# When Proximity Isn't Enough: Network Segregation and SES Bias in Referrals

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## Abstract

The share of high-SES connections in one's network is a strong correlate of labor market income. We investigate whether SES biases in referral selection exacerbate differences high-SES connection shares. We conduct a lab-in-the-field experiment with 734 Colombian university students who make incentivized referrals from their enrollment networks. Randomizing participants between performance-only incentives and performance plus a fixed bonus for referral recipients, we find that referrals go to high-performing peers with whom they take many courses together, regardless of incentives. While low-SES referrers exhibit strong in-group preferences, middle- and high-SES referrers show no biases towards their own and other groups, referring along their network shares. We find that network segregation, driven by program selection based on SES, limits cross-SES referral opportunities for even without an explicit SES bias. These suggest institutional policies promoting cross-SES contact are key for reducing SES-based inequalities.

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# 1 Introduction

Equally qualified individuals face different labor market outcomes based on their socioeconomic status (Stansbury & Rodriguez, 2024). This persistent inequality undermines meritocratic ideals and represents a substantial barrier to economic mobility. A key driver of SES-based inequality in the labor market stems from differences in social capital.[1] Economic connectivity, defined as the share of high-SES connections among low-SES individuals, is an important facet of social capital because it correlates strongly with labor market income (Chetty et al., 2022a). In this sense, a lack of social capital means lack of access to individuals with influential (higher paid) jobs and job opportunities. It implies having worse outcomes when using one's network to find jobs conditional on the capacity to leverage one's social network.[2]

Research on economic connectivity has focused on two distinct mechanisms that shape cross-SES connections: network composition (who you have the chance to meet inside an institutional environment) versus individual preference (who you choose to connect with among those available). The prevailing hypothesis emerging from the seminal work of Chetty et al. (2022b) is that increasing exposure to high-SES individuals will lead low-SES individuals to connect with them at higher rates. Universities, in this regard, represent a particularly promising setting as they attract higher-than-population shares of high-SES students, and create more opportunities for cross-SES connections. However, credible evidence on biases in individual preferences to connect across SES groups remains limited. One important reason for this gap is the challenge of creating controlled environments that isolate SES biases while accounting for natural variations in network compositions.

We overcome this challenge through a lab-in-the-field experiment at a Colombian

[1] See for example Bourdieu (1986); Loury (1977) for pioneering work on the relationship between social position and human capital acquisition.

[2] See for example Lin et al. (1981); Mouw (2003) for differential outcomes while using contacts in job search, and Pedulla and Pager (2019); Smith (2005) specifically for the effects of race conditional on network use.

university. Focusing on the role of SES in referral selection, we studied whether individuals who were asked to refer a peer tended to refer a same-SES candidate. We recruited 734 undergraduate students to make incentivized referrals among peers they encountered during their coursework. Referrals were made for the math and critical reading areas of the national university entry exam, and to incentivize performance-based referral selection, participants earned payments up to $60 per referral based on their nominee's percentile ranking at the university. This setup provided an objective performance benchmark for referrals where SES biases in referral selection could still play a role.

Referrals originated from each participant's unique course enrollment network that we constructed using extensive administrative data. The enrollment network covered each course the referrer had taken with all other undergraduate students at the university (more than 4,500 individuals). It allowed us to observe both characteristics of every potential referral candidate, and the intensity of interaction between the two, which we measured by the number of courses taken together. Referrals from the enrollment networks enabled us to separate network composition (i.e., chance of meeting during coursework and frequency of contact) from SES biases in referral selection (i.e., individual choice in picking a referral). By doing so, we were able to control for naturally varying network compositions with referral candidates at the individual level, and could identify group-level SES biases in referral selection that go beyond mere opportunities to interact at the university.

We randomized participants into two conditions. In the **Baseline** condition participants made referrals with performance-based incentives only, where their earnings depended on the actual performance of their referrals. In the **Bonus** condition, participants made referrals with performance-based incentives and an additional fixed bonus ($25) going to their referral of choice. We designed the **Bonus** condition to make SES biases in referral selection even more salient. The fixed bonus created incentives to refer peers even if they performed less well, potentially amplifying the relevance of other factors like the SES bias and the connection intensity.

We find that referrals consistently go to higher-performing peers with high connection intensity (14 vs. 4 courses), regardless of the conditions and the exam area. Pooling across these, we find that SES bias in referral selection is primarily driven by low-SES participants exhibiting in-group preferences: Controlling for network composition, low-SES referrers are 45% more likely to refer other low-SES peers and 44% less likely to refer high-SES relative to middle-SES peers. In contrast, middle- and high-SES referrers show no biases toward their own or other groups.

With 93% of referrals going to peers within the same academic program with whom referrers have taken many courses together, we find that network composition rather than SES biases better explain the observed referral patterns. At the connection intensity where referrals typically occur (median 12 courses together), network segregation becomes stark: low-SES networks contain 44.5% low-SES peers versus 35% university-wide (27% increase), while high-SES networks contain only 15.7% low-SES peers (55% decrease from the university average). This segregation means that even without any bias against low-SES peers, high-SES referrers rarely encounter low-SES candidates in their practical choice sets.

Looking for potential mechanisms driving the segregation in enrollment networks, we identify program selection as key. Program fees at our partner university are fixed on a cost basis, and less than 5% of undergraduates qualify for scholarships. One consequence of these policies is that SES groups end up sorting into programs on the basis of their costs, where some programs cost up to six times more on a yearly basis. To sum, even though low-SES are exposed to higher-than-population shares of high-SES students, and high-SES are not biased toward other SES groups, meaningful interaction opportunities at the university are genuinely limited.

Our findings should be interpreted with some scope conditions. First, our referrals have no direct job consequences, and participants refer under anonymity. These may represent a lower stake environment for referrers with no potential reputational concerns. Nevertheless, we replicate typical findings from earlier referral experiments where performance-based incentives brings in qualified candidates from participant networks (e.g., Beaman and Magruder (2012); Witte (2021)).

Second, enrollment networks capture classroom-based interactions and their intensity rather than broader networks of close friendships. While our approach has clear advantages over self-reported friendship network elicitation which suffers from censoring due to limitations in size (Griffith, 2022), triangulating it with an additional method (e.g., social media friendship data) could provide useful for better identifying actual interactions at the university. Still, we find that connection intensity predicts referral selection well beyond same program affiliation, suggesting it does capture meaningful variation in social interactions in some dimension.

Finally, our setting examines SES bias within a single institution where cross-SES contact is possible, and the networks of different SES groups are separated due to program selection. The generalizability to contexts with different institutional structures remains an open question for future research.

We contribute to several strands of literature. First, a burgeoning literature studies the effects of SES on labor market outcomes (Friedman & Laurison, 2019; Laurison & Friedman, 2024; Stansbury & Rodriguez, 2024), with mechanisms including cultural matching and SES-based discrimination in the hiring processes (Galos, 2024; Núñez & Gutiérrez, 2004; Rivera, 2012; Rivera & Tilcsik, 2016). We extend this literature by examining the role of referral networks as a specific mechanism through which SES could affect economic opportunities.

A subset of the literature focuses on SES-based differences in social capital and network formation (Chetty et al., 2022a; Engzell & Wilmers, 2025; Michelman et al., 2022), with connection intensity (Gee et al., 2017; Kramarz & Skans, 2014; Sterling, 2014; Wang, 2013) and homophily (Bolte et al., 2024; Currarini et al., 2009; Jackson, 2022; McPherson et al., 2001; Montgomery, 1991) driving differences across groups. Based on the pioneering work of Currarini et al. (2010), we contribute by identifying two different types of homophily, and separate whether differential referral outcomes stem from network composition (who you know) versus taste-based biases (who you choose to interact with). Our findings suggest that structural factors impacting network composition, rather than taste-based SES biases, drive the differences in referral outcomes. Under this light, implementing mixed-program courses to increase across-SES connection intensity should be a clear policy goal in order to reduce SES-based network segregation.

Methodologically, we contribute to the literature on job referral experiments. This literature provides causal evidence on why referrals in the labor market are prevalent,[3] finding that performance-based incentives bring in qualified candidates otherwise not identified by demographic characteristics (Beaman & Magruder, 2012; Friebel et al., 2023; Pallais & Sands, 2016; Witte, 2021), and the consequences of relying upon referral hiring, which come at the cost of disadvantaging certain groups (Beaman et al., 2018; Hederos et al., 2025). We extend this literature by causally evaluating the effect of a sizeable monetary bonus for the referral candidate and exploring SES biases in referral selection.

The remainder of the paper is organized as follows. Section 2 begins with the background and setting in Colombia. Section 3 presents the empirical strategy and Section 4 presents the design of the experiment. In Section 5 we describe the experimental sample, incentives and the procedure. Section 6 discusses the results of the experiment and Section 7 discusses potential mechanisms and robustness checks. Section 8 concludes. The Appendix presents additional tables and figures as well as the experiment instructions.

# 2 Background and Setting

## 2.1 Inequality and SES in Colombia

Our experiment took place in Colombia, a country that consistently ranks highly in terms of economic inequality. The richest decile of Colombians earn 50 times more than the poorest decile (United Nations, 2023; World Bank, 2024). This economic disparity creates profound differences in outcomes across SES groups in terms of education, geo-

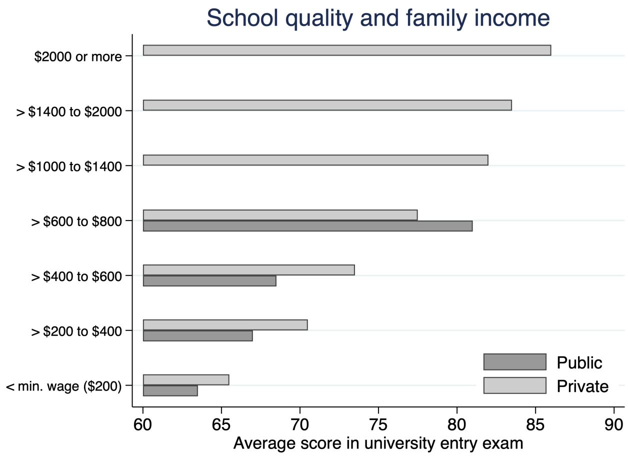
[3]Referrals solve frictions in the search and matching process and benefit both job-seekers and employers (Topa, 2019). Referral candidates tend to get hired more often, have lower turnover, and earn higher wages (Brown et al., 2016; Dustmann et al., 2016; Obukhova & Lan, 2013).

graphic residence, language, manners, and social networks (Angulo et al., 2012; García et al., 2015; García Villegas & Cobo, 2021). While similar patterns also exist elsewhere, Colombia's pronounced economic inequality makes educational and cultural differences across SES groups particularly visible.

