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PEER EFFECTS IN THE DEVELOPMENT OF CAPABILITIES IN ADOLESCENCE

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ABSTRACT

We estimate peer effects in cognitive, non-cognitive and health-related outcomes in a sample of Uruguayan high-school students. Our identification strategy is based on two features of the data: (i) parents are not able to choose their child's class within the school of their choice, and (ii) we observe outcomes over two points in time. We use school and grade fixed effects to avoid confounding peer influence with selection and exploit the longitudinal nature of the data to address Manski's (1993) reflection problem. We find small but statistically significant peer effects in academic grades (cognitive ability), in having shoplifted, being involved in a fight, and self-satisfaction (proxies for non-cognitive abilities) and in symptoms of depression. The size of the peer effects in non-cognitive and cognitive skills are of similar magnitude. We also find that popular students are less likely to be influenced by peers in terms of cognitive outcomes and that peer effects in non-normative behavior (shoplifting) and depression are milder for students with higher levels of household education.

JEL classification: I1; I2; J24.

Keywords: cognitive and non-cognitive ability; peer effects.

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EFECTOS DE LOS PARES EN EL DESARROLLO DE CAPACIDADES EN LOS ADOLECENTES.

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RESUMEN

Usando una muestra de adolescentes uruguayos estimamos el impacto de los pares en el desarrollo de comportamientos y percepciones vinculadas a las capacidades cognitivas, no cognitivas y a la salud. Nuestra estrategia de identificación se basa en dos características de los datos: (i) los padres no pueden elegir la clase en la que estará su hijo dentro de la escuela de su elección y (ii) tenemos observaciones sobre comportamientos en dos momentos del tiempo. Con el fin de distinguir la influencia de los pares de efectos de selección, usamos efectos fijos a nivel de escuela y grado. Asimismo, usamos datos longitudinales para atacar el llamado problema de reflexión de Manski (1993). Nuestros resultados indican la presencia de efectos de pares pequeños pero estadísticamente significativos en notas académicas (habilidad cognitiva), la probabilidad de haber hurtado de alguna tienda, la probabilidad de verse envuelto en una pelea y la autosatisfacción (como aproximaciones de habilidad no cognitiva) y síntomas de depresión. Los impactos de los pares en habilidades cognitivas y no cognitivas son de similar magnitud. Encontramos también que los estudiantes más populares son menos influenciados por sus pares en términos de resultados cognitivos y que los efectos de pares en comportamientos no-normativo son más leves para estudiantes con mayores niveles de educación en el hogar.

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Peer effects in the development of capabilities in adolescence

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Abstract *

We estimate peer effects in cognitive, non-cognitive and health-related outcomes in a sample of Uruguayan high-school students. Our identification strategy is based on two features of the data: (i) parents are not able to choose their child's class within the school of their choice, and (ii) we observe outcomes over two points in time. We use school and grade fixed effects to avoid confounding peer influence with selection and exploit the longitudinal nature of the data to address Manski's (1993) reflection problem. We find small but statistically significant peer effects in academic grades (cognitive ability), in having shoplifted, being involved in a fight, and self-satisfaction (proxies for non-cognitive abilities) and in symptoms of depression. The size of the peer effects in non-cognitive and cognitive skills are of similar magnitude. We also find that popular students are less likely to be influenced by peers in terms of cognitive outcomes and that peer effects in non-normative behavior (shoplifting) and depression are milder for students with higher levels of household education.

JEL classification: I1; I2; J24.

Keywords: cognitive and non-cognitive ability; peer effects.

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1. Introduction

In daily life individuals participate of multiple exchanges that offer opportunities and challenges. Successful, effective interaction requires the development of cognitive and socio-emotional skills. Besides genetic heritage, these skills are mostly developed in childhood and adolescence. Family and school are probably the two most important scenarios for the formation of these capabilities. During adolescence, the nature of social exchanges and interactions with the group of peers acquires a considerable role. The goal of this paper is to study the impact of peers in the development of skills and capabilities in adolescence. We approach this issue by exploiting a database with full social network information on 10 and 11-graders in ten private high schools in Uruguay over two points in time.

In a paper for the National Academy of Sciences, Heckman (2007) introduced a model of investment in human capabilities that synthesizes two currently unrelated literatures: the human capital approach to health economics (Grossman, 1972) and the model of cognitive and noncognitive skill formation (Cunha and Heckman, 2008). This lifecycle investment framework is based on three groups of capabilities: cognitive skills, noncognitive skills, and health status. Cognitive skills are the mental skills that are used in the process of acquiring knowledge, including reasoning, memory, visual-spatial skills, and attention. Noncognitive abilities capture competencies such as motivation, socio-emotional regulation, time and risk preferences, perseverance, and the ability to work and interact with others. Health status involves physical and mental health. Two properties define the technology of production of these capabilities. Self-productivity implies that the capabilities produced at one stage augment those attained at later stages. Dynamic complementarity refers to the fact that capabilities produced at one stage raise the productivity of investment at subsequent stages. Moreover, there are cross-

productivity effects across all capabilities: each capability affects the accumulation of the others.

