

COGNITIVE AND NON-COGNITIVE SKILLS OF FRIENDS: CHOICE, NOT PEER EFFECT

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ABSTRACT. In a multi-ethnic, multi-cultural society, friendship among children may be overwhelmingly shaped by ethnicity and cultural heritage. We show instead that cognitive skills and personality traits (“elective affinities”) matter as much as ethnicity. To support this claim a fundamental issue to be addressed is the potential endogeneity of the traits: friends might affect who you are, more than who you are determining your friends. We test if there are peer effects for cognitive skills and personality, and we measure the sizes of these effects, using an original panel data of classmate networks in multi-ethnic primary schools ($N=396$ children in 2nd and 5th grade). We find that friendship networks among children arise not only based on their sex, but also according to affinity of personality and cognitive skills, as much as on ethnic background. Peer effects on cognitive skills are very small in size and statistically significant for the Math grade, while they are not significant if we consider the KBIT score, a measure of the individuals’ intelligence. A similar result emerges for personality traits: only Extraversion shows evidence of significant peer effect. These findings are crucial when immigration policies are designed: rather than emphasizing what makes the individuals in an ethnic group different, as suggested by the multi-cultural approach, a farsighted policy could try to point to the elective affinity among individuals.

Keywords: Cognitive skills; Multi-ethnic schools; Networks; Personality.

JEL codes: D09; JD13; JD15

INTRODUCTION

The integration of immigrants and their descendants in the North American educational system and, more recently, in most European countries is an issue at the center of a lively debate among scholars and policy makers. The school environment has always been considered of great interest because, on the one hand, the social dynamics that develop at school are considered crucial for understanding those of the society as a whole and, possibly, to lay the foundations of its cohesion. On the other hand, investigating the consequences of the ethnic composition of the classes on the students’ performances poses methodological issues common to the study of the peer effects in a wider range of social interactions as, for example, the spread of behaviors like smoking and obesity (Christakis and Fowler (2007), Christakis and Fowler (2008)).

Date: September 13, 2016.

Supported in part by grants from the.

Social interactions in classrooms have been largely exploited to give evidence of the homophily principle, i.e. the idea that relations between similar people are established at a higher rate than those among dissimilar people. The race is an individual characteristics frequently investigated in the network formation at school, most times in isolation from traits like intelligence or personality (Hallinan and Smith (1989); Hallinan and Teixeira (1987); Baerveldt et al. (2004); Feddes, Noack, and Rutland (2009), Currarini, Jackson, and Pin (2010)), with the idea that the degree of homophily by race registered in the school networks may be interpreted as proxy of that prevailing in the society. Or, when longitudinal data are available, the change in the homophily degree is seen as the test of the Allport contact theory (Allport (1954)), which predicts that cross-ethnic relationships may improve positive out-group attitudes among individuals (Baerveldt et al. (2004) or in that of Feddes, Noack, and Rutland (2009)).

At the same time, the number of immigrant students by class is considered crucial in the study of academic performances, because of peer effects. Peer effects include how a student's innate ability may affects her peers via direct instruction, but also through her influence on the classroom standards. "Peer effects may follow lines like disability, race, gender, or family income: a learning disabled child may raw disproportionately on teacher time, racial or gender tension in the classroom may interfere with the learning, richer parents may purchase learning resources that get spread over the classroom" (Hoxby (2000)). When the academic student performances are explained by the proportion of immigrants in the class, or by the proportion of students by socio-economic backgrounds, the assumption is that certain groups of students, for example the immigrants, impose negative spill-overs, while others, for example the children of affluent families, have positive effects. But, the inclusion of the proportion of immigrants, in the peer effects' measurement causes the fundamental challenge of its identification (a complete review is in Sacerdote et al. (2011)). Even if there are several possible sources of endogeneity when estimating peer effects -on which we will come back later in the paper- the selection of students with immigration background, or by socio-economic status, in some schools is surely the most important. Actually, the class formation is not a random process, because of either the choices of the parents for the schools (and/or for the neighborhoods of residence) or the rules that the principals (or the teachers' boards) are used to adopt or they are asked to follow by the legislation (e.g. Angrist and Lang (2004); Hoxby (2000); Ballatore, Fort, and Ichino (2015)). As we will further specify, in the Italian school system the selection due to the parents' choices is less important in comparison to what happens in North American, which is the educational system of first reference of the cited literature. On the contrary, the role played by schools in the formation of the classrooms is relevant and it affects their composition in all the aspects before mentioned, i.e. the sex, the immigration background, the skills and the disabilities of the students. On top, the reflection problem that "arises when a researcher observing the distribution of behavior in a population tries to infer whether the average behavior in some group influences the behavior of the individuals that comprises the group" (Manski (1993)) emerges not only because of

the decisions taken by parents and schools, but also because homophily rules the way in which students select into peer groups. Said differently, whether the similarity between peers is due to causation, selection or a mixture of both is an open issue regardless the rules governing the formation of the classrooms in schools (Barnes et al. (2014)).

A different and more recent strand of literature, stemming from the experimental evaluation of the well known Perry Preschool program, highlights the role played by personality in educational and related outcomes (Borghans et al. (2008); Almlund et al. (2011)). In particular, Heckman and colleagues are able to show that individuals who received the preschool intervention had higher levels of educational attainment, employment and marriage and lower levels of crime as adults than individuals who did not receive the intervention (Heckman, Pinto, and Savelyev (2013)). In detail, they find evidence that although Perry program did not produce long run gains in IQ, it did create persistent improvements in personality skills. Furthermore, the investigation on the role played by personality factors on academic outcomes widely recognises the positive association of the latter with the Conscientiousness trait, which is one of the Five-Factor Model of personality (Poropat (2009), Poropat (2014)). Personality traits are shown to be relevant in academic outcomes also when long-term goals are considered. The grit construct, proposed by Duckworth and colleagues (Duckworth and Seligman (2005), Duckworth et al. (2007)), even though highly correlated with Conscientiousness, adds to this trait "the perseverance and a combination of self-control and passion that allows individuals to entails working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress" (Duckworth et al. (2007), page 1088).

The present study uses longitudinal observations on 396 children of a sample of multi-ethnic classes in primary school in Italy to investigate the relative importance of the sex, the immigration background, the personality traits and the cognitive skills in predicting relationship among classmates, measuring the peer effects on the possible endogenous traits, i.e. cognitive skills and personality traits. To this aim, we have gathered data of three networks, i.e. the best-friend, play and help, among the children of our sample, together with a complete profile of the samples individual characteristics, i.e. personality, cognitive skills, sex, ethnic origin and family background.

The analysis is articulated in the following steps. First, we investigate the motivation behind each kind of relationship, by calculating simple indices summarizing basic characteristics of each network, and of the relation between them. Second, we develop a simple theoretical matching model to study the formation of a relationship among classmates. Third, we use the regression analysis of the panel data set to identify the factors determining whether a link exists, by means of a logit model with fixed effects at the dyadic level. Fourth, to give evidence of the causal nature of the relationship estimated, we test if the similarity of the factors explaining whether a link exists are the same for which the distance explains its dissolution. Fifth, we estimate a linear regression model with children fixed effect, i.e. *à la* Manski linear-in-means equation of peer effect, to quantify how much the

characteristics of the peers affect that of a child.

METHOD

Participants. Between September 2011 and January 2015 we conducted a two-wave survey in 21 classes in 7 elementary schools near Florence -Italy- to gather demographic information (sex, ethnic background), personality scores as well as childrens cognitive skills and their networks of friends in the class. At the time of the first wave, children were in the second year of the elementary school, while during the second wave they were in their fifth year of elementary school. In the Italian system, elementary school lasts five years and the middle school, which is the next educational level, involves new teachers, new classes and new classmates, so children of the same elementary school class are usually enrolled in different middle schools, located in different buildings. Thus, the second wave was realized in the last year in which the children, who took part to the first wave, were still together in the same class. In the first wave 453 children took part to the survey, while in the second wave the participants were 521 (68 children have joined and 57 have left the survey), so we have a balanced panel of 396 children. The schools participating in the whole project were chosen at the time of the first wave by the Regional Education Board. A tight consent procedure for the conduct of the research in the schools was signed at the outset. Classes were involved if the school principal and school teachers board agreed with the procedure, and only children whose parents had given their consent in each wave took part in the study. The average rate of participation was 94 percent of the children enrolled in the selected classes for the first wave and 89 percent for the second wave. Approximately one month before the day of the session, either of the first or of the second wave, we had meetings with the teachers of each class to present in detail the protocol of the session. Even if the protocol adopted in 2011 and 2015 was the same, the meetings before the sessions of the second wave were due to the fact that some of the teachers of the classes involved have changed meanwhile. Teachers were then asked to fill in on paper the 65-item BFQ for each student during the month before both the sessions in 2011 and 2015 (see Supplemental Material -SM henceforth- for the 65-item Big Five questionnaire administered to the teachers). The 65-item questionnaire was the Big Five Questionnaire Children version (BFQ-C), which is not a simple adaptation of the adult BFQ but a specific instrument developed for analysis of personality in late childhood and validated in Italian (Barbaranelli et al. (2003))¹. Each class had on average 23.5 children (min. 19 and max. 26) in wave 1, 24.1 children (min. 19 and max 26) in wave 2, and 2 teachers in charges in both waves. Thus, each teacher had to fill approximately 12 questionnaires in the month preceding the session of both waves. In both waves, the teachers were also

¹According to the validation article, higher correlations for each personality trait are found among the answers given by adults, and in particular mothers and teachers, while the correlations between self-reports and teacher reports are less than 10 percent, except for Mental Openness (Barbaranelli et al. (2003)). Given this evidence, we consider the answers from the teachers to be the more reliable, and we will only use the children's answers for the purpose of checking the robustness of the results.

asked to extract from their school records the most recent grades assigned to each child.