In higher education, Colombia's pronounced economic equality manifests itself by preventing meaningful interaction between SES groups. Wealthy families attend exclusive private schools while poorer families access lower-quality public or "non-elite" private institutions (see Figure 1). Taken together, the unique ways in which economic inequality manifests itself in the Colombian higher educational setting provides the ideal conditions to study biases related to SES in referral selection.

We rely on Colombia's established estrato classification system to measure SES in our study. In 1994, Colombia introduced a nationwide system that divides the population into six strata based on "similar social and economic characteristics" (Hudson & Library of Congress, 2010, p. 102). Designed for utility subsidies from higher strata to support lower strata, the system aligns with and reinforces existing social class divisions (Guevara S & Shields, 2019; Uribe-Mallarino, 2008). It is also widely used by policymakers and in official statistics (Fergusson & Flórez, 2021a) and well known to by the public. Using the estrato system, we categorize students in strata 1-2 as low-SES, strata 3-4 as middle-SES, and strata 5-6 as high-SES.

Figure 1: Income, performance, and university choice in Colombia




*Note:* This figure shows the average score national university entry exam by monthly family income and type of higher education institution. With average student scores in the 65-70 band, the private university where we conducted this study caters to both low- and high-income students. Figure reproduced from Fergusson and Flórez (2021b).

## 2.2 Partner institution and the enrollment network

Our study takes place in a non-elite private university which attracts students across the socioeconomic spectrum: The university's undergraduate student body comprises 35% low-SES, 50% middle-SES, and 15% high-SES students.[4] This diversity provides opportunities for different SES groups to meet and interact within the same institutional framework.

The opportunities for contact at the university are on equal status. All undergraduate students pay the same fees based on their program choices, and less than 5% of undergraduate students receive scholarships. The student body is mostly urban (> 70%), not part of an ethnic minority (> 95%), and has comparable university entry exam scores (see Appendix Figures A.1a and A.1b). These make our setting appropriate to study the effects of contact on intergroup discrimination.

[4] Government statistics reveal less than 5% of the population is high-SES (Hudson & Library of Congress, 2010, p. 103).

Undergraduate students at the university choose among 32 different academic programs. Students take between 5 and 7 courses per semester, and programs last anywhere between 4 and 12 semesters (2 to 6 years). The majority (64%) of students are enrolled in the 10 programs described in Appendix Figure A.2. Medicine, the largest program by size at the university, lasts for 12 semesters, followed by engineering programs at 10 semesters. Most remaining programs last for about 8 to 10 semesters, with specialized programs for immediate entry into the workforce lasting only 4 semesters. Academic program choice thus shapes students' connections at the university, influencing both who they encounter in classes and the frequency of these interactions.

To map these social connections, we construct enrollment networks using administrative data. For each participant, we identify all other undergraduate students with whom they have taken at least one course and create their individual network of university connections. The size of this network depends on how many students a participant has encountered through coursework, while the intensity of connection is measured by the number of courses taken together. This approach provides a complete picture of each participant's social environment at the university, and includes detailed characteristics (i.e., SES, academic program, performance) for both the participant and every person in their network.

## 3 Empirical Strategy

We use a conditional logit model to study SES biases in referral selection. Our dependent variable follows a multinomial distribution where referrer $i$ selects one candidate $j$ from their enrollment network for two exam areas. For each referrer, we observe all potential candidates, i.e, students they took at least one course with, along with their characteristics. The conditional logit model with individual fixed effects takes the form:

$$Y_{ij} = \alpha_i + \beta_1 SES_{ij} + \beta X_{ij} + \varepsilon_{ij} \tag{1}$$

where $Y_{ij} = 1$ if referrer $i$ chooses referral candidate $j$, and 0 otherwise. We set middle-SES as the base category, so $\beta_1$ is the log-odds estimate for referring low- and high-SES candidates relative to middle-SES. $X_{ij}$ includes the remaining characteristics of referral candidates in the enrollment network that improve model fit such as entry exam scores and the number of courses taken together with the referrer. These continuous variables are standardized using means and standard deviations calculated by first computing network-level statistics for each referrer, then averaging across all 734 networks.[5] The individual fixed effects $\alpha_i$ control for referrer-specific factors that might influence both network formation and referral decisions. Because we observe two referrals (one per exam area) from each referrer, we cluster standard errors at the referrer level and account for the potential correlation in the error terms.

The key advantage of this approach is that by conditioning on each referrer's enrollment network, we eliminate selection bias from program choice and other factors that determine who appears in each person's choice set. The identifying variation comes from within-network differences in referral decisions, holding constant the pool of available candidates. We estimate separate models for each referrer SES group to estimate aggregate SES biases across socioeconomic groups.

For causal identification, we require two assumptions. First, conditional exogeneity. SES and the number of courses taken together could be endogenous due to program selection. High-SES students sort into expensive programs while low-SES students choose affordable programs, creating SES variation across enrollment networks. Similarly, the number of courses taken together reflects program selection decisions that may correlate with unobserved referral preferences. However, conditional on the realized enrollment network, the remaining variation in both SES and the number of courses taken together across referral candidates must be independent of unobserved factors affecting referral decisions. As a robustness check, we show that being in the same program with the referrer does not impact our SES bias estimates, although it reduces the coefficient estimate

[5] Each referral candidate's entry exam score and the number of courses they have taken with the referrer is standardized using these sample-level statistics. The standardization formula is $z_i = (x_i - \bar{X})/\sigma$, where $\bar{X}$ and $\sigma$ are the average mean and standard deviation across participant networks for the measure.

for the number of courses taken together.

Second, the independence of irrelevant alternatives. This assumption could be violated if peers within the same SES group are viewed as close substitutes, where adding similar alternatives distorts choice probabilities. While this concern may have some validity in our setting,[6] alternative discrete choice models that relax IIA are computationally prohibitive given our large dataset.[7] We therefore proceed with the conditional logit framework while acknowledging its limitations.

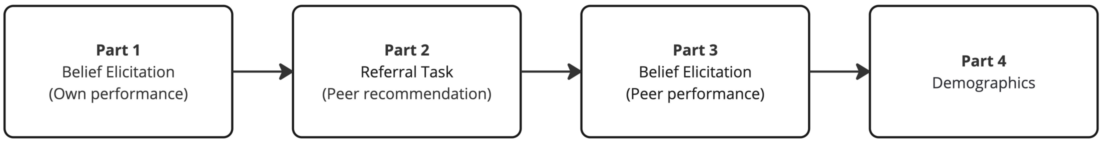
# 4 Design

We designed an experiment to assess SES biases in referral selection and to evaluate the causal effect of providing a bonus to referral candidates. The experimental design consisted of two incentivized tasks administered in the following sequence: First, participants completed belief elicitation tasks about their own performance on the national university entry exam. Second, they completed the main referral task, nominating peers based on exam performance in two academic areas. Finally, participants reported beliefs about their referrals' performance and provided demographic information. This structure allowed us to measure the accuracy of participants' beliefs and observe their referral decisions in a controlled setting. Figure 2 shows the experimental timeline, and detailed instructions are provided in Appendix B.

[6] Among participants making referrals to two different individuals, half refer to someone else from the same SES, suggesting potential substitutability within SES groups.

[7] Models such as nested logit become computationally intractable with over 250,000 observations across 734 individuals.

Figure 2: Experimental Timeline




*Note:* Participants first reported beliefs about their own university entry exam performance, then made referrals for each academic area, and finally reported beliefs about their referrals' performance and provided demographics.

### 4.1 Performance measures

To establish an objective basis for referral performance, we use national university entry exam scores (SABER 11). All Colombian high school students take the SABER 11 exam at the end of their final year as a requirement for university admission. The scores from this exam provide pre-existing, comparable measures of performance.

The exam consists of five areas (critical reading, mathematics, natural sciences, social sciences, and English). We focus on critical reading and mathematics as these represent independent and overarching skills. Critical reading evaluates competencies necessary to understand, interpret, and evaluate texts found in everyday life and broad academic fields (e.g., history). Mathematics assesses students' competency in using high school level mathematical tools (e.g., reasoning in proportions, financial literacy). These together capture performance in comprehending and critically evaluating written material as well as reasoning and problem-solving abilities.

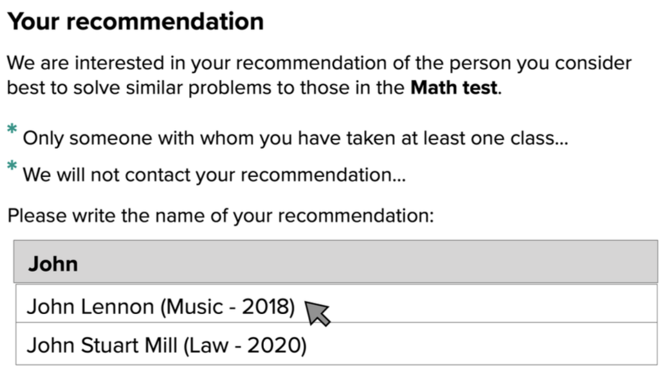
For each area, we calculate percentile rankings based on the distribution of scores among all currently enrolled students, providing a standardized measure of relative performance within the university population.

### 4.2 Referral task

The main task involves making referrals among peers. For both exam areas (critical reading and mathematics), participants refer one peer they believe excels in that area.

We provide an example question from the relevant exam area to clarify the skills that are being assessed. Participants type the name of their preferred candidate to make a referral. To avoid issues with recall, the interface provides autocomplete name and program suggestions from the administrative database (see Figure 3).

Figure 3: Referral task interface



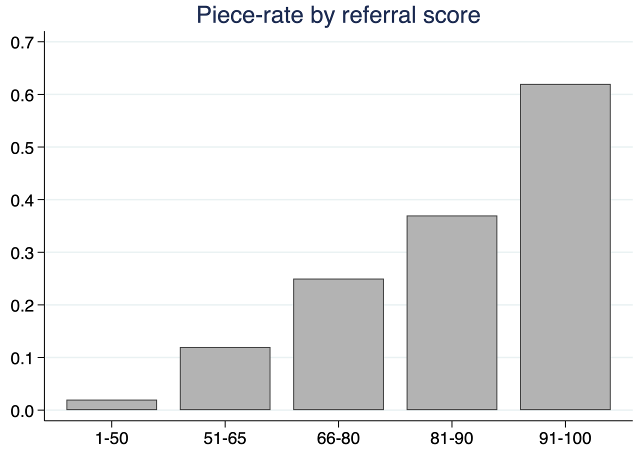

*Note:* This illustration shows how the system provides suggestions from enrolled students with their program and year of study from the administrative database.

Participants can only refer students with whom they have taken at least one class during their university studies. This requirement ensures that referrals are based on actual peer interactions. We randomize the order in which participants make referrals across the two exam areas.

