Homophily of Behavioral Traits is Strong in Social Networks, but Depends on Demographics and Increases Segregation

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Abstract

Social networks are a key factor for success in life, but they are also strongly segmented by gender, ethnicity, and other demographic characteristics. We present novel evidence on an understudied source of homophily: behavioral traits (such as prosociality, risk aversion, or cooperation). Using unique data from incentivized experiments with more than 3,000 French high-school students, we find high levels of homophily across all behavioral traits that we study. Notably, the extent of homophily depends on demographic similarities, particularly gender. As a result, the demographic-based segregation of networks is further amplified by a behavioral-based segregation, which exacerbates the differences related to gender or socio-economic status. We discuss policy implications of this exacerbation.

Keywords: Social networks, Homophily, behavioral traits, segregation, experiments

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1 Introduction

An individual's social network of friends, relatives and peers is a key factor for success in life (Jackson, 2021). A large body of research shows that social networks affect a wide range of outcomes such as the probability of finding a job (Rubineau and Fernandez, 2013; Zeltzer, 2020), teen pregnancy (Kearney and Levine, 2015), or the probability of being vaccinated (Banerjee et al., 2019). Even before adulthood, networks shape important decisions and behaviors that may have long-lasting consequences. Friends in school affect student achievement (Epple and Romano, 2011; Sacerdote, 2014; Golsteyn et al., 2021), educational aspirations (Gagete-Miranda, 2020; Norris, 2020), disruptive classroom behavior, school dropout rates (Case and Katz, 1991; Gaviria and Raphael, 2001), and prosocial behavior (Rao, 2019; Alan et al., 2021), which has been shown to influence labor market success during one's professional life (Kosse and Tincani, 2020).

Social networks are not only highly influential, they are also strongly segregated (Jackson, 2010, 2021). A large literature on homophily—a term that refers to people associating with others who are similar to themselves (Lazarsfeld et al., 1954)—shows that social networks are strongly segregated by demographic factors, such as ethnicity, income, gender, age, profession, or religion (McPherson et al., 2001; Currarini et al., 2009; Chetty et al., 2022). For example, in the US in 2020, 56 percent of Black Americans had social networks composed entirely of people who are also black (Cox et al., 2020). Using data on the social networks of 70.3 million Facebook users, Chetty et al. (2022) document large homophily by parental SES among high school friends. So, the existence of homophily based on demographic characteristics is a well-established fact.

However, we know surprisingly little about whether and to what extent homophily is also based on behavioral traits such as risk aversion, prosociality, or the willingness to cooperate or to compete. Given the influence of a large set of behavioral traits on success in life (Cunha and Heckman, 2007, 2008; Meier and Sprenger, 2010; Borghans et al., 2011; Golsteyn et al., 2014; Alan et al., 2019; Kosse and Tincani, 2020; Algan et al., 2022), it is important to investigate whether people are more likely to interact or befriend each other when they share similar behavioral traits. This could imply that social networks would also be segregated along the lines of behavioral traits, thus exacerbating the well-known segregation based on demographics. Moreover, there might be important interaction effects such that homophily based on behavioral traits might be more likely in the case of shared demographic traits. Given that demographic traits like gender or social background have been found to relate to behavioral traits – for example, with women being less competitive and less risk taking, or children from high-socio-economic-status families being more competitive (Niederle and Vesterlund, 2007; Croson and Gneezy, 2009; Buser et al., 2014; Almås et al., 2016) – an interaction effect of de-

mographic and behavioral traits might exacerbate the segregation between different groups in society. Therefore, we believe that it is important to learn more about the potential importance of behavioral traits for social network segregation, as this has received relatively little attention so far.

It is important to note that our paper emphasizes on behavioral traits - which may often be difficult to observe in everyday-life - rather than on observed behavior. The latter (like smoking or drinking) has captured lots of interest, particularly in sociologists' work, studying how social networks relate to observable social behaviors that may, in fact, reflect emulation rather than underlying preferences (Adams et al., 2022; Jeon and Goodson, 2015; Laursen and Veenstra, 2021). This means that individuals might mimic risky behaviors like smoking or extreme sports to gain social acceptance or conform to group norms, without necessarily sharing the same latent dispositions that we call behavioral traits. Social behaviors, being visible and socially contextual, may therefore reflect strategic signaling rather than intrinsic preferences (Gardner and Steinberg, 2005).

Compared to related work documenting the association between behavioral traits and social networks (Jackson et al., 2023; Shan and Zölitz, 2025), our paper provides novel evidence on homophily with respect to many different traits (elicited in an incentivized way in our study) that have not been studied before. More precisely, we provide evidence on prosociality (as a composite index of several traits), depth of reasoning, educational aspirations, coordination, risk tolerance, and competitiveness. What also sets our paper apart from previous work like Jackson et al. (2023) who document homophily among a cohort of students attending an elite university (Caltech), is that we consider a large sample of more than 3,000 French high school students representative of the French population in terms of gender and social background. Lastly, our sample of high school students is younger than in comparable studies, thus covering a period in life when behavioral traits have been shown to be fairly malleable, usually more so than in adulthood (Sutter et al., 2019).

2 Sample Description and Data Collection

In October 2019, we partnered with 67 high schools in three French regions (Nantes, Montpellier, and Créteil) to collect data on behavioral traits and friendship networks. 3,064 students, aged 15 to 18 (with an average age of 15.8 years), participated in our study and attempted the questions relevant for our analysis. The study was administered during regular school hours, thus reducing self-selection concerns. We set up a novel online platform for data collection using oTree (Chen et al., 2016). First, subjects played a series of incentivized games or allocation tasks. Afterwards, we elicited their friendship networks.

Behavioral Traits. We elicited the following traits: risk tolerance, competitiveness, trust, cooperation, coordination, altruism, morality, tolerance of inequality, depth of reasoning, and generosity. The details of how we measured those traits are given in section 6. To ensure that the duration of the survey would fit in a one hour class, we randomized which traits were elicited. On average, for each student we elicited about 9 of our 10 traits, yielding more than 2,800 observations for each behavioral trait. Regarding incentives, we randomly drew 300 students and converted their experimental credits into gift vouchers.

To reduce the number of traits we present in the results section, and to account for potential measurement error in behavioral traits, we adopt the approach in Terrier et al. (2021) by applying a principal components analysis (PCA) to get a compound measure of prosociality that includes altruism, tolerance for inequality, morality, trust, generosity, and cooperation. In the Appendix, we show our results also separately for each these traits.

We also asked subjects to report the highest level of educational qualification they wished to obtain (with 1 corresponding to finishing high school, 2 obtaining an undergraduate degree, 3 a graduate degree, and 4 a PhD). This yields a measure for educational aspirations.

Student friendship network. We measured friendship networks by asking students to report the five closest friends they have in their classroom. The friends question came after students played the games to make sure that it did not influence their decisions.

Student demographic characteristics. Finally, we merge the data we collected with administrative data from the French ministry of education which contains information on student gender, age, nationality, parents' occupation, number of siblings, place of residence, ethnicity and middle school attended. We use parents' profession to capture a student's socio-economic status (SES; see section 6 for more details).

Table A.1 in the Appendix provides summary statistics of our data: in panel A on the number of friends, in panel B on their behavioral traits, and in panel C on the demographic characteristics based on administrative data. 55.9% of the students are female (versus 51.6% at the national level in 2020), 42% are low SES, which is slightly lower than the 46.4% national average (see Table A.3). Students in our sample are 15.8 years old on average, and 78.8% are white. They report 4.1 friends on average.

3 Estimation Method

To document homophily on behavioral traits, we explore how the probability of two students being friends depends on their similarity in behavioral traits. It is important to note that the coefficients from our analysis should be interpreted as conditional correlations, and we don't

imply any causality when presenting our results. For our analysis, we use the following specification:

$$d_{ij} = \beta_0 + \beta_1 \left(-|y_i - y_j|\right) + \beta_2 \mathbf{1}[\mathbf{x}_i = \mathbf{x}_j] + \zeta_i + \psi_j + \nu_{ij} \tag{1}$$

d_{ij} is a potential friendship pair, i.e., $d_{ij} = 1$ if student i nominates student j as their friend and 0 otherwise.[1] y_i captures student i's behavioral traits, so that $\left(-|y_i - y_j|\right)$ captures how close two students are in terms of these traits. $\mathbf{x}_i$ captures student demographic characteristics such as their age, ethnicity, nationality, country of birth, parental occupation, number of siblings, postal code of residence, and the middle school attended. For all these variables, except for age and number of siblings, $\mathbf{1}[x_i = x_j] = 1$ if student i and j share the same demographic characteristic and 0 otherwise.[2] For the sake of comparison, all measures of similarity in the regressions are standardized.[3] We control for a set of *sender* and *receiver* fixed effects (ζ_i and ψ_j), i.e., a fixed effect for each student nominating a friend (the sender) and each student being nominated as a friend (the receiver). These fixed effects account for student idiosyncratic characteristics which may increase a student's likelihood of nominating or being nominated as a friend, such as popularity, charisma, amicability, etc.

4 Results

Five main facts stand out from our analysis of homophily. First, we confirm a well-established finding in the literature:

Fact 1: *High school students exhibit a large degree of homophily based on demographic characteristics.*

Figure 1 reports homophily coefficients on demographic characteristics. In blue, we present the estimations without controls for behavioral traits. To facilitate the comparison of homophily based on demographic characteristics and homophily based on behavioral traits, we standardize all demographic and behavioral variables to have a standard deviation of 1.

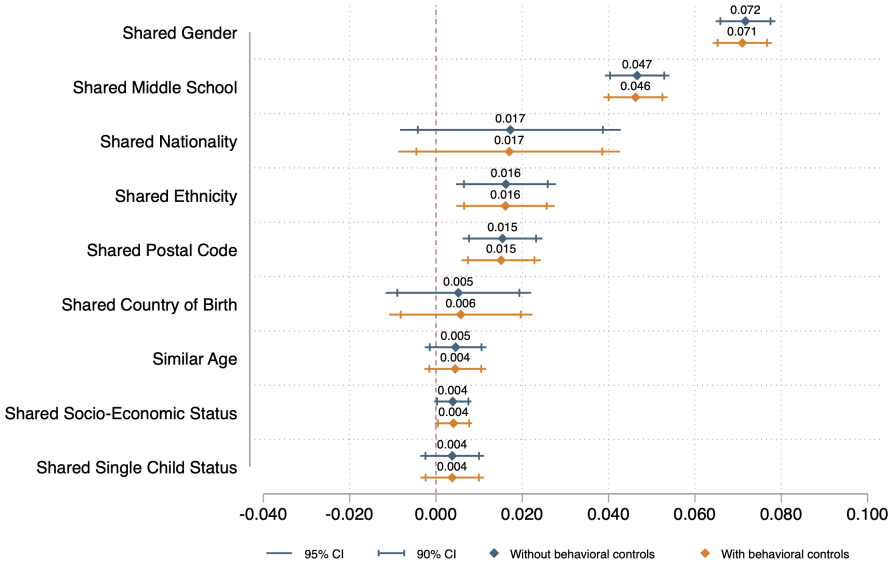
Two students who have the same gender are 14.3 percentage points more likely to be friends than two students of opposite gender. To put this number - and all following ones - into per-

[1] Potential links are restricted to students within the same classroom and they are directed, meaning that $d_{ij} = 1$ does not necessarily imply $d_{ji} = 1$. Allowing for undirected networks would not change our results.

[2] Age is measured in months and for any two students i and j, $|\text{Age}_i - \text{Age}_j| / \max_{xy} |\text{Age}_x - \text{Age}_y|$ captures how close two students are in age relative to the maximum age distance between all pairs of students. Sibling similarity is defined similarly, i.e., relative to the maximum number of siblings between all pairs of students.

