	(0.017)	(0.020)	(0.018)	(0.017)	(0.019)
Interview score	0.092***	0.073***	0.071***	0.091***	0.049***	0.068***	0.057***	0.049***	-0.036**	0.074***	0.118***	0.088***
	(0.019)	(0.016)	(0.016)	(0.018)	(0.018)	(0.015)	(0.015)	(0.017)	(0.017)	(0.015)	(0.016)	(0.015)
N	3,106	3,106	3,106	3,106	3,106	3,637	3,637	3,637	3,637	3,654	3,654	3,654

Notes: This table reports standardized estimates of an OLS regression on social skills outcomes of sociability at baseline and the score in the three tests of the admission process to the COAR Network. All regressions include school-by-grade-by-gender fixed effects. Sociability at baseline is measured by the eigenvector centrality of an aggregate social network of dorm preferences, friendships, study, and social partnerships. Eigenvector centrality is a measure of the influence of a student in the network. Academic achievement at baseline is the score in the admission test to the COAR Network, which evaluates the applicants in math and reading comprehension. Personality traits correspond to the Big Five. Measures of peers' perception correspond to the number of peers who think the student is in the top 5 of leadership, friendliness, popularity, and shyness (school-by-grade). The table presents two social skills indexes for robustness. The first one is constructed using Principal Component Analysis (PCA) on all the variables that measure social skills (see Appendix C for details), excluding personality traits and measures of peers' perception. The second index is contructed using Principal Component Analysis (PCA) on all the variables that measure social skills (see Appendix C for details).

TABLE A.3: Balance Tests for the More Sociable Peers Treatment

Variable	All Students		Less Sociable at Baseline		More Sociable at Baseline	
	Control mean	Difference	Control mean	Difference	Control mean	Difference
Admission test	-0.016	0.002	-0.064	-0.024	0.058	0.028
		(0.019)		(0.027)		(0.026)
Interview score	14.065	0.009	14.053	0.019	14.082	-0.000
		(0.042)		(0.059)		(0.061)
Social-fit score	20.001	0.095	19.977	0.071	20.035	0.119
		(0.064)		(0.088)		(0.092)
Female	0.589	0.003	0.594	0.002	0.582	0.004
		(0.003)		(0.004)		(0.003)
Not poor	0.426	-0.014	0.393	-0.008	0.475	-0.020
		(0.014)		(0.021)		(0.020)
Poor	0.364	0.026*	0.378	0.034	0.344	0.019
		(0.015)		(0.022)		(0.020)
Extremely poor	0.210	-0.012	0.229	-0.026	0.182	0.001
		(0.012)		(0.018)		(0.017)
Rural	0.279	-0.014	0.315	-0.028	0.224	0.000
		(0.012)		(0.018)		(0.017)
Subsidized health insurance	0.508	0.008	0.552	-0.011	0.443	0.027
		(0.016)		(0.022)		(0.022)
Average math at baseline	-0.049	0.019	-0.157	0.012	0.115	0.027
		(0.027)		(0.037)		(0.038)
Average reading at baseline	-0.049	0.010	-0.169	0.041	0.134	-0.021
		(0.028)		(0.041)		(0.038)
Sociability index baseline	-0.042	-0.041	-0.293	-0.033	0.333	-0.050
		(0.080)		(0.117)		(0.111)
Indegree baseline network	-0.077	-0.021	-0.434	-0.003	0.460	-0.040
		(0.027)		(0.033)		(0.044)
Outdegree baseline network	-0.094	0.023	-0.419	0.016	0.395	0.029
		(0.026)		(0.027)		(0.046)
Centrality baseline network	0.303	0.003	0.203	-0.002	0.453	0.008
		(0.003)		(0.003)		(0.006)
Peers' perception leader	2.502	-0.184	1.587	-0.113	3.879	-0.257
		(0.151)		(0.132)		(0.272)
Peers' perception friendly	2.553	-0.009	1.837	0.200**	3.631	-0.221
		(0.080)		(0.083)		(0.136)
Peers' perception popular	2.203	0.110	1.466	0.126	3.313	0.093
		(0.159)		(0.142)		(0.285)
Peers' perception shy	2.083	0.029	2.560	-0.131	1.366	0.192
		(0.144)		(0.227)		(0.178)
Baseline grit	43.707	-0.248	43.340	-0.171	44.251	-0.325
		(0.198)		(0.285)		(0.274)
Baseline Rosenberg scale	32.991	0.101	32.777	0.119	33.306	0.081
		(0.154)		(0.224)		(0.212)
Baseline Read the Mind	20.521	-0.060	20.224	0.184	20.960	-0.304*
		(0.130)		(0.186)		(0.180)
Multivariate F p-value		0.785		0.571		0.726

Notes: This table reports balance checks of being assigned to more sociable peers on baseline characteristics. All regressions include strata fixed effects, control for the baseline value of the dependent variable, and include the higher-achieving peers treatment. For the 2017 cohort, all regressions include strata-by-classroom fixed effects. The control group is defined as being assigned to less sociable and lower-achieving peers. The "F p-value" correspond to the F-statistic of the more sociable peers treatment of multivariate regressions that include all the variables at baseline. Standard errors are clustered at the peer group type-by-type level; *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