Sessions. To collect the data, two researchers spent an entire school day in each class, i.e. from 8.30 a.m. to 4 p.m., and the session was organized to comply with the lunch break (nearly an hour) and the two breaks scheduled by the schools (half an hour each). In total, each child spent with the researchers approximately two hours: the first, to fill out the questionnaire in the classroom together with all the classmates; the second hour, required for the remaining tasks, was spent in groups of maximum six children each in a separate classroom. At the beginning of each session of both waves, the same questionnaire was administered in the classroom with paper and pencil to gather demographic information about the childrens families and their social relations in the class (see SM for the translated full text of the questionnaire). In the second part of the questionnaire, children were asked to choose peers in the class whom they considered their best friends (Bukowski and Hoza (1989)). They were also asked to identify the peers with whom they usually played and those they usually asked for help during class hours. As said, the children took approximately an hour to answer the 18 questions; they were under the supervision of one researcher and one of their teachers. After filling in the questionnaire, the children were divided into groups of six and each group was taken to a different room in turns. The children in each group were assigned to a portable computer on which we administered both the visual matrices task included in the brief intelligence test developed by Kaufman and the 65-item Big Five questionnaire (a simplified 30-item Big five questionnaire was administered during the first wave). The KBIT assesses ability to solve new problems by perceiving relationships and completing analogies using pictures and abstract designs rather than words; it can thus assess non-verbal ability even when language skills are limited. The experimenter gave each subject the instructions for the test and an example before beginning, and the Z-tree software was programmed to follow the times and sequences provided in the KBIT manual (Kaufman and Kaufman (1990)). When the six subjects had finished these two tasks, for which they needed around 40 minutes, they played also an ultimatum game and, in the second wave, a stickers game ². When the children had finished all the tasks, they were taken back to their classroom and another group of six started the procedure. Overall, each group of six children spent one hour with the researchers.

Sample. Our sample contains children aged 7.46 on average, in the first wave, and children aged 10.38 on average, in the second wave; 48 percent of them are girls in both waves. 27 percent of those enrolled in the schools in the survey were children with an immigrant background, in the first wave, while in the second wave they were close to 30 per cent (see Rapallini and

²These games are not described here in detail because the behavior of the children when playing them was not studied specifically to investigate the formation of networks but is part of a more general research project.

Rustichini (2016) for the definition of immigrant student we have adopted). This percentage includes the children of mixed couples and we do not distinguish among first- and second-generation immigrants (see Table 1). Children with an immigration background are not all enrolled in a small number of classes or schools but they are quite well represented in 19 of the 21 classes involved. Only two classes consist exclusively of Italian children. Even if the nationalities of the children participating in our survey are those most numerous in Italy, notably Chinese, Moroccan and from Eastern Europe countries (Italian National Institute of Statistics, 2011), in the analysis we classify students into majority (Italian) and minority (non-Italian) groups, since there are not enough representatives of each nationality to consider the nationalities separately.

Correlations among the sex and the ethnicity of the children with their cognitive skills and personality are shown in Table 3 and Table 2).

Measures. From the questionnaire, for each network and for each child we computed two variables: (i) a *nomination sent*, namely a binary variable equal to 1 if child (or node) i chose classmate j in one of the fields investigated (friendship, play or help), 0 otherwise. Notice that child j does not need to indicate i as a best friend, i.e. the binary variable Y_{ij} representing the nomination sent from i to j is such that $Y_{ij} \neq Y_{ji}$ may occur. (ii) A *cross-nomination*, a binary variable equal to 1 if the children reported relationships were reciprocated, and 0 otherwise. In this case, the binary variable representing the cross-nomination satisfies $Y_{ij} = Y_{ji}$. The natural interpretation that we adopt of a nomination sent is that node i regards node j as one of his/her best friends, i likes j for playing and i values help from j as useful or interesting. The number of nominations and cross-nominations by sex and ethnic group, as well as the differences between the two waves are shown in Table 4).

RESULTS

From the descriptive analysis of the networks, two main results emerge. The first is that the best friends and play networks are clearly the most relevant in measuring social cohesion, as both are widely spread and reciprocated (see the frequency index and the index of reciprocity in both waves as shown in Table 5), and the similarity among the two networks is increased between the two waves (see in Table 5 the coincidence index of the best friends and play network in wave 1 and wave 2). Second, when answering who they ask for help, children seem to look for a classmate with higher grades, or higher IQ, who is not necessarily a friend. The asymmetry index is larger for the help network in comparison with the other two networks, and in the case of help discordant responses are very common and coincidences with children nominated as best friend or for play are quite rare. As 5 shows the coincidence of the best friends and help networks is almost 29 percent, and the same is for the play network, being the coincidence index of the best friends and play networks 60 percent.

In terms of the characteristics predicting friendship (Equation 13 in SM is the model estimated), we find that the probability of a friendship increases

of the 22 per cent if children are of the same sex (see Table 6). Comparing the role played by ethnic group, personality traits and cognitive skills, we find that the probability of a friendship increases of 4.7 percent if both children of a dyad are belonging to the majority group, being the reference the links between minority children and those between children belonging to different groups. The probability of a friendship increases of 4.4 percent if both children have an Extraversion score over the median of the class, the reference being the links between children lower than the median of the class, or different in this trait. The probability of a friendship increases of 3.3 percent if both children have the Kbit score over the median of the class, the reference being the links between children below the median, or different, in cognitive skills. If the cognitive skills are measured with the math grade, we find that the relative weight of the child's characteristics predicting friendship is such as the math grade follows the sex (+5.4 percent), while the Extraversion score (+4.3 percent) and the child's ethnic group (+3.9 percent) both come after (see Table 6, column 2). This ranking is still valid when the Conscientiousness trait is added to the estimation (see see Table 6, column 3).

This relative importance of the different characteristics - sex, ethnicity, personality and cognitive skills- in predicting friendships is confirmed by the sizes of the coefficients of the logit models (see Table 9 of the SM).

In the play network, the Extraversion score is the individual trait the most relevant in predicting a relationship, after sex of the child, and before either the ethnic group or the cognitive skills. This is quite similar to what we verify for the help network, being in this case the ethnic group the less relevant (see Tables 10 and 11 of the SM).

The probability of a link is affected also by the characteristics of the other members of the group (see Equation 6 in the SM), and rather by the average difference in the class for each characteristics. In our sample, the probability of a friendship between male (female) children decreases of 24.3 percent if in the class the boys (girls) are in a smaller proportion; the proportion of children with high (low) score in Agreeableness in the class reduces the probability of a friendship of approximately of 13-14 percent for children with low (high) scores. Less relevant for the sorting mechanism is the composition in terms of ethnicity group and math grade (around 6 percent), while the relative presence of children with the high/low Kbit score is not at all significant (Table 6).

Our control variables are focused on those activities that children perform out of the school and that may affect the probability of a relationship among them. In particular, Table 6 shows the coefficients of the variable that records if both children in a dyad are practising some sport³. The possible role of both parents and teachers in promoting - during class hours or out of school- some links among others asks for clarifications. First, in the Italian school system the grades reached during the elementary school

³Robustness checks have been performed taking into account other possible activities performed out of school by children, as for example the attendance to birthday parties or the friendships among parents of the classmates. These different controls do not alter our main results. Estimates available upon request.

years are not taken into account in the subsequent stages of the academic career, which is never conditioned by selective admission criteria, if not for few specialisations at the university level. Furthermore, elementary schools are largely public, uniformly financed by the Italian budget, and thus not highly differentiated in terms of quality. For both these reasons, we may exclude either that the majority of the parents chose an elementary school different from that of the neighborhood, or that they apply pressure to their children for having those with higher grades in the class as their friends. Second, in the Italian system the class is a group of students that does not change its composition during class hours, not even in the form of ability groups, thus we may be confident that the links that we have verified are all equally potentially probable. Third, in our research design we do not have observational information that may help us exclude that in some of the classes some of the teachers try to promote some connections among children. Nonetheless, we can be confident that this attitude is not part of their activities with the children because they never mentioned this as a common goal during the meeting that we had during the project. If some teachers in a few classes have this attitude, we are able to control this sort of unobserved heterogeneity by introducing class fixed effects in the sorting model.⁴

The features explaining the dissolution of a friendship between wave 1 and wave 2 confirm the relevance of the sex and the personality of the children. We find that the probability of the dissolution of a friendship increases by almost 28 percent if children are of different sex, and being different in the Extraversion trait reduces the probability to still friends in the two waves of about 17 percent (see Table 12 if the SM).

Finally, we measure how much children can influence each others in their cognitive and non cognitive skills (see Equation 14 in the SM). Being best friends with a group of peers for whom the Extraversion score is in average increased by one point between wave 1 and wave 2, results in an increase of the Extraversion score of each child of about 0.15 (similar results worths if they play together, see table 13 SM). As illustrated in Figure 1, a change from -25 to +25 in the Extraversion of peers is associated with a change from -3.5 to +3.5 in the Extraversion of the child ($7/50=0.14$, the coefficient of our regression). The effect is null for the Agreeableness trait, and for both the Extraversion and Agreeableness traits if one looks at the help network (see Table 15 of the SM). As far as the cognitive skills are concerned, the math grade increases of 0.27 point if the best friends of the child have increased they average grade of one point between the two waves, and 0.21 point if the play together (see Table 14 of the SM). In terms of IQ the effect is not statistically significant both the best friend network and the help, and it is negative for the play network (see Tables 14 and 16 of the SM). As illustrated in Figure ??, a change of -50 to +50 in the Kbit score of peers is associated with a change from approximately -0.55 to +0.55 in the Kbit score of the child ($2.2/50=0.022$ is the coefficient of the estimation).