We incentivize referrals using a piece rate payment structure. Referrers earn increasing payments as the percentile ranking of their referral increases (see Figure 4). We multiply the piece rate coefficient associated with the percentile rank by the actual exam scores of the referral to calculate earnings. This payment structure provides strong incentives to refer highly ranked peers with potential earnings going up to $60 per referral. [8]

[8]Note that due to the selection into the university, the actual exam score distribution has limited variance. Below a certain threshold students cannot qualify for the institution and choose a lower ranked university, and above a certain threshold they have better options to choose from.

Figure 4: Referral incentives




*Note:* This figure shows how the piece rate coefficient increases as a function of the referral ranking in the university, providing incrementally higher rewards for higher ranked peers.

### 4.3 Bonus Treatment

To examine how different incentive structures affect referral selection, we randomly assign a fixed bonus payment for students who get a referral. In the **Baseline** treatment, only the participants, i.e., those who make referrals, can earn money based on their referral's performance. The **Bonus** treatment adds a fixed payment of $25 to the peer who gets the referral. This payment is independent of the referral's actual performance (see Table 1).

Table 1: Incentive structure by treatment

| | **Baseline** | **Bonus** |
|---|---|---|
| Referrer (sender) | Performance-based | Performance-based |
| Referral (receiver) | No payment | Fixed reward |

We use a between-subjects design and randomly assign half our participants to the **Bonus** treatment. This allows us to causally identify the effect of the bonus on referral selection. Participants learn whether their referral gets the fixed bonus before making referral decisions.

### 4.4 Belief elicitation

We collect two sets of incentivized beliefs to assess the accuracy of participants' knowledge about exam performance. Participants first report beliefs about their own percentile ranking in the university for each exam area. After making referrals, participants report their beliefs about their referrals' percentile ranking in the university. For both belief elicitation tasks, participants earn \$5 per correct belief if their guess is within 7 percentiles of the true value. This margin of error is designed to balance precision with the difficulty of the task.

## 5 Sample, Incentives, and Procedure

We invited all 4,417 undergraduate students who had completed their first year at the university at the time of recruitment to participate in our experiment. A total of 837 students participated in the data collection (19% response rate). Our final sample consists of 734 individuals who referred peers with whom they had taken at least one class together (88% success rate).

Table 2 presents key demographic characteristics and academic performance indicators across treatments (see Appendix Table A.1 for selection). The sample is well-balanced between the **Baseline** and **Bonus** conditions, and we observe no statistically significant differences in any of the reported variables (all $p$ values $> 0.1$). Our sample is characterized by a majority of middle-SES students with about one-tenth of the sample being high-SES students. The test scores and GPA distributions are balanced. On average, participants had taken 3.8 courses together with members of their network, and the average network consisted of 175 peers.

Table 2: Balance between treatments

| | **Baseline** | **Bonus** | ***p*** |
|---|---|---|---|
| Reading score | 64.712 | 65.693 | 0.134 |
| Math score | 67.366 | 67.597 | 0.780 |
| GPA | 4.003 | 4.021 | 0.445 |
| Connections | 173.40 | 176.88 | 0.574 |
| Courses taken | 3.939 | 3.719 | 0.443 |
| Low-SES | 0.419 | 0.401 | 0.615 |
| Middle-SES | 0.492 | 0.506 | 0.714 |
| High-SES | 0.089 | 0.094 | 0.824 |
| Observations | 382 | 352 | 734 |

*Note:* This table presents balance tests between **Baseline** and **Bonus** conditions. $p$-values for binary outcomes are from two-sample tests of proportions; for continuous variables, from two-sample $t$-tests with unequal variances. All reported $p$-values are two-tailed. Reading and math scores are in original scale units out of 100. GPA is grade point average out of 5. Connections refer to the average number of network members. Low-SES, Med-SES, and High-SES indicate SES categories based on strata.

The experiment was conducted online through Qualtrics, with participants recruited from active students. To ensure data quality while managing costs, we randomly selected one in ten participants for payment. Selected participants received a fixed payment of \$17 for completion. They also received potential earnings from one randomly selected belief question (up to \$5) and one randomly selected referral question (up to \$60). This structure resulted in maximum total earnings of \$82. The average time to complete the survey was 30 minutes, with an average compensation of \$80 for the one in ten participants randomly selected for payment. Payment processing occurred through bank transfer within 15 business days of participation.

# 6 Results

## 6.1 Network characteristics

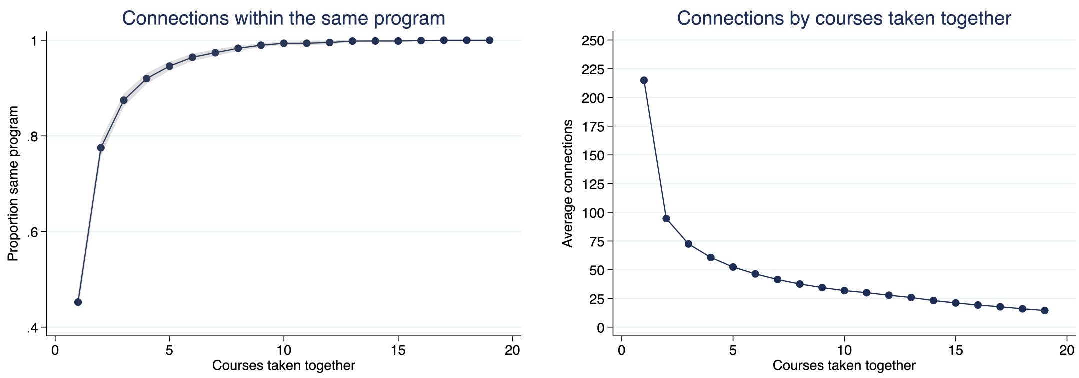
We begin by describing the key features of the enrollment networks. On average, participants connect with 175 other students, and take an average of 3.62 courses together. Figure 5 shows how network characteristics vary by students' time at the university: both the number of connections (network size) and the number of courses taken together (connection intensity) change as participants progress through their studies.

Figure 5: Network size and courses taken together by time spent at the university


*Note:* This figure displays the average number of connections in blue and the average number of courses taken together with connections in gray across semesters completed. Network size (nb. of connections) peaks around 7 semesters before declining as students graduate. Connection intensity (nb. of courses taken) has an increasing trend.

We now examine how connection intensity relates to network size and composition. First, if two students take more courses together, it is very likely that they are in the same academic program. We plot this relationship in Figure 6a: As students take more than 5 courses together, the share of students in their enrollment network from the same academic program quickly exceeds 90%. Second, because students sort into specialized academic programs, increases in courses taken together should result in decreases in connections. We plot this relationship in Figure 6b: As students take more than 5 courses together, the size of their enrollment network drops dramatically from above 210 to below 50. These patterns reveal that while participants' overall networks are large with relatively few courses taken together on average, they are more frequently in contact within a much smaller group of peers from the same academic program.

Figure 6: Network characteristics and courses taken together




(a) Same-program share

(b) Network size

*Note:* The left panel illustrates the share of connections within the same program as a function of the number of courses taken together. The right panel shows the average network size as a function of the number of courses taken together. Taking more than 5 courses together with a network member means on average 90% chance to be in the same program. Similarly, past 5 courses together, the average network size dwindles by 80%, from more than 210 individuals to below 50.

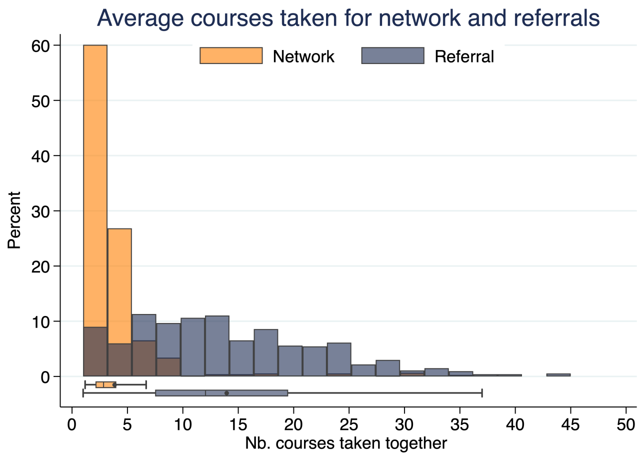
## 6.2 Referral characteristics

Participants made one referral for math and one referral for the reading part of the university entry exam from their enrollment networks. We observe 1,342 referrals from 734 participants in our final dataset. More than 90% of these consist of participants referring for both exam areas (see Appendix Table A.2). About 70% of these referrals go to two separate individuals. We compare the outcomes across exam areas for referrals only going to separate individuals in Appendix Table A.3 and all referrals in Appendix Table A.4. In both cases, we find no meaningful differences between referrals made for math or critical reading areas of the entry exam. As referrals in both exam areas come from the same enrollment network, we group referrals per participant and report average outcomes.

What are the characteristics of the individuals who receive referrals, and how do they compare to others in the enrollment network? Because we have an entire pool of potential candidates with one referral chosen from it, we compare the distributions for our variables of interest between the referred and non-referred students.

First, referrals go to peers with whom the referrer has taken around 14 courses with on average, compared to almost 4 on average with others in their network (see Figure 7). This difference of 10.1 courses is significant ($t = 34.98$, $p < 0.001$), indicating that referrers choose individuals with whom they have higher contact intensity. While the median referral recipient has taken 12 courses together with the referrer, the median network member has shared only 2.8 courses. The interquartile range for referrals spans from 7.5 to 19.5 courses, compared to just 2.1 to 4.0 courses for the broader network, highlighting the concentration of referrals among peers with higher connection intensity. In addition, 93% of referrals go to students in the same program as the referrer.

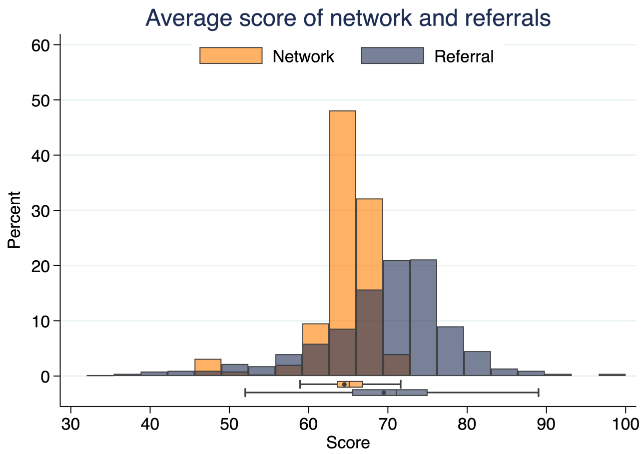
Figure 7: Courses taken together with network members and referrals




*Note:* This figure compares the distributions of the number of courses taken together between referrers and their network members (orange) versus referrers and their chosen referral recipients (dark blue) for all 734 participants. 75% of referral recipients take more than 7.5 courses together with the referrer, compared to only 25% of network members. The distributions are significantly different (Kolmogorov-Smirnov test $D = 33.37$, $p < 0.001$).