[3] In Appendix A, we also report results where we scale the measures to take a value between 0 and 1 where 0 implies completely dissimilar w.r.t the trait in consideration and 1 implies completely similar.

Figure 1: Homophily based on demographic characteristics (**Facts 1 and 2**)



Note: This figure plots coefficients for homophily based on demographic characteristics. The dependent variable is an indicator variable which takes the value 1 if individual i sends a link to individual j and 0 otherwise. Regression controls for sender and receiver fixed effects. For each demographic characteristic, the top blue coefficient corresponds to a regression that does not control for shared behavioral traits. The bottom orange coefficient corresponds to a regression that controls for shared behavioral traits. Standard errors are clustered at the classroom level. All variables are standardized to facilitate comparisons.

spective, it is important to note that, given the average classroom size in our sample is 30.7 and a student nominates, on average, 4.08 friends, the unconditional probability of being friends is 13.3%. So, having the same gender doubles this likelihood.

Having attended the same middle school increases friendship chances by 11.7 percentage points, as does having the same ethnicity (+3.4 p.p.), living in the same geographical area (+3.4 p.p.), and having the same socio-economic status of parents (+0.8 p.p.). The coefficients reported in Figure 1 use the standardized value of the student characteristics. Increasing gender similarity between two students by 1 SD is associated with a 7.2 percentage point higher chance of being friends. A 1 SD increase in similarity of attendance of the same middle school increases friendship chances by 4.7 percentage points, as similarity in ethnicity (+1.6 p.p.), similar geographical area (+1.5 p.p.), and having similar socio-economic status (+0.4 p.p.). In contrast to all of these variables, our results suggest that similarity in nationality, country of birth, or number of siblings does not increase friendship chances.

The large homophily based on demographic characteristics we document among high school students raises the question: How much of this homophily is explained by similarity in behavioral traits? A rich body of literature has documented differences in behavioral traits by gender,

social background, and race (Niederle and Vesterlund, 2007; Croson and Gneezy, 2009; Buser et al., 2014; Almås et al., 2016). Our data confirms these associations. Figure 2 plots gender, social, and ethnic differences in behavioral traits. We find that girls have a 0.26 SD higher prosociality index. Girls also have higher levels of depths of reasoning (+0.14 SD). Yet, they are also significantly less competitive (-0.27 SD), less likely to coordinate on the efficient outcome (-0.10 SD), and less risk tolerant (i.e., 1.10 SD more risk averse).

A student's social background is also associated with behavioral traits. Students with higher socio-economic status are more prosocial (+0.09 SD), have higher educational aspirations (+0.24 SD), are more competitive (+0.06 SD) and they more frequently coordinate on the efficient outcome in a coordination game (+0.12 SD). Regarding ethnicity, we find that whites are more prosocial (+0.08 SD), but they have lower educational aspirations than non-whites (-0.11 SD), which might be driven by Asian students being classified as non-whites.

Next, we tease out homophily based on demographic characteristics from homophily based on behavioral traits. More specifically, we test how much the homophily coefficients change when we control for students' behavioral traits. The results are reported in orange in Figure 1 (compared to the blue coefficients without controls for behavioral traits).

Fact 2: *Homophily on behavioral traits does not explain homophily based on demographic characteristics.*

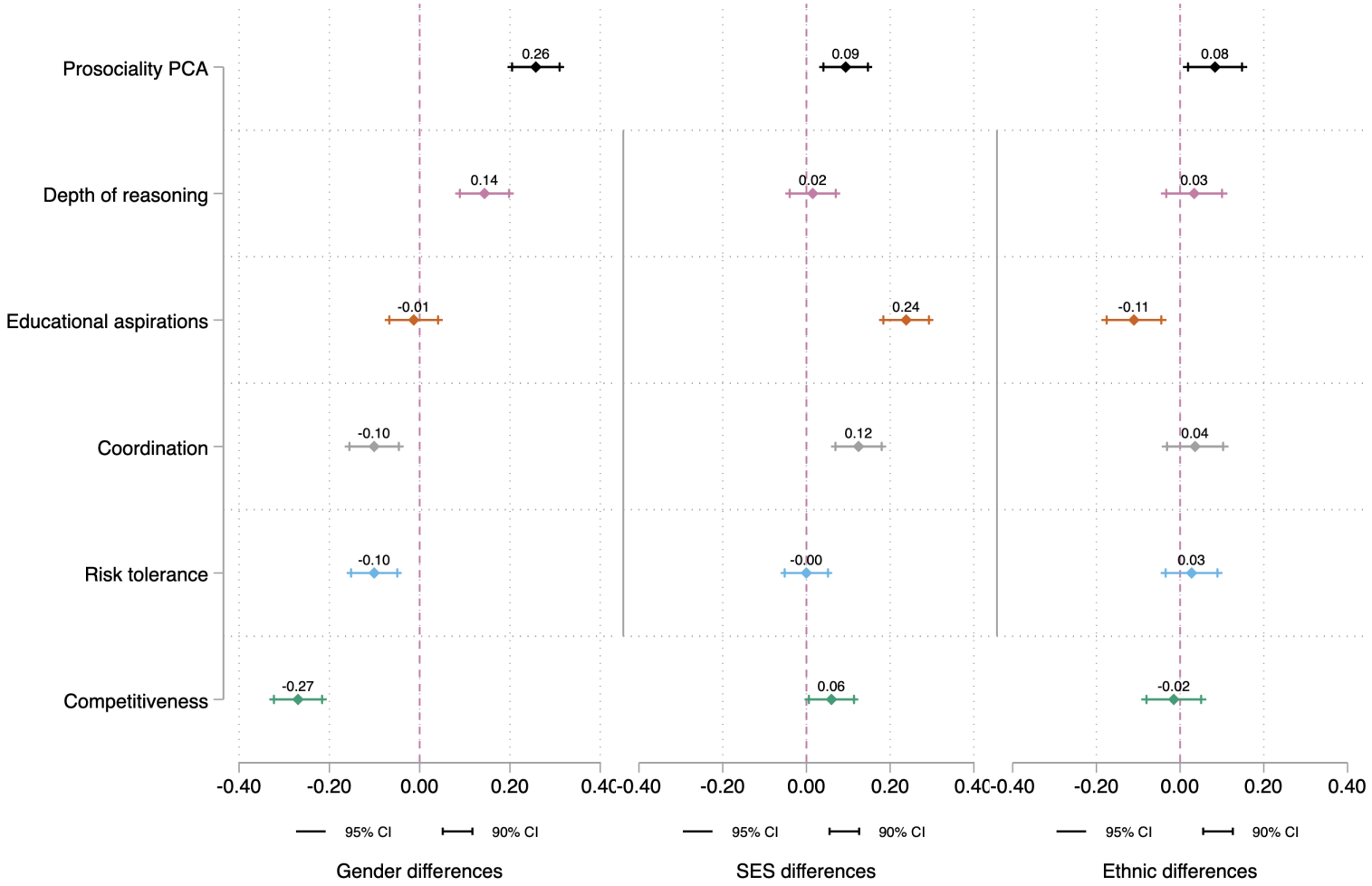
Despite large gender and social differences in behavioral traits, these differences explain only marginally the degree of homophily based on demographic characteristics. For instance, we previously showed that increasing gender similarity between two students by 1 SD is associated with a 7.2 percentage point higher chance of being friends. Controlling for all behavioral traits only reduces this probability by 0.1 percentage points. Comparing the homophily coefficients across both specifications in Figure 1 yields similar conclusions for homophily based on ethnicity, middle school, socio-economic status and shared postal code. It is hardly driven by similarity in behavioral traits. Yet, we document large homophily on behavioral traits, which is our main finding.

Fact 3: *High school students exhibit a large degree of homophily based on behavioral traits, above and beyond the well-documented homophily on demographic characteristics.*

In Figure 3 we present our results (see also column 4 in Table A.2 in the Appendix). We show coefficients from a regression of friendship on similarity in behavioral traits, based on eq. 1 in section 3. We control for students' demographic characteristics, meaning that the homophily by behavioral traits comes *on top* of the homophily by demographic characteristics.

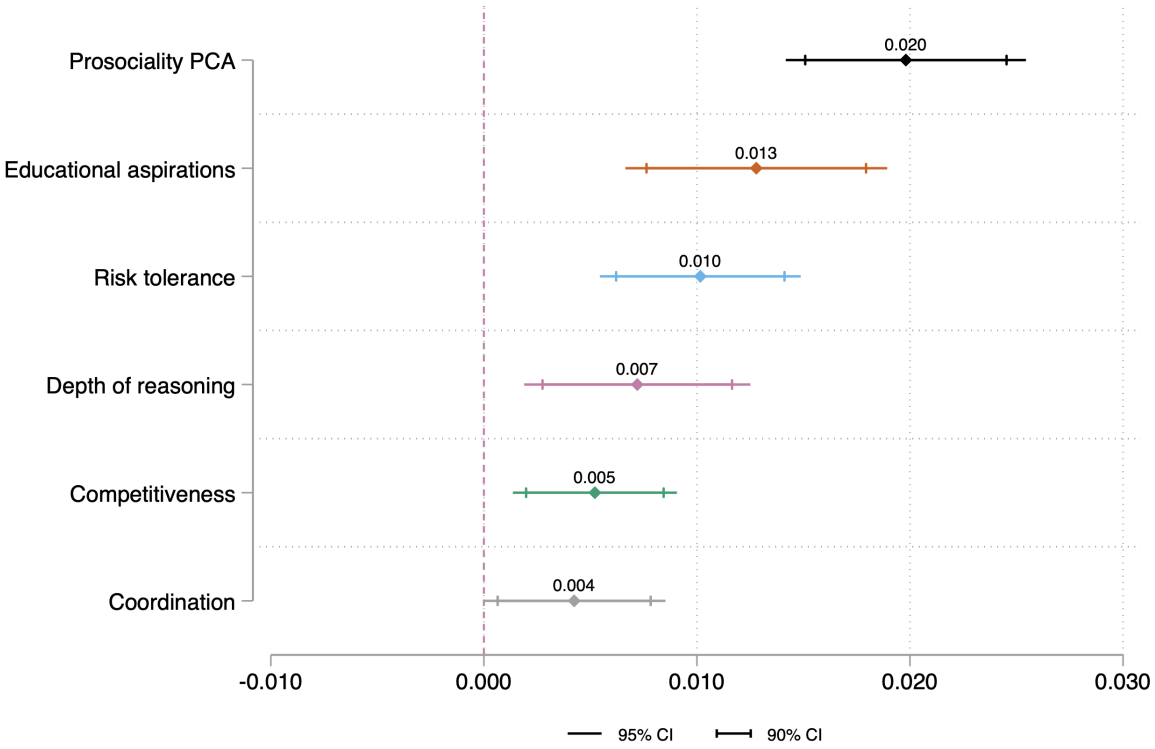
Our results reveal that similarity in behavioral traits is independently and significantly associated with the likelihood of being friends. All homophily estimates are positive and significant, with the larger effects observed for prosociality, educational aspirations, and risk aversion. For example, increasing similarity in prosociality between two students by 1 SD is associated with a 2 percentage points higher probability of being friends. This is comparatively large, if one recalls that, for example, an increase in gender similarity by one standard deviation (SD) corresponds to a 7.2 p.p. increase in the likelihood of forming a friendship, and the same increase in ethnic similarity leads to a 1.6 p.p. increase. This suggests that the influence of homophily based on behavioral traits is comparable to that of various demographic characteristics, confirming that student friendships are far from being randomly formed. They depend not only on shared demographic characteristics, but also to a large extent on similarity in behavioral traits.