⁴Estimates available upon request.

DISCUSSION AND CONCLUSIONS

In this paper we have estimated the relative importance of ethnicity and individual characteristics, such as personality traits and cognitive skills, in determining social connections among children of a sample of multi-ethnic primary schools in Italy. Children were surveyed in their 2nd and 5th grade and data include three different networks, i.e. best-friend, help and play. Longitudinal data allows us to measure the effect of the peers on the potentially endogenous traits, i.e. personality and cognitive skills.

From this study emerges that the best-friends network is the relative bigger in size, in comparison with the play and help networks, and it is the more frequent. Data show a similarity between the links for best friends and for play: the two networks are frequently coincident and reciprocated. This is probably because of their common motivation: it is easier to coordinate on a common activity if children have similar interests, tastes and inclinations. The motivation behind the help network is different, but clear: children look for help from the most capable who is willing to help. In this case, discordant responses are very common, and the coincidence with nominations as best friend and for play are rare. Due to this outcome, our subsequent analysis has been focused on the best-friends network, which provides the clearest insight into the development of social cohesion independently from the specificities of the school activities.

When we compare the predicting powers of characteristics such as ethnicity, cognitive skills and personality in shaping friendships, we find them to be very similar. In detail, we confirm the well-known result that during childhood and approaching adolescence boys prefer to link with boys and girls with girls, but we can also compare the strength of this motivation with ethnicity, and we find that sex is stronger. Our results are robust to several different checks and they have been verified not only in wave 1, when children were 7 years-old, but also in wave 2, when children were 10 years-old and they approach adolescence. At first glance, the latter evidence could appear different from the existing literature on homophily, claiming that the division stemming from ethnicity is likely to become stronger when children approach adolescence (e.g. Hallinan and Teixeira (1987), Hallinan and Smith (1989), Baerveldt et al. (2004)). But the comparison with the existing literature is not easily feasible because until now the predictive power of the ethnic group in the sorting process has been verified in isolation, i.e. in few cases considering the sex of the individuals and never taking into account their personality or their cognitive skills (as reviewed in Rapallini and Rustichini (2016)). The evidence emerging from our analysis can be explained thinking that having experienced cross-ethnic friendships during the first childhood has a positive effect later in adolescence. But this effect may be due to different underlying mechanisms: first, one may think that elective affinities matter not only for children, but also for teens. Second, it may be the case of friendships born during the first years of the elementary school, when the ethnic divide is present but less strong (Aboud, Mendelson, and Purdy (2003); Castelli, De Amicis, and Sherman (2007)), and that might end up with the conclusion of this study cycle. Third, our result may be due to the functioning of the Allport (1954) contact theory which predicts that

cross-ethnic relationships may improve positive out-group attitudes among individuals. Among these explanations, the first two seem to be more likely supported by our analysis. Actually, we have not tested if having experienced cross-ethnic friendships during childhood may improve out-group attitudes among individuals later in life broadly speaking and including - for example- new acquaintances, as suggested by the contact theory. On the contrary, it could be that our result is due to the fact that elective affinities matter, as much as ethnicity, in groups of children and teens who have been in relationships for several years, but not having any information on the future we can't say if these relationships will continue later in life. Or, it may be that elective affinities matter as much as ethnicity, even for the teens and the young adults, and also with their new acquaintances. In conclusion, our analysis gives evidence that ethnicity matter as much as elective affinities in the sorting process of friends not only in childhood, but also when students approach adolescence, with the necessary caveat that our data does not allows either to state if this sorting mechanism is true also when teenagers meet for the first time, or to say how long will endure the relationships we have verified.

Looking deeper in what we have called elective affinities, our results are coherent with both the personality theory, that claims being Extraversion (attitude to being active, being forthcoming and desiring social relationships), Agreeableness (being friendly, warm and sensitive towards others) and Mental Openness (being imaginative, creative, curious and unconventional) the traits that naturally predict the formation of a friendship, and with the existing empirical literature on the friends' personality during adolescence and late adolescence (Selfhout, Branje, and Meeus (2007), Selfhout et al. (2010)). Indeed some caveats are necessary: first, the result concerning the Extraversion trait may be biased by the so-called network bias, due to the fact that extravert children are more likely to become friends with any given other Feiler and Kleinbaum (2015). Second, we have excluded Mental Openness from the estimation because it partly reflects the individual cognitive skills, already included with both a measure of the intelligence and of the academic achievement. Third, even if Conscientiousness is also highly correlated with the academic achievements, we have decided to include this trait in our estimation. In fact, in the literature mentioned in the Introduction, Conscientiousness is interpreted as complementary to both the intelligence and to the curiosity traits, rather than as an alternative measure. Accordingly, we have included in our model one by one the Kbit score and the math grade, and then we have estimated a specification with both the math grade and the Conscientiousness trait. The latter specification allow us to show that these traits do not loose their statistical significance in predicting the process of the sorting of friends even when they are both included in the model.

The check of the robustness of our main finding shows small and significant peer effects on the Extraversion trait and on the math grades, and not statistically significant for the KBIT score. These results given, we can be confident that individual traits determine who are the friends of the children, more than how friends affect the traits of the children. Moreover, if the peer

effect on the math grade here measured is coherent with those reviewed by Sacerdote et al. (2011), the result on the KBIT seems of particular interest if interpreted together with that of the personality. In fact, we show that the math grade, the KBIT score and the Conscientiousness trait predict the children relationships, while a small peer effect emerges for the grades in math, and non significant peer effects are verified for the latter two traits. From one side, being our sample taken by primary schools, and thus related with the first level of education, the grades in math are more likely explained by the attitude to be self-disciplined, goal oriented and systematic, i.e. the Conscientiousness trait, than by a strict trait of intelligence. In this sense, the role played by the Conscientiousness trait and the grade in math in the sorting process can overlap. On the other hand, even if children choose their friends according to the two relevant traits in terms of academic and related outcomes, i.e. the intelligence and the Conscientiousness trait, neither of these traits are significantly affected by the peers.

To conclude, children in our sample are raised in an environment that is multi-ethnic in proportions now common in several countries of Western Europe (as illustrated in detail Rapallini and Rustichini (2016)). Thus, this study can provide insights into wider social dynamics even though it is not designed to discuss a specific immigration policy adopted in a country. Assessing which individual characteristics are more relevant in establishing social relationships is crucial for well-informed design of immigration policies. On the one hand, our results suggest that emphasis on ethnicity, typical of the multicultural approach, may be misguided because individual characteristics seem to matter at least as much as ethnicity in establishing links among individuals. On the other hand, if different ethnic groups, for reasons due to nature or nurture or a combination of the two, are also systematically different in the distribution of these individual characteristics, then multi-ethnicity might provide a lasting cause for reduced social cohesion, because it would not be simply motivated by easily-erased prejudice.

TABLE 1. Summary statistics of the panel sample

Variable	Wave 1		Wave 2	
	Mean	Std. Dev.	Mean	Std. Dev.
Age of the child	7.46	0.36	10.38	0.32
Male child	0.52	0.50	0.52	0.50
Majority (Italian)	0.77	0.42	0.74	0.44
Chinese	0.05	0.22	0.05	0.21
Moroccan	0.02	0.15	0.03	0.16
Albanian	0.04	0.20	0.04	0.20
Romanian	0.01	0.11	0.02	0.12
Peruvian	0.00	0.04	0.00	0.04
Filipino	0.02	0.13	0.02	0.13
Other countries	0.02	0.13	0.02	0.15
Mixed couples	0.07	0.25	0.09	0.28
Number of children	396		396	

TABLE 2. Personality traits -teachers reports-

Variable	Wave 1					Corr. majority
	Mean	Std. Dev.	Min	Max	Corr. male	
Agreeableness	43.98	9.04	17	65	-0.22*	0.05*
Extraversion	42.72	10.10	9	64	-0.00	0.13*
Neuroticism	29.49	10.62	11	64	0.13*	0.13*
Conscientiousness	42.34	11.57	11	65	-0.23*	0.03*
Mental Openness	39.75	11.51	14	65	-0.00*	0.13*
Variable	Wave 2					Corr. majority
	Mean	Std. Dev.	Min	Max	Corr. male	
Agreeableness	45.88	8.73	16	63	-0.33*	0.02
Extraversion	45.31	8.37	15	64	-0.03*	0.11*
Neuroticism	31.57	10.48	13	61	0.17*	0.05*
Conscientiousness	43.88	11.58	14	65	-0.37*	0.03*
Mental Openness	44.18	11.15	17	65	-0.05*	0.07*

* Significant at 0.05 or better

TABLE 3. Cognitive skills

Wave 1						
Variable	Mean	Std. Dev.	Min	Max	Corr. male	Corr. majority
Math grade	7.89	1.18	5	10	-0.01	0.07*
KBIT score	94.00	15.74	40	146	0.02	-0.04*
Wave 2						
Math grade	7.89	1.20	5	10	-0.04*	0.03*
KBIT score	96.03	14.97	40	135	0.00	0.04*