Heckman's model focuses on the formation of cognitive, noncognitive, and health-related capabilities over the life cycle, underscoring how investment at earlier stages produces higher returns. In addition, both the model and related empirical work highlight the importance of noncognitive skills. While a large body of literature has focused on the effects of cognitive skills on economic and non-economic outcomes (Murnane, Willett, and Levy, 1995; Hanushek and Woessman, 2008; Burks et al. 2009; Hanushek and Woessmann, 2012), only recently have noncognitive traits been recognized a role in economics. Research shows that noncognitive abilities have a strong influence on earnings, employment, labor force experience, college attendance, teenage pregnancy, participation in risky activities, compliance with health protocols, and participation in crime (Bowles and Gintis, 1976; Bowles et al., 2001; Groves, 2004; Segal, 2012; Heckman, Stixrud, and Urzua, 2006; Borghans et al., 2007; Borghans et al. 2008; Heckman and Kautz, 2012).

In addition to recognizing their impact, understanding how these skills are shaped is of substantive importance. The evidence suggests that a healthy family environment (Anda et al., 2006; Huttenlocher et al., 1991; Huttenlocher et al., 2010; Bianchi and Robinson 1997; Rutter, 2006) and the quality and quantity of schooling (Cunha et al., 2006; Heckman et al., 2006; Blau and Currie 2006; Currie and Almond, 2011) can contribute substantially to shape cognitive, noncognitive, and health-related outcomes.

In this paper we focus on an alternative mechanism behind the formation of human capital competencies: peer influence. In particular, we explore how peer influence can affect each of the three broadly defined developmental capabilities, and

whether the influence operates in different ways across each of these skills. We use academic grades as a proxy for cognitive ability; engagement in risky behaviors and self-satisfaction as noisy proxies for noncognitive ability; and having health problems and depression symptoms as proxies for health status. We recognize that none of these measures is determined solely by the dimension it seeks to approximate. Still, the evidence shows that academic attainment is substantially related to cognitive ability (Welsch et al 2010); that non-cognitive skills such as the levels of self-regulation and conscientiousness, and the levels of risk tolerance are among the main determinants of risky behaviors (Heckman, Stixrud, and Urzua, 2006); and that self-esteem and locus of control are behind self-satisfaction. (Judge et al 2005, Diener and Diener 2009).

Sacerdote (2011) defines peer influence as “nearly any externality in which peers’ backgrounds, current behavior, or outcomes affect an individual’s outcome.” Peer influence attains special policy significance when the externality works through peers’ current behaviors, as it implies that the individual-level effects of a particular policy will be multiplied by the influential processes that take place between peers. The study of peer effects has received profuse attention in the area of education (Hoxby, 2000; Zimmerman, 2003; Sacerdote, 2001; Angrist and Lang, 2004; Ammermueller and Pischke, 2009; Sojourner, 2012, Fletcher, 2012). In a recent summary of this literature, Sacerdote (2011) reports modest sized and statistically significant peer effects in linear-in-means models (models in which the average outcome of peers affects an individual’s outcome), and larger effects in nonlinear models, where, for example, high achieving students (but not low achieving ones) benefit significantly from the presence of other high achievers. There is also a large body of literature on peer influence in social outcomes, such as drinking, drug use, and criminal behavior (Gavira and Raphael, 2001; Powell et al., 2005; Duncan et al., 2005; Kremer and Levy, 2008; Lundborg, 2006;

Clark and Lohéac, 2007; Trogdon et al., 2008). The evidence tends to suggest larger peer effects when the outcome is social than when it is academic (Sacerdote 2011). Finally, there is an incipient literature on the transmission of influences in economic parameters and attitudes (Zimmerman et al., 2004; Boisjoly et al., 2006; Ahern et al.; 2012). Within this strand, in Balsa, Gandelman and González (2014), we inquire about the endogenous transmission of risk attitudes by studying social spillovers in risk aversion using the same sample of adolescents we use in this paper. We find that an increase in one standard deviation in classmates' average risk aversion increases a high school student's risk aversion by between 44% and 64%.

Methodologically, we employ school and grade fixed effects to avoid confounding influence with selection and exploit the longitudinal nature of the data to work around Manski's reflection problem (i.e. the difficulty to disentangle an individual's influence on others from others' influence on the individual). We also explore a student's susceptibility to influence by gender, household education, and position in the school and grade's social network.

We find statistically significant effects in the grades (proxy for cognitive abilities), in several behaviors or perceptions associated with non-cognitive skills (having shoplifted, being involved in a fight, and self-satisfaction), and in symptoms of depression. Higher household education and network centrality moderate some negative influence in non-cognitive outcomes, and being popular decreases susceptibility to positive cognitive influence. All effects are quantitatively small. A one standard-deviation increase in peers' average has at most an effect of 0.21 standard deviations in shoplifting, 0.13 and 0.12 standard deviations for grades and self-satisfaction, respectively, and 0.08 and 0.05 standard deviation in the case of depression and

involvement in fights. Unlike other studies, the size of the peer effects in non-cognitive and cognitive skills are of similar magnitude.

2. Methodology and data

2.1. Identification strategy

The empirical identification of peer effects faces two important challenges. First, peer influence is hard to disentangle from self-selection, a phenomenon also known in the literature as correlated effects (Manski, 1993). Peer associations in economic attitudes and behaviors can be explained by selective group formation - that is, the tendency for those with similar preferences, information, and behavior patterns to get together. In the school setting, the selection (or correlated effects) problem stems from the fact that parents choose schools for their children based on their preferences for location, quality, costs, school values, and other school features. Due to this sorting, it is natural to find that students share more characteristics (e.g. religion) within schools than between schools.