TABLE A.4: Balance Tests for the Higher-Achieving Peers Treatment

Variable	All Students		Lower Achieving at Baseline		Higher Achieving at Baseline	
	Control mean	Difference	Control mean	Difference	Control mean	Difference
Admission test	-0.163	0.013	-0.787	-0.006	0.764	0.031
		(0.016)		(0.018)		(0.026)
Interview score	8.400	-0.013	8.589	-0.011	8.117	-0.015
		(0.033)		(0.042)		(0.052)
Social-fit score	11.973	-0.061	12.161	0.012	11.693	-0.131*
		(0.049)		(0.061)		(0.077)
Female	0.575	-0.000	0.575	0.004	0.575	-0.004
		(0.002)		(0.004)		(0.003)
Not poor	0.443	0.010	0.404	0.001	0.502	0.019
		(0.012)		(0.017)		(0.018)
Poor	0.369	-0.017	0.387	-0.005	0.342	-0.030*
		(0.013)		(0.018)		(0.017)
Extremely poor	0.188	0.007	0.209	0.003	0.156	0.011
		(0.011)		(0.016)		(0.014)
Rural	0.276	-0.003	0.319	-0.021	0.212	0.014
		(0.013)		(0.019)		(0.016)
Subsidized health insurance	0.504	0.013	0.517	0.045**	0.485	-0.019
		(0.015)		(0.021)		(0.022)
Average math at baseline	-0.093	0.016	-0.373	-0.023	0.319	0.053
		(0.023)		(0.030)		(0.034)
Average reading at baseline	-0.064	-0.000	-0.281	-0.012	0.256	0.011
		(0.023)		(0.032)		(0.033)
Sociability index baseline	-0.023	0.048	-0.065	0.060	0.040	0.038
		(0.059)		(0.083)		(0.083)
Indegree baseline network	0.008	-0.050*	-0.075	-0.032	0.131	-0.068*
		(0.027)		(0.038)		(0.039)
Outdegree baseline network	-0.001	-0.013	-0.016	-0.059	0.021	0.033
		(0.028)		(0.040)		(0.038)
Centrality baseline network	0.330	-0.003	0.324	-0.007	0.338	0.000
		(0.003)		(0.004)		(0.004)
Peers' perception leader	2.493	0.006	1.930	-0.036	3.331	0.050
		(0.148)		(0.178)		(0.236)
Peers' perception friendly	2.691	0.010	2.618	-0.001	2.801	0.021
		(0.078)		(0.112)		(0.109)
Peers' perception popular	2.362	-0.013	2.007	-0.024	2.890	-0.006
		(0.158)		(0.186)		(0.255)
Peers' perception shy	2.020	0.036	2.110	0.160	1.886	-0.089
		(0.146)		(0.211)		(0.203)
Baseline grit	43.568	0.158	43.330	0.431	43.921	-0.108
		(0.196)		(0.271)		(0.282)
Baseline Rosenberg scale	33.013	0.139	32.854	0.127	33.249	0.153
		(0.154)		(0.221)		(0.215)
Baseline Read the Mind	20.602	-0.265**	20.248	-0.231	21.127	-0.295
		(0.128)		(0.180)		(0.183)
Multivariate F p-value		0.810		0.857		0.625

Notes: This table reports balance checks of being assigned to higher-achieving peers on baseline characteristics. All regressions include strata fixed effects, control for the baseline value of the dependent variable, and include the more sociable peers treatment. For the 2017 cohort all regressions include strata-by-classroom fixed effects. The control group is defined as being assigned to less sociable and lower-achieving peers. The "F p-value" correspond to the F-statistic of the higher-achieving peers treatment of multivariate regressions that include all the variables at baseline. Standard errors are clustered at the peer group type-by-type level; *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

TABLE A.5: Treatments and Outcomes Available by Cohort

Treatments	**Outcomes**	
	Social Skills	Academic Outcomes
More sociable peers	2015, 2016	2016
Higher-achieving peers	2015, 2016, 2017	2016, 2017

TABLE A.6: Randomization Inference p-values

Group	Treatment	Dependent variables			
		(1)	(2)	(3)	(4)
		Panel A: Results on Social Skills			
		Connections	Centrality	Psychological Tests	Peers' perception
	More sociable peers	0.791	0.629	0.002	0.105
All students	Higuer-achieving peers	0.603	0.980	0.673	0.208
	Joint test	0.838	0.891	0.022	0.118
	More sociable peers	0.109	0.007	0.000	0.099
Boys	Higuer-achieving peers	0.102	0.353	0.473	0.840
	Joint test	0.071	0.021	0.001	0.241
	More sociable peers	0.006	0.000	0.002	0.013
Less sociable boys	Higuer-achieving peers	0.925	0.979	0.147	0.020
	Joint test	0.025	0.003	0.003	0.005
		Panel B: Results on Academic Skills			
		Grades		Test Scores	
		Math	Reading	Math	Reading
	More sociable peers	0.720	0.205	0.284	0.551
All students	Higuer-achieving peers	0.579	0.471	0.137	0.302
	Joint test	0.817	0.366	0.221	0.519
	More sociable peers	0.743	0.135	0.123	0.601
Lower-achieving	Higuer-achieving peers	0.018	0.055	0.033	0.061
	Joint test	0.060	0.071	0.040	0.178
	More sociable peers	0.595	0.265	0.072	0.785
Lower-achieving girls	Higuer-achieving peers	0.002	0.260	0.022	0.010
	Joint test	0.004	0.331	0.024	0.017

Notes: This table reports randomization inference p-values.

TABLE A.7: Multiple-hypotheses Testing

Group	Test	Dependent variables			
		(1)	(2)	(3)	(4)
		Panel A: Results on Social Skills			
		Connections	Centrality	Psychological Tests	Peers' perception
	Sidak and Holm	0.146	0.034	0.001	0.182
Boys	Bonferroni and Holm	0.151	0.034	0.001	0.191
	Westfall and Young	0.198	0.062	0.001	0.273
	Sidak and Holm	0.028	0.002	0.006	0.055
Less sociable boys	Bonferroni and Holm	0.028	0.002	0.006	0.057
	Westfall and Young	0.064	0.004	0.018	0.109
		Panel B: Results on Academic Skills			
		Grades		Test Scores	
		Math	Reading	Math	Reading
	Sidak and Holm	0.044	0.108	0.106	0.130
Lower-achieving	Bonferroni and Holm	0.044	0.111	0.108	0.134
	Westfall and Young	0.080	0.168	0.175	0.200
	Sidak and Holm	0.008	0.461	0.119	0.026
Lower-achieving girls	Bonferroni and Holm	0.008	0.538	0.125	0.026
	Westfall and Young	0.019	0.597	0.204	0.056

Notes: This table reports randomization inference p-values.