Figure 2: Gender, social, and ethnic differences in behavioral traits



Note: This figure plots gender, social, and ethnic differences in behavioral traits. The reported coefficients come from separate OLS regressions. The dependent variable is a behavioral trait (standardized). Each regression controls for gender, low-SES, ethnicity, and age. The gender variable takes the value 1 if the student is female and 0 otherwise. The SES variable takes the value 1 if the student's parents are from a high SES and 0 otherwise. The ethnicity variable takes the value 1 if the individual is white and 0 otherwise.

Figure 3: Homophily based on behavioral traits **(Fact 3)**



Note: This figure plots coefficients for homophily based on behavioral traits. Each coefficient corresponds to a separate regression based on eq. 1. The dependent variable is an indicator variable which takes the value 1 if individual i sends a link to individual j and 0 otherwise. On the right-hand-side, $|y_i - y_j|$, whose coefficient is reported in this figure, captures how close two students are in terms of behavioral traits. For the sake of comparison, all measures of similarity in behavioral traits in the regressions are standardized. We control for shared demographic characteristics such as gender, ethnicity, nationality, place of residence, SES, number of siblings, age (in months), a dummy to indicate whether the individual is an only child or not, and a dummy to indicate if the individual was born in France. We also control for sender and receiver fixed effects. Standard errors are clustered at the classroom level. Figure A.1 decomposes the results for the prosociality PCA into its sub-components.

Next, we examine whether homophily in behavioral traits is more prevalent among students who are more alike in terms of demographic characteristics. This leads to our next finding.

Fact 4: *Similarity in demographic characteristics, particularly with respect to gender, amplifies homophily based on behavioral traits.*

The estimates for homophily based on behavioral traits are always higher when students share the same gender than when considering pairs of boys and girls. Figure 4 shows that homophily based on behavioral traits is often close to zero and statistically insignificant when students are of different gender. For most behavioral traits, homophily only exists if students

have initially sorted themselves based on gender. For example, increasing similarity in students' prosociality by 1 SD is associated with a 2.5 p.p. higher friendship chance when students share the same gender, but it only raises friendship chances by 0.8 p.p. for opposite-gender students. We find similar differences for homophily based on educational aspirations (+1.7 p.p. for same-gender students versus +1.0 p.p. for opposite-gender), risk tolerance (+1.6 p.p. versus non-significant +0.2 p.p.), depth of reasoning (+1.0 p.p. versus non-significant +0.1 p.p.), competitiveness (+0.9 p.p. versus non-significant +0.1 p.p.), and coordination (+0.7 p.p. versus non-significant +0.1 p.p.). We find weaker evidence that shared middle school, shared ethnicity, and shared SES increase the level of homophily based on behavioral traits.

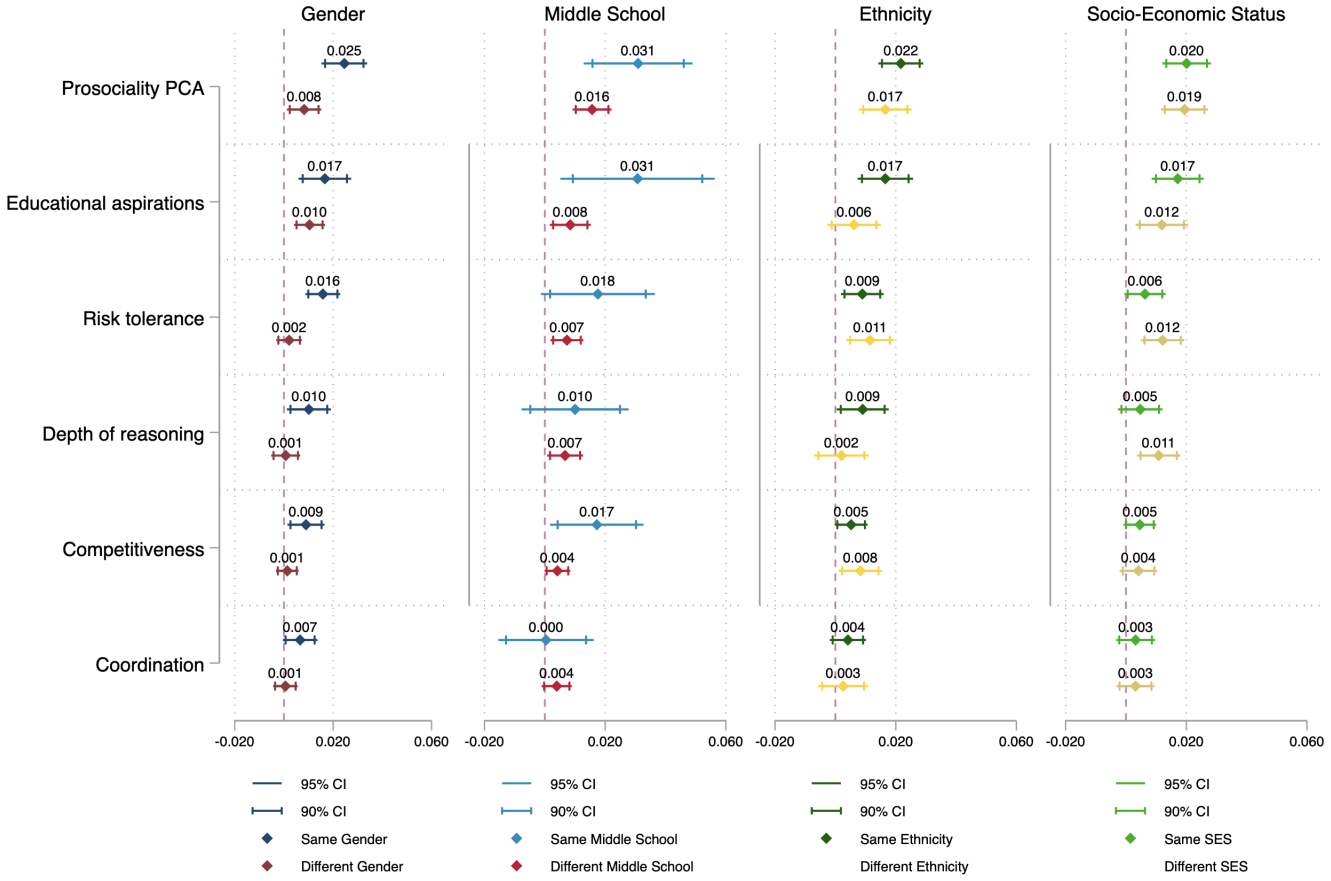
Finally, we show that similarity in one behavioral trait does not substitute well for similarity in another trait when it comes to network formation. We run a kitchen sink regression in which we regress potential friendship links on similarity across all behavioral traits, while controlling for demographic characteristics and sender and receiver fixed effects.

Fact 5: *The larger the number of behavioral traits that students share, the higher the overall homophily. In other words, similarity in one behavioral trait does not substitute well for similarity in another one when it comes to determining friendships.*

The results we obtain, reported in Figure 5, do not substantially differ from the results discussed above (in Figure 3). In other words, similarity in each behavioral trait is individually and independently associated with higher friendship chances. This notable result implies that students who are similar in several behavioral traits (rather than only one) see their friendship chances increased by the number of similar traits. Our finding also means that it is not the case that one of our behavioral traits turn insignificant once additional traits are entered into the regression. This is an important insight to put also earlier work that had considered much fewer traits into perspective. When considering only a few traits, it might easily be the case that adding other such traits might render the original ones insignificant. With our ten traits, this is much less likely.

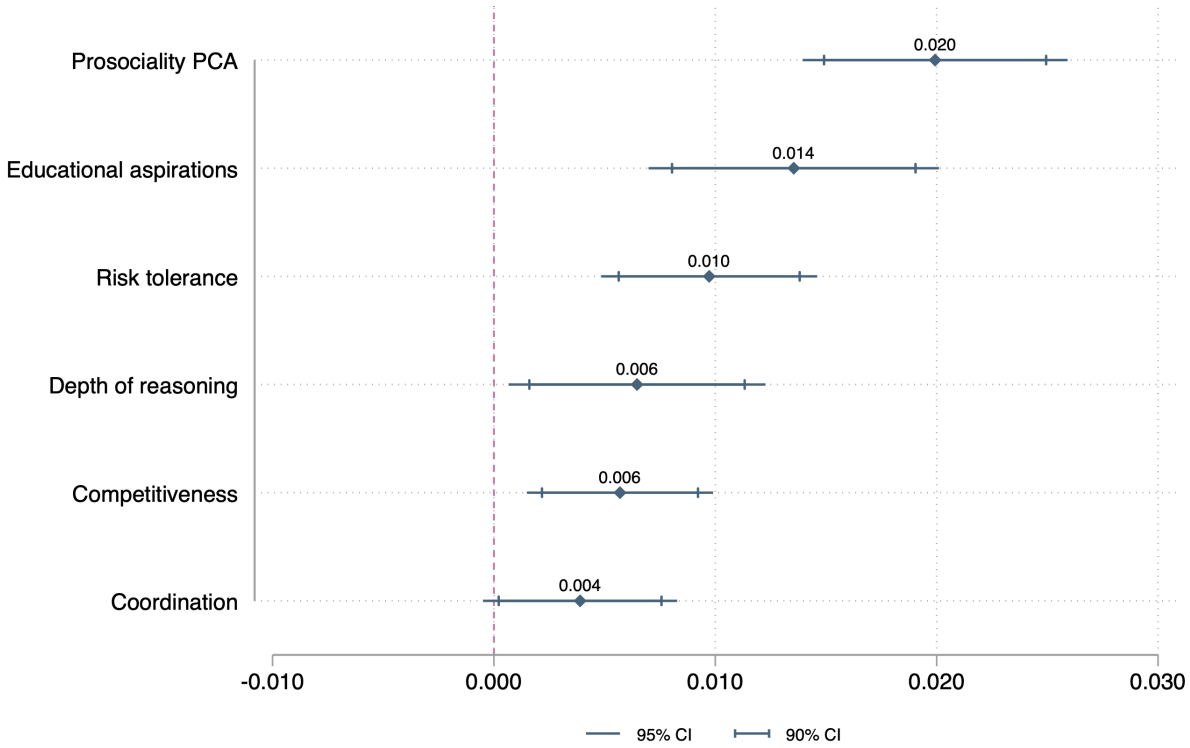
All of our findings are robust to considering different network structures. Fig A.5 in the Appendix compares the results from our original specification (using a directed and unweighted network in panel A) with those using a weighted network where we assume that the order in which students typed in their friend's name reflects the strength of their friendship (see panel B) or an undirected network in which a friendship link from student i to j always implies also one from student j to i (see panel C). The overall pattern shows a similar set of coefficients across different network specifications, indicating robustness of our findings with respect to the considered network structure.

Figure 4: Homophily based on behavioral traits for students who share the same demographic characteristics **(Fact 4)**



Note: This figure plots coefficients for homophily based on behavioral traits. Coefficients in the first sub-panel correspond to sub-samples where individuals either share the same gender or have different gender. Coefficients from the second, third, and fourth sub-panels analogously correspond to sub-samples where individuals either share the same middle school, ethnicity, or SES or have different middle school, ethnicity, SES respectively. Each coefficient corresponds to a separate regression based on eq. 1. We run regressions separately for each sub-group (same gender v.s. different gender, same SES v.s. different SES, and so on). The dependent variable is an indicator variable, which takes the value 1 if individual i sends a friendship link to individual j and 0 otherwise. On the right-hand-side, $|y_i - y_j|$, whose coefficient is reported in the figure, captures how close two students are in terms of behavioral traits. For the sake of comparison, all measures of similarity in behavioral traits in the regressions are standardized. We control for shared demographic characteristics such as gender, ethnicity, nationality, place of residence, SES, number of siblings, age (in months), a dummy to indicate whether the individual is an only child or not, and a dummy to indicate if the individual was born in France. We also control for sender and receiver fixed effects. Standard errors are clustered at the classroom level. Figure A.3 decomposes the results for the prosociality PCA into its sub-components.