Second, we examine entry exam score differences between referred students and the broader network. Referrals go to peers with an average score of 69.5 points, compared to 64.5 points for other network members (see Figure 8). This difference of 5 points is significant ($t = 18.97$, $p < 0.001$), indicating that referrers choose higher-performing peers. While the median referral recipient scores 71 points, the median network member scores 65.1 points. The interquartile range for referrals spans from 65.5 to 75 points, compared to 63.5 to 66.9 points for the broader network, highlighting the concentration of referrals among higher performing peers.

Figure 8: Entry exam scores of network members and referrals




*Note:* This figure compares the distributions of entry exam scores (Math and Reading average) between referrers' network members (orange) versus their chosen referral recipients (dark blue) for all 734 participants. 75% of referral recipients score above 65.5 points compared to only 25% of network members scoring above 66.9 points. The distributions are significantly different (Kolmogorov-Smirnov test $D = 71.16$, $p < 0.001$).

### 6.3 Effect of the Bonus treatment

Do referrals across treatments have different outcomes? We compare the performance and the number of courses taken together with the referrer between the **Baseline** and **Bonus** treatments in Table 3. We find that the number of courses taken together with referrer, as well as performance measures across Reading, Math, and GPA are similar across treatments. Taken together, the similarities in academic performance and connection intensity suggest these two factors drive referrals regardless of treatment. For this reason, in the remainder of the paper, we report pooled results combining the averages of referral outcomes across treatments.

Table 3: Characteristics of referrals by treatment

| | **Baseline Referred** | **Bonus Referred** | ***p*** |
|---|---|---|---|
| Reading score | 67.806 | 67.210 | 0.308 |
| Math score | 70.784 | 70.155 | 0.406 |
| GPA | 4.155 | 4.149 | 0.799 |
| Courses taken | 13.840 | 14.065 | 0.723 |
| Observations | 382 | 352 | |

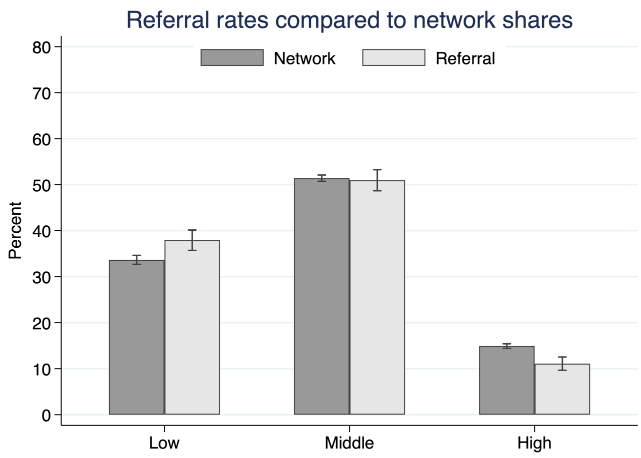
*Note:* This table compares the characteristics of network members who were referred under baseline vs bonus treatment conditions. $p$-values for binary outcomes are from two-sample tests of proportions; for continuous variables, from two-sample $t$-tests with unequal variances. All reported $p$-values are two-tailed. Reading and math scores are raw test scores out of 100. GPA is grade point average out of 5. Courses taken is the number of courses participant has taken with their referral. Both columns only include network members who were referred in each treatment.

## 6.4 Referral SES composition

To motivate the SES biases in referral selection, we now examine the overall SES composition of referrals compared to the average network availability. Descriptively, referral patterns largely mirror underlying network structure.[9] Referrals to low-SES peers constitute 37.9% of all referrals compared to 33.7% network share, middle-SES referrals account for 51.0% versus 51.4%, and high-SES referrals represent 11.1% compared to 14.9% (see Figure 9). The largest deviation is less than 5 percentage points for any SES group.

[9] Because we estimate the share of SES groups in every individual network, we get very precise estimates of the actual means. However, it is important to note that these are not independent observations. Each enrollment network is a draw with replacement from the same pool of university population, from which we calculate the proportion of SES groups per individual network, and take the average over an SES group. Pooling over SES groups who are connected with similar others systematically reduces variance (similar to resampling in bootstrapping). For this reason we choose not reporting test results in certain sections including this one and focus on describing the relationships between SES groups.

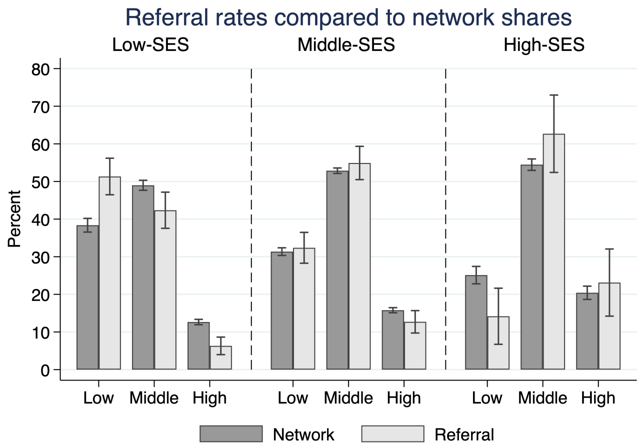
Figure 9: Referral patterns compared to network composition




*Note:* This figure compares the average SES composition of referrers' networks (dark gray) to the SES composition of referrals (light gray). Error bars represent 95% confidence intervals.

Examining patterns by referrer SES reveals larger deviations. Low-SES referrers have the largest same-SES deviation, referring 12.9 percentage points more to low-SES students than their network composition suggests, while high-SES referrers under-refer to low-SES students by 10.9 percentage points (see Figure 10). These descriptive findings suggest that referral selection in SES terms diverges most from underlying network structure when SES groups are further apart, and motivate our formal analysis.

Figure 10: Referral patterns by referrer SES compared to network composition




*Note:* This figure compares the average SES composition of referrers' networks (dark gray) to the SES composition of referrals (light gray) for low-, middle- and high-SES referrers (left to right). Error bars represent 95% confidence intervals.

## 6.5 Identifying the SES bias in referrals

We now describe our findings using the regression specification (see Equation 1) in Table 4. We first run three separate regressions, one for each referrer SES group, with a single regressor which is the referral candidate's SES. Controlling for network composition, we find that low-SES participants are more likely to refer other low-SES, and are less likely to refer high-SES relative to the probability of referring middle-SES peers. In contrast, we find that high-SES participants are less likely to refer other low-SES, relative to the probability of referring middle-SES peers.

Table 4: SES bias in referral decisions by referrer SES group

| | Referrer SES | | |
|---|---|---|---|
| | Low | Middle | High |
| | (1) | (2) | (3) |
| Low-SES referral | 0.453*** | -0.019 | -0.710** |
| | (0.109) | (0.098) | (0.333) |
| High-SES referral | -0.584*** | -0.255* | 0.001 |
| | (0.211) | (0.145) | (0.261) |
| $\chi^2$ | 33.47 | 3.18 | 4.94 |
| Observations | 110,142 | 127,088 | 19,767 |
| Individuals | 301 | 366 | 67 |

*Note:* Individual-level clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Each column represents a separate conditional logit regression estimated on the subsample of referrers from the indicated SES group. Coefficients represent log-odds of referring from the specified SES group relative to referring middle-SES candidates. All models include individual fixed effects that control for each referrer's choice set composition.

Next, we include a control for connection intensity. We proceed by adding the standardized number of courses taken together as a control in our specification and describe the results in Table 5. A one standard deviation increase in the number of courses taken together proves to be highly significant across all models, with coefficients ranging from 0.856 to 1.049, indicating that connection intensity substantially increases the probability of referral. The high $\chi^2$ statistics suggest that the model with this regressor provides a better fit than previous models. We find that low-SES participants still show a strong same-SES bias relative to referring middle-SES peers at the average number of courses taken together. This same-SES bias is not observed among middle-SES or high-SES referrers, who also display no statistically significant bias toward low-SES candidates. No referrer group shows a positive bias for high-SES candidates relative to middle-SES candidates.

Table 5: SES bias in referral decisions by referrer SES group

| | Referrer SES | | |
|---|---|---|---|
| | Low | Middle | High |
| | (1) | (2) | (3) |
| Low-SES referral | 0.348*** | -0.064 | -0.489 |
| | (0.123) | (0.115) | (0.337) |
| High-SES referral | -0.366 | -0.165 | -0.140 |
| | (0.223) | (0.157) | (0.286) |
| Courses taken (z-score) | 0.856*** | 0.931*** | 1.049*** |
| | (0.035) | (0.037) | (0.126) |
| $\chi^2$ | 626.15 | 636.10 | 71.43 |
| Observations | 110,142 | 127,088 | 19,767 |
| Individuals | 301 | 366 | 67 |

*Note:* Individual-level clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Each column represents a separate conditional logit regression estimated on the subsample of referrers from the indicated SES group. Coefficients represent log-odds of referring from the specified SES group relative to referring middle-SES candidates. All models include individual fixed effects that control for each referrer's choice set composition.

We then add standardized entry exam scores as a second control variable and describe our results in Table 6. A one standard deviation increase in the entry exam score (math and critical reading average) proves highly significant across all models, with coefficients ranging from 0.587 to 0.883. This shows merit-based considerations due to the incentive structure of the experiment remained central to referral decisions. The slightly higher $\chi^2$ statistics compared to the earlier specification suggests that entry exam scores improve model fit. The inclusion of standardized entry exam scores strengthens SES biases: Low-SES referrers maintain their same-SES bias, with now a significant negative bias against high-SES. Middle-SES referrers, previously showing no SES bias, now show marginal negative bias against high-SES. Finally, high-SES referrers exhibit marginal negative bias against low-SES candidates.

The evidence of a bias becoming significant when controlling for entry exam scores has a nuanced interpretation. While at the university-level, low-SES typically score lower in the entry exam, low-SES students appearing in high-SES networks are positively selected, scoring about 0.14 standard deviations higher than middle-SES students (see Appendix Table A.5). Controlling for performance thus removes this positive selection and reveals the SES bias that was previously underestimated by above average performance of low-SES. Vice versa, high-SES in low-SES networks perform 0.12 standard deviations better than middle-SES students. The bias was underestimated as high-SES candidates' better performance relative to middle-SES increased referrals. Controlling for exam scores reveal that both high- and low-SES referrers have negative SES bias towards one another that operates independently of – and counter to – performance-based considerations. What makes a symmetric bias interpretation difficult is that while biased against low-SES, high-SES referrers do not (under any specification) display a positive bias towards their in-group.