TABLE A.8: Correlations and Effects on Hard Outcomes for Less Sociable Boys

Dependent variable:	Dropout	College	Certified	Top 20
	(1)	(2)	(3)	(4)
	Panel A: Correlations			
Social skills	-0.001	0.016**	0.016***	0.014**
	(0.001)	(0.008)	(0.006)	(0.006)
Math score	-0.003	0.060***	0.034***	0.032***
	(0.002)	(0.010)	(0.008)	(0.008)
Reading score	-0.000	0.014	0.007	0.024***
	(0.002)	(0.010)	(0.008)	(0.007)
mean control	0.02	0.46	0.20	0.16
N	6,085	3,649	3,649	3,649
	Panel B: Impact on less sociable boys			
More sociable	-0.023***	0.009	0.051**	0.044*
	(0.008)	(0.029)	(0.026)	(0.025)
Higher-achieving	0.020**	0.003	-0.012	-0.015
	(0.010)	(0.029)	(0.026)	(0.026)
mean control	0.02	0.46	0.20	0.16
N	753	753	753	753

Notes: This table reports correlation of social skills with hard outcomes (Panel A), and the effect of being assigned to more sociable and higher-achieving peers on hard outcomes for less sociable boys (Panel B). All regressions in Panel A include school-by-cohort-by-gender fixed effects. All regressions in Panel B include strata fixed effects and control for the dependent variable at baseline. Standard errors are clustered at the group of peers-by-type level; *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

TABLE A.9: Reduced-Form Estimates on Academic Performance (Lower-achieving First-years)

Dependent variable:	Grades				Test scores			
	Math		Reading		Math		Reading	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Higher-achieving	-0.062	-0.151**	-0.056	-0.075	-0.044	-0.084**	-0.064	-0.207***
	(0.054)	(0.069)	(0.051)	(0.061)	(0.045)	(0.042)	(0.060)	(0.078)
Higher-achieving × boy		0.188*		0.039		0.084		0.303**
		(0.108)		(0.102)		(0.092)		(0.117)
mean control	-0.27	-0.27	-0.22	-0.22	-0.35	-0.35	-0.09	-0.09
p-val ha boys		0.654		0.663		0.999		0.274
N	1,168	1,168	1,169	1,169	1,169	1,169	1,170	1,170

Notes: This table reports the effect of being assigned to higher-achieving peers identified at baseline on grades and test scores for lower-achieving first-year students. All regressions include strata fixed effects and control for the baseline value of the dependent variable. For the 2017 cohort all regressions include gender-by-classroom fixed effects. The control group is defined as being assigned to lower-achieving peers. Grades are standardized at the school-by-grade level and test scores at the grade level. Standard errors are clustered at the peer group type-by-type level; *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

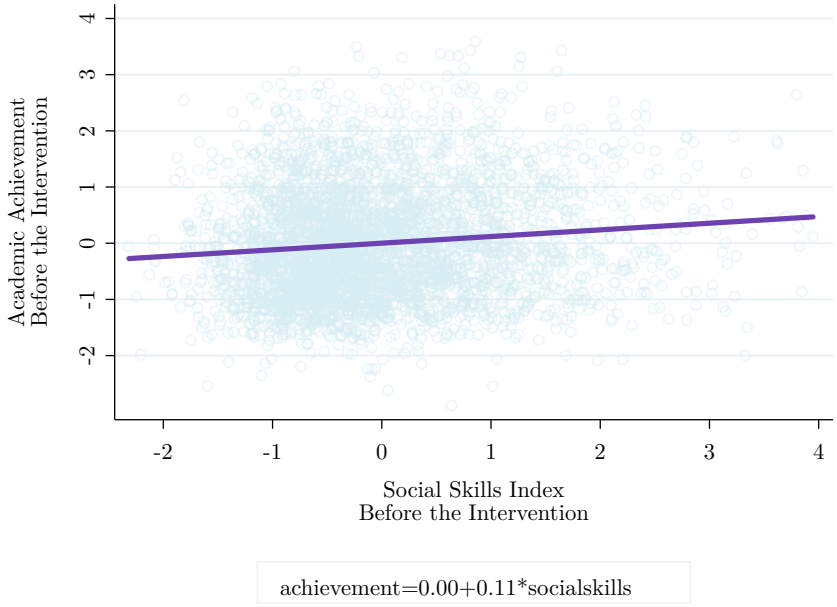
TABLE A.10: Self-confidence in Academic Skills

Dependent variable:	Self-nomination	Academic Ranking		
	(top 5) skilled	Dorm	Classroom	Cohort
	(1)	(2)	(3)	(4)
Panel A: Lower-achieving students at baseline				
More sociable	-0.012	-0.679	-0.077	-0.633
	(0.016)	(1.007)	(1.003)	(0.947)
Higher-achieving	0.037**	-1.071	0.883	0.174
	(0.017)	(1.013)	(0.997)	(0.977)
More sociable × boy	-0.041	-1.372	-0.938	-0.493
	(0.027)	(1.614)	(1.555)	(1.498)
Higher-achieving × boy	-0.061**	0.664	-2.039	0.205
	(0.028)	(1.540)	(1.503)	(1.453)
mean control	0.13	73.06	70.30	67.16
p-val ms boys	0.014	0.103	0.393	0.331
p-val ha boys	0.282	0.726	0.304	0.725
N	1,681	1,676	1,677	1,677
Panel B: Higher-achieving students at baseline				
More sociable	0.001	-0.291	-0.768	-0.707
	(0.018)	(0.947)	(0.853)	(0.850)
Higher-achieving	0.040**	-0.725	-1.720**	-1.331
	(0.018)	(0.970)	(0.832)	(0.846)
More sociable × boy	-0.036	1.899	2.912*	1.516
	(0.034)	(1.612)	(1.553)	(1.438)
Higher-achieving × boy	-0.058*	1.477	2.108	2.032
	(0.034)	(1.618)	(1.533)	(1.446)
mean control	0.16	74.17	73.34	69.91
p-val ms boys	0.212	0.220	0.100	0.488
p-val ha boys	0.543	0.560	0.762	0.550
N	1,710	1,701	1,702	1,701