Figure 5: Homophily based on behavioral traits (with control for similarity in each trait) **(Fact 5)**



Note: This figure plots coefficients for homophily based on behavioral traits. The coefficients come from a single regression that includes all the shared behavioral traits on the right-hand side. The dependent variable is an indicator variable which takes the value 1 if individual i sends a link to individual j and 0 otherwise. On the right-hand side, $|y_i - y_j|$, whose coefficient is reported in the figure, captures how close two students are in terms of behavioral traits. All measures of similarity in behavioral traits in the regressions are standardized. We control for shared demographic characteristics such as gender, ethnicity, nationality, place of residence, SES, number of siblings, age (in months), a dummy to indicate whether the individual is a single child or not, and a dummy to indicate if the individual was born in France. We also control for sender and receiver fixed effects. Standard errors are clustered at the classroom level.

5 Conclusion

Homophily in behavioral traits prevails in each trait that we have studied. The breadth of this set, and the fact that these traits were elicited with incentives (except for the educational aspirations), sets our paper apart from previous work. Although our primary focus is on behavioral traits, our findings also align with earlier studies demonstrating significant homophily in demographic characteristics such as gender, socioeconomic status, and geographic proximity (McPherson et al., 2001; Jackson, 2021). Going beyond this finding, one of our main contri-

butions lies in the insight that similarity in demographic characteristics fosters homophily in behavioral traits. We consistently find that individuals who share demographic traits are more likely to exhibit homophily in behavioral traits compared to those who do not.

Hence, the combination of behavioral traits and demographic characteristics contributes jointly to the segregation of social networks. In fact, homophily based on behavioral traits exacerbates the already well-known segregation based on demographic characteristics, notably gender and socio-economic status. Because behavioral traits are partly malleable, finding homophily in them means that interventions that affect behavioral traits will not only have a direct effect on students' outcomes, as documented by Kautz et al. (2014), Alan et al. (2021), or Sorrenti et al. (2020)), but also an indirect effect through a potential change of peers and their behavioral traits, which may then affect the segregation of social networks. To conclude, we consider this insight as potentially applicable for public policy, for example for the quest for gender equality. Numerous studies have shown, for example, that women are less risk taking and less competitive (Niederle and Vesterlund, 2007; Croson and Gneezy, 2009; Almås et al., 2016). These characteristics have downside effects on women's labor market prospects and later earnings (Buser et al., 2014). Like assigning roommates in student dorms has effects on student achievement (Epple and Romano, 2011; Sacerdote, 2014), one could think about seating more competitive and more risk tolerant women next to less competitive and more risk averse ones to increase the latter's willingness to compete and take risks.

6 Experimental Implementation and Procedures

Student Recruitment. Our recruitment of survey participants took place in several steps. First, we obtained support from the superintendents of three French regions—Nantes, Montpellier, and Créteil. These superintendents informed school principals about our research project. Interested principals invited their teachers to use one of their class hours for their students to take the survey. Although participation was on a voluntary basis, our sample is reasonably representative in terms of gender and social composition. We were able to recruit 67 high schools (4,449 students) in the three regions. Of these students, we were able to match 4,430 students to adminsitrative data and 3,064 students attempted the question which asked them to report their friends within the classroom. This forms the basis of our main sample which we use for our analysis.

Elicitation of Traits. This section describes how we elicited students' behavioral traits in an incentivized manner.[4]

[4]We also elicited time preferences, but the data were not recorded correctly for most participants, so we do not report results on time preferences.

1. **Risk tolerance**. Students had to choose how many out of ten boxes to open (Crosetto and Filipin, 2013). Nine boxes contained one credit (our experimental currency unit) each, but one box contained a shark. After having decided on how many boxes to open, they could choose which ones. If one of the opened boxes contained the shark, they earned nothing in this game, otherwise they received all the credits from the opened boxes. The number of boxes opened by a student is our measure of risk tolerance. See Figure B1 in the appendix for an illustration.

2. **Competitiveness**. We asked students to place 48 sliders in the middle of a [0,1] axis. Students had two minutes to perform the task, and had to choose between two payment options (Niederle and Vesterlund, 2007): (i) playing alone and gaining 0.2 credits for each slider correctly positioned, or (ii) competing with another player. In the latter option they would earn 0.5 credits for each correctly positioned slider, if students performed better than their competitor, else they would earn nothing. We take the choice of the second payment option as our measure of competitiveness. See Figure B2 for an illustration.

3. **Trust**. Each student made a choice to send between 0 and 5 credits to a partner. The quantity sent was tripled and the second student subsequently chose what amount of this tripled quantity they wanted to send back to the first student (Berg et al., 1995). Our trust measure is the amount the first mover transfers to a second mover.[5] See Figure B3 for an illustration.

4. **Cooperation**. Here, students were paired with another student for four rounds.[6] In each round, they were endowed with one credit. Then they had to choose simultaneously how much they wanted to transfer to the other player (in steps of 0.1 credits). The amount transferred was then doubled (Angerer et al., 2016). A student's final payoff was therefore equal to $1 - \mathbf{x} + 2\mathbf{y}$, where $\mathbf{x}$ is the own amount transferred and $\mathbf{y}$ is the amount transferred by the partner. Our measure of cooperation is the average amount of credits transferred over the four rounds. See Figure B4 for an illustration.

5. **Coordination**. In this game, students played for four rounds with the same partner. They had to simultaneously choose between options A and B, like in a stag hunt game (Cooper et al., 1990). Choosing A gave a student 3 credits irrespective of the other player's decision, while choosing B gave 5 credits if and only if the second player made the same choice, but zero otherwise. Our measure of coordination is the average number of times a student chose option B. See Figure B5 for an illustration.

6. **Altruism:** Students were allotted 10 credits in a dictator game (Forsythe et al., 1994)

[5]Students also played the role of a second mover. Yet, due to a software bug the data collected for the second mover was incorrect, which prevents us from including trustworthiness as a behavioral trait.

[6]Students played this game with either the same person or a randomly selected student who changed every round. Students were informed which condition applied.

and were told that another student didn't receive any credits. They had to make a choice of transferring any amounts of credits (in steps of 1) to the other student. This constitues our measure of altruism.[7] See Figure B6 for an illustration.

7. **Morality**. Students had to decide between receiving x credits from the research team versus letting the researchers donate 10 credits to a vaccination campaign (against measles) run by UNICEF (Kirchler et al., 2016). The amount x increased progressively and took on the values 2, 4, 6, 8, and 10. Our measure of morality is the frequency with which subjects donate the 10 credits to UNICEF rather than keeping the credits for themselves. See Figure B7 for an illustration.

8. **Tolerance for inequality**. A student was first informed that two other students had performed a task and the better performing of those had received an initial amount of 9 credits, and the other one of 1 credit. Then the student had the option to re-allocate the sum of 10 credits in any preferred way between the two students (Cappelen et al., 2007). Our measure of a tolerance of inequality is the absolute difference between the amounts allocated to both students. A difference of zero (10) indicates the strongest preference for equality (inequality). See Figure B8 for an illustration.

9. **Depth of reasoning**. We randomly matched each student with 3 other players in a so-called beauty contest or guessing game (Nagel, 1995). Each player had to submit a number between 0 and 100. We defined a target number as the average of the four proposed numbers multiplied by a certain factor (which was either 1/3, 1/2, or 2/3). The student who proposed the number closest to the target number earned 6 credits. Students played this game for four rounds. Our measure of depth of reasoning is a student's mean of the numbers chosen over all rounds (i.e. higher values imply a lower level of depth of reasoning). See Figure B9 for an illustration.

10. **Generosity**. At the end of a session, we gave students the option to donate a share of their total payoff (from all games) to a charitable organization. Our measure of generosity is the share of each student's total payoff that they decided to donate.[8]

11. **Educational aspirations**. As the only non-incentivized task, we asked subjects to report the highest level of educational qualification they wished to obtain (with 1 corresponding to finishing high school, 2 obtaining an undergraduate degree, 3 a graduate degree, and 4 a PhD). This is our measure for educational aspirations. .

Playing all games would have been slightly too long for a one hour class, for which reason we randomized the games that students played. This means that each student played about 9

[7] Due to a recording error, we were only able to use the information on a limited subsample of the students.

[8] We do not have information on generosity for the Créteil sub-sample since we were not allowed to incentivize students in that region with money.

out of those 10 games to elicit behavioral traits, yielding more than 2,800 observations for each behavioral trait (except for altruism and generosity; see Table A.1 in the Appendix). Four of the games were interactive (the trust, cooperation, coordination, and competition games). Students played these games with another student. We randomly chose whether the student would play with someone (i) from their class, (ii) from their school, (iii) from their region. A fourth group of students were told the other player's first name (but without the above information). Finally, a last group was not given any information on their partner. The other student's identity in the dictator game also followed the 4 treatments mentioned above. Our analysis does not exploit these different treatments, but we control for this treatment variation in all regressions.

With regards to incentives, we informed students that we would randomly draw 300 of them who would receive their credits converted in gift vouchers. The Créteil region did not want to incentivize students with money. We did not convert credits in gift vouchers there. We account for that by controlling for students' region in the analysis.

Student demographic characteristics. We use parents' profession (obtained from administrative data) to define a student's socio-economic status (SES). Following the guidelines from the French Statistical Office (INSEE), we define a student as having low SES if the occupation of the parent who is the head of household is either a manual worker ("ouvrier" in French), a non-manual worker ("employé"), an agricultural worker, a retired person, or out of market. Non-manual workers include, e.g., professions like postman, ambulance driver, caregiver, cashier, shop seller, police officer, security agent, or secretary. Manual workers include, e.g., professions like electrician, carpenter, painter, taxi driver, gardener, or builder. Appendix Table A.3 contains the list of professional classifications by INSEE, their relative frequency, the mean wage, and the fraction of workers with a high-school degree in each profession (referring to the whole French working population; showing that our sample is fairly similar to the French population).

We use student names to determine their ethnicity. It is forbidden to collect data on ethnicity in France, so we relied on the python package *ethnicolr* to predict student ethnicity based on their full name. The Pearson correlation coefficient between the broad categorization between white / non-white and the confidence score generated by *ethnicolr* predictor is 0.9.

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Author contributions. All authors contributed equally to this paper.