* Significant at 0.05 or better

TABLE 4. Nominations sent and cross-nominations for each network

Wave 1						
Variable	Mean	Std. Dev.	Min	Max	Corr. male	Corr. majority
Nominations sent best friend	4.00	1.34	0	7	-0.07 *	0.09*
Nominations sent play	3.23	1.52	0	5	-0.03 *	0.02*
Nominations help	1.12	1.29	0	5	-0.09 *	-0.09*
Cross-nominations friend	2.47	1.43	0	5	-0.01	0.16*
Cross-nominations play	1.80	1.31	0	5	-0.04 *	0.14*
Cross-nominations help	0.33	0.61	0	4	-0.15 *	0.00
Wave 2						
Nominations sent best friend	3.88	1.26	0	5	0.16 *	0.03 *
Nominations sent play	3.56	1.41	0	5	0.08 *	0.09 *
Nominations help	2.13	1.38	0	5	-0.06 *	0.00
Cross-nominations friend	2.29	1.44	0	5	0.17 *	0.13 *
Cross-nominations play	2.18	1.36	0	5	0.09 *	0.19 *
Cross-nominations help	0.96	1.01	0	5	-0.19 *	0.13 *

* Significant at 0.05 or better

TABLE 5. Statistical Indices of the networks (mean)

	Wave 1	Wave 2
Reciprocity Index		
Best Friend	0.62	0.59
Help	0.09	0.25
Play	0.45	0.57
Frequency Index		
Best Friend	0.17	0.16
Help	0.05	0.09
Play	0.14	0.14
Asymmetry Index of the Best Friend network		
Best friend (higher grade in Math)	0.71	0.68
Help (higher grade in Math)	0.80	0.75
Play (higher grade in Math)	0.66	0.67
Asymmetry Index of the Best Friend network		
Best friend (higher Kbit score)	0.54	0.56
Help (higher Kbit score)	0.54	0.59
Play (higher Kbit score)	0.54	0.55
Coincidence Index		
Best Friend-Help	0.13	0.29
Play and Help	0.14	0.29
Best Friend and Play	0.45	0.60
Relative Size Index		
Best Friend (over Best Friend+Help)	0.89	0.60
Help (over Best Friend+Help)	0.24	0.84
Play (over Play+Help)	0.85	0.46
Help (over Play+Help)	0.29	0.49
Best Friend (over Best Friend+Play)	0.80	0.84
Play (over Best Friend+Play)	0.65	0.77

TABLE 6. Cross-nominations for Best Friends

Dependent variable: cross-nominations. Linear probability models. Cognitive skills measured by Kbit score in model (1) and the Math grade in model (2). (a) Dummy variable. When referred to the dyad and scores, the dummy variable is equal to 1 if both children are over the median of the class in the personality score, Kbit or Math grade.(b) Ratio between the number of children with the same characteristics of the student and the students in the class. (c) Teachers' reports are used for personality scores

	(1)		(2)		(3)	
<i>Dyad's characteristics</i>						
Sex (a)	0.223***	(0.010)	0.225***	(0.010)	0.225***	(0.012)
Ethnic group(a)	0.047***	(0.011)	0.039***	(0.012)	0.027*	(0.066)
Extraversion (a)(c)	0.044***	(0.011)	0.043***	(0.011)	0.034**	(0.011)
Agreeableness (a)(c)	0.028**	(0.011)	0.024**	(0.011)	0.012	(0.013)
Neuroticism (a)(c)	-0.022**	(0.010)	-0.025***	(0.009)	-0.021	(0.011)
Kbit (a)	0.033***	(0.010)				
Math (a)			0.054***	(0.012)	0.044**	(0.014)
Conscientiousness (a)(c)					0.047**	(0.014)
Sport (a)	0.021**	(0.009)	0.018*	(0.009)	0.028**	(0.001)
<i>Characteristics of the children in the class</i>						
Sex (b)	-0.243***	(0.053)	-0.242***	(0.056)	-0.21**	(0.066)
Ethnic group (b)	-0.066***	(0.023)	-0.060***	(0.023)	-0.052	(0.025)
Extraversion (b)(c)	0.028	(0.064)	0.023	(0.065)	0.027	(0.080)
Agreeableness (b)(c)	-0.140*	(0.073)	-0.135*	(0.072)	-0.110	(0.106)
Neuroticism (b)(c)	0.088	(0.072)	0.098	(0.071)	0.134	(0.095)
Kbit	-0.068	(0.113)				
Math (b)			-0.057**	(0.027)	-0.061*	(0.030)
Conscientiousness (a)(c)					0.006**	(0.380)
Sport (b)	0.040**	(0.017)	0.046***	(0.016)	0.044*	(0.020)
Constant	0.115	(0.072)	0.097*	(0.057)	0.05	(0.084)
R^2	0.13		0.13		0.13	
N	6,612		6,885		4843	
Dyad fixed effects	Yes		Yes		Yes	
S.E. clustered (child and class)	Yes		Yes		Yes	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE 7. Peer effect of the best friends' networks - Personality traits-

Dependent variable: Child's personality score in wave 2. Teachers' reports for personality scores (a) Dummy variable (b) Proportion of friends with the same score -over or lower the median of the class- or characteristic over the total number of friends in wave 1 and in wave 2.

	(Extraversion)		(Agreeableness)	
Peers' score	0.147***	(0.053)	0.001	(0.056)
Age of the child	-3.301	(2.517)	1.237	(2.951)
Male child (a)	3.269	(4.877)	2.119	(12.936)
Majority group (a)	-0.942	(2.340)	-4.798	(2.971)
Practice of a sport (a)	-0.935	(1.184)	-0.509	(1.267)
Age of the peers (b)	-0.341	(0.332)	0.522	(0.340)
Male peers (b)	1.991	(1.987)	0.752	(2.223)
Peers from the majority group (b)	0.319	(0.287)	0.027	(0.240)
Peers doing sport (b)	-3.539**	(1.724)	-4.330***	(1.557)
Year panel	-12.673*	(7.452)	3.581	(8.718)
Constant	77.780***	(26.342)	33.787	(31.889)
R^2	0.11		0.07	
N	744		736	
Children fixed effects	Yes		Yes	
S.E. clustered (for child and class)	Yes		Yes	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE 8. Peer effect of the best friends' networks -Cognitive skills-

Dependent variable: Child's cognitive skills in wave 2. (a)Dummy variable
 (b)Proportion of friends with the same score -over or lower the median of the class- or
 characteristic over the total number of friends in wave 1 and in wave 2.

	(Kbit score)		(Math grade)	
Peers' score	0.022	(0.042)	0.267***	(0.048)
Age of the child	3.991	(3.430)	0.111	(0.117)
Male child (a)	10.547***	(3.016)	-0.196	(0.150)
Majority group (a)	2.284	(2.784)	0.020	(0.115)
Practice of a sport (a)	-0.992	(1.999)	0.151*	(0.089)
Age of the peers (b)	0.066	(0.576)	-0.195***	(0.039)
Male peers (b)	2.538	(3.442)	0.133	(0.150)
Peers from the majority group (b)	-1.003**	(0.436)	-0.004	(0.022)
Peers doing sport (b)	1.112	(2.516)	0.018	(0.119)
Year panel	9.758	(10.098)	-0.197	(10.098)
Constant	45.494	(35.650)	6.535***	(1.236)
R^2	0.02		0.05	
N	764		767	
Children fixed effects	Yes		Yes	
S.E. clustered (child and class)	Yes		Yes	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