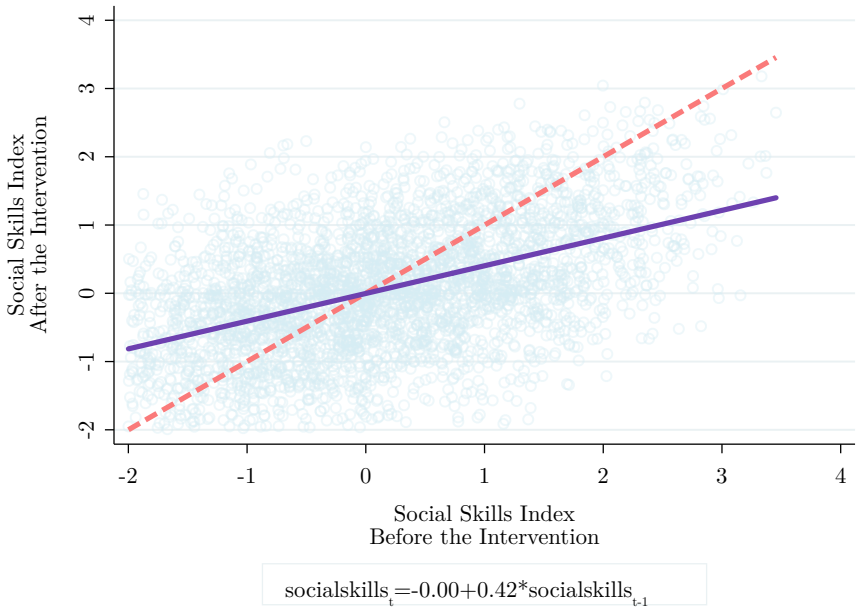
Notes: This table reports the effect of being assigned to more sociable and higher-achieving peers identified at baseline on self-confidence in social skills. All regressions include strata fixed effects and control for the dependent variable at baseline. For the 2017 cohort, all regressions include strata-by-classroom fixed effects. The control group is defined as being assigned to less sociable and lower-achieving peers. Standard errors are clustered at the group of peers-by-type level; *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

FIGURE A.1: Social Skills Index

Panel A: Correlation with Academic Achievement



Panel B: Correlation over Time



Notes: Panel A shows a scatter plot of academic achievement and sociability at baseline for the 2015-16 cohorts by student type. A one standard deviation of the social skills index predicts an increase in 0.11 standard deviations of academic achievement at baseline. Panel B shows a scatter plot and the linear prediction of the sociability index before and after the intervention. A one standard deviation of the social skills index before the intervention predicts an increase of 0.42 in the social skills index after the intervention.

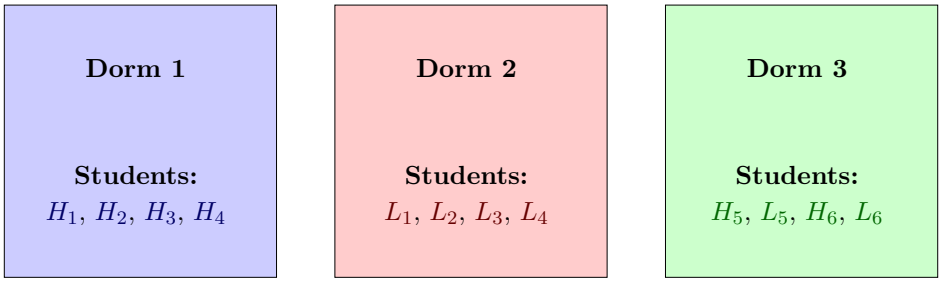
B Use of the Lists to Allocate Students to Dorms and Classrooms

This section explains in detail how the order of students on the lists determines their allocation to dormitories. To start, recall the simple two-type example in which students were either H and L. As described in section 3.3.2, this case allows for three groups of combined types: Group 1 (only Hs), Group 2 (a mixed group of Hs and Ls), and Group 3 (only Ls). Let us assume that the random ordering of the groups on the list is: Group 1-Group 3-Group 2. For the purpose of illustration, I will assume that there are 12 students, four in each group. After numbering the students by type, the order on the list would be the following: $H_1 - H_2 - H_3 - H_4 - L_1 - L_2 - L_3 - L_4 - H_5 - L_5 - H_6 - L_6$. Notice that on the list, the order of the students in Group 2 alternates the type of student in the form H-L.

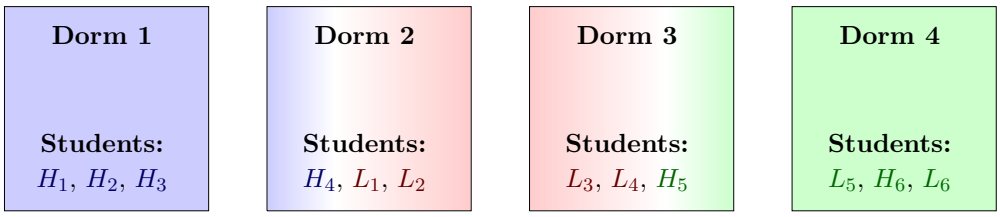
Figure B.1 shows an illustrative example of how the lists were used to allocate students to dorms and classrooms. Panel A describes the allocation when each room holds four students, Panel B when dorm rooms hold three students and Panel C for a big dorm room of 12 students. The order on the list is used to determine the allocation. When dorm rooms hold four students, dorms and *peer group types* have the same size so there is perfect compliance with the initial allocation. Yet, when dorm rooms hold three students, the first three students of type H –who were assigned to Group 1 (only Hs)—are allocated to room 1. The fourth student assigned to Group 1 is assigned to a room with two students who are type L. Notice that in this case there is no perfect compliance. In the big dorm, all students $H_1 - H_4$ are in beds close to each other. However, students H_3 and H_4 are also close to students of type L, while students H_1 and H_2 are surrounded only by peers who are type H.