A second problem with the identification of social spillovers is the difficulty in isolating the effect of peers' attitudes on the individual from the influence of the individual on his/her peers, known as Manski's reflection problem. A traditional solution in the literature has been to use instrumental variable techniques (Gaviria and Raphael, 2001; Powell et al., 2005; Lundborg, 2006; Clark et al., 2007; Trogdon, 2008; Fletcher, 2011), where individual-level variables determined ex-ante (such as peers' average family characteristics) instrument for students' current behavior. There are two problems with these instruments. First, they are unable to distinguish contextual from endogenous peer effects. Second, from an empirical point of view, they are usually weak (Angrist, 2014).

To avoid confounding peer influence with selection, in this paper we follow Lundborg, 2006 and Ammermueller and Pischke, 2009, and focus on variations in attitudes and behaviors across classes within the same grade and school. We exploit the fact that parents of students in our sample are not able to choose the class in which their children will be placed within their age cohort. The assignment of students across classes in Uruguay is majorly a decision of the school authorities, who seek to balance student characteristics across the different groups. Groups are reorganized every year or every couple of years, depending on the school. While the assignment process is not completely random, it relies on avoiding sorting of equals within classes.¹ Furthermore, once assigned to a class, students are not mixed up with students in other classes. Also, none of the participating schools have tracking rules in the assignment of students. This configuration ensures more frequent and intense interaction among students within a class than between classes. As in Ammermueller and Pischke (2009), the variation in our peer variable most likely reflects the small differences in composition when multiple groups are formed out of a small population (the absence of the law of large numbers).

We avoid the reflection problem by dissociating student i 's and his peers' outcomes over time: concretely, we identify endogenous effects by studying how peers' capabilities in period t affect a student's capabilities in period $t+1$, conditional on the student's capabilities in period t . Our approach allows us also to explore the separate role of *contextual effects* (i.e. the effects of peers' characteristics on i 's behavior) by controlling for aggregate peer characteristics in our regressions (e.g. education of peers' parents)

¹ We interviewed principals at each school to understand the nature of students' assignment to classes. While in some schools, students are consulted regarding their friendship preferences, the guiding principle for class assignment is randomization with some intervention aimed at avoiding the reinforcement of negative influences, both behavioral and academic, within classes.

The magnitude and significance of peer effects is highly dependent, in addition, on the selection of a relevant peer group. While prior research has selected groups based on region or shared characteristics, our analysis relies on the reference group defined by a student's classmates. We provide empirical evidence, in what follows, that this is a group most likely to exert influence on the adolescent.

Formally, for each variable of interest (e.g. grades) we define the average of the i^{th} student's peers without considering the value of such variable for student i :

$$P_{isgc} = \frac{(\sum_j y_{jsgc}) - y_{isgc}}{N_{sgc} - 1} \quad (1)$$

where y_{jsgc} is the variable of interest for the j^{th} student in school s , in generation (cohort) g , and class c . N_{sgc} is the number of students in school s that belong to generation g and class c .

The econometric model to be estimated conditions outcomes on student i 's past behavior, peers' average behavior, and other individual and group level determinants, i.e:

$$y_{isgc,2} = \alpha_0 + \alpha_1 y_{isgc,1} + \alpha_2 P_{isgc,1} + \alpha_3 X_{isgc,1} + \alpha_4 X_{sgc,1} + \gamma_{sg} + \varepsilon_{sgc} + u_{isgc} \quad (2)$$

where $y_{isgc,2}$ is the outcome for individual i in school s , grade g and class c at follow-up (at the end of the academic year), $y_{isgc,1}$ is the outcome for the same individual at baseline (in the middle of the academic year), $P_{isgc,1}$ is peer's average behavior measured at baseline, $X_{isgc,1}$ is a vector of individual and family characteristics of student i measured at baseline, and $X_{sgc,1}$ is a vector of average demographic characteristics of students in class c , grade g and school s at baseline. γ_{sg} is a vector of dummy variables for school and grade, that allows us to compare students belonging to

the same school/grade across exogenously assigned classes that have different peer composition.

The error term includes an idiosyncratic individual level term u_{isgc} and a term common to the reference group ε_{sgc} . To accommodate inference to common shocks, we cluster standard errors at the school/generation/class level. This implies that the error term allows for intra-class correlation, relaxing the requirement that the observations are individually independent. We assume that they are independent across clusters but not necessarily within them. This assumption does not affect the point estimates, it only affects the covariance matrix of the estimators and therefore its significance levels.

In addition to estimating the average peer effect, we explore heterogeneous effects by interacting the peer effects differ with student i 's gender, family education, and position in the grade's social network.

2.2.Data

The data comes from a study originally aimed at addressing the impact of a web-based substance use preventive program (see Balsa, Gandelman and Porzecanski 2010 for a description of the project and Balsa, Gandelman and Lame 2014 for an analysis of participation in the program).²

The target population was a sample of teenagers who were in their third or fourth year of secondary school in ten private schools in Montevideo. The majority of these students were between 14 and 16 years old. Compared to the average Uruguayan teenager, students who attend private secondary schools have a significantly higher socio-economic status.

² The research proposal underwent review by an Ethics committee of Universidad ORT Uruguay in July 2009.