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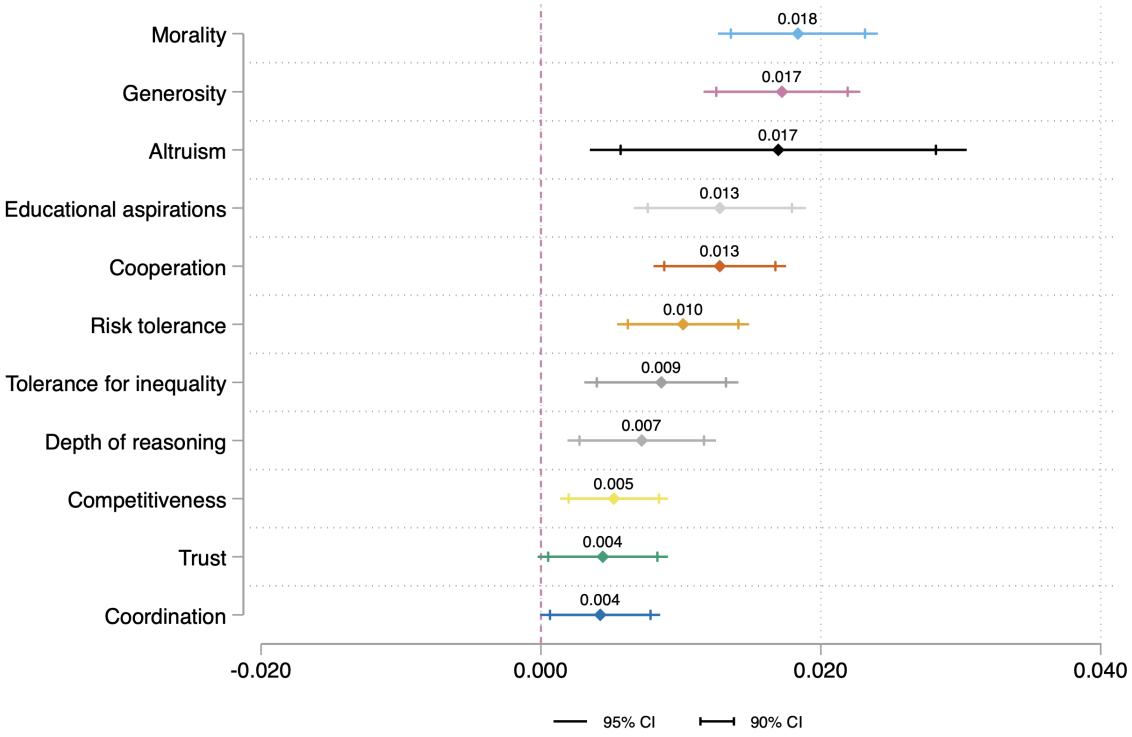
Online Appendix

A Additional Tables and Figures

Figure A.1: Homophily based on behavioral traits - Disaggregated **(Fact 3)**



Note: This figure plots coefficients for homophily based on each single behavioral trait that was elicited (in the main paper, we build a prosociality index from the traits altruism, tolerance for inequality, morality, trust, generosity and cooperation by applying a PCA). Each coefficient corresponds to a separate regression based on eq. 1. The dependent variable is an indicator variable which takes the value 1 if individual i sends a link to individual j and 0 otherwise. On the right-hand-side, $|y_i - y_j|$, whose coefficient is reported above, captures how close two students are in terms of behavioral traits. For the sake of comparison, all measures of similarity in behavioral traits in the regressions are standardized. We control for shared demographic characteristics such as gender, ethnicity, nationality, place of residence, SES, number of siblings, age (in months), a dummy to indicate whether the individual is an only child or not, and a dummy to indicate if the individual was born in France. We also control for sender and receiver fixed effects. Standard errors are clustered at the classroom level.

Table A.1: Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Panel A: Friendship Information					
No. of friends reported	4.083	1.684	0	5	3064
No. of friends matched	2.842	1.727	0	5	3064
No. of times reported as a friend	2.111	1.693	0	10	3064
Panel B: Behavioral Traits					
Altruism	3.133	2.624	0	10	716
Tolerance for inequality	1.656	2.704	0	8	2800
Morality	7.501	3.071	0	10	2932
Trust	2.435	1.620	0	5	2800
Generosity	0.451	0.406	0	1	2344
Cooperation	0.489	0.280	0	1	2800
Coordination	0.482	0.313	0	1	2800
Risk Tolerance	5.721	2.754	0	10	3064
Competitiveness	0.477	0.500	0	1	2800
Depth of reasoning	33.546	14.300	0	100	2800
Educational aspirations	2.857	0.814	1	4	3064
Prosociality PCA	0.033	1.280	-4	4	2908
Panel C: Demographic characteristics					
Female	0.559	0.497	0	1	3064
French	0.961	0.192	0	1	3064
White	0.788	0.409	0	1	3064
Arab	0.053	0.224	0	1	3064
Hispanic	0.064	0.245	0	1	3064
Black	0.059	0.236	0	1	3064
Asian	0.035	0.184	0	1	3064
Primary parent occupation: low skill	0.420	0.494	0	1	3064
No. of siblings from primary parent	1.066	1.042	0	11	3064
Single Child	0.332	0.471	0	1	3064
Born in France	0.950	0.217	0	1	3064
Age (in years)	15.781	0.928	13	19	3064
From Créteil	0.172	0.377	0	1	3064
From Montpellier	0.322	0.467	0	1	3064
From Nantes	0.506	0.500	0	1	3064
Grade 10	0.478	0.500	0	1	3064
Grade 11	0.298	0.458	0	1	3064
Grade 12	0.224	0.417	0	1	3064

Note: Sample restricted to individuals who could be matched to the administrative data and had attempted the question which required them to report their friends. Detailed description of games used to measure behavioral traits are reported in section 2

Table A.2: Homophily coefficients for behavioral traits

	(1)	(2)	(3)	(4)
Prosociality PCA	0.013***	0.010***	0.012***	0.020***
	(0.002)	(0.002)	(0.002)	(0.003)
Coordination	0.004**	0.004**	0.004***	0.004*
	(0.002)	(0.002)	(0.002)	(0.002)
Risk tolerance	0.007***	0.006***	0.007***	0.010***
	(0.002)	(0.002)	(0.002)	(0.002)
Competitiveness	0.006***	0.004**	0.004**	0.005***
	(0.002)	(0.002)	(0.002)	(0.002)
Rationality	0.005***	0.004**	0.004**	0.007***
	(0.002)	(0.002)	(0.002)	(0.003)
Educational aspiration	0.009***	0.007***	0.007***	0.013***
	(0.002)	(0.002)	(0.002)	(0.003)
Shared demographic characteristics	N	Y	Y	Y
Sender and receiver characteristics	N	N	Y	N
Sender and receiver fixed effects	N	N	N	Y

Note: This table reports coefficients for homophily based on behavioral traits. Each coefficient corresponds to a separate regression based on Eq. 1. The dependent variable is an indicator variable which takes the value 1 if individual i sends a link to individual j and 0 otherwise. On the right-hand-side, $|y_i - y_j|$, whose coefficient is reported above, captures how close two students are in terms of behavioral traits. For the sake of comparison, all measures of similarity in behavioral traits are standardized. "Sender and receiver characteristics" as well as "shared demographic characteristics" include gender, ethnicity, nationality, commune of residence, low SES, number of siblings, age (in months), dummy to indicate whether the individual is an only child or not and a dummy to indicate if the individual was born in France. Standard errors are clustered at the classroom level. *** p<0.01, ** p<0.05, * p<0.1, + p<0.15 .

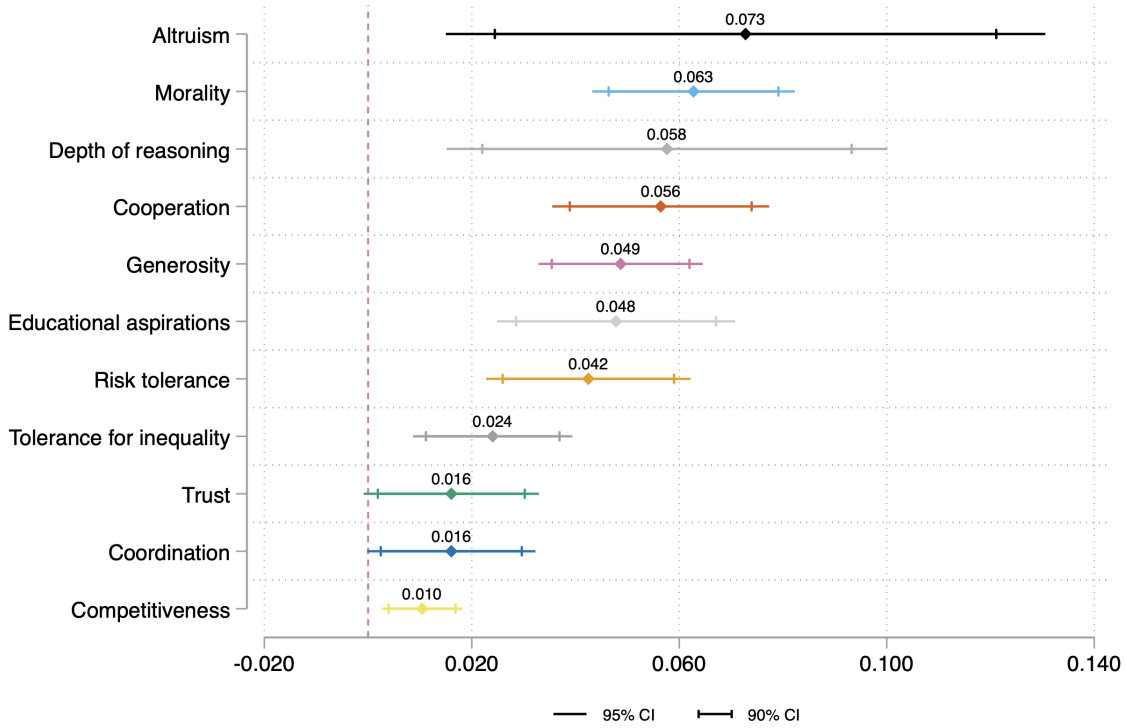
Our results on homophily in behavioral traits persist across a range of robustness checks we carry out. Columns 1, 2, and 3 of Table A.2 report results from different specifications in which we (i) replace the sender and receiver fixed effects by variables that control for sender and receiver demographic characteristics (Column 3), (ii) omit the sender and receiver demographic characteristics (Column 2), and (iii) further omit variables that control for students' shared demographic characteristics (Column 1). Table A.2 confirms that our homophily results hold across these alternative specifications.

Table A.3: Profession classifications of the French statistical agency (INSEE)

	Share of pop in 2020 (1)	Wage (mean) in euros (2)	% graduated from high school (or more) (3)
Farmers	1.4	1210	41
Craftsmen, small business owners, and CEOs	6.8	2580	48
Managers and intellectual professions	20.4	4060	93
Intermediate professions	26.0	2241	78
Non-manual workers (Employees)	25.8	1590	46
Manual workers	19.2	1681	23
Undefined	0.4	-	-
All	100.0	2238	57