FIGURE B.1: Illustrative Examples of the Allocation to Dorms

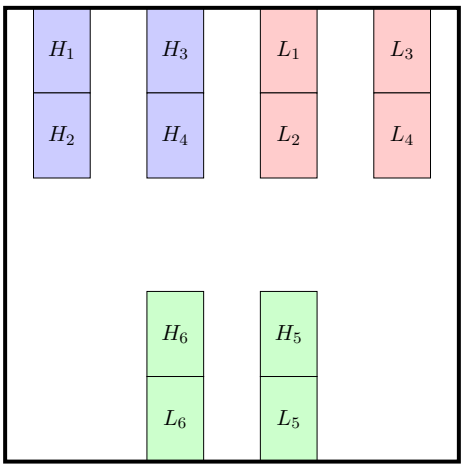
Panel A: Dorms of 4 Students



Panel B: Dorms of 3 Students



Panel C: Big Dorm of 6 Bunk Beds



Student:	H_1	H_2	H_3	H_4	L_1	L_2	L_3	L_4	H_5	L_5	H_6	L_6
3 dorms of 4 students:	D1	D1	D1	D1	D2	D2	D2	D2	D3	D3	D3	D3
4 dorms of 3 students:	D1	D1	D1	D2	D2	D2	D3	D3	D3	D4	D4	D4

Notes: This figure displays three examples of how the randomization to groups was used to allocate students to dorm rooms and classrooms.

C Psychological Tests

This section describes in detail the psychological tests that were used to construct the sociability index.

In addition to the Big Five personality traits and the peers' perceptions measures described in section 5.1, the tests used to construct the sociability index are:

C.1 The Big Five

The most widely accepted taxonomy of psychological traits, both in the literature and in my data, is the Big Five (McCrae and John, 1992; John and Srivastava, 1999).[17] The *American Psychology Association Dictionary* defines the Big Five personality traits as follows (Table 1.1 in Almlund et al. (2011)):

1. Conscientiousness: the tendency to be organized, responsible, and hardworking.
2. Openness to Experience: the tendency to be open to new aesthetic, cultural, or intellectual experiences.
3. **Extraversion**: an orientation of one's interests and energies toward the outer world of people and things rather than the inner world of subjective experience; characterized by positive affect and sociability.
4. **Agreeableness**: the tendency to act in a cooperative, unselfish manner.
5. Neuroticism or Emotional Stability: Emotional Stability is "predictability and consistency in emotional reactions, with absence of rapid mood changes." Neuroticism is a chronic level of emotional instability and proneness to psychological distress.

Only two traits from the Big Five are associated with social skills: extraversion[18] and agreeableness[19]. Empirical evidence shows that extraversion is associated with good labor market outcomes (Fletcher, 2013), and that agreeableness influences occupational decisions (Almlund et al., 2011; Cobb-Clark and Tan, 2011). These results are consistent with a study by Deming (2017) that concludes that the labor market increasingly rewards social skills.

C.2 Altruism

The altrusim self-reported scale was developed by Rushton et al. (1981). The test used in the COAR network is composed of 17 items. The score on the test is found to predict criteria such as peer ratings of altruism, completing an organ donor card, and paper-and-pencil measures of prosocial orientation (Rushton et al., 1981). More recent evidence shows that the score on the test is related to spontaneous smiles—which is an important signal in the formation and maintenance of cooperative relationships

[17] Almlund et al. (2011) summarizes the Big Five personality traits and their application to economics. Likewise, Akee et al. (2018); Donato et al. (2017); Kranton and Sanders (2017) provide recent evidence of the Big Five in economics research.

[18] The facets of extraversion correspond to: warmth (friendly), gregariousness (sociable), assertiveness (self-confident), activity (energetic), excitement seeking (adventurous), and positive emotions (enthusiastic).

[19] The facets of agreeableness are: trust (forgiving), straight-forwardness (not demanding), altruism (warm), compliance (not stubborn), modesty (not show-off), tender-mindedness (sympathetic).

(Mehu et al., 2007). Likewise, there is evidence that the score in the test is related to charity giving but not to blood donor donation behavior (Otto and Bolle, 2011).

C.3 Leadership

The leadership scale corresponds to the leader behavior questionnaire developed in Spanish by Castro-Solano (2007). It is based on the theory of Yukl (2013). The scale measures three components of leadership: (1) behaviors guided towards tasks, (2) behaviors guided towards others, and (3) behaviors guided towards changes. In my data, there is a positive correlation between the score on the scale and the number of peers who perceived the subject as a leader.

C.4 Empathy

The empathy scale corresponds to the Basic Empathy Scale developed by Jolliffe and Farrington (2006). The scale is composed of two factors: cognitive and emotional empathy. The scale has been validated in other contexts: when applied to adults (Carre et al., 2013) and the Spanish version of it (Villadangos et al., 2016). It has also been affirmed that students who report higher scores in socially aversive personalities (psychopathy, narcissism, and Machiavellianism) have a low score on the scale (Wai and Tiliopoulos, 2012). Likewise, Gambin and Sharp (2018) show that a low score on the test is associated with guilt and depressive symptoms.

C.5 Intercultural Sensitivity

This 24-item scale of intercultural sensitivity was developed by Chen and Starosta (2000). The authors define intercultural sensitivity as: "*a person's ability to develop a positive emotion towards understanding and appreciating cultural differences that promotes appropriate and effective behavior in intercultural communication.*" The scale is composed of two factors: positive and negative reactions to intercultural interactions. Evidence shows that there is a positive correlation between intercultural sensitivity and compassion in nurses (Arli and Bakan, 2018), that American student scores depend on religious affiliation and the number of times they have traveled outside the US (Gordon and Mwavita, 2018), and that Iranian university students have demonstrated a strong relationship between intercultural sensitivity and ethnic background.

C.6 Emotional Intelligence

Emotional intelligence is defined as individuals' ability to recognize their own emotions and those of others, discern between different feelings and label them appropriately, use emotional information to guide thinking and behavior, and manage and/or adjust emotions to adapt to environments or achieve one's goal(s) (Colman, 2009). The emotional intelligence test corresponds to the scale developed by Law et al. (2004). The test is composed of 16 items and has four factors: self-emotional appraisal, uses of emotion, regulation of emotion, and others' emotional appraisal.