We conclude that the SES bias in referral selection is primarily driven by low-SES referrers who exhibit strong in-group preferences. Middle- and high-SES referrers show no systematic discrimination against other SES groups once we account for network composition and other relevant factors contributing to the referral decision. We will next explore potential mechanisms that help explain this unexpected result.

Table 6: SES bias in referral decisions by referrer SES group with academic performance controls

| | Referrer SES | | |
|---|---|---|---|
| | Low | Middle | High |
| | (1) | (2) | (3) |
| Low-SES referral | 0.242** | -0.159 | -0.600* |
| | (0.123) | (0.114) | (0.327) |
| High-SES referral | -0.445** | -0.274* | -0.345 |
| | (0.222) | (0.157) | (0.287) |
| Courses taken (z-score) | 0.859*** | 0.948*** | 1.043*** |
| | (0.036) | (0.038) | (0.118) |
| Entry exam (referral z-score) | 0.607*** | 0.587*** | 0.883*** |
| | (0.052) | (0.047) | (0.111) |
| $\chi^2$ | 789.87 | 756.06 | 120.54 |
| Observations | 110,142 | 127,088 | 19,767 |
| Individuals | 301 | 366 | 67 |

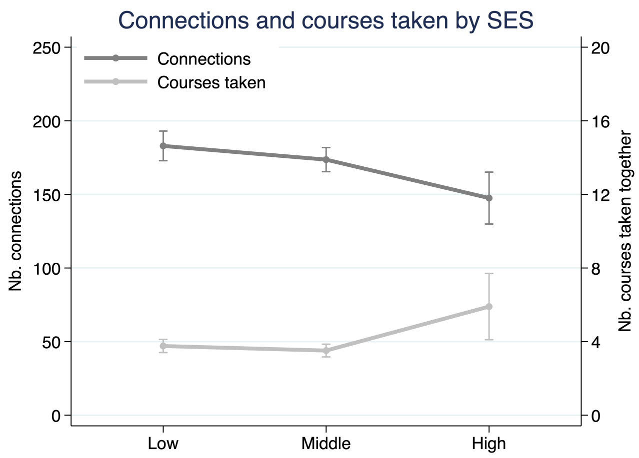
*Note:* Individual-level clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Each column represents a separate conditional logit regression estimated on the subsample of referrers from the indicated SES group. Coefficients represent log-odds of referring candidates from the specified SES group relative to referring middle-SES candidates. All models include individual fixed effects that control for each referrer's choice set composition.

# 7 Potential Mechanisms and Robustness Checks

## 7.1 SES diversity in networks

How do enrollment networks differ across SES groups? We look at how the number of connections (network size) and number of courses taken together (connection intensity) change across SES groups in Figure 11. Both low- and middle-SES students have significantly larger networks than high-SES students ($t = 3.03$, $p = 0.003$ and $t = 2.49$, $p = 0.013$, respectively), while high-SES students take significantly more courses with their network members than both low- ($t = -3.70, p < .001$) and middle-SES ($t = -4.20$, $p < .001$).

Figure 11: Network size and courses taken together by SES




*Note:* This figure displays the average number of connections and the average number of classes taken together across SES groups. The data shows a decrease in the number of connections with SES, and an associated increase in the number of classes taken together.

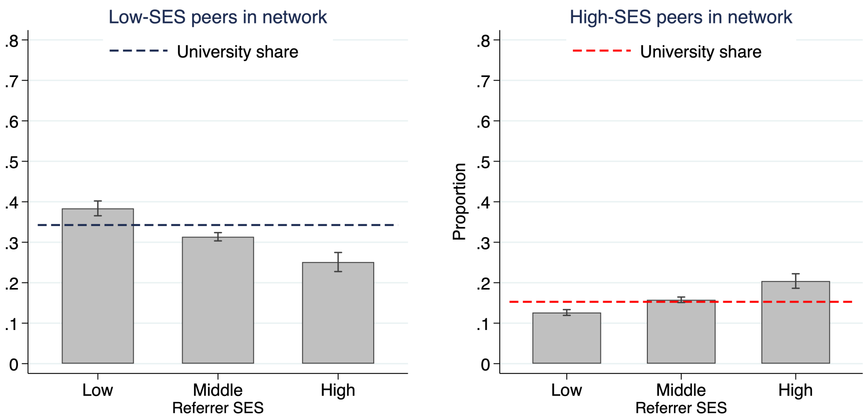
What are the diversity consequences of SES-driven differences across networks? In terms of network compositions, participants could connect with other SES groups at different rates than would occur randomly depending on their own SES. Figure 12a and Figure 12b illustrate the average network shares conditional on referrer SES respectively for low- and high-SES.[10] We observe modest deviations from university-wide SES shares in enrollment networks: Low-SES referrers have on average 38.4% low-SES peers compared to the university average of 34.3%, while high-SES referrers have 20.4% high-SES

[10]For sake of brevity we omit middle-SES from this exposition. For the complete relationship, see Appendix Figure A.3.

connections compared to the university average of 15.3%.

We find larger differences when studying connections between SES groups: Low-SES referrers connect with other low-SES at much higher rates than high-SES referrers (38.4% vs 25.1%). Conversely, high-SES referrers connect more with other high-SES than low-SES referrers (20.4% vs 12.6%). Middle-SES referrers are in between the two extreme patterns, connecting with middle-SES at higher rates than low-SES referrers (52.9% vs 49.0%) but lower rates than high-SES referrers (52.9% vs 54.5%). These findings indicate SES-based segregation in networks, with same-SES homophily across groups.

Figure 12: Network shares of SES groups

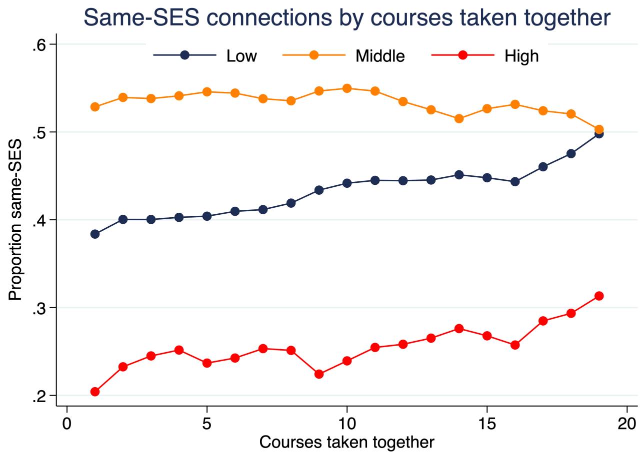



(a) Low-SES network share (b) High-SES network share

*Note:* Figures illustrate the average network shares of low- and high- SES peers conditional on referrer SES. Horizontal lines plot the university-wide shares of SES groups (Low: 34%, High: 15%). While the share of low-SES peers in the network decreases as referrer SES increases, the share of high-SES peers in the network increases. Error bars represent 95% confidence intervals.

While same-SES students are connected more often with each other, so far we only consider the average the number of courses taken together with network members. What are the diversity implications of increased connection intensity between students? As students take more courses together with peers, the share of same-SES peers in the networks of low- and high-SES increases while the share of middle-SES declines (see Figure 13). Both increases are substantial, amounting to 50% for high-, and 30% for low-SES beyond 15 courses together. While it is known that students who take courses together have similar characteristics (Kossinets & Watts, 2009), it is important to understand how increasing similarities in SES reflects on referral choice sets.

Figure 13: Network size and connection intensity




*Note:* This figure illustrates the shares of same-SES connections for low-, middle-, and high-SES as a function of the average number of courses taken together with network members. Low- and high-SES networks both become more homogenous as the average number of courses taken together with their connections increase.

### 7.2 SES diversity in referral choice sets

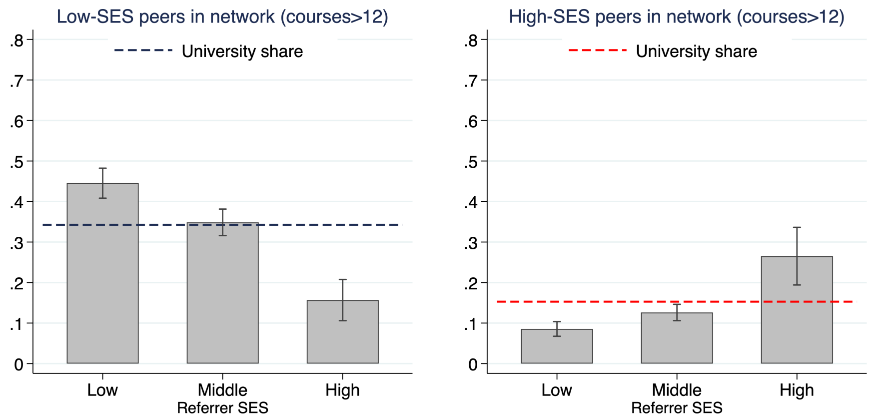
How did the referrer choice sets look like in practice? We now combine our findings about network segregation with referral selection. In Section 6.2, we found that referrals went to peers with whom the median participant took 12 courses (average 14). By restricting the networks for courses taken above the median, we get an *ex post* snapshot of referrer choice sets.

We show the average network shares conditional on referrer SES and above median number of courses taken together for low-SES in Figure 14a and for high-SES in Figure 14b.[11] Network compositions above the median number of courses taken reveal strong segregation effects in referral choice sets: Low-SES networks contain 44.5% low-SES peers, higher than the 35% university-wide share by 9.5 percentage points. Conversely, high-SES students are under-represented in low-SES networks at only 8.6% average share, compared to the 14% university share (−5.4 pp.). At the other extreme, high-SES networks show the reverse pattern with average low-SES share dropping to just 15.7%, a 19.3 percentage point decrease relative to the university average. High-SES students have a same-SES concentration at 26.5%, doubling their 14% university share (+12.5 pp.). Middle-SES networks remain relatively balanced and closely track university proportions.

Put differently, in an environment where 1 out of 3 students are low-SES, the chance that a low-SES peer is considered for a referral by high-SES is already less than 1/6. This stark disparity reveals that low-SES and high-SES students practically have separate networks within the same university, despite the opportunities to meet as equal-status students. The network segregation makes cross-SES referrals structurally unlikely even without any taste-based SES biases. We now explore program selection that emerges as a key driver of this segregation.

[11] In Appendix Figure A.4 we present the complete relationship including middle-SES.