Each student was asked to complete two surveys, one at baseline and the other after the end of the intervention, at 3 month follow-up. The surveys collected a variety of information on socio-demographics, school performance, time allocation, and substance consumption. The first survey was the initial contact and the second survey the last contact that the project staff had with students. The surveys were self-administered by students at schools under the supervision of the research staff and took around one hour to complete. The academic year in Uruguay goes from March to December. The baseline survey was conducted in July and the follow up survey in November. 1,044 students corresponding to 47 classes responded to the first survey. During the second survey, around 206 interviews had to be conducted on the phone with a scaled down questionnaire due to scheduling problems and 48 students refused to participate. Two schools had only one class and had to be dropped of the database given our identification strategy. In Table 1 we report summary statistics collected in the follow up wave.

2.3. Outcomes

The survey has information on several variables that are associated with skills relevant for successful social interaction and future economic performance. We focus on three broad development capabilities: cognitive ability, non-cognitive ability, and health.

Secondary school students in Uruguay have to take partial subject tests every month or two. Students were asked to report the grade they obtained in the last test they took in Mathematics, History, Literature and Biology. We use the average of these grades as the proxy for cognitive ability. We assume the observation is non-missing when we have at least grades for two of these subjects. Grades range from 1 to 12. The

minimum passing grade is 6. In our sample the average grade is 7.3 with a standard deviation of 1.9 (Table 1). Females' average grade is above males' average grade but the difference is not statistically significant.

The proxies for non-cognitive ability are engagement in non-normative and risky behaviors, and self-satisfaction. We asked students how many times in the past three months they had shoplifted and how many times they had engaged in a physical fight. The options were never, once, twice, three or more and five or more times. We use dichotomous indicators of these behaviors, measuring respectively, any shoplifting and any involvement in fights. Table 1 shows that 6.9% of total students reported having shoplifted and 12.3% reported having been involved in a fight in the past 3 months. Both of these violent conducts are more common among male than female students at statistically significant levels. Another risky behavior is alcohol and drugs consumption. We asked students how many times they had got drunk in the past 30 days and the frequency of consumption of marijuana, cocaine, ecstasy, LSC, and other drugs in the past three months. On the basis of these questions, we construct two dummies. The first takes the value 1 if the student got drunk (15.2%, see Table 1) and the second takes the value 1 if the student consumed at least one of these substances (21.3%). Summary statistics do not show statistically significant differences in average consumption of alcohol by gender, but there is a higher percentage of drug consumption among adolescent males. Finally, we asked students how satisfied they were with themselves. On the basis of these questions, we construct a dummy variable that takes the value of 1 if the student responds being very satisfied or 0 if the response was satisfied, neither satisfied nor unsatisfied, unsatisfied, or very unsatisfied. We find large levels of high satisfaction (around 40%). Boys tend to be more satisfied at statistically significant levels than girls.

To proxy mental health status we use the CES-D10 (Center for Epidemiologic Studies Short Depression Scale) measure of depression symptoms. The reduced version of this test was validated in Spanish by Herrero and Gracia (2007) with an adult population in Spain. The CES-D10 rates the frequency of ten moods or symptoms “during the past week” on a four-point Likert scale, i.e.: 1. I was bothered by things that usually don’t bother me; 2. I had trouble keeping my mind on what I was doing; 3. I felt depressed; 4. I felt that everything I did was an effort; 5. I felt hopeful about the future; 6. I felt fearful; 7. My sleep was restless; 8. I was happy; 9. I felt lonely; 10. I could not “get going”. The total score is the summation of all items after reversing the positive mood items 5 and 8. The frequency options and their scores are: i. rarely or none of the time (less than 1 day, score 0) ii. some or a little of the time (1-2 days, score 1), iii. occasionally or a moderate amount of the time (3-4 days, score 2) and iv. all of the time (5-7 days, score 3). A student with a score of 10 or more is considered depressed. Table 1 shows that the average score is 7.5 with a standard deviation of 4.3. We also account for physical health with a variable that captures whether the individual had some health problem in the past three months (either that he was admitted to a hospital or treated in the emergency room or at home). Table 1 shows that 52.6% of students had a health problem in the past 3 months.

Table 1. Descriptive Statistics

	Full sample			Females			Males			Avg. diff. (%)	
	Mean (%)	SD (%)	N	Mean (%)	SD (%)	N	Mean (%)	SD (%)	N		
Average grades (scale from 1 to 12)	7.3	1.9	698	7.4	1.8	347	7.2	1.9	351	-0.12	
Shoplifted in past 3 months (%)	6.9	25.4	781	3.6	18.7	386	10.1	30.2	395	0.06	***
Involved in a fight in past 3 months (%)	12.3	32.9	779	4.9	21.7	384	19.5	39.7	395	0.15	***
Was drunk at least once in the past 30 days (%)	24.6	43.1	639	25.2	43.5	325	23.9	42.7	314	-0.01	
Consumed drugs in the past 3 months (%)	16.5	37.2	985	12.0	32.5	502	21.3	41.0	483	0.09	***
Feels very satisfied with him/herself (%)	40.2	49.1	776	34.8	47.7	382	45.4	49.9	394	0.11	***
CES-Depression index (min=1; max=20)	7.5	4.3	977	8.0	4.5	500	6.9	4.0	477	-1.16	***
Health problems, past 3 months (%)	52.6	50.0	881	55.5	49.7	443	49.5	50.1	438	-0.06	*

***Difference is significant at 1% level; **difference is significant at 5% level; *difference is significant at 10% level

2.4. Network information

The information about each student's position in the social network contributes to bring forth information about the social resources available to the individual and also about the student's susceptibility to influence. Imagine a group of individuals in a society who live in islands isolated from one another. Compare this to a group of individuals who live in the same city, very close to each other. The social resources that the society as a whole may offer to each member, by means of social relationships, is quite different in each of these extreme cases. Furthermore, isolated individuals are not able to interact, so peer effects may not take place.