C.7 The Read the Mind in the Eyes Test

The objective of this test is to assess how well people can read others' emotions just by looking at pictures of their eyes. It is a multiple choice test with 36 items. For each item, the respondent has to identify the corresponding emotion expressed in a pair of eyes; four choices are given for each

question. According to Deming (2017), this test is a reliable measure of social skills since it is positively correlated with performance in groups (Declerck and Bogaert, 2008). However, this measure could potentially have problems due to the cultural differences between the context where the test was developed and the context of my study. In particular, according to the website Lab in the Wild: `socialintelligence.labinthewild.org`, the test was developed in Great Britain and the images were taken from British magazines in the 1990s. Therefore, the test may not produce accurate results when administered to people who are not native speakers of English or those who come from cultures that are very different from Britain's.

C.8 Achievement Goals

While not part of the construction of the social skills index, students completed the *The Achievement Goal Questionnaire* (J. Elliot and Murayama, 2008). Achievement goals are conceptualized as cognitive–dynamic aims that focus on competence. The test is composed of 12 items and has four factors: mastery approach goal items, mastery avoidance goal items, performance-approach goal items, and performance-avoidance goal items. The last two items are related to goals in comparison with peers and are the ones I use to proxy for preferences for competition.

D Theoretical Framework

D.1 General Model

The model that I describe next is based on Compte and Postlewaite (2004). The model addresses how peer effects can shift students' beliefs about their skills—defined as self-confidence— and eventually change students' outcomes. I extend the model to two activities: (1) activities with neighbors (type n) and (2) other activities (type (o). By changing the probability of success in activities type n, students change their level of confidence which affects their general outcomes and investment decisions.[20] All proofs are provided in Appendix D.3.

In the model, the agent faces a sequence of decisions for each time period t whether she decides or not to invest in an activity. There are two types of activities: n and o. Undertaking an activity entails a cost c. This cost is stochastic with support in $[0, 1]$. The random variables $\{c_t\}_{t=1}^{\infty}$ are independent, and when the agent makes a decision at t, she knows the realization of c_t and the type of the activity n or o.

In this theoretical framework, success in both types of activities depends on the self-confidence of the agent, and her self-confidence depends on her perception of past successes. Let ρ_a denote the probability of success in an activity of type a, for $a = \{n, o\}$, and $\kappa \in (0, 1]$ as a measure of the agent's self-confidence. The model assumes that:

$$\rho_a = \kappa\mu_a,$$

where μ_a is an exogenous parameter—the probability of success in an activity of type a, that does not depend on the agent's self-confidence.

The level of self-confidence κ is a function of the empirical frequency of past successes ϕ in activities n and o:

$$\kappa = \kappa(\phi),$$

$$\phi = \gamma\phi_n + (1 - \gamma)\phi_o,$$

where $\phi_a = \frac{s_a}{s_a + f_a}$ is the frequency of success in activities of type a, s_a denotes the number of successes and f_a the number of failures. The parameter γ is the weight the agent assigns to the n activities in her past successes. I will assume that $\gamma \in (0, 1)$, so that the agent decides on both types of activities.

The model assumes that κ is a smooth and increasing function of ϕ: $\kappa = \kappa(\phi)$, where $\kappa'(\cdot) > 0$, $\kappa(0) > 0$, and, without loss of generality $\kappa(1) = 1$. Combining the two functions above, the probability of success in an activity is a function of the perception of success ϕ, where:

$$\rho_a(\phi) = \kappa(\phi)\mu_a, \text{for } a = \{n, o\}.$$

Finally, the model assumes that the effect of self-confidence on performance cannot be too strong, that is, $\rho'_a(\phi) < 1$.[21]

An equilibrium in this model implies that for each type of activity, the probability of success coincides with the agent's perception of the frequency of success. Among the possible perceptions ϕ

[20] The model in Compte and Postlewaite (2004) focuses on how biases in information processing can enhance welfare. Here, I don't introduce any bias in the recall of failures. Instead, I focus on how changes in the probability of success in activities with peers can affect the general success of the student.

[21] This assumption guarantees an interior solution for the level of self-confidence in equilibrium.

that an agent may have about the frequency of success, the one that plays a focal role is the unique perception ϕ^*, such that:

$$\phi_n^* = \kappa(\phi^*)\mu_n, \tag{11a}$$

$$\phi_o^* = \kappa(\phi^*)\mu_o, \tag{11b}$$

where $\phi^* = \gamma\phi_n^* + (1-\gamma)\phi_o^*$.

The agent assesses whether it is worth investing in an activity of type a and forms a belief p_a on whether or not she will succeed. With a belief p_{a_t} about her chance of success at time t, the agent compares the expected payoff from undertaking the activity to its cost. The agent only undertakes the activity a if and only if:

$$p_{a_t} \geq c_t.$$

The belief of success is a function of the data that she recollects: $p_a = \beta(s_a, f_a)$. This function can be interpreted as an agent who is initially unsure of the probability of success in activities a and updates her initial beliefs as she acumulates experience. The restrictions on the function β are the following:

(i) $\forall s, f \geq 0$, $0 < \beta(s_a, f_a) < 1$.

(ii) There exists $A > 0$ such that $\forall s_a, f_a > 0$, $|\beta(s_a, f_a) - s_a(s_a + f_a)| \leq \frac{A}{s_a + f_a}$.

The first assumption states that beliefs must lie between 0 and 1. The second assumption is for "asymptotic consistency", ruling out belief formation processes for which there is a permanent divergence between the agent's perceived successes and failures and her beliefs.

Compte and Postlewaite (2004) show that under these conditions, beliefs are correct in the long run, and $\lim_{t\to\infty} p_{a_t} = \rho_a(\phi^*)$. The agent invests in an activity in the long-run when $\rho_a(\phi^*) \geq c_t$, and this probability is given by:

$$Pr(c_t \leq \rho_a(\phi^*)) = \int_0^{\rho_a(\phi^*)} g(c)dc = G(\rho_a(\phi^*)),$$

where $G(\cdot)$ corresponds to the c.d.f. of the cost parameter c. I assume that $G(\cdot)$ has no flat regions.