Figure 14: Network shares of SES groups above median connection intensity



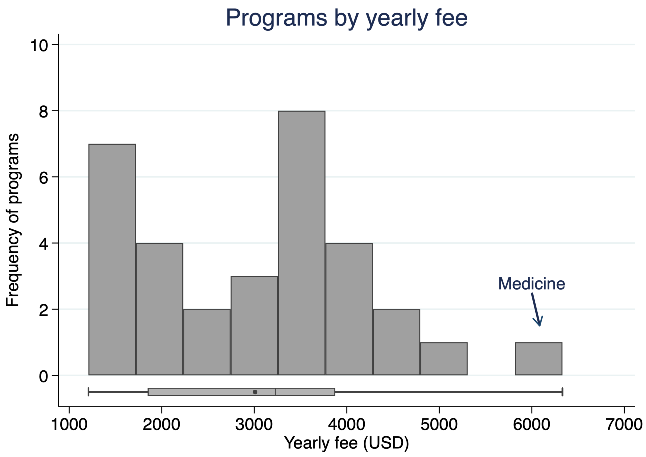

(a) Low-SES network share (b) High-SES network share

*Note:* Figures illustrate the average network shares of low- and high- SES peers conditional on referrer SES above the median number of courses taken together. Horizontal lines plot the university-wide shares of SES groups (Low: 34%, High: 15%). While the share of low-SES peers in the network decreases as referrer SES increases, the share of high-SES peers in the network increases. Error bars represent 95% confidence intervals.

### 7.3 Program selection as a mechanism

Academic programs at this university have cost-based pricing, and typically less than 5% of students receive any kind of scholarship. Based on this, we first calculate how much every undergraduate program at the university is expected to cost students per year (see Figure 15). Considering that net minimum monthly wage stands at $200 and the average Colombian salary around $350, the cost differences between programs are large enough to make an impact on program selection. Is it the case that SES groups select into programs with financial considerations?

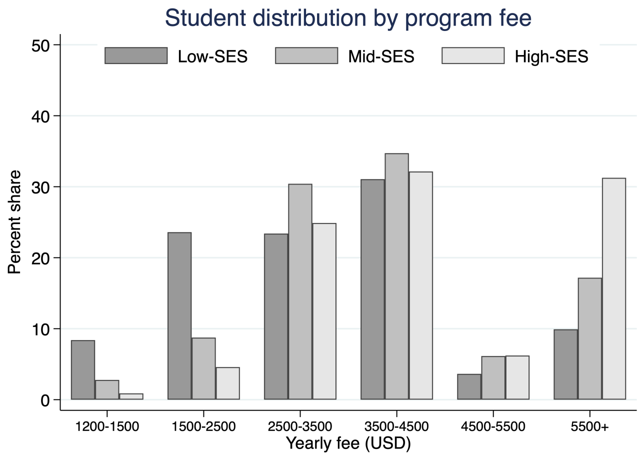
Figure 15: Undergraduate programs sorted by fee




*Note:* This figure illustrates the distribution of programs at the university by their average yearly fee. The average yearly fee stands at \$3000, and medicine is an outlier at \$6000.

To answer, we examine how SES groups are distributed across programs to identify evidence of SES-based selection (see Figure 16). Indeed, low-SES students select into more affordable programs, followed by middle-SES students. High-SES students sort almost exclusively into above-average costing programs, with a third selecting into medicine and creating a very skewed distribution. The distributions are significantly different across all pairwise comparisons: low-SES vs. middle-SES (Kolmogorov-Smirnov test $D = 33.89$, $p < 0.001$), low-SES vs. high-SES ($D = 31.31$, $p < 0.001$), and middle-SES vs. high-SES ($D = 31.31$, $p < 0.001$). These findings support the idea that program selection could be the reason why low- and high-SES networks tend to segregate as the number of courses taken increases. Financial constraints channel students into different academic programs, which in turn determine their classroom interactions and university social networks.

Figure 16: SES distribution by program fee




*Note:* This figure illustrates the distribution of each SES group across programs sorted by fee. The majority of low-SES select into programs with below average cost, while high-SES select into programs with above average cost. Medicine accounts for a third of all high-SES students at this university.

### 7.4 Robustness check: Connection intensity and sharing academic programs

Does the number of courses taken together have an independent effect that goes beyond identifying peers in the same academic program? To evaluate this question we leverage our administrative data, and identify peers within the same program: In each individual network we observe the participant-specific academic program for the participant making the referral and alternative-specific academic program for each referral candidate. We add this new variable in our specification and describe our findings in Table 7. Being in the same academic program has a substantial positive effect on referral likelihood, with coefficients ranging from 1.257 to 2.198 across all referrer SES groups. This confirms that program affiliation serves as a strong predictor of referral decisions. Our comparison of interest is the point estimate for the standardized number of courses taken. Across all three referrer groups, the standardized number of courses taken together maintains its statistical significance after controlling for same program membership. The coefficient magnitudes are expectedly smaller compared to specifications without program controls (ranging from 0.688 to 0.930) as the newly added variable is a moderator: Matching academic programs leads to taking more courses together. The remaining estimates in our model remain robust to the inclusion of the same-program variable with little change in point estimates. The persistence of statistical significance (all $p < 0.001$) suggests that the number of courses taken together has an independent effect on referral decisions. To sum, our measure of connection intensity seems to capture meaningful social interaction patterns that lead to referrals, and go beyond simply identifying matching academic programs.

Table 7: SES bias in referral decisions by referrer SES group with program controls

| | Referrer SES | | |
|---|---|---|---|
| | Low | Middle | High |
| | (1) | (2) | (3) |
| Low-SES referral | 0.236** | -0.140 | -0.567* |
| | (0.119) | (0.111) | (0.331) |
| High-SES referral | -0.421* | -0.249 | -0.383 |
| | (0.220) | (0.158) | (0.281) |
| Entry exam (referral z-score) | 0.623*** | 0.590*** | 0.892*** |
| | (0.054) | (0.048) | (0.114) |
| Courses taken (z-score) | 0.688*** | 0.760*** | 0.930*** |
| | (0.032) | (0.035) | (0.119) |
| Same program | 2.074*** | 2.198*** | 1.257*** |
| | (0.215) | (0.185) | (0.467) |
| $\chi^2$ | 865.35 | 981.99 | 135.47 |
| Observations | 110,142 | 127,088 | 19,767 |
| Individuals | 301 | 366 | 67 |

*Note:* Individual-level clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Each column represents a separate conditional logit regression estimated on the subsample of referrers from the indicated SES group. Coefficients represent log-odds of referring candidates from the specified SES group relative to referring middle-SES candidates. All models include individual fixed effects that control for each referrer's choice set composition.

# 8 Conclusion

We investigate whether SES biases in referral selection stem from taste-based preferences in choosing an SES group over others or network segregation. Through a lab-in-the-field experiment with 734 university students making incentivized referrals from their unique enrollment networks, we find that institutional factors dominate individual preferences.

Our key findings are threefold. First, referral patterns remain unchanged across different incentive structures: participants consistently select high-performing peers with a high number of courses taken together regardless of whether referral recipients receive additional compensation. Second, we find an SES bias is that is asymmetric and limited. While low-SES referrers exhibit strong in-group preferences, middle- and high-SES referrers show no bias toward their own and other groups. Third, network segregation driven by cost-based program selection explains most referral patterns. At typical referral range measured by the number of courses taken together, low-SES and high-SES students have dramatically different choice sets, with high-SES networks containing only 15.7% low-SES peers compared to 34% university-wide.

These results have important policy implications. While universities expose low-SES students to higher-than-population shares of high-SES peers, segregation within institutions limits meaningful interaction across SES. Our findings suggest that institutional interventions promoting cross-SES contact, represents a promising approach to reduce SES-based inequality in opportunity transmission. Future research should explore the causal effects of specific institutional interventions such as mixed seating (Rohrer et al., 2021), or cross-SES mentoring programs (Alan & Kubilay, 2025), that increase interactions between with SES groups.

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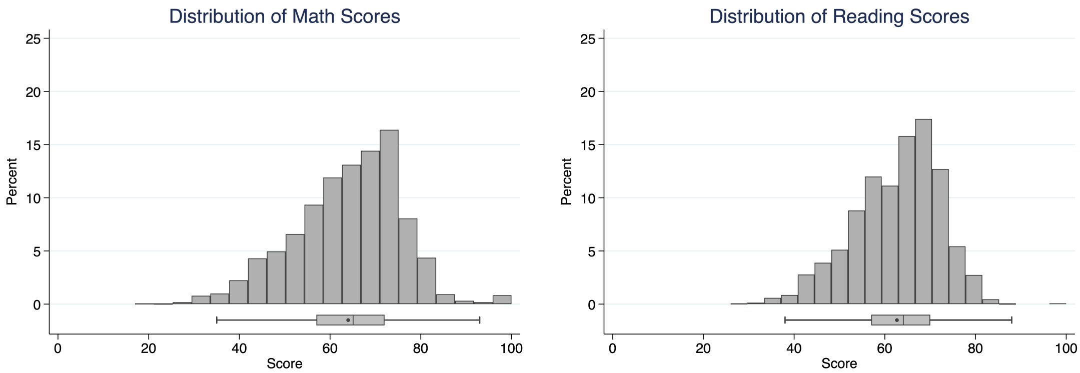
# A Additional Figures and Tables

## Additional Figures

Figure A.1: Distribution of exam scores at the university

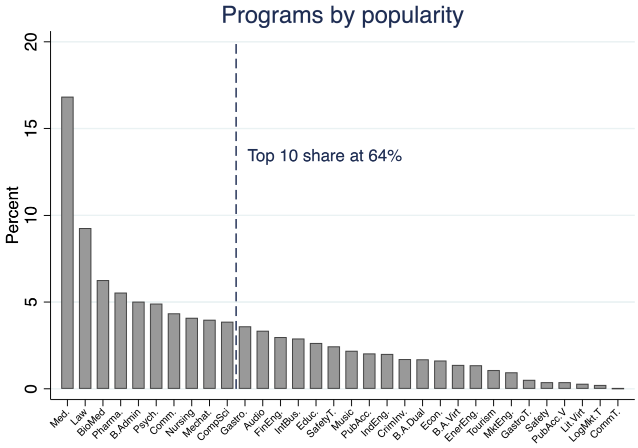



(a) Math scores at the university

(b) Reading scores at the university

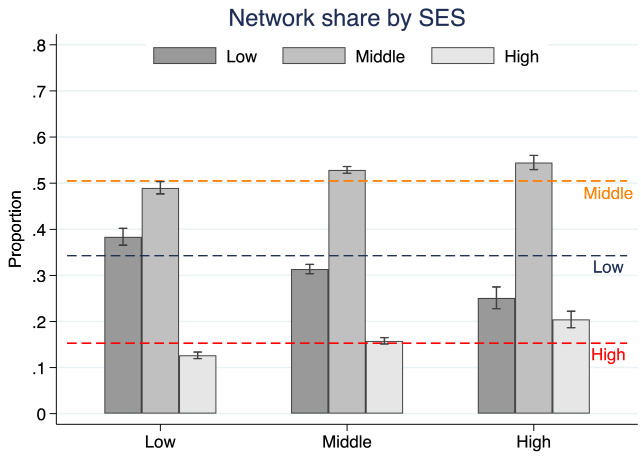
*Note:* Reading scores (left panel) and math scores (right panel) show tight distributions with approximately 75% of students falling within just 13-15 points of each other.