We account for a student's position within a network by using friendship data based upon friend nominations. Each student was asked to identify their best friends from a list of students in his/her same cohort, including up to five males and five females.³ By matching the identification numbers of the friendship nominations to respondents' identification numbers, we obtained information on the characteristics of nominated friends. It is important to note that friendship relationships are not necessarily reciprocal.

Our data confirm that friends from school are a relevant reference group for adolescents. First, students were asked whether they had a group of friends with whom they met frequently, and more than 90% answered yes. Then, students were asked about the source of their primary group of friends and more than 75% said that school friends were their primary group of friends. Finally, 80% said that they would first tell a personal problem to a friend.

We choose to work with two measures of network position in order to capture a notion of social status in our friendship networks. These measures are in-degree

³ This might not be binding since only 6% of student nominated ten best friends.

centrality and betweenness centrality. Centrality is a property of a node's position in a network. In-degree centrality is the sum of nominations that an individual received from peers in his/her cohort. In a friendship framework, in-degree centrality is often interpreted as a measure of prestige or popularity of an individual. It is the simplest measure of centrality, as it can be calculated without information about the whole network. Betweenness centrality takes into account the particular position of each individual within the full network. That is, betweenness centrality considers how frequently an individual falls in the paths between all pairs of individuals. Higher level of betweenness centrality means that the individual is in a more powerful position, as more students depend on that individual to make connections with other students⁴. For ease of interpretation we dichotomize each of these two measures around their medians and refer to them as Popularity and Centrality, respectively.

3. Results

3.1. Peer effects

Tables 2, 3 and 4 report results for peer effects in outcomes associated with cognitive ability (Table 2), non-cognitive outcomes (Table 3), and health (Table 4). Column (A) depicts the main effects of own and peer behavior or perceptions at time 1 (baseline) on the individual's behavior or perceptions at time 2 (follow up). The other columns add interactions of peer effects with gender (Column B), household head's education (Column C), and two measures of student's position in the network, popularity (Column D) and betweenness centrality (Column E). To simplify interpretation, we dichotomize household education, popularity, and network centrality

⁴ The betweenness centrality of individual i

$$b_i = \frac{\sum_{j < l} \text{number of shortest paths between individual } j \text{ and } l \text{ through } i \text{ in } g}{\text{number of geodesic path connecting } j \text{ and } l \text{ in } g}$$
, where g is the network. In our case, g is the cohort of each student. We can normalize this measure by expressing it as a fraction of the maximum possible betweenness that an individual can have.

around the median with the values of 1 indicating higher levels. The median for household education is 15 years. The median for popularity is 5 friendship nominations (in a range between 0 and 22) and the median for betweenness centrality is 25 (in a scale from 0 to 100). A common result in all regressions is that outcomes measured in the second wave are positively correlated with the same outcome in the baseline survey. The coefficient, displayed in the first row in all tables, is in all cases positive and statistically significant. The correlation is as high as 0.85 when measuring grades and as low as 0.20 when capturing involvement in fights.

The relevant reference group is all peers in the student's classroom. All regressions adjust for individual-level controls (age, gender, family structure, parental working status, and an asset index) as well as for average peer characteristics at the classroom level (average age, gender, and class size, average household head's education, and average family structure). Detailed results of the coefficients for all controls but the school-grade dummies are reported in the appendix.

Column A in Table 2 shows that a student's grades in period 2 are positively and strongly associated with his/her grades in period 1 as well as with his/her peers' grades in period 1. In particular, a one standard deviation increase in peers' grades at time 1 results in a 0.24 increase in the original grade scale, which goes from 1 to 12, (0.567×0.422) equivalent to a 0.13 increase in individual grades' standard deviations ($0.24/1.853$). Columns B and C show, respectively, no statistically significant differences in peer effects by the student's gender or the education of the head of household. However, peer effects appear to be milder for individuals with higher levels of popularity or "in-degree centrality", as shown in Column D. In terms of standard deviations, a one deviation increase in peers' average grades increases grades by 0.09 standard deviations for a student with a popularity above the median and by 0.19

standard deviations for a student with a popularity below the median. Moreover, more popular individuals are more likely to have higher grades. This appears to suggest that popular students (those highly nominated by their peers) tend to be role models. We find no evidence of differential effects by student's betweenness centrality.

Table 3 reports results for variables highly associated with non-cognitive skills: shoplifting, involvement in a fight, alcohol abuse, consumption of illegal drugs, and self-satisfaction. The first panel reports peer effects in the probability of shoplifting. The likelihood that a student engages in shoplifting in period 2 increases with having shoplifted in the prior period (coefficient of 0.284) and with an increase in peers' probability of shoplifting (100% increase in this probability changes the individual probability of shoplifting by 0.599 percentage points). In terms of standard deviations, a one-standard deviation-increase in peers' probability of shoplifting increases a student's likelihood of engaging in this behavior by 0.20 standard deviations ($0.599 \times 0.086 / 0.254$). We find no differential peer influence by gender or level of popularity, but at a 10% significance level, we find that peers' influence on shoplifting decreases nearly in half as the household level of education gets higher and as the student's betweenness centrality is higher. Parents education could moderate this influence by providing more information about consequences, reinforcing social norms, or fostering self-control. Students with higher levels of social connections are less vulnerable to non-normative influence, an effect that could be due to better self-control or higher self-esteem.