To understand the impact of the intervention on students' self-confidence and their subsequent changes in skills, I will argue that the intervention changed the parameter μ_n: the probability of success that doesn't depend on the self-confidence of the individual in activities n. This parameter affects students' self-confidence and the likelihood of investing in activities n through two different channels: (1) a direct channel, whereby the agent exogenously becomes more likely to succeed, and (2) an indirect channel, whereby she gains self-confidence in her skills and this translates into a larger probability of success in equilibrium. Hence, through self-confidence, an increase in μ_n amplifies the probability of success for the agent in activities n. We can observe these effects by calculating the derivative of equation 11a with respect to μ_n:

$$\frac{d\phi_n^*}{d\mu_n} = \underbrace{\kappa(\cdot)}_{\text{direct channel}} + \underbrace{\kappa'(\cdot)\mu_n \frac{d\phi^*}{d\mu_n}}_{\text{indirect channel}} \tag{12}$$

Equation 12 reveals the the two channels through which changes in μ_n can affect the probability of success in equilibrium ϕ_n^*: the direct channel is given by changes in μ_n, and the indirect channel—where I choose to focus my attention—is determined by the increase in self-confidence $\kappa'(\cdot)$ of an

individual in equilibrium. Both channels jointly explain how increasing the parameter μ_n leads to an agent's higher success in activities r in equlibrium.

The changes in μ_n also affect the probability of success in other activities through self-confidence. More specifically, they affect the probability of success of the second type of activity in this model, activities of type o. We can observe this by applying the implicit funtion theorem to 11b:

$$\frac{d\phi_o^*}{d\mu_n} = \mu_o \underbrace{\kappa'(\cdot)\frac{d\phi^*}{d\mu_n}}_{\text{self-confidence}} \tag{13}$$

The overall changes in the probability of success in both types of activities, accounting for the fact that $\frac{d\phi^*}{d\mu_n}$ is also determined in equilibrium, is summarized as follows:

Proposition 1. Under the assumptions that $\kappa'(\cdot) > 0$, $\kappa(0) > 0$, $\rho_a'(\phi) < 1$, and $\gamma \in (0, 1)$, then:

1. The probability of success in activities n in equilibrium ϕ_n^* increases with μ_n.
2. The probability of success in activities o in equilibrium ϕ_o^* increases with μ_n.
3. The level of self-confidence in equilibrium $\kappa(\phi^*)$ increases with μ_n.

Corollary 1. *The probability that the agent invests in both types of activities in equilibrium is an increasing function of the parameter μ_n.*

Once the agent becomes more likely to succeed, she is willing to invest more frequently in equilibrium. There is a direct channel for activities n, and an indirect channel through which self-confidence influences an individual's success, both in activities of type n and o.

D.2 The Intervention

To understand this model in the context of my intervention, I will assume that activities n involve interactions with neighbors, and activities o do not. The randomization changed the peer characteristics and hence generated variation in the parameter μ_n. In particular, a student's success in neighbor activities depends on the characteristics of the student and her neighbors. More precisely, the parameter μ_n is determined by the types of the student and her neighbor. I consider only two types of individuals $i \in \{l, h\}$ and assume that:

$$\mu_n = \mu_n(\tau_i, \tau_j) \quad \text{for} \quad \tau_i,\ \tau_j = \{h, l\}.$$

where τ_i and τ_j are the types of individual i (the student) and j (the student's neighbor), respectively.

Furthermore, I consider two types of activities: social and academic activities.

(a) Social activities form social skills. These are described as activities where students interact with peers by having a conversation or playing a game. Neighbor activities involve interaction with neighbors and other activities involve interaction with other people. Success in a social activity can be intuitively described by a student who enjoyed the interaction.

(b) Academic activities form academic skills. Academic activities involve the likes of studying for a test, attending class or receiving support from a tutor. Success can take different shapes for neighbor and other activities. For example, success in other activities can occur when a student learns or when she receives a good grade. Alternatively, success in neighbor activities is defined as

a situation where students do not perform worse than their neighbors. That is, I will assume that students will have a lower utility if they underperfom or learn less than their neighbors: academic success in neighbor activities is determined relatively, not absolutely.

I impose two additional assumptions on the likelihood of a student's success. The probability of success in neighbor activities depends on student and neighbor types as follows:

Assumption 1. ***Social success****: The probability of success in a social neighbor activity is larger when either the student or her neighbor is high in social skills:* $\mu_n(l,l) < \mu_n(\cdot,h) = \mu_n(h,\cdot)$.

Under this assumption, a student is prone to feel good about participating in social activities with their neighbors when at least one of them is more sociable.

Assumption 2. ***Academic success****: The probability of success in a academic neighbor activity is lower when the student is a low-type and her neighbor a high-type:* $\mu_n(l,h) < \mu_n(l,l) = \mu_n(h,h) = \mu_n(l,h)$.

Under this assumption, students care about their relative ranking and avoid doing worse than their peers. A student is more likely perform worse than her neighbor when she is lower-achieving and her neighbor is higher-achieving.

Proposition 2. Under the assumption of social success:

1) When assigned to more sociable peers, in equilibrium less sociable students:
   (a) Invest more in social activities with neighbors.
   (b) Invest more in other social activities.
   (c) Increase their self-confidence in social skills.
2) More sociable students do not change their self-confidence or investment decisions on social skills.

The intuition behind this statement is that less sociable students benefit from interacting with more sociable peers. It is a direct result of proposition 1. Less-sociable students can more easily engage in conversations or other activities with more sociable—rather than less sociable—neighbors. As a result, students feel more successful in social activities. The higher the success, the more the increase in students' self-confidence, which loops back into more successful activities with neighbors as well as with other people. By contrast, the intervention did not change the probability of success of more sociable students in social neighbor activities. Hence, the sociability of neighbors does not affect the self-confidence of more sociable students. This rationalizes why more sociable students do not change their social skills under the lens of this model.

Proposition 3. Under the assumption of academic success:

1) When assigned to higher-achieving peers, in equilibrium lower-achieving students:
   (a) Invest less in academic activities with neighbors.
   (b) Invest less in other academic activities.
   (c) Decrease their self-confidence in academic skills.
2) Higher-achieving students do not change their self-confidence or investment decisions on academic skills.