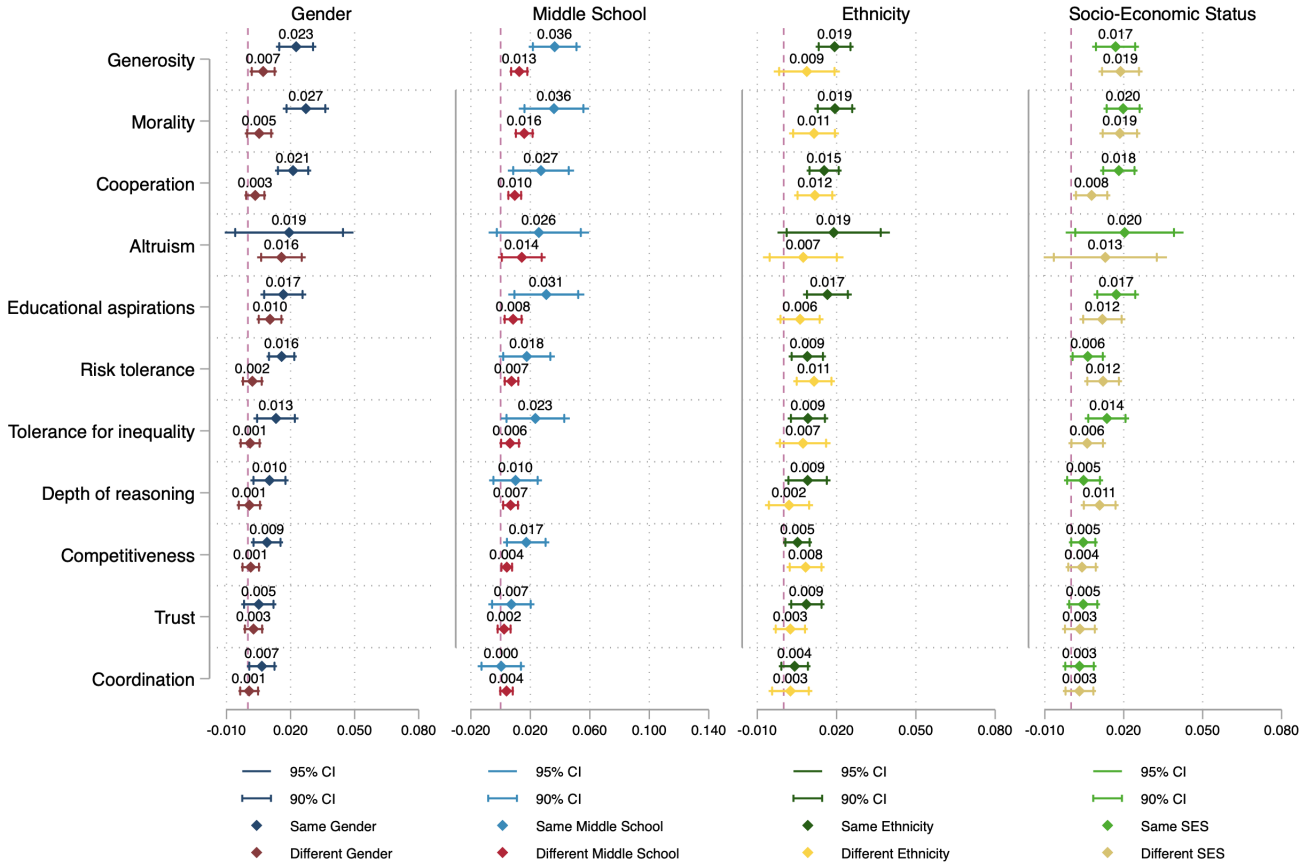
Note: This table presents the six occupation categories of the French Statistical Office (INSEE), the share of the employed population that belongs to each category (Column 1), the average wage of the category (Column 2) and the share of the employed population that graduated with a high school degree or a higher degree (Column 3).

Figure A.2: Homophily based on behavioral traits - Disaggregated and Scaled **(Fact 3)**



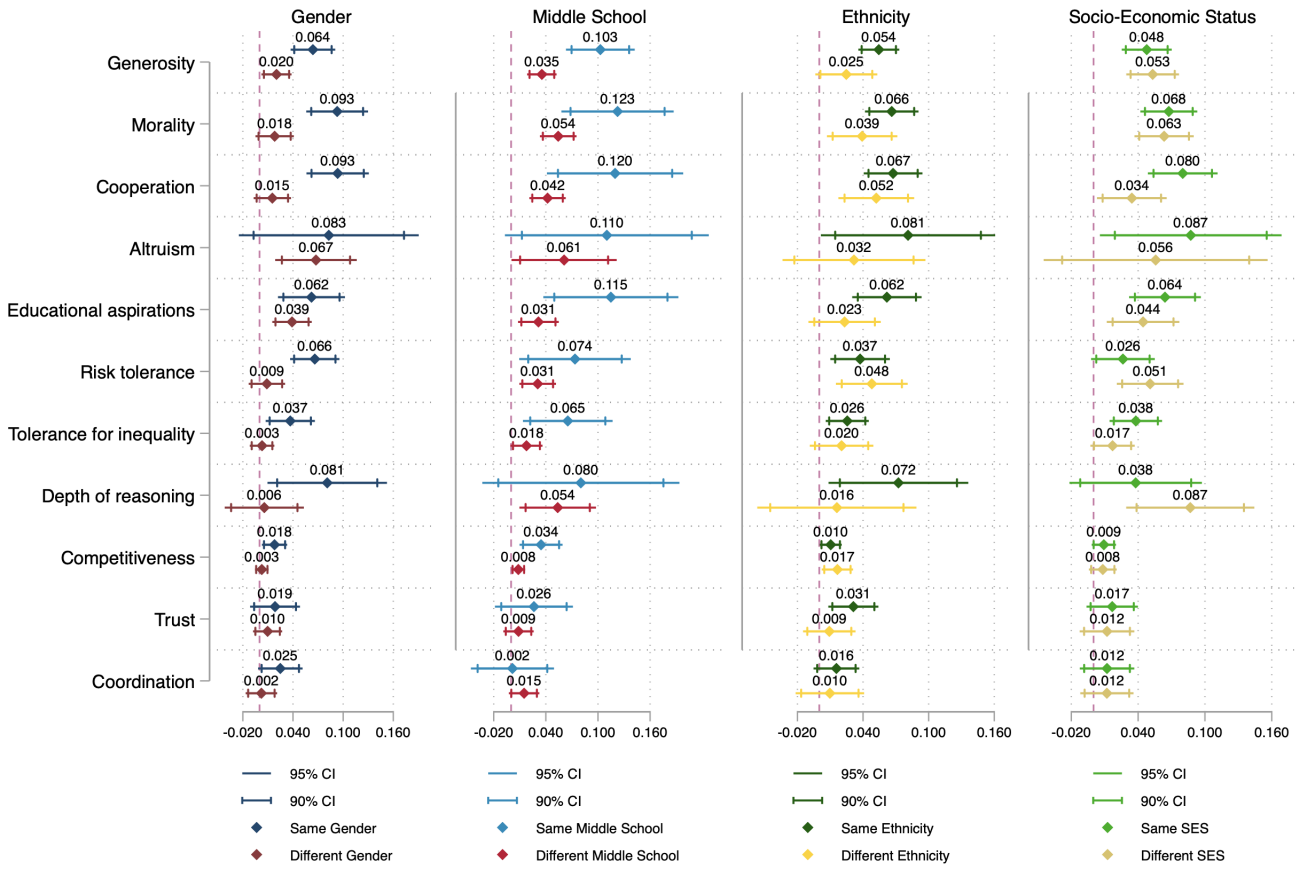
Note: This figure plots coefficients for homophily based on behavioral traits. Each coefficient corresponds to a separate regression based on eq. 1. The dependent variable is an indicator variable which takes the value 1 if individual i sends a link to individual j and 0 otherwise. On the right-hand-side, $|y_i - y_j|$, whose coefficient is reported in the figure, captures how close two students are in terms of behavioral traits. For the sake of comparison, all measures of similarity in behavioral traits in the regressions are normalized to take a value between 0 and 1. We control for shared demographic characteristics such as gender, ethnicity, nationality, place of residence, SES, number of siblings, age (in months), a dummy to indicate whether the individual is an only child or not, and a dummy to indicate if the individual was born in France. We also control for sender and receiver fixed effects. Standard errors are clustered at the classroom level.

Figure A.3: Homophily based on behavioral traits for students who share the same demographic characteristics - Disaggregated **(Fact 4)**



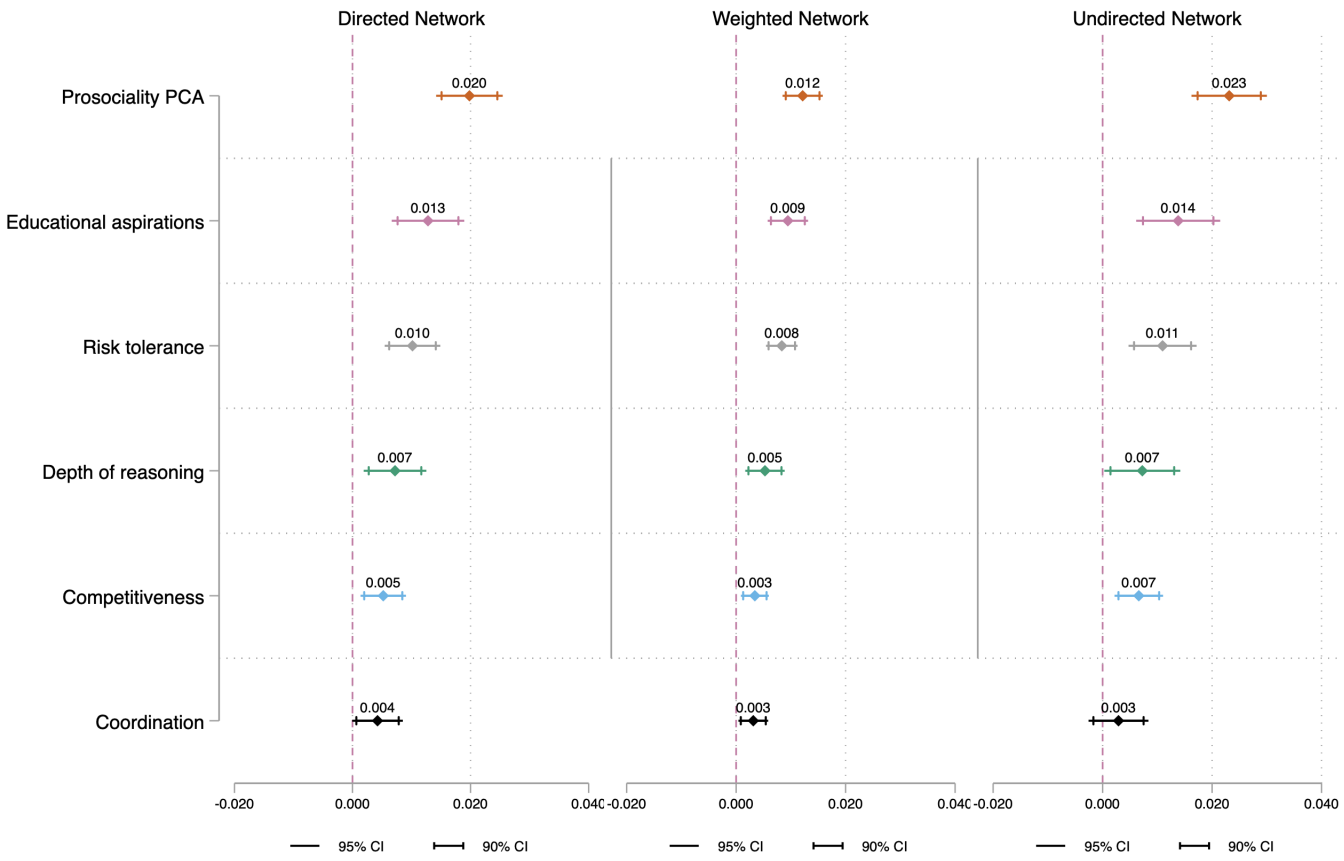
Note: This figure plots coefficients for homophily based on behavioral traits. Coefficients in the first sub-panel correspond to sub-samples where individuals either share the same gender or have different gender. Coefficients from the second, third, and fourth sub-panels analogously correspond to sub-samples where individuals either share the same middle school, ethnicity, or SES or have different middle school, ethnicity, SES respectively. Each coefficient corresponds to a separate regression based on eq. 1. We run regressions separately for each sub-group (same gender v.s. different gender, same SES v.s. different SES, and so on). The dependent variable is an indicator variable, which takes the value 1 if individual i sends a friendship link to individual j and 0 otherwise. On the right-hand-side, $|y_i - y_j|$, whose coefficient is reported in the figure, captures how close two students are in terms of behavioral traits. For the sake of comparison, all measures of similarity in behavioral traits in the regressions are standardized (with a mean of 0 and SD of 1). We control for shared demographic characteristics such as gender, ethnicity, nationality, place of residence, SES, number of siblings, age (in months), a dummy to indicate whether the individual is an only child or not, and a dummy to indicate if the individual was born in France. We also control for sender and receiver fixed effects. Standard errors are clustered at the classroom level.