Figure A.2: Distribution of students across undergraduate programs



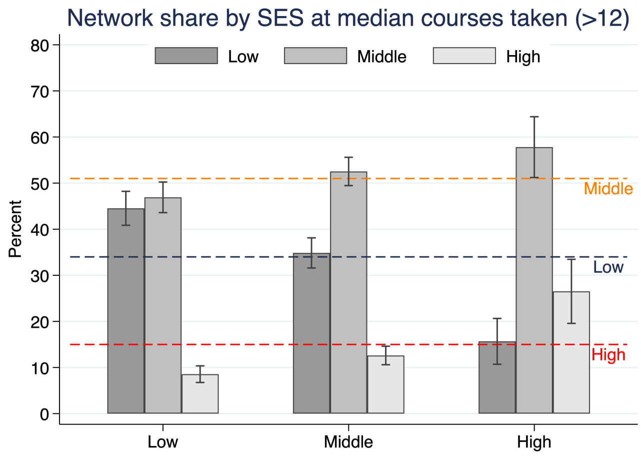

*Note:* This figure shows the concentration of students across 32 undergraduate programs at the university. Students cluster around certain programs. The top 5 most popular programs (Medicine, Law, Biomedical Engineering, Pharmacy Technology, and Business Administration) account for 43% of all undergraduates, and the top 10 most popular programs account for 63% of students.

Figure A.3: Network shares by SES




*Note:* This figure displays the average network shares of SES groups respectively for low-, middle-, and high-SES referrers. Horizontal lines plot the university-wide shares of each SES group (Low: 35%, Mid: 51%, High: 14%). While the share of low-SES peers in the network decreases as the SES of the referrers increases, the share of high-SES peers in the network increases. Error bars represent 95% confidence intervals.

Figure A.4: Network shares by SES at courses taken above 12




*Note:* This figure displays the average network shares of SES groups respectively for low-, middle-, and high-SES referrers above the median number of courses taken together. Horizontal lines plot the university-wide shares of each SES group (Low: 35%, Mid: 51%, High: 14%). Low- and high-SES networks both become same-SES dominated at the expense of each other while middle-SES networks remain balanced. Error bars represent 95% confidence intervals.

## Additional Tables

Table A.1: Selection into the experiment

| | **University** | **Sample** | ***p*** |
|---|---|---|---|
| Reading score | 62.651 | 65.183 | $< 0.001$ |
| Math score | 63.973 | 67.477 | $< 0.001$ |
| GPA | 3.958 | 4.012 | $< 0.001$ |
| Low-SES | 0.343 | 0.410 | $< 0.001$ |
| Middle-SES | 0.505 | 0.499 | 0.763 |
| High-SES | 0.153 | 0.091 | $< 0.001$ |
| Female | 0.567 | 0.530 | $< 0.001$ |
| Age | 21.154 | 20.651 | $< 0.001$ |
| Observations | 4,417 | 734 | |

*Note:* This table compares characteristics between the university and the experimental sample. $p$-values for binary outcomes (Low-SES, Med-SES, High-SES, Female) are from two-sample tests of proportions; for continuous variables, from two-sample $t$-tests with unequal variances. All reported $p$-values are two-tailed.

Table A.2: Distribution of referrals by area

| **Area** | **Only one area** | **Both areas** | **Total** |
|---|---|---|---|
| Verbal | 65 | 608 | 673 |
| Math | 61 | 608 | 669 |
| Total | 126 | 1,216 | 1,342 |

*Note:* The table shows how many referrers made referrals in only one area versus both areas. "Only one area" indicates individuals who made referrals exclusively for one area of the exam. "Both areas" shows individuals who made referrals in both verbal and math areas. The majority of referrers (608) made referrals in both areas.

Table A.3: Referral characteristics by exam area (unique referrals only)

| | **Reading** | **Math** | $\boldsymbol{p}$ |
|---|---|---|---|
| Reading score | 67.733 | 67.126 | 0.252 |
| Math score | 69.339 | 71.151 | 0.008 |
| GPA | 4.136 | 4.136 | 0.987 |
| Courses taken | 13.916 | 13.019 | 0.123 |
| Low-SES | 0.372 | 0.385 | 0.666 |
| Med-SES | 0.526 | 0.518 | 0.801 |
| High-SES | 0.103 | 0.097 | 0.781 |
| Observations | 487 | 483 | |

*Note:* This table compares characteristics of uniquely referred students by entry exam area for the referral (verbal vs. math). $p$-values are from two-sample t-tests with unequal variances. Referrals in Math area go to peers with significantly higher math scores ($p = 0.008$), while we find no significant differences for Reading scores, GPA, courses taken, or SES composition for referrals across the two areas. Excluding referrals going to the same individuals does not change the outcomes for referrals compared to Appendix Table A.4

Table A.4: Referral characteristics by academic area

| | **Reading** | **Math** | ***p*** |
|---|---|---|---|
| Reading score | 67.85 | 67.41 | 0.348 |
| Math score | 70.04 | 71.36 | 0.029 |
| GPA | 4.153 | 4.153 | 0.984 |
| Courses taken | 14.467 | 13.822 | 0.206 |
| Low-SES | 37% | 38% | 0.714 |
| Middle-SES | 51% | 51% | 0.829 |
| High-SES | 11% | 11% | 0.824 |
| Observations | 673 | 669 | |

*Note:* This table compares characteristics of referred students by entry exam area for the referral (verbal vs. math). $p$-values are from two-sample t-tests with unequal variances. Referrals in Math area go to peers with significantly higher math scores ($p = 0.029$), while we find no significant differences for Reading scores, GPA, courses taken, or SES composition for referrals across the two areas.

Table A.5: Average entry exam z-scores by SES network connections

| | **Network average for SES group** | | |
|---|---|---|---|
| **Referrer SES** | **Low** | **Middle** | **High** |
| Low | 0.086 | -0.018 | 0.144 |
| Middle | 0.186 | 0.023 | 0.215 |
| High | 0.204 | 0.064 | 0.285 |
| All | -0.361 | -0.078 | 0.169 |

*Note:* This table shows average (math and critical reading) standardized entry exam scores for individuals of different SES levels (rows) when connected to peers of specific SES levels (columns). The “All” row shows the overall average scores across all participant SES levels when connected to each network SES type. Higher values indicate better academic performance in SD’s.

# B Experiment

*We include the English version of the instructions used in Qualtrics. Participansts saw the Spanish version. Horizontal lines in the text indicate page breaks and clarifiying comments are inside brackets.*

## Consent

You have been invited to participate in this decision-making study. This study is directed by [omitted for anonymous review] and organized with the support of the Social Bee Lab (Social Behavior and Experimental Economics Laboratory) at UNAB.

In this study, we will pay **one (1)** out of every **ten (10)** participants, who will be randomly selected. Each selected person will receive a fixed payment of **70,000** (seventy thousand pesos) for completing the study. Additionally, they can earn up to **270,000** (two hundred and seventy thousand pesos), depending on their decisions. So, in total, if you are selected to receive payment, you can earn up to **340,000** (three hundred and forty thousand pesos) for completing this study.

If you are selected, you can claim your payment at any Banco de Bogotá office by presenting your ID. Your participation in this study is voluntary and you can leave the study at any time. If you withdraw before completing the study, you will not receive any payment.

The estimated duration of this study is 20 minutes.

The purpose of this study is to understand how people make decisions. For this, we will use administrative information from the university such as the SABER 11 test scores of various students (including you). Your responses will not be shared with anyone and your participation will not affect your academic records. To maintain strict confidentiality, the research results will not be associated at any time with information that could personally identify you.

There are no risks associated with your participation in this study beyond everyday risks. However, if you wish to report any problems, you can contact Professor [omitted for anonymous review]. For questions related to your rights as a research study participant, you can contact the IRB office of [omitted for anonymous review].

By selecting the option “I want to participate in the study” below, you give your consent to participate in this study and allow us to compare your responses with some administrative records from the university.

- I want to participate in the study [advances to next page]
- I do not want to participate in the study

---

## Student Information

Please write your student code. In case you are enrolled in more than one program simultaneously, write the code of the first program you entered:

[Student ID code]

What semester are you currently in?

[Slider ranging from 1 to 11]

---

[Random assignment to treatment or control]

# Instructions

The instructions for this study are presented in the following video. Please watch it carefully. We will explain your participation and how earnings are determined if you are selected to receive payment.

[Treatment-specific instructions in video format]

If you want to read the text of the instructions narrated in the video, press the "Read instruction text" button. Also know that in each question, there will be a button with information that will remind you if that question has earnings and how it is calculated, in case you have any doubts.

- I want to read the instructions text [text version below]

---

In this study, you will respond to three types of questions. First, are the belief questions. For belief questions, we will use as reference the results of the SABER 11 test that you and other students took to enter the university, focused on three areas of the exam: mathematics, reading, and English.

For each area, we will take the scores of all university students and order them from lowest to highest. We will then group them into 100 percentiles. The percentile is a position measure that indicates the percentage of students with an exam score that is above or below a value.

For example, if your score in mathematics is in the 20th percentile, it means that 20 percent of university students have a score lower than yours and the remaining 80 percent have a higher score. A sample belief question is: "compared to university students, in what percentile is your score for mathematics?"

If your answer is correct, you can earn 20 thousand pesos. We say your answer is correct if the difference between the percentile you suggest and the actual percentile of your score is not greater than 7 units. For example, if you have a score that is in the 33rd percentile and you say it is in the 38th, the answer is correct because the difference is less than 7. But if you answer that it is in the 41st, the difference is greater than 7 and the answer is incorrect.

The second type of questions are recommendation questions and are also based on the mathematics, reading, and English areas of the SABER 11 test. We will ask you to think about the students with whom you have taken or are taking classes, to recommend from among them the person you consider best at solving problems similar to those on the SABER 11 test.

When you start typing the name of your recommended person, the computer will show suggestions with the full name, program, and university entry year of different students. Choose the person you want to recommend. If the name doesn't appear, check that you are writing it correctly. Do not use accents and use 'n' instead of 'ñ'. If it still doesn't appear, it may be because that person is not enrolled this semester or because they did not take the SABER 11 test. In that case, recommend someone else.