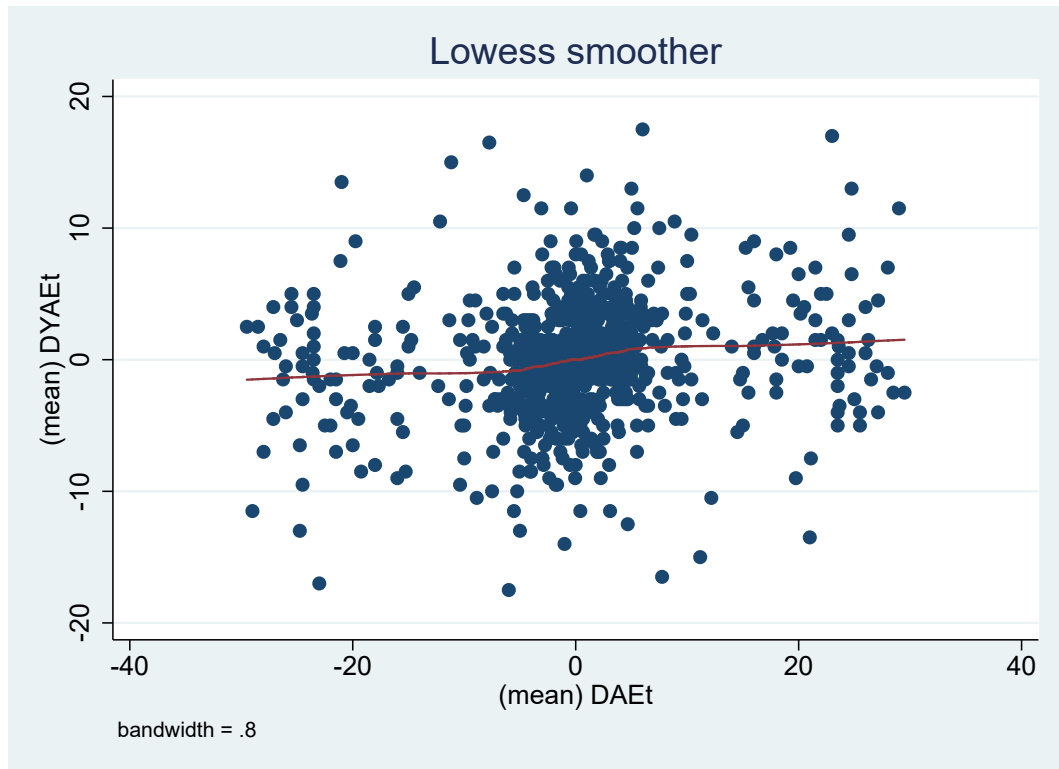


FIGURE 1. Peer effect of the best friends' networks - Extraversion score

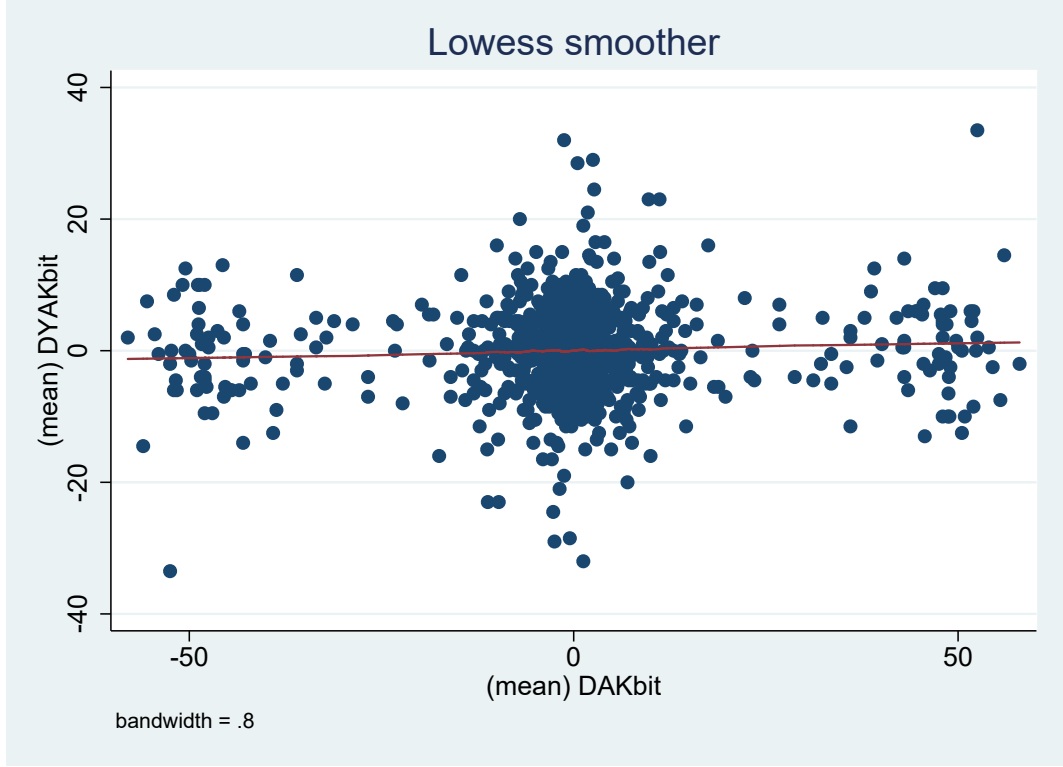


FIGURE 2. Peer effect of the best friends' networks -KBIT score

SUPPLEMENTAL MATERIAL

Theoretical model.

Setup. Students in a class are indexed by $i = 1, \dots, n$. Each student is described by a vector of characteristics, $\theta^i \equiv (\theta_k^i)_{k=1, \dots, K}$. For example, the first coordinate may describe whether the student is female or male, the second may describe whether he is foreign born or not, and so on.

The utility from having a link for a student depends on the characteristics of the student and of the match. Assuming a simple additive form, the *value* for i of having a link (friendship) with j is

$$w^{ij} = \sum_{k=1}^K \left(\lambda_k \delta_{\theta_k^i = \theta_k^j} + \mu_k \delta_{\theta_k^i \neq \theta_k^j} \right)$$

where δ is the indicator function; and if $\sigma_{ij}^k \equiv \delta_{\theta_k^i = \theta_k^j}$ then

$$(1) \quad w^{ij} = \sum_{k=1}^K \mu_k + \sum_{k=1}^K \gamma_k \sigma_{ij}^k$$

If we make the homophilic preferences assumption, then for every characteristic k we have that

$$\lambda_k \geq \mu_k \geq 0.$$

and $\gamma_k \equiv \lambda_k - \mu_k \geq 0$. If C denotes the set of students that are linked to i the utility of i is

$$(2) \quad U^i(C) = \sum_{j \in C} w^{ij} - \#(C)^\alpha$$

with $\alpha > 1$, and where $\#(C)$ is the number of elements in the set C . The convex cost from having a larger group of friends represents the cost (transportation, network management, and so on) associated with a larger group.

0.0.1. *Matching process.* At the beginning of the school year, students have an information on the distribution of characteristics in the class. Each student then sends a link to a set of class mates, to maximize the utility defined in equation (2). This choice is done simultaneously for all students and the links are sent to all students that each one would like to have as friend. If we order the vector of values in a decreasing order of the index, then the optimal size of the group of links for student i is the solution of the simple maximization problem:

$$(3) \quad c_i^* \equiv \max\{c : w^{ic} \geq (c+1)^\alpha - (c)^\alpha\}.$$

that is, the marginal student c_i^* in the order is the last for whom the marginal benefit w^{ic^*} to i from adding c_i^* to the list is larger than the incremental cost of adding another friend to the list of friends, $(c^*+1)^\alpha - (c^*)^\alpha$. This optimal c^* exists and is unique: this follows from the definition in equation (3), the fact that the marginal cost is only dependent on the size c and the ordering convention on the values.

0.0.2. *Comparative statics.* A uniform shift upward of the values of the class mates induces a larger value of c^* (the student has larger number of friends) and makes the marginal friend with a higher value (the student is more “demanding”). Both statements follow from equation (3). For example, if the values of the characteristics is drawn independently, then if we compare a student belonging to the majority group and a minority, the first will have a larger number of friends.

0.0.3. *Estimation.* Let L_{ij} be the 0/1 variable, equal to 1 when the student chooses to send a link to j . The student chooses to send the link if the value to him of establishing the link with j , w^{ij} , is larger than a threshold $w^{i,th}$ that is class and student dependent.

A simple statistics of the distribution of values in the class to student i is the average value:

$$(4) \quad \begin{aligned} \bar{w}^i &\equiv \frac{1}{n-1} \sum_{l \neq i} w^{il} \\ &= \sum_k (\mu_k + \gamma_k \frac{1}{n-1} \sum_{l \neq i} \sigma_{il}^k) \\ &= \sum_k (\mu_k + \gamma_k \bar{\sigma}_i^k) \end{aligned}$$

The values values $\bar{\sigma}_i^k \equiv \sum_{l \neq i} \sigma_{il}^k$ depend on subject and class, and can be easily computed from the data.

In view of the equation 3 determining the optimal size of the group of friends, the threshold $w^{i,th}$ is increasing if the vector of values increases point-wise. We adopt the simple assumption that the threshold $w^{i,th}$ is increasing in the average value \bar{w}^i , and even more simply first that

$$(5) \quad w^{i,th} = \eta \bar{w}^i.$$

where $\eta > 0$. So a student i sends a link to j if and only if $w^{ij} > \eta w^{i,th}$. We will later explore conditions under which the equation 5 holds at the true solution of the problem.

The parameters $(\alpha, (\beta\gamma_k)_{k=1,\dots,K})$ are determined using the simple logit model (6) below:

$$(6) \quad \begin{aligned} Pr(L_{ij} = 1 | \theta^i, \dots, \theta^n) &= \Lambda \left(\alpha + \beta(w^{ij} - \eta w^{i,th}) \right) \\ &= \Lambda \left(\alpha + \beta(1 - \eta) \sum_k \lambda_k + \beta \sum_k \gamma_k (\sigma_{ij}^k - \eta \bar{\sigma}_i^k) \right) \end{aligned}$$

with $\beta\gamma_k$ the coefficient on the j -specific difference σ_{ij}^k , and $\beta\gamma_k\eta$ for the average difference in the class for characteristic k .

Statistical indexes. To investigate the motivation behind each kind of relationship we calculate simple indices summarizing basic features of each network, and of the relation between them. All indices are between 0 and 1 and are illustrated in detail in Rapallini and Rustichini (2016). In short, the reciprocity index is the ratio:

$$(7) \quad RI = (2\#R)/(\#S)$$

where we denote the cardinality of set X as $\#X$, R is the set of cross-nominations existing in a network and S the set of nominations sent. Since $\#S$ is greater than or equal to $2\#R$, the index is between 0 and 1; when no nomination sent is reciprocated the index is 0, and when all the nominations sent are reciprocated the index is 1.

The density index of the network gives a measure of the proportion of the nominations sent out of the total possible and is:

$$(8) \quad DI = (\#S)/N(N - 1)$$

When a variable has a natural order (like the math grade) the asymmetry index measures whether nominations are more likely to be sent when the sender has a lower score than the receiver. Let $N_{up} = \#$ (set of nominations where the value of the variable of the sender is lower than that of the receiver) and N_{down} the complement. The asymmetry index is:

$$(9) \quad AI = N_{up}/(N_{up} + N_{down})$$

For a summary representation of the relationships among pairs of networks, consider two networks, such as, for example, the best friends and help networks, indexed 1 and 2. We call the set of nominations sent in network i D_i , the set of links that are in both networks (the intersection) INT_{12} and the set of links that are in at least one network (the union) U_{12} . The coincidence index CI gives a measure of the coincidence of two networks and the relative size index RSI gives the relative size of each of the two networks:

$$(10) \quad CI = (\#INT_{12})/(\#U_{12})$$

$$(11) \quad RSI = (\#D_1)/(\#U_{12})$$

Empirical Strategy. The linear model we estimate is the following:

$$(12) \quad Y_{ijk} = (\beta_0 + \beta_1 X_{ijk} + \beta_2 X_{ik} + \delta_{ijk} + \varepsilon_{ijk})$$

The logit model is as follow:

$$(13) \quad Y_{ijk} = \lambda(\beta_0 + \beta_1 X_{ijk} + \beta_2 X_{ik} + \delta_{ijk} + \varepsilon_{ijk})$$

where $\lambda(x) = \exp(x)/(1 + \exp(x))$.