Figure A.4: Homophily based on behavioral traits for students who share the same demographic characteristics - Disaggregated and Scaled **(Fact 4)**



Note: This figure plots coefficients for homophily based on behavioral traits. Coefficients in the first sub-panel correspond to sub-samples where individuals either share the same gender or have different gender. Coefficients from the second, third, and fourth sub-panels analogously correspond to sub-samples where individuals either share the same middle school, ethnicity, or SES or have different middle school, ethnicity, SES respectively. Each coefficient corresponds to a separate regression based on eq. 1. We run regressions separately for each sub-group (same gender v.s. different gender, same SES v.s. different SES, and so on). The dependent variable is an indicator variable, which takes the value 1 if individual i sends a friendship link to individual j and 0 otherwise. On the right-hand-side, $|y_i - y_j|$, whose coefficient is reported in the figure, captures how close two students are in terms of behavioral traits. For the sake of comparison, all measures of similarity in behavioral traits in the regressions are normalized to take a value between 0 and 1. We control for shared demographic characteristics such as gender, ethnicity, nationality, place of residence, SES, number of siblings, age (in months), a dummy to indicate whether the individual is an only child or not, and a dummy to indicate if the individual was born in France. We also control for sender and receiver fixed effects. Standard errors are clustered at the classroom level.

Figure A.5: Homophily based on behavioral traits - Alternative network specifications



Note: This figure plots coefficients for homophily based on behavioral traits. Each coefficient corresponds to a separate regression based on eq. 1. In directed networks, the dependent variable is an indicator variable which takes the value 1 if individual i sends a link to individual j and 0 otherwise. In undirected networks, the indicator variable takes the value 1 if either individual i or individual j sends a friendship link to the other and 0 otherwise. For weighted networks, we weight the friendship links by the order in which friends are reported. $d_{ij} \in \{0.0675, 0.125, 0.25, 0.5, 1\}$ depending on the order in which individual j is reported as a friend by individual i and 0 otherwise. The first reported friend takes the highest weight. On the right-hand-side, $|y_i - y_j|$, whose coefficient is reported in the figure, captures how close two students are in terms of behavioral traits. All measures of similarity in behavioral traits in the regressions are standardized. We control for shared demographic characteristics such as gender, ethnicity, nationality, commune of residence, SES, number of siblings, age (in months), a dummy to indicate whether the individual is an only child or not, and a dummy to indicate if the individual was born in France. We also control for sender and receiver fixed effects. Standard errors are clustered at the classroom level.

B Screenshots of Incentivized Games (Translated in English)

Figure B1: Risk tolerance

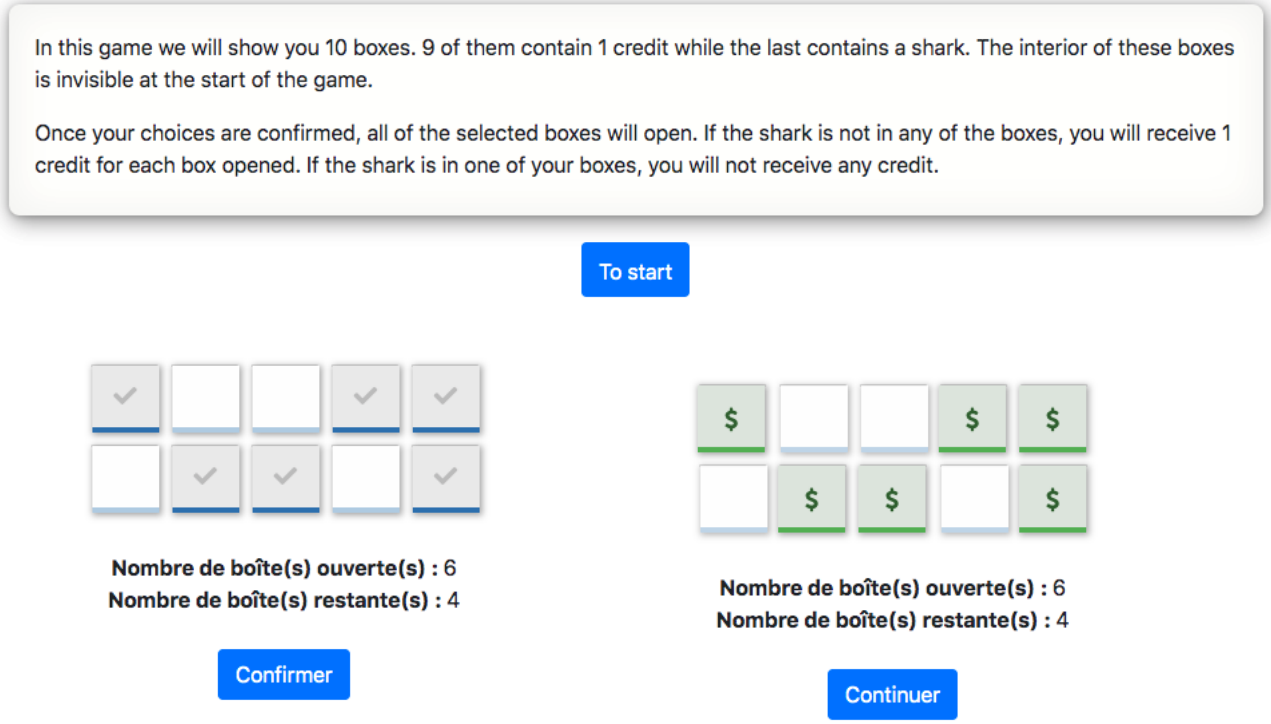


Figure B2: Competitiveness

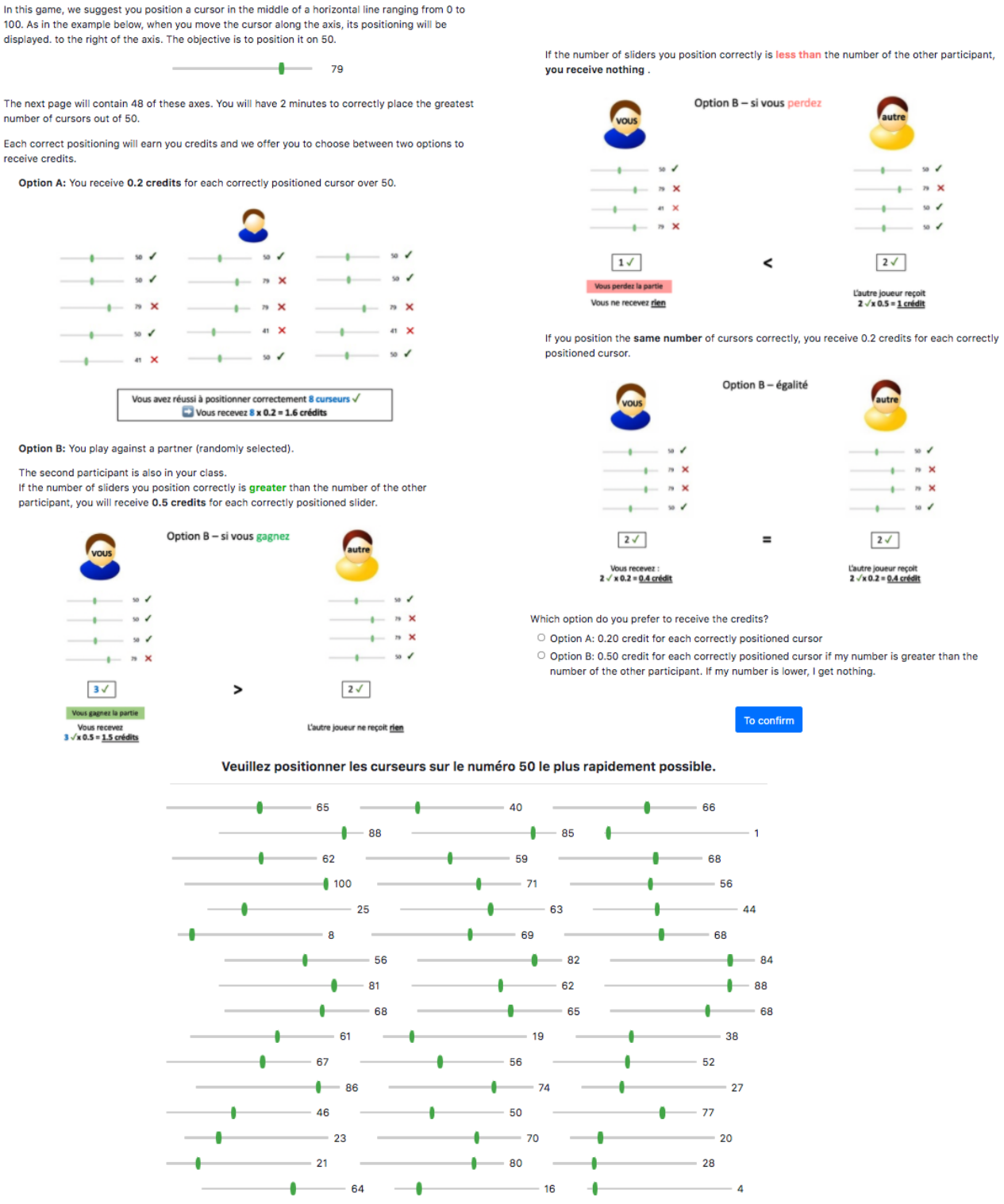


Figure B3: Trust

In this game, we offer you to interact with another participant.

You will each have to make 2 decisions.

Decision 1

We allocate you 5 credits.

1 / You can send between 0 and 5 of these credits to the other participant. The quantity you send will be tripled.

2 / Among this tripled quantity, the other participant must decide how much he wishes to return to you in turn. The quantity returned to you by the other participant is not tripled.

Your final credits are calculated as follows: Your initial 5 credits **minus** your transfer to the other participant **plus** what the other participant returned to you.

Decision 2

Now the other participant receives an endowment of 5 credits.

1 / He chooses the quantity he wishes to send you (between 0 and 5 credits). This quantity is tripled and then sent to you.

2 / You then decide how much you want to return to the other participant. This returned quantity is not tripled.

Your final credits are calculated as follows: credits sent by the other participant tripled **minus** what you returned to the other participant.

When you are ready to start with decision 1, press the start button.

To start

Please indicate how much (between 0 and 5 credits) you wish to transfer to the other participant. Remember that this transferred quantity is tripled and that the other participant can return part of it to you afterwards.

I am transferring:
(Please use multiples of 0.50)

credit (s)

To confirm

Figure B4: Cooperation

We suggest I play with another participant **for 4 rounds** .

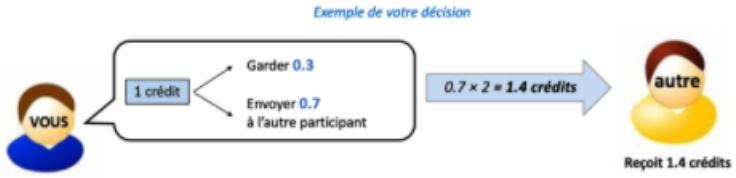
You keep the same partner during the 4 turns.

The second participant is also in your class.

Each turn, you both receive an initial endowment of 1 credit.

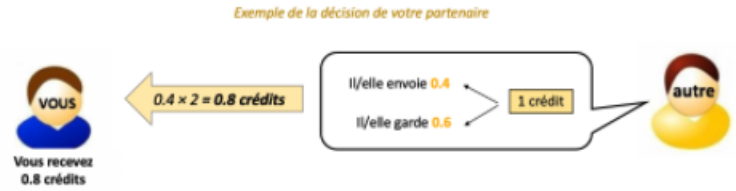
Decision on your part

You must decide how much of this initial endowment you want to transfer to the other participant (between 0 and 1 credit). The transferred quantity will be doubled and the other participant will receive this doubled quantity. What you choose not to transfer remains in your possession but will not however be duplicated.