The second panel in Table 3 reports results for involvement in fights in the past 3 months. We find evidence of positive peer effects in this measure but only at a statistical significance of 10%. The coefficient on the peer average is 0.294, suggesting that when all peers engage in fights, the likelihood that a student follows the same

behavior increases by 0.294 percentage points, relative to a situation in which no peer engages in fights. In terms of standard deviations, a one-standard deviation in peers' engagement in fights increases a student's likelihood of reporting the same behavior by 0.05 standard deviations ($0.294 \times 0.060 / 0.329$). We find no statistically significant effect of any of the interactions analyzed, although when adding the gender interaction, the effect becomes statistically significant at a 5% level for males.

Panels 3 and 4 in Table 3 show no evidence of peer effects in the likelihood of having been drunk in the past 30 days or of having consumed drugs in the past 3 months. Peer effects remain null even when considering interactions across gender, household education or network position.

The last panel of Table 3 reports peer effects when the outcome is self-satisfaction. In addition to finding positive effects of the individual's prior self-satisfaction (coefficient centered in 0.49), there is strong evidence for peer influence in this outcome. An increase in one standard deviation in peers' self-satisfaction increases an individual's self-satisfaction by 0.12 standard deviations ($0.421 \times 0.139 / 0.489$).

Table 4 reports peer effects in health. The first panel depicts results when the student had a health problem that forced him to be taken to the emergency room of a hospital or call an emergency service at home. The second panel analyzes depression. We do not find statistically significant peer effects in health problems, except in the case when we interact the effect with centrality. Central students are less likely than other students to be influenced by their peers' health. The effect is statistically significant only at the 10% level. We find stronger evidence of peer influence in symptoms of depression, in particular when adding gender and education interactions. Males are more likely to be influenced by their peers' mental health than females. While

the difference is not statistically significant, the main effect (now capturing only the effect for males), is statistically significant at 5% with a coefficient of 0.319. In terms of standard deviations, a one standard deviation increase in peers' depression symptoms results in a 0.08 standard deviation increase in a male student's depression symptoms. We also find that students with higher household education are less likely to be influenced by peers' depression symptoms.

Table 2. Peer Effects in Cognitive Ability as Proxied by Average Grade

	A. Full effect	B. By gender	C. By household education	D. By popularity	E. By centrality
Grade in baseline survey	0.854*** (0.032)	0.853*** (0.032)	0.853*** (0.033)	0.850*** (0.032)	0.849*** (0.032)
Peer group average grade	0.422** (0.187)	0.495* (0.273)	0.400** (0.185)	0.642*** (0.214)	0.383 (0.231)
Peer group average*Female		-0.124 (0.244)			
Peer group average*Education			0.021 (0.041)		
Peer group average*Indegree				-0.359* (0.207)	
Peer group average*Centrality					-0.074 (0.184)
Female	-0.031 (0.122)	0.862 (1.821)	-0.029 (0.122)	-0.045 (0.124)	-0.009 (0.131)
Household Education	0.151 (0.143)	0.147 (0.143)	0.23 (0.207)	0.166 (0.140)	0.141 (0.165)
Dummy for high Indegree				2.786* (1.534)	
Dummy for high Centrality					0.551 (1.369)
Standard deviation of the peer group average	0.567	0.567	0.567	0.567	0.567
Standard deviation of dependent variable	1.853	1.853	1.853	1.853	1.853
Other controls	Yes	Yes	Yes	Yes	Yes
Observations	561	561	561	561	528
Number of Clusters	40	40	40	40	40
R-Squared	0.662	0.662	0.662	0.667	0.657

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level. Clustered standard errors are in parentheses. All regressions control for school-grade fixed effects. All regressions adjust for individual-level controls (age, gender, family structure, parental working status, and an asset index) as well as for average peer characteristics at the classroom level (average age, gender, and class size, average household head's education, and average family structure) and for school-grade dummies. The relevant peer group is all students in i's class, excepting i.

Table 3. Peer Effects in Non-Cognitive Skills (Violent Behavior)