In both the models, the dependent variable is a binary dummy $Y_{ijk} = Y_{jik} = 1$ if child i has indicated child j - being both in class k - and vice versa, and 0 otherwise. This model has been estimated three times, one for each kind of relationship, i.e. best friend, play and help. The dependent variable is regressed on a set of explanatory variables X_{ijk} representing the characteristics of the dyad ij (e.g. both are male children, both children are belonging to the majority group). In more detail, for the math grade and the five personality scores X_{ijk} are dummy variables that record if the cognitive skill (personality score) is higher than the median of the class for both the children of the dyad. X_{ik} is the proportion of the children with the same characteristics of child i over the total number of children in class k . δ_{ijk} is the dyad ij fixed effect for controlling for time-invariant unobserved

heterogeneity.

Estimation of dyadic regressions raises difficulties both in the models identification and in inference. The identification should take into account that dyadic data contain both the attributes of the link between child i and child j and the attributes of each of the children i and j . The attributes of the children must enter the dyadic regression symmetrically to take into account the fact that the effect of the attributes of child i and child j on the link Y_{ij} is the same as the effects of the attributes of child j and child i on the link Y_{ji} . In addition, identification of the model (1) depends on the degree distribution, i.e. on the number of links for each node. As shown in Rapallini and Rustichini (2016), our sample is such as we can identify both 1 and 2. As for inference, the main problem of dyadic observations is that they are not independent, for two main reasons: the first is that there are individual specific factors common to all the observations involving an individual, the second is because mutuality characterizes social networks (i.e. the presence of a directional link between node i and node j in a network is not independent of a directional link from node j to node i). Similarly, the presence of a cross-nomination between node i and node j is not independent of a link between node i and node m , or of a link between node j and node m - the so-called transitivity. For all these reasons it is reasonable to assume that in each class k , $E[u_{ij}, u_{im}] > 0$ for all m and $E[u_{ij}, u_{jm}] > 0$ for all m , but also that $E[u_{ij}, u_{jm}] < 0$ and $E[u_{ij}, u_{im}] < 0$. For these reasons, the standard errors of the fixed effects logistic regressions are clustered by student and class. The observations used to fit the logit model are....????, where n_k is the number of children in class k who take part in the experiment and fill in the questionnaire.

To measure the possible reverse effect present in our main model, the equation estimated is the following:

$$(14) \quad Y_{it} = \beta_0 + \beta_x X_{it} + \beta_{\bar{y}} \bar{Y}_{it} + \beta_{\bar{x}} \bar{X}_{it} + \varrho_t + \varepsilon_{it} + \omega_i$$

where the dependent variable Y_{it} is the score of a specific personality trait or, alternatively, one of the measures of the cognitive skills we have chosen, i.e. the Kbit score and the Math grade.

The main explanatory variable is $\bar{Y}_{it} = \sum_{j=1}^n Y_j$, i.e. the average of the endogenous trait (personality scores, Kbit score, or Math grade) of the child i ' friends. The control variables are either the other characteristics of the child (X_{it}) or the average of those of his/her friends (\bar{X}_{it}). ϱ_t is a dummy variable for the year of the wave; ε_{it} is the error term, while ω_i is the individual fixed effect. We estimate this equation with a fixed effect model to exclude time-invariant unobserved heterogeneity at the children level. As point out by Sacerdote et al. (2011), there are at least three reasons why the identification of the peer effects is particularly challenging. The first is the fact that child i score Y_{it} affects his peers' mean score \bar{Y}_{it} and viceversa, thus coefficient $\beta_{\bar{y}}$ is subject to endogeneity bias. The so-called *Mansky reflection*

problem. Second, children are selected into peer group based, in part, on their unobservable characteristics. Said differently, the peers of our models are the result of a sorting process for which children join similar peers. Manky labeled the influence of the selection the *correlated effect*. Third, equation 14 includes effects that originates either from the children scores or the peers' average characteristics, i.e. (\bar{X}_{it}) . Separate identification of $\beta_{\bar{y}}$ and $\beta_{\bar{x}}$ is difficult since peer background itself affects peer outcome. Here we include the student fixed effect in an effort to control for the selection process, as one of the two most commonly approaches of the modern peer effect literature to overcome at least part of all these challenges (Sacerdote et al. (2011)).

Questionnaires and survey materials.

Questionnaire(translated from Italian). (1) What nationality is your mom? (Possible answers (PA): Italy, China, Morocco, Albania, Romania, Peru; Philippines; another country); (2) What nationality is your dad? (PA: Italy, China, Morocco, Albania, Romania, Peru; Philippines; another country); (3) Do you have any brothers or sisters? (PA: yes, no, if yes: how many?); (4) How many rooms are there in the house you live in (not counting the bathroom and the kitchen)? (PA: 1 to 5 or more); (5) Is there is a computer at home? (PA: yes, no); (6) Who helps you to do homework? (PA: nobody, mom, daddy, brother or sister, another person); (7) Which sports do you play? (PA: none, swimming; soccer, basketball, dancing, another sport); (8) Did you attend kindergarten? (PA: yes, no, if yes: where?); (9) Who are your best friends in this class?; (10) Who do you usually play with during class hours?; (11) Who helps you usually during class hours?; (12) Who do you usually not play with during class hours?; (13) Who does not help you during class hours?; (14) To which of your classmates birthday parties have you been?; (15) Are there classmates with whom you usually play/practice sport/do homework in the afternoon out of school?; (16) If yes, who are they?; (17) Are there any classmates' parents that meet with your parents in their spare time?; (18) If, yes, who are these classmates?

65-Item survey to measure the Big Five, teacher-report format(English version: the test was administered in Italian.) For each of the 65 items, behavior is rated by teachers on a 5-point Likert scale from 1 (=Almost never) to 5 (=Almost always).

Extraversion: (1) He/She likes to meet with other people; (9) He/She likes to compete with others; (14) He/She likes to move and to do a great deal of activity; (19) He/She likes to be with others; (23) He/She can easily say to others what he/she thinks; (26) He/She says what he/she thinks; (35) He/She does something not to get bored; (40) He/She likes to talk with others; (42) He/She is able to convince someone of what he/she thinks; (50) When he/she speaks, the others listen to him/her and do what he/she says; (55) He/She likes to joke; (57) He/She easily makes friends; (63) He/She is happy and lively.

Agreeableness: (2) He/She shares his/her things with other people; (11) He/She behaves correctly and honestly with others; (13) He/She understands when others need his/her help; (16) He/She likes to give gifts; (21) If someone commits an injustice to him/her, he/she forgives him/her; (27) He/She treats his peers with affection; (32) He/She behaves with others with great kindness; (38) He/She is polite when he/she talks with others; (45) If a classmate has some difficulty he/she helps her/him; (47) He/She trusts others; (51) He/She also treats kindly persons who he/she dislikes; (60) He/She thinks other people are good and honest; (64) He/She lets other people use his things.

Conscientiousness: (3) He/She does his job without carelessness and inattention; (7) He/She works hard and with pleasure; (20) He/She engages

himself/herself in the things he/she does; (22) During class-time he/she concentrates on the things he/she does; (25) When he/she finishes his/her homework, he/she checks it many times to see if he/she has done it correctly; (28) He/She respects the rules and order; (34) If he/she makes an engagement he/she keeps it; (37) His room is in order; (44) When he/she starts to do something he/she has to finish it at all costs; (48) He/She likes to keep all his school things in good order; (53) He/She plays only when he/she has finished his homework; (56) It is unlikely for his/her attention to be distracted; (65) He/She does his duty.

Neuroticism: (4) He/She gets nervous about silly things; (6) He/She gets in bad moods; (8) He/She argues with others with excitement; (15) He/She easily gets angry; (17) He/She quarrels with others; (29) He/She easily gets offended; (31) He/She is sad; (39) If he/she wants to do something, he/she is not capable of waiting and he/she has to do it immediately; (41) He/She is not patient; (49) He/She easily loses his/her temper; (54) He/She does things with agitation; (58) He/She weeps; (61) He/She worries about silly things.

Mental Openness: (5) He/She knows many things; (10) He/She has a great deal of imagination; (12) He/She easily learns what he/she studies at school; (18) When the teacher asks questions he/she is able to answer correctly; (24) He/She likes to read books; (30) When the teacher explains something he/she understands immediately; (33) He/She likes scientific TV shows; (36) He/She likes to watch TV news, and to know what happens in the world; (43) He/She is able to create new games and entertainments; (46) He/She is able to solve mathematics problems; (52) He/She likes to know and to learn new things; (59) He/She would like very much to travel and to know the habits of other countries; (62) He/She understands immediately.

30-Item survey to measure the Big Five(self-report format, translated from Italian). For each of the 30 items, behavior is rated by children on a 3-point Likert scale, from 1 (= rarely) to 3 (= often).

Extraversion: (21) I like to move and to do a great deal of activity; (22) I like to be with others; (23) I like to talk with others; (10) I like to joke; (11) I easily make friends; (12) I am happy and lively.