You can earn up to 250,000 pesos for your recommendation. We will multiply your recommended person's score by 100 pesos if they are in the first 50 percentiles. We will multiply it by 500 pesos if your recommended person's score is between the 51st and 65th percentile. If it is between the 66th and 80th percentile, we will multiply your recommended person's score by 1000 pesos. If the score is between the 81st and 90th percentile, you earn 1500 pesos multiplied by your recommended person's score. And if the score is between the 91st and 100th percentile, we will multiply your recommended person's score by 2500 pesos to determine the earnings.

The third type of questions are information questions and focus on aspects of your personal life or your relationship with the people you have recommended.

## Earnings

Now we will explain who gets paid for participating and how the earnings for this study are assigned. The computer will randomly select one out of every 10 participants to pay for their responses. For selected individuals, the computer will randomly choose one of the three areas, and from that chosen area, it will pay for one of the belief questions.

Similarly, the computer will randomly select one of the three areas to pay for one of the recommendation questions.

**Additionally, if you are selected to receive payment, your recommended person in the chosen area will receive a fixed payment of 100 thousand pesos.** [Only seen if assigned to the treatment]

Each person selected to receive payment for this study can earn: up to 20 thousand pesos for one of the belief questions, up to 250 thousand pesos for one of the recommendation questions, and a fixed payment of 70 thousand pesos for completing the study.

Selected individuals can earn up to 340 thousand pesos.

---

[Participants go through all three Subject Areas in randomized order]

# Subject Areas

## Critical Reading

For this section, we will use as reference the Critical Reading test from SABER 11, which evaluates the necessary competencies to understand, interpret, and evaluate texts that can be found in everyday life and in non-specialized academic fields.

[Clicking shows the example question from SABER 11 below]

Although the democratic political tradition dates back to ancient Greece, political thinkers did not address the democratic cause until the 19th century. Until then, democracy had been rejected as the government of the ignorant and unenlightened masses. Today it seems that we have all become democrats without having solid arguments in favor. Liberals, conservatives, socialists, communists, anarchists, and even fascists have rushed to proclaim the virtues of democracy and to show their democratic credentials (Andrew Heywood). According to the text, which political positions identify themselves as democratic?

- Only political positions that are not extremist
- The most recent political positions historically
- The majority of existing political positions
- The totality of possible political currents

## Mathematics

This section references the Mathematics test from SABER 11, which evaluates people's competencies to face situations that can be resolved using certain mathematical tools.

[Clicking shows the example question from SABER 11 below]

A person living in Colombia has investments in dollars in the United States and knows that the exchange rate of the dollar against the Colombian peso will remain constant this month, with 1 dollar equivalent to 2,000 Colombian pesos. Their investment, in dollars, will yield profits of 3% in the same period. A friend assures them that their profits in pesos will also be 3%. Their friend's statement is:

- Correct. The proportion in which the investment increases in dollars is the same as in pesos.

- Incorrect. The exact value of the investment should be known.
- Correct. 3% is a fixed proportion in either currency.
- Incorrect. 3% is a larger increase in Colombian pesos.

---

## English

This section uses the English test from SABER 11 as a reference, which evaluates that the person demonstrates their communicative abilities in reading and language use in this language.

[Clicking shows the example question from SABER 11 below]

Complete the conversations by marking the correct option.

- Conversation 1: I can't eat a cold sandwich. It is horrible!
  - I hope so.
  - I agree.
  - I am not.
- Conversation 2: It rained a lot last night!
  - Did you accept?
  - Did you understand?
  - Did you sleep?

---

[Following parts are identical for all Subject Areas and are not repeated here for brevity]

## Your Score

Compared to university students, in which percentile do you think your [**Subject Area**] test score falls (1 is the lowest percentile and 100 the highest)?

[Clicking shows the explanations below]

How is a percentile calculated?

A percentile is a position measurement. To calculate it, we take the test scores for all students currently enrolled in the university and order them from lowest to highest. The percentile value you choose refers to the percentage of students whose score is below yours. For example, if you choose the 20th percentile, you're indicating that 20% of students have a score lower than yours and the remaining 80% have a score higher than yours.

What can I earn for this question?

For your answer, you can earn **20,000 (twenty thousand) PESOS**, but only if the difference between your response and the correct percentile is less than 7. For example, if the percentile where your score falls is 33 and you respond with 38 (or 28), the difference is 5 and the answer is considered correct. But if you respond with 41 or more (or 25 or less), for example, the difference would be greater than 7 and the answer is incorrect.

Please move the sphere to indicate which percentile you think your score falls in:

[Slider with values from 0 to 100]

---

## Recommendation

Among the people with whom you have taken any class at the university, who is your recommendation for the [**Subject Area**] test? Please write that person's name in the box below:

Important: **You will not be considered for payment unless the recommended person is someone with whom you have taken at least one class during your studies.**

Your response is only a recommendation for the purposes of this study and we will **not** contact your recommended person at any time.

[Clicking shows the explanations below]

Who can I recommend?

Your recommendation **must** be someone with whom you have taken (or are taking) a class. If not, your answer will not be considered for payment. The person you recommend will not be contacted or receive any benefit from your recommendation.

As you write, you will see up to 7 suggested student names containing the letters you have entered. The more you write, the more accurate the suggestions will be. Please write **without** accents and use the letter 'n' instead of 'ñ'. If the name of the person you're writing doesn't appear, it could be because you made an error while writing the name.

If the name is correct and still doesn't appear, it could be because the student is not enrolled this semester or didn't take the SABER 11 test. In that case, you must recommend someone else.

My earnings for this question?

For your recommendation, you could receive earnings of up to 250,000 (two hundred and fifty thousand) PESOS. The earnings are calculated based on your recommendation's score and the percentile of that score compared to other UNAB students, as follows:

- We will multiply your recommendation's score by \$100 (one hundred) pesos if it's between the 1st and 50th percentiles
- We will multiply your recommendation's score by \$500 (five hundred) pesos if it's between the 51st and 65th percentiles
- We will multiply your recommendation's score by \$1000 (one thousand) pesos if it's between the 66th and 80th percentiles
- We will multiply your recommendation's score by \$1500 (one thousand five hundred) pesos if it's between the 81st and 90th percentiles
- We will multiply your recommendation's score by \$2500 (two thousand five hundred) pesos if it's between the 91st and 100th percentiles

This is illustrated in the image below:

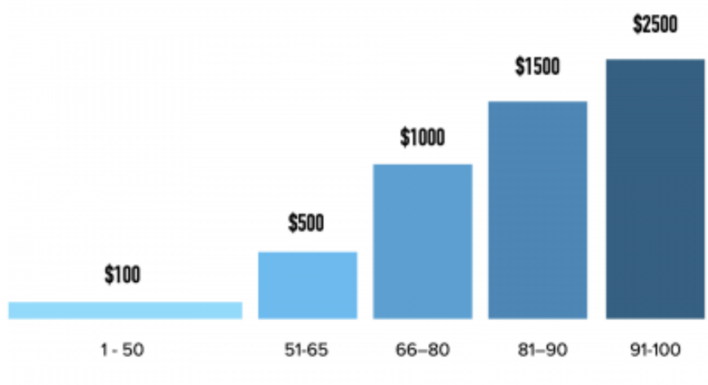



Figure B.1: Earnings for recommendation questions

For example, if your recommendation got 54 points and the score is in the 48th percentile, you could earn 54x100 = 5400 PESOS. But, if the same score of 54 points were in the 98th percentile, you could earn 54x2500 = 135,000 PESOS.

[Text field with student name suggestions popping up as participant types]

---

## Relationship with your recommendation

How close is your relationship with your recommendedation: "[Name of the student selected from earlier]"? (0 indicates you are barely acquaintances and 10 means you are very close)

[Slider with values from 0 to 10]

---

## Your recommendation's score

Compared to university students, in which percentile do you think [Name of the student selected from earlier]'s score falls in the [**Subject Area**] test (1 is the lowest percentile and 100 the highest)?

[Clicking shows the explanations below]

How is a percentile calculated?

A percentile is a position measurement. To calculate it, we take the test scores for all students currently enrolled in the university and order them from lowest to highest. The percentile value you choose refers to the percentage of students whose score is below yours. For example, if you choose the 20th percentile, you're indicating that 20% of students have a score lower than yours and the remaining 80% have a score higher than yours.

What can I earn for this question?

For your answer, you can earn **20,000 (twenty thousand) PESOS**, but only if the difference between your response and the correct percentile is less than 7. For example, if the percentile where your recommended person's score falls is 33 and you respond with 38 (or 28), the difference is 5 and the answer is considered correct. But if you respond with 41 or more (or 25 or less), for example, the difference would be greater than 7 and the answer is incorrect.

Please move the sphere to indicate which percentile you think your recommended person's score falls in:

[Slider with values from 0 to 100]

---

## Demographic Information

What is the highest level of education achieved by your father?

[Primary, High School, University, Graduate Studies, Not Applicable]

What is the highest level of education achieved by your mother?

[Primary, High School, University, Graduate Studies, Not Applicable]

Please indicate the socio-economic group to which your family belongs:

[Group A (Strata 1 or 2), Group B (Strata 3 or 4), Group C (Strata 5 or 6)]

---

## UNAB Students Distribution

Thinking about UNAB students, in your opinion, what percentage belongs to each socio-economic group? The total must sum to 100%:

[Group A (Strata 1 or 2) percentage input area]

[Group B (Strata 3 or 4) percentage input area]

[Group C (Strata 5 or 6) percentage input area]

[Shows sum of above percentages]

---

## End of the Experiment

Thank you for participating in this study.

If you are chosen to receive payment for your participation, you will receive a confirmation to your UNAB email and a link to fill out a form with your information. The process of processing payments is done through Nequi and takes approximately 15 business days, counted from the day of your participation.

[Clicking shows the explanations below]

Who gets paid and how is it decided?

The computer will randomly select one out of every ten participants in this study to be paid for their decisions.

For selected individuals, the computer will randomly select one area: mathematics, reading, or English, and from that area will select one of the belief questions. If the answer to that question is correct, the participant will receive 20,000 pesos.

The computer will randomly select an area (mathematics, critical reading, or English) to pay for one of the recommendation questions. The area chosen for the recommendation question is independent of the area chosen for the belief question. The computer will take one of the two recommendations you have made for the chosen area. Depending on your recommendation's score, you could win up to 250,000 pesos.

Additionally, people selected to receive payment for their participation will have a fixed earnings of 70,000 pesos for completing the study.

---

# Participation

In the future, we will conduct studies similar to this one where people can earn money for their participation. The participation in these studies is by invitation only. Please indicate if you are interested in being invited to other studies similar to this one:

[Yes, No]