	Panel 1. Shoplifted in the past 3 months					Panel 2. Involved in fights in the past 3 months				
	A. Full effect	B. By gender	C. By household education	D. By popularity	E. By centrality	A. Full effect	B. By gender	C. By household education	D. By popularity	E. By centrality
Dummy if shoplifted in 3 months prior to baseline survey	0.284*** (0.052)	0.283*** (0.053)	0.286*** (-0.051)	0.283*** (-0.052)	0.295*** (-0.048)					
Dummy if was involved in fight in 3 months prior to baseline survey						0.203*** (0.074)	0.202*** (0.074)	0.202*** (0.074)	0.201*** (0.074)	0.215** (0.085)
Peer group average in shoplifting dummy	0.599*** (0.153)	0.634*** (0.224)	0.816*** (-0.238)	0.540*** (-0.190)	0.849*** (-0.186)					
Peer group average in fight dummy						0.294* (0.170)	0.424** (0.205)	0.244 (0.288)	0.06 (0.335)	0.294 (0.276)
Peer group average*Female		-0.062 (0.277)					-0.267 (0.405)			
Peer group average*Education			-0.337* (0.195)					0.077 (0.317)		
Peer group average*Indegree				0.109 (0.212)					0.409 (0.443)	
Peer group average*Centrality					-0.460* (0.228)					0.025 (0.458)
Female	-0.097*** (0.028)	-0.088** (0.034)	-0.096*** (0.028)	-0.096*** (0.028)	-0.105*** (0.030)	-0.046** (0.021)	-0.025 (0.029)	-0.046** (0.022)	-0.045** (0.021)	-0.051** (0.022)
Household Education	-0.019 (0.045)	-0.018 (0.044)	-0.042 (0.044)	-0.02 (0.046)	-0.028 (0.046)	-0.006 (0.015)	-0.004 (0.015)	-0.003 (0.017)	-0.004 (0.016)	-0.007 (0.018)
Dummy for high Indegree				-0.038 (0.037)					-0.046 (0.032)	
Dummy for high Centrality					0.024 (0.032)					-0.024 (0.030)
Standard deviation of the peer group average	0.086	0.086	0.086	0.086	0.086	0.060	0.060	0.060	0.060	0.060
Standard deviation of dependent variable	0.254	0.254	0.254	0.254	0.254	0.329	0.329	0.329	0.329	0.329
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	654	654	654	654	612	657	657	657	657	615
Number of Clusters	40	40	40	40	40	40	40	40	40	40
R-Squared	0.214	0.214	0.216	0.215	0.226	0.112	0.112	0.112	0.115	0.118

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level. Clustered standard errors are in parentheses. All regressions control for school-grade fixed effects. All regressions adjust for individual-level controls (age, gender, family structure, parental working status, and an asset index) as well as for average peer characteristics at the classroom level (average age, gender, and class size, average household head's education, and average family structure) and for school-grade dummies. The relevant peer group is all students in i 's class, excepting i .

Table 3 (cont.). Peer Effects in Non Cognitive Skills (Substance Use)

	Panel 3. Was drunk in the past 30 days					Panel 4. Consumed drugs in the past 3 months				
	A. Full effect	B. By gender	C. By household education	D. By popularity	E. By centrality	A. Full effect	B. By gender	C. By household education	D. By popularity	E. By centrality
Dummy if was drunk last 30 days prior to baseline survey	0.375*** (0.063)	0.372*** (0.064)	0.375*** (0.062)	0.375*** (0.063)	0.364*** (0.065)					
Dummy if was consumed drugs 3 months prior to baseline survey						0.752*** (0.040)	0.752*** (0.040)	0.752*** (0.040)	0.752*** (0.041)	0.763*** (0.040)
Peer group average in drunk dummy	0.143 (0.224)	0.332 (0.262)	0.015 (0.289)	0.095 (0.312)	0.088 (0.248)					
Peer group average in drugs consumption dummy						-0.073 (0.133)	-0.004 (0.115)	-0.046 (0.144)	-0.036 (0.140)	-0.025 (0.165)
Peer group average*Female		-0.336 (0.212)					-0.125 (0.168)			
Peer group average*Education			0.215 (0.197)					-0.053 (0.134)		
Peer group average*Indegree				0.066 (0.262)					-0.082 (0.091)	
Peer group average*Centrality					0.120 (0.233)					-0.104 (0.142)
Female	0.040 (0.041)	0.139* (0.080)	0.036 (0.041)	0.038 (0.041)	0.051 (0.042)	-0.044** (0.022)	-0.025 (0.031)	-0.044** (0.021)	-0.044** (0.022)	-0.046** (0.022)
Household Education	-0.016 (0.036)	-0.016 (0.035)	0.008 (0.038)	-0.017 (0.036)	-0.023 (0.034)	-0.002 (0.020)	-0.001 (0.020)	-0.005 (0.020)	-0.002 (0.021)	-0.017 (0.017)
Dummy for high Indegree				0.002 (0.083)					0.023 (0.021)	
Dummy for high Centrality					-0.007 (0.068)					0.001 (0.025)
Standard deviation of the peer group average	0.172	0.172	0.172	0.172	0.172	0.142	0.142	0.142	0.142	0.142
Standard deviation of the dependent variable	0.451	0.451	0.451	0.451	0.451	0.368	0.368	0.368	0.368	0.368
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	457	457	457	457	437	825	825	825	825	773
Number of Clusters	43	43	43	43	43	43	43	43	43	43
R-Squared	0.223	0.227	0.226	0.224	0.234	0.601	0.601	0.601	0.601	0.604

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level. Clustered standard errors are in parentheses. All regressions control for school-grade fixed effects. All regressions adjust for individual-level controls (age, gender, family structure, parental working status, and an asset index) as well as for average peer characteristics at the classroom level (average age, gender, and class size, average household head's education, and average family structure) and for school-grade dummies. The relevant peer group is all students in i 's class, excepting i .