Agreeableness: (3) If someone commits an injustice to me, I forgive her/him; (4) I treat my peers with affection; (6) I trust others; (9) I also treat kindly persons who I dislike; (24) I think other people are good and honest; (13) I let other people use my things.

Conscientiousness: (14) I do my own duty (25) When I finish my homework, I check it many times to see if I have done it correctly; (5) I respect the rules and order; (26) My room is in order; (7) I like to keep all my school things in good order; (27) I play only when I have finished my homework.

Neuroticism: (29) I get nervous about silly things; (1) I get in a bad mood; (30) I argue with others with excitement; (2) I easily get angry; (30) I quarrel with others; (28) I easily get offended; (8) I easily lose my temper.

Mental Openness: (16) I know many things; (17) I easily learn what I study at school; (19) When the teacher asks questions I am able to answer

correctly; (18) When the teacher explains something I understand immediately; (20) I am able to solve mathematics problems; (15) I understand immediately the content of the class.

TABLE 9. Cross-nominations for Best Friends

Dependent variable: cross-nominations. Logit models. Cognitive skills measured by Kbit score in model (1) and with the Math grade in model (2) and (3). (a) Dummy variable. When referred to the dyad and scores, the dummy variable is equal to 1 if both children are over the median of the class in the personality score, Kbit or Math grade.(b) Ratio between the number of children with the same characteristics of the student and the students in the class. (c) Teachers' reports are used for personality scores

	(1)	(2)	(3)
<i>Dyad's characteristics</i>			
Sex (a)	3.142*** (0.200)	3.150*** (0.192)	3.100*** (0.222)
Ethnic group(a)	0.531*** (0.132)	0.448*** (0.131)	0.340* (0.142)
Extraversion (a)(c)	0.433*** (0.108)	0.413*** (0.106)	0.348** (0.122)
Agreeableness (a)(c)	0.268** (0.113)	0.239** (0.111)	0.127 (0.138)
Neuroticism (a)(c)	-0.259** (0.106)	-0.295*** (0.105)	-0.237 (0.131)
Kbit (a)	0.339*** (0.101)		
Math (a)		0.593*** (0.308)	0.493*** (0.146)
Conscientiousness (a)(c)			0.399** (0.141)
Sport (a)	0.284** (0.121)	0.238** (0.120)	0.365** (0.140)
<i>Characteristics of the children in the class</i>			
Sex (b)	-2.432*** (0.582)	-2.456*** (0.618)	-2.163** (0.732)
Ethnic group (b)	-0.740*** (0.264)	-0.672** (0.271)	-0.605* (0.287)
Extraversion (b)(c)	0.291 (0.724)	0.243 (0.736)	0.168 (0.911)
Agreeableness (b)(c)	-1.550* (0.811)	-1.568* (0.820)	-1.278 (1.216)
Neuroticism (b)(c)	0.881 (0.781)	0.982 (0.764)	1.356 (1.053)
Kbit (b)	-0.703 (1.304)		
Math (b)		-0.662** (0.308)	-0.686* (0.338)
Conscientiousness (b)(c)			0.143 (0.420)
Sport (b)	0.499** (0.216)	0.557** (0.216)	0.544* (0.256)
<i>pseudo - R²</i>	0.21	0.21	0.21
<i>N</i>	6,612	6,885	4843
Dyad fixed effects	Yes	Yes	Yes
S.E. clustered (child and class)	Yes	Yes	Yes

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE 10. Cross-nominations for Play

Dependent variable: cross-nominations. (a) Dummy variable. When referred to the dyad and scores, the dummy variable is equal to 1 if both children are over the median of the class in the personality or Kbit score.(b) Ratio between the number of children with the same characteristics of the student and the students in the class. (c) Teachers' reports are used for personality scores

	(Linear model)		(Logit)	
<i>Dyad's characteristics</i>				
Sex (a)	0.172***	(0.009)	2.750***	(0.197)
Ethnic group (a)	0.039***	(0.010)	0.508***	(0.143)
Extraversion (a)(c)	0.054***	(0.010)	0.622***	(0.117)
Agreeableness (a)(c)	0.017	(0.010)	0.187	(0.122)
Neuroticism (a)(c)	-0.008	(0.010)	-0.127	(0.131)
Kbit scores (a)	0.027***	(0.009)	0.317***	(0.106)
Sport (a)	0.014	(0.009)	0.224*	(0.131)
<i>Characteristics of the children in the class</i>				
Sex (b)	-0.163***	(0.049)	-1.868***	(0.611)
Ethnic group (b)	-0.043**	(0.020)	-0.554**	(0.273)
Extraversion (b)(c)	-0.016	(0.056)	-0.328	(0.744)
Agreeableness (b)(c)	-0.215***	(0.062)	-2.681***	(0.791)
Neuroticism (b)(c)	-0.034	(0.062)	-0.494	(0.779)
Kbit score(b)	-0.072	(0.099)	-0.948	(1.262)
Constant	0.200***	(0.061)		
R^2 and <i>pseudo</i> - R^2	0.10		0.17	
N	6,612		6,612	
Dyad fixed effects	Yes		Yes	
S.E. clustered (for child and class)	Yes		Yes	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE 11. Cross-nominations for Help

Dependent variable: cross-nominations. (a) Dummy variable. When referred to the dyad and its scores, the dummy variable is equal to 1 if both children are over the median of the class in the personality or Kbit score.(b) Ratio between the number of children with the same characteristics of the student and the students in the class. (c) Teachers' reports are used for personality scores

	(Linear model)		(Logit)	
<i>Dyad's characteristics</i>				
Sex (a)	0.033***	(0.005)	1.218***	(0.187)
Ethnic group (a)	0.013**	(0.006)	0.446*	(0.252)
Extraversion (a)(c)	0.027***	(0.006)	0.807***	(0.178)
Agreeableness (a)(c)	0.010	(0.006)	0.288	(0.182)
Neuroticism (a)(c)	-0.023***	(0.005)	-0.870***	(0.203)
Kbit scores (a)	0.015***	(0.005)	0.445***	(0.161)
Sport (a)	0.011**	(0.004)	0.529**	(0.234)
<i>Characteristics of the children in the class</i>				
Sex (d)	-0.035	(0.031)	-1.136	(1.062)
Ethnic group (b)	-0.018	(0.012)	-0.642	(0.469)
Extraversion (b)(c)	0.003	(0.037)	-0.284	(1.261)
Agreeableness(b)(c)	-0.032	(0.041)	-0.955	(1.282)
Neuroticism (b)(c)	0.065	(0.045)	2.018	(1.369)
Kbit score(b)	-0.103*	(0.058)	-2.726	(1.942)
Sport (b)	0.002	(0.008)	0.007	(0.395)
Constant	0.049	(0.041)		
R^2 and <i>pseudo</i> - R^2	0.02		0.08	
N	6,612		6,612	
Dyad fixed effects	Yes		Yes	
S.E. clustered (for child and class)	Yes		Yes	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE 12. Dissolution of friendships

Dependent variable: cross-nominations in wave 1 not confirmed in wave 2.
 (a) Dummy variable. When referred to the dyad and its scores, the dummy variable is equal to 1 if children are different (one over and the other below the median of the class in the personality score or Kbit).(b) Ratio between the number of children with the same characteristics of the student and the students in the class. (c) Teachers' reports are used for personality scores

	(Linear model)		(Logit)	
<i>Dyad's characteristics</i>				
Different sex (a)	0.287***	(0.081)	1.380***	(0.505)
Different origin(a)	0.048	(0.073)	0.230	(0.327)
Different Extraversion (a)(c)	0.172***	(0.055)	0.738***	(0.240)
Different Agreeableness (a)(c)	-0.053	(0.062)	-0.239	(0.277)
Different Neuroticism (a)(c)	-0.045	(0.062)	-0.192	(0.277)
Different Kbit (a)	0.062	(0.057)	0.262	(0.257)
Different sport (a)	0.002	(0.093)	0.017	(0.427)
<i>Characteristics of children in the class</i>				
Same sex (b)	0.026	(0.326)	0.182	(1.425)
Same ethnic group (b)	0.090	(0.152)	0.384	(0.674)
Same Extraversion (b)(c)	-0.968***	(0.308)	-4.355***	(1.476)
Same Agreeableness (b)(c)	0.134	(0.409)	0.797	(1.977)
Same Neuroticism score (b)(c)	0.235	(0.409)	1.185	(1.847)
Same Kbit score (b)	0.510	(0.577)	2.168	(2.571)
Same sport (b)	-0.018	(0.178)	-0.068	(0.816)
Constant	0.409	(0.380)		
R^2 and <i>pseudo</i> - R^2	0.10		0.07	
N	342		342	
Dyad fixed effects	Yes		Yes	
S.E. clustered (child and class)	Yes		Yes	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE 13. Peer effect of the play networks -Personality traits-

Dependent variable: Child's personality score in wave 2. Teachers' reports are used for personality scores. (a) Dummy variable. (b) Proportion of friends with the same score -over or lower the median of the class- or characteristic over the total number of friends in wave 1 and in wave 2.

	(Extraversion)		(Agreeableness)	
Peers' score	0.120**	(0.056)	0.032	(0.055)
Age of the child	-2.949	(2.527)	1.190	(2.942)
Male child (a)	3.271	(6.959)	2.299	(12.982)
Majority group (a)	-0.149	(2.277)	-4.265	(2.967)
Practice of a sport (a)	-0.963	(1.212)	-0.418	(1.287)
Peers' age (b)	-0.132	(0.345)	0.366	(0.330)
Male peers (b)	0.469	(1.709)	0.831	(1.739)
Majority group peers (b)	0.234	(0.252)	-0.318	(0.234)
Peers doing sport (b)	-3.235**	(1.553)	-3.931***	(1.475)
Year panel	-10.934	(7.482)	3.020	(8.670)
Constant	73.276***	(26.585)	34.253	(31.683)
R^2	0.11		0.07	
N	744		736	
Children fixed effects	Yes		Yes	
S.E. clustered (child and class)	Yes		Yes	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE 14. Peer effect of the play networks -Cognitive skills-

Dependent variable: Child's cognitive skills in wave 2. (a) Dummy variable.
 (b) Proportion of friends with the same score -over or lower the median of the class- or characteristic over the total number of friends in wave 1 and in wave 2.