The intuition behind this statement is that lower-achieving students feel less accomplished when they compare their performance to their higher-achieving neighbros. The lower the perceived success, the greater the frustration, and the lower the self-confidence, which brings down their investment in academic outcomes. The lower self-confidence loops back into less successful study interactions with their neighbors as well as other learning activities. By contrast, the intervention did not change the probability of success for higher-achieving students in academic neighbor activities. Hence, higher-achieving students did not experience changes in their academic achievement.

Why changes in self-confidence asymmetrically affect the formation of social and academic skills? The measurement of academic outcomes and social skills could potentially explain this difference. While schools regularly test academic performance and students can visibly be ranked based on it, there is no such clearly defined measure of social skills. Most measures of social skills are not only based on self-perception, but more importantly, students do not have information on the individual versus peer contribution to the formation of social skills. Hence, when they perceive a high level of social skills due to the interaction with sociable peers, students are likely to believe that their individual contribution is high, reinforcing the idea that they are successful in social activities.

D.3 Proofs

Proof of Proposition 1: In equilibrium we have that:

$$\phi_n^* = \kappa(\phi^*)\mu_n, \tag{1a}$$

$$\phi_o^* = \kappa(\phi^*)\mu_o. \tag{1b}$$

To show (1) and (2) in the proposition, we apply the implicit function theorem to 1a and 1b:

$$\frac{d\phi_n^*}{d\mu_n} = \kappa'(\cdot)\mu_n\frac{d\phi^*}{d\mu_n} + \kappa(\cdot), \tag{2a}$$

$$\frac{d\phi_o^*}{d\mu_n} = \kappa'(\cdot)\mu_o\frac{d\phi^*}{d\mu_n}, \tag{2b}$$

where $\frac{d\phi^*}{d\mu_n} = \gamma\frac{d\phi_n^*}{d\mu_n} + (1-\gamma)\frac{d\phi_o^*}{d\mu_n}$.

Solving this system of equations yields:

$$\frac{d\phi_n^*}{d\mu_n} = \frac{\kappa(\cdot) + \kappa'(\cdot)\mu_n(1-\gamma)\frac{\gamma\kappa(\cdot)\kappa'(\cdot)\mu_o}{1-(\gamma\kappa'(\cdot)\mu_n+(1-\gamma)\kappa'(\cdot)\mu_o)}}{1-\kappa'(\cdot)\mu_n}, \tag{3a}$$

$$\frac{d\phi_o^*}{d\mu_n} = \frac{\gamma\kappa(\cdot)\kappa'(\cdot)\mu_o}{1-(\gamma\kappa'(\cdot)\mu_n + (1-\gamma)\kappa'(\cdot)\mu_o)}. \tag{3b}$$

Since we assumed that $\rho_a'(\cdot) < 1$ for $a = \{n, o\}$. Then, we know that $\rho_n'(\cdot) = \kappa'(\cdot)\mu_n < 1$. Likewise, $\rho_o'(\cdot) = \kappa'(\cdot)\mu_o < 1$. This implies that $\gamma\kappa'(\cdot)\mu_n + (1-\gamma)\kappa'(\cdot)\mu_o < 1$. This assures that the denominators in both 3a and 3b are greater than zero. Notice that if $\rho_n'(\cdot) > 1$, then the right hand side of 2a is larger than the left hand side, and we are in a corner solution where $\phi_n^* = 1$. Similarly, in case $\gamma\rho_n'(\cdot) + (1-\gamma)\rho_o'(\cdot) > 1$, then the right hand side of 2b is greater than the left hand side and $\phi_o^* = 1$.

Since $\kappa(\cdot) \in (0,1)$, and it is an increasing function in ϕ, then $\kappa(\cdot) > 0$, $\kappa'(\cdot) > 0$. Similarly, μ_n and μ_o are probabilities: $\mu_n \in (0,1]$, and $\mu_o \in (0,1]$. Hence, the numerators in both expressions 3a and 3b are greater than zero. This guarantees that:

$$\frac{d\phi_n^*}{d\mu_n} > 0, \tag{4a}$$

$$\frac{d\phi_o^*}{d\mu_n} > 0. \tag{4b}$$

Hence, (1) and (2) of proposition 1 hold.

For (3), we have that $\kappa(\phi)$ is an increasing function in ϕ. We have that:

$$\phi^* = \gamma\phi_n^* + (1-\gamma)\phi_o^*$$

$$\frac{d\phi^*}{d\mu_n} = \gamma\frac{d\phi_n^*}{d\mu_n} + (1-\gamma)\frac{d\phi_o^*}{d\mu_n}.$$

Since $\gamma \in (0,1)$, and $\frac{d\phi_n^*}{d\mu_n} > 0$, $\frac{d\phi_o^*}{d\mu_n} > 0$, then $\frac{d\phi^*}{d\mu_n} > 0$. Since $\kappa(\phi)$ is an increasing function in ϕ, then $\frac{d\kappa(\phi^*)}{d\mu_n} = \kappa'(\cdot)\frac{d\phi^*}{d\mu_n} > 0$.

Proof of corollary 1: The likelihood that the agent invests in equilibrium is given by $G(\phi_a^*)$. Since $G(\cdot)$ is a c.d.f. with no flat regions then, $G(\cdot)$ is a strictly increasing function and $\phi_a^*(\cdot)$ increases with μ_n for $a = \{n, o\}$. Hence, the agent invests more in both types of activities.

Proof of Proposition 2: Under the assumption of social success, for less sociable students $\mu_n(l,l) < \mu_n(l,h)$. By applying proposition 1 and corollary 1 we obtain the result. For more sociable students $\mu_n(h,l) = \mu_n(h,h)$, and therefore they do not experience changes in self-confidence or investment decisions.

Proof of Proposition 3: Under the assumption of academic success, for lower-achieving students $\mu_n(l,h) < \mu_n(l,l)$. By applying proposition 1 and corollary 1 we obtain the result. For higher-achieving students $\mu_n(h,l) = \mu_n(h,h)$, and therefore they do not experience changes in self-confidence or investment decisions.