Decision (simultaneous) from your partner

The other participant simultaneously makes the same decision. He decides how much of his initial endowment he wishes to transfer to you (between 0 and 1 credit). You will receive double the amount transferred.



Your winnings on a round are calculated as the sum of what you keep (from your initial endowment) plus double what the other participant transfers to you.

At the end of each round, you will be able to know the decision made by the other participant and how many credits you have won on that round.

Start round 1

Please choose how much of your initial endowment (between 0 and 1 credit) you wish to transfer to the other participant.

Please use a multiple of 0.1 credit: Credit (s)

To confirm

Figure B5: Coordination

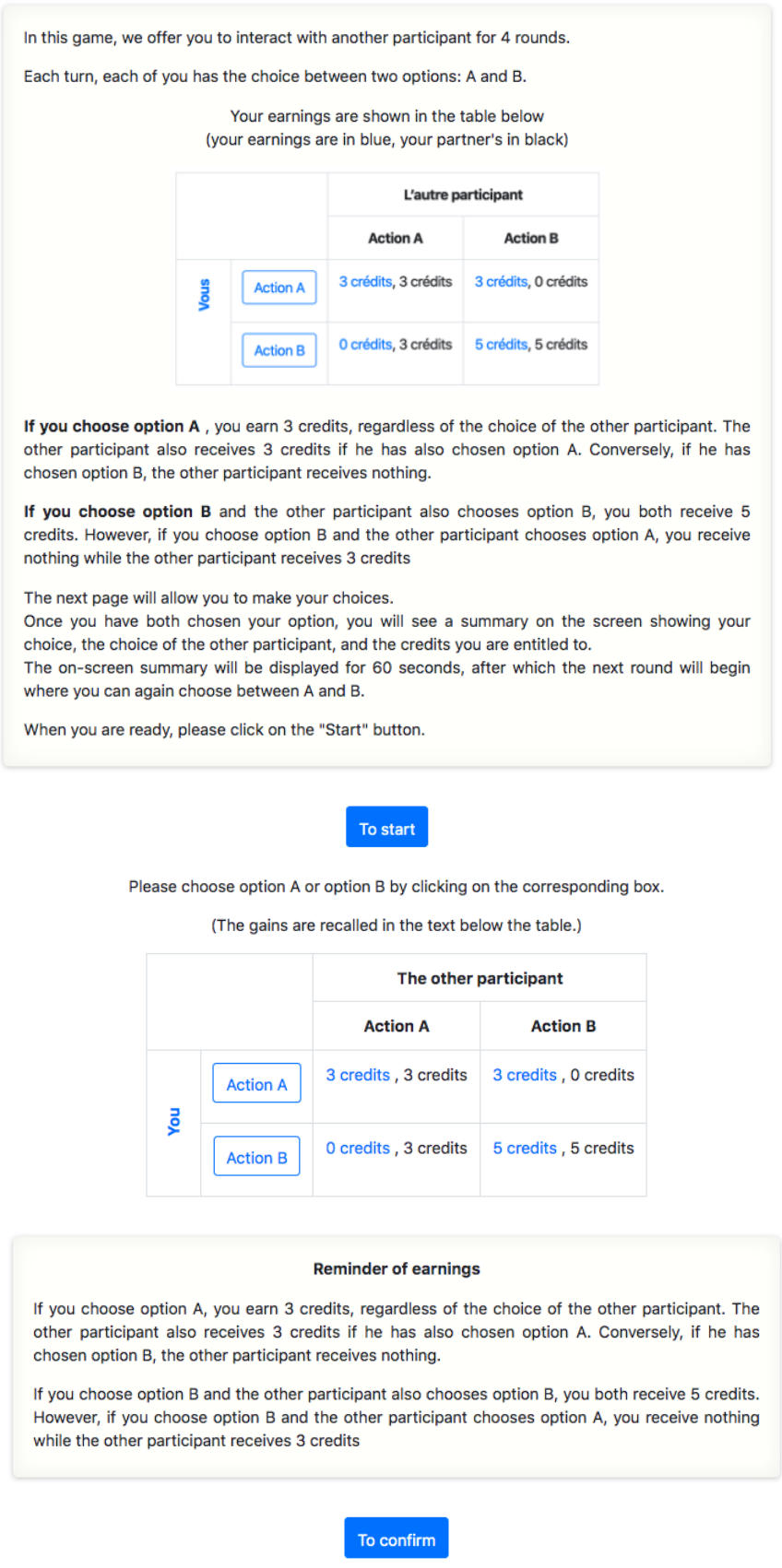


Figure B6: Altruism

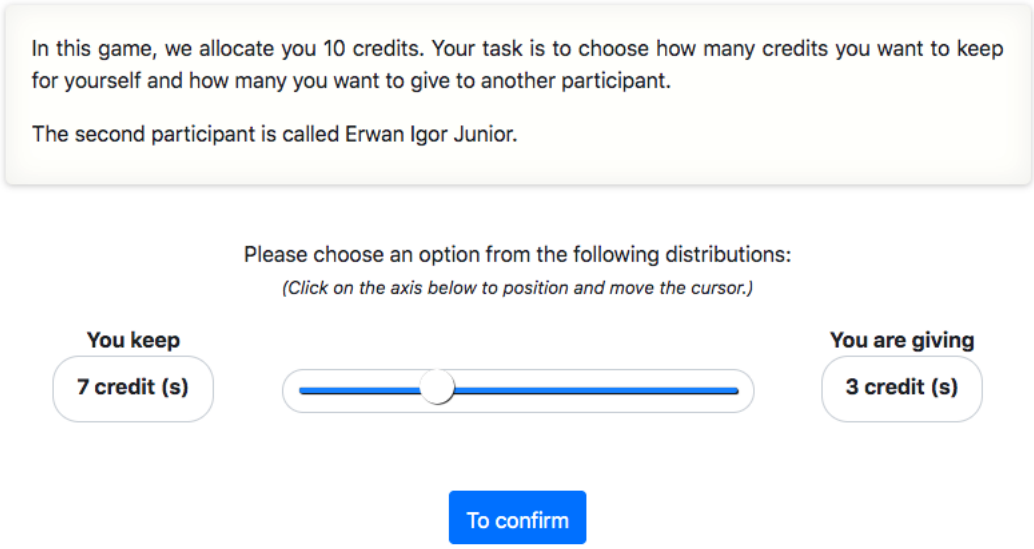


Figure B7: Morality

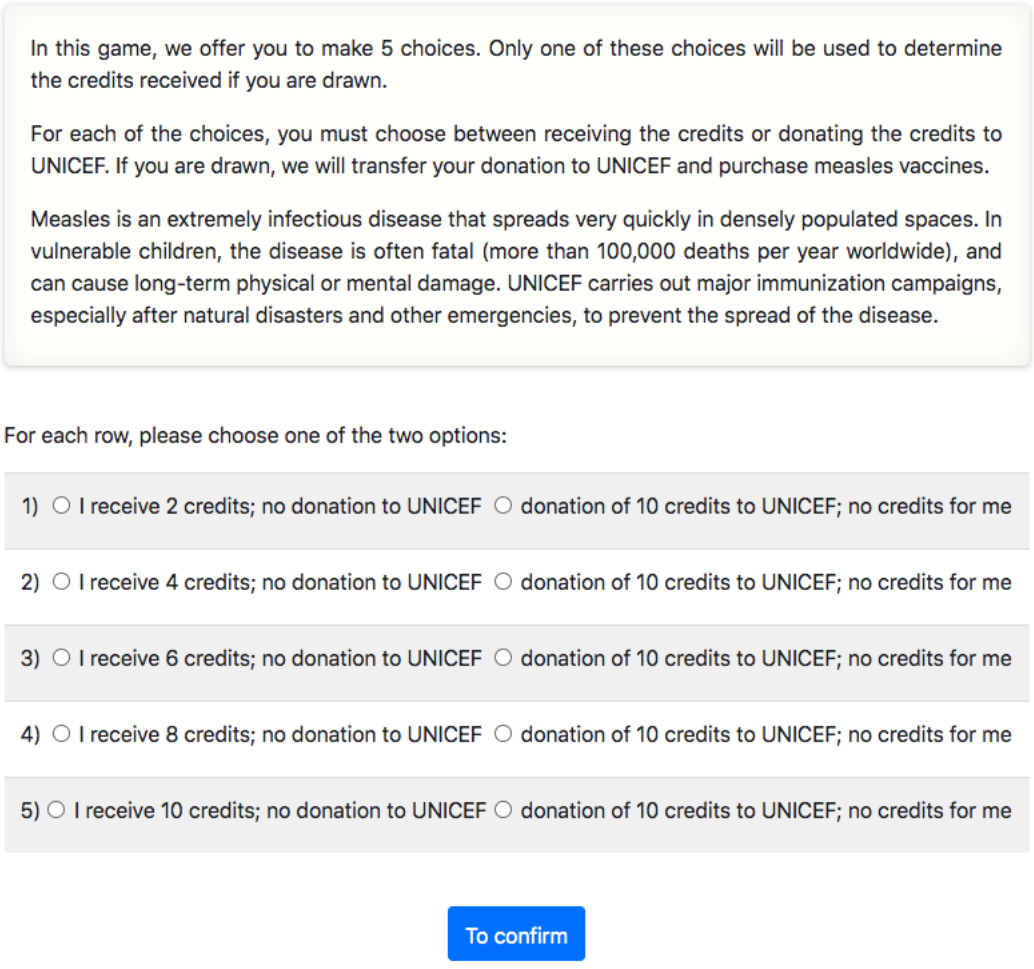


Figure B8: Tolerance for inequality

In this game, we suggest that you determine the credits that will receive two other participants (that we call participant A and participant B).

Participant A is in your class. Participant B is in another school.

Step 1

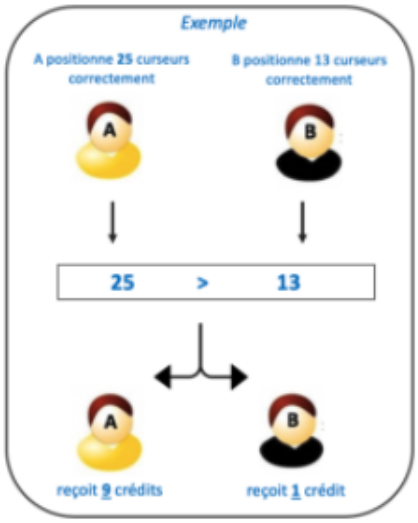
Participants A and B each had the first task of placing cursors in the middle of a row from 0 to 100 (as you did previously). A and B, however, were not playing against each other during this slider game.

2nd step

We randomly match the two participants and we **share 10 credits between them** .

To determine the split, we look at the number of cursors placed correctly by each player.

We allocate 9 credits to the participant who correctly placed the most sliders and 1 credit to the other participant. Between them, the two participants therefore won 10 credits.

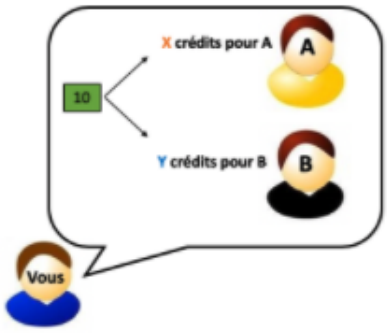


Step 3

Your task is to determine the final allocation of credits between the two participants.

You can leave the current distribution unchanged (9-1), or choose any other final distribution.

Both participants will receive the credits corresponding to the distribution you have chosen.



Which distribution do you want to choose for participants A and B?

(Click on the blue bar below to position and move the cursor.)

Participant A

4 credit

(s)

Participant B

6 credit

(s)

To confirm

Figure B9: Depth of reasoning