	(Kbit score)		(Math grade)	
Peers' score (in average)	-0.092***	(0.033)	0.215***	(0.037)
Age of the child	4.174	(3.381)	0.050	(0.117)
Male child (a)	8.749**	(4.384)	0.038	(0.131)
Majority group (a)	2.494	(2.907)	0.015	(0.117)
Practice of a sport (a)	-1.399	(1.832)	0.139	(0.088)
Peers' age (b)	1.632***	(0.459)	-0.149***	(0.031)
Male peers (b)	-1.363	(2.346)	-0.144	(0.110)
Majority group peers (b)	-1.484***	(0.378)	-0.019	(0.017)
Peers doing sport (b)	-0.199	(2.381)	0.013	(0.098)
Year panel	13.705	(9.818)	-0.224	(0.338)
Constant	43.867	(34.921)	7.187***	(1.248)
R^2	0.08		0.00	
N	764		767	
Children fixed effects	Yes		Yes	
S.E. clustered (for child and class)	Yes		Yes	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE 15. Peer effect of the help networks -Personality traits-

Dependent variable: Child's personality score in wave 2. Teachers' reports are used for personality scores. (a) Dummy variable. (b) Proportion of friends with the same score -over or lower the median of the class- or characteristic over the total number of friends in wave 1 and in wave 2.

	(Extraversion)		(Agreeableness)	
Peers' score	0.026	(0.044)	0.006	(0.052)
Age	-3.841	(2.636)	1.118	(3.022)
Male child (a)	3.922	(8.177)	2.629	(15.400)
Majority group (a)	-0.737	(2.276)	-4.905	(3.076)
Practice of a sport (a)	-1.449	(1.275)	-0.480	(1.309)
Peers' age (b)	0.305	(0.301)	0.369	(0.292)
Male peers (b)	0.378	(1.213)	-0.282	(1.149)
Majority group peers (b)	-0.415*	(0.236)	-0.246	(0.199)
Peers doing sport (b)	-3.039	(2.190)	-2.483	(1.588)
Year panel	-12.782	(7.819)	2.701	(8.891)
Constant	84.217***	(27.842)	35.987	(32.900)
R^2	0.07		0.05	
N	744		736	
Children fixed effects	Yes		Yes	
S.E. clustered (child and class)	Yes		Yes	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE 16. Peer effect of the help networks -Cognitive skills-

Dependent variable: Child's cognitive score in wave 2. Teachers' reports are used for personality scores. (a) Dummy variable. (b) Proportion of friends with the same score -over or lower the median of the class- or characteristic over the total number of friends in wave 1 and in wave 2.

	(Kbit)		(Math grade)	
Peers' score	-0.050	(0.044)	0.001	(0.034)
Age	4.443	(3.470)	-0.027	(0.115)
Male child (a)	10.087***	(2.118)	-0.014	(0.117)
Majority group (a)	0.798	(2.937)	-0.002	(0.123)
Practice of a sport (a)	-1.219	(1.915)	0.183**	(0.090)
Peers' age (b)	0.466	(0.490)	0.012	(0.030)
Male peers (b)	3.879**	(1.867)	-0.172	(0.105)
Majority group peers (b)	-0.250	(0.321)	0.014	(0.019)
Peers doing sport (b)	0.730	(2.533)	0.061	(0.156)
Year panel	12.008	(10.026)	-0.043	(0.337)
Constant	43.807	(35.594)	7.969***	(1.221)
R^2	0.05		0.04	
N	764		767	
Children fixed effects	Yes		Yes	
S.E. clustered (child and class)	Yes		Yes	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

REFERENCES

- About, Frances, Morton Mendelson, and Kelly Purdy. 2003. "Cross-race peer relations and friendship quality." *International Journal of Behavioral Development* 27 (2):165–173.
- Allport, Gordon W. 1954. *The nature of prejudice*. Addison-Wesley.
- Almlund, Mathilde, Angela Lee Duckworth, James J Heckman, and Tim D Kautz. 2011. "Personality psychology and economics." Tech. rep., National Bureau of Economic Research.
- Angrist, Joshua D and Kevin Lang. 2004. "Does school integration generate peer effects? Evidence from Boston's Metco Program." *The American Economic Review* 94 (5):1613–1634.
- Baerveldt, Chris, Marijtje AJ Van Duijn, Lotte Vermeij, and Dianne A Van Hemert. 2004. "Ethnic boundaries and personal choice. Assessing the influence of individual inclinations to choose intra-ethnic relationships on pupils networks." *Social Networks* 26 (1):55–74.
- Ballatore, Rosario Maria, Margherita Fort, and Andrea Ichino. 2015. "The Tower of Babel in the classroom: immigrants and natives in Italian schools." .
- Barbaranelli, Claudio, Gian Vittorio Caprara, Annarita Rabasca, and Concetta Pastorelli. 2003. "A questionnaire for measuring the Big Five in late childhood." *Personality and Individual Differences* 34 (4):645–664.
- Barnes, JC, Kevin M Beaver, Jacob TN Young, and Michael TenEyck. 2014. "A behavior genetic analysis of the tendency for youth to associate according to GPA." *Social Networks* 38:41–49.
- Borghans, Lex, Angela Lee Duckworth, James J Heckman, and Bas Ter Weel. 2008. "The economics and psychology of personality traits." *Journal of human Resources* 43 (4):972–1059.
- Bukowski, William M and Betsy Hoza. 1989. *Popularity and friendship: Issues in theory, measurement, and outcome*. John Wiley & Sons.
- Castelli, Luigi, Leyla De Amicis, and Steven J Sherman. 2007. "The loyal member effect: On the preference for ingroup members who engage in exclusive relations with the ingroup." *Developmental Psychology* 43 (6):1347.
- Christakis, Nicholas A and James H Fowler. 2007. "The spread of obesity in a large social network over 32 years." *New England journal of medicine* 357 (4):370–379.
- . 2008. "The collective dynamics of smoking in a large social network." *New England journal of medicine* 358 (21):2249–2258.
- Currarini, Sergio, Matthew O Jackson, and Paolo Pin. 2010. "Identifying the roles of race-based choice and chance in high school friendship network formation." *Proceedings of the National Academy of Sciences* 107 (11):4857–4861.
- Duckworth, Angela L, Christopher Peterson, Michael D Matthews, and Dennis R Kelly. 2007. "Grit: perseverance and passion for long-term goals." *Journal of personality and social psychology* 92 (6):1087.
- Duckworth, Angela L and Martin EP Seligman. 2005. "Self-discipline outdoes IQ in predicting academic performance of adolescents." *Psychological science* 16 (12):939–944.

- Feddes, Allard R, Peter Noack, and Adam Rutland. 2009. "Direct and extended friendship effects on minority and majority childrens interethnic attitudes: A longitudinal study." *Child development* 80 (2):377–390.
- Feiler, Daniel C and Adam M Kleinbaum. 2015. "Popularity, similarity, and the network extraversion bias." *Psychological science* :0956797615569580.
- Hallinan, Maureen T and Stevens S Smith. 1989. "Classroom characteristics and student friendship cliques." *Social forces* 67 (4):898–919.
- Hallinan, Maureen T and Ruy A Teixeira. 1987. "Opportunities and constraints: Black-White differences in the formation of interracial friendships." *Child development* :1358–1371.
- Heckman, James, Rodrigo Pinto, and Peter Savelyev. 2013. "Understanding the mechanisms through which an influential early childhood program boosted adult outcomes." *The American economic review* 103 (6):2052–2086.
- Hoxby, Caroline. 2000. "Peer effects in the classroom: Learning from gender and race variation." Tech. rep., National Bureau of Economic Research.
- Kaufman, Alan S and Nadeen L Kaufman. 1990. *K-BIT: Kaufman brief intelligence test*. American Guidance Service.
- Manski, Charles F. 1993. "Identification of endogenous social effects: The reflection problem." *The review of economic studies* 60 (3):531–542.
- Poropat, Arthur E. 2009. "A meta-analysis of the five-factor model of personality and academic performance." *Psychological bulletin* 135 (2):322.
- . 2014. "Other-rated personality and academic performance: Evidence and implications." *Learning and Individual Differences* 34:24–32.
- Rapallini, Chiara and Aldo Rustichini. 2016. "Elective affinities matter as much as ethnicity in multi-ethnic schhols." *Journal of Economic Behavior and Organization* .
- Sacerdote, Bruce et al. 2011. "Peer effects in education: How might they work, how big are they and how much do we know thus far?" *Handbook of the Economics of Education* 3:249–277.
- Selfhout, Maarten, William Burk, Susan Branje, Jaap Denissen, Marcel Van Aken, and Wim Meeus. 2010. "Emerging late adolescent friendship networks and Big Five personality traits: A social network approach." *Journal of personality* 78 (2):509–538.
- Selfhout, Maarten HW, Susan JT Branje, and Wim HJ Meeus. 2007. "Similarity in adolescent best friendships: The role of gender." *Netherlands journal of psychology* 63 (2):42–48.

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