Table 3 (cont.). Peer Effects in Non Cognitive Skills

	Panel 5. High Self-satisfaction				
	A. Full effect	B. By gender	C. By household education	D. By popularity	E. By centrality
High self-satisfaction in baseline survey	0.490*** (0.032)	0.489*** (0.032)	0.487*** (0.032)	0.487*** (0.032)	0.479*** (0.032)
Peer group average satisfaction with himself	0.421*** (0.100)	0.388** (0.145)	0.315** (0.134)	0.325** (0.137)	0.474** (0.210)
Peer group average*Gender		0.066 (0.241)			
Peer group average*Education			0.176 (0.202)		
Peer group average*Indegree				0.182 (0.165)	
Peer group average*Centrality					-0.081 (0.243)
Gender	-0.035 (0.040)	-0.059 (0.096)	-0.035 (0.040)	-0.037 (0.040)	-0.039 (0.042)
Household Education	0.046 (0.061)	0.046 (0.061)	0.083 (0.074)	0.05 (0.061)	0.026 (0.067)
Dummy for high Indegree				-0.044 (0.085)	
Dummy for high Centrality					0.035 (0.092)
Standard deviation of the peer group average	0.139	0.139	0.139	0.139	0.139
Standard deviation of dependent variable	0.489	0.489	0.489	0.489	0.489
Other controls	Yes	Yes	Yes	Yes	Yes
Observations	654	654	654	654	613
Number of Clusters	40	40	40	40	40
R-Squared	0.259	0.259	0.26	0.261	0.250

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level. Clustered standard errors are in parentheses. All regressions control for school-grade fixed effects. All regressions adjust for individual-level controls (age, gender, family structure, parental working status, and an asset index) as well as for average peer characteristics at the classroom level (average age, gender, and class size, average household head's education, and average family structure) and for school-grade dummies. The relevant peer group is all students in i 's class, excepting i .

Table 4. Peer Effects in Health

	Panel 1. Health Problems					Panel 2. Depression Symptoms				
	A. Full effect	B. By gender	C. By household education	D. By popularity	E. By centrality	A. Full effect	B. By gender	C. By household education	D. By popularity	E. By centrality
Dummy for having health problems	0.240*** (0.030)	0.240*** (0.030)	0.242*** (0.031)	0.242*** (0.031)	0.242*** (0.033)					
CES-10 Depression index in baseline survey						0.572*** (0.030)	0.574*** (0.031)	0.572*** (0.030)	0.570*** (0.030)	0.575*** (0.034)
Peer group average of health problems	0.106 (0.236)	-0.030 (0.236)	0.032 (0.257)	0.304 (0.234)	0.460 (0.304)					
Peer group average depression index						0.180 (0.120)	0.319** (0.147)	0.301** (0.131)	0.115 (0.177)	0.385* (0.198)
Peer group average*Female		0.276 (0.252)					-0.254 (0.220)			
Peer group average*Education			0.124 (0.126)					-0.205*** (0.070)		
Peer group average*Indegree				-0.360 (0.379)					0.140 (0.200)	
Peer group average*Centrality					-0.473* (0.245)					-0.304 (0.230)
Female	0.057** (0.027)	-0.148 (0.202)	0.057** (0.028)	0.056** (0.028)	0.075** (0.028)	0.175 (0.255)	2.047 (1.659)	0.166 (0.256)	0.186 (0.255)	0.231 (0.273)
Household Education	0.021 (0.042)	0.019 (0.042)	0.059 (0.052)	0.020 (0.042)	0.028 (0.042)	-0.166 (0.251)	-0.154 (0.250)	-0.786** (0.318)	-0.150 (0.256)	-0.313 (0.233)
Dummy for high Indegree				0.249 (0.277)					-1.204 (1.549)	
Dummy for high Centrality					0.300 (0.184)					2.017 (1.714)
Standard deviation of the peer group average	0.105	0.105	0.105	0.105	0.105	1.124	1.124	1.124	1.124	1.124
Standard deviation of dependent variable	0.500	0.500	0.500	0.500	0.500	4.285	4.285	4.285	4.285	4.285
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	734	734	734	734	686	797	797	797	797	747
Number of Clusters	43	43	43	43	43	43	43	43	43	43
R-Squared	0.125	0.126	0.126	0.127	0.134	0.432	0.433	0.436	0.432	0.433

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level. Clustered standard errors are in parentheses. All regressions control for school-grade fixed effects. All regressions adjust for individual-level controls (age, gender, family structure, parental working status, and an asset index) as well as for average peer characteristics at the classroom level (average age, gender, and class size, average household head's education, and average family structure) and for school-grade dummies. The relevant peer group is all students in i 's class, excepting i .

4. Conclusions

In this paper we aim at measuring peer effects in cognitive, non-cognitive and health capabilities during adolescence. We use a database with detailed information on various variables that can proxy for these capabilities. Within this framework we use data at two points in the academic year (at the middle and end of the academic year) to estimate a model in which outcome y for individual i in period 2 depends on the average of y for i 's peers in period 1 (baseline survey), conditional on i 's own value of y in period 1. Our model avoids Manski's (1993) reflection problem by conditioning future behavioral choices on the individual's past choices as well as on peers' past choices. Considering that parents are not able to select their child's class within a school and cohort, we address selection by using school and cohort fixed effects.

We find statistically significant peer effects in grades (proxy for cognitive abilities) and in several dimensions of non-cognitive capabilities (shoplifting, being involved in a fight, and self-satisfaction). We also find significant evidence of peer effects in symptoms of depression. Popular students are less likely to be influenced by peers in terms of cognitive outcomes. Peer effects in non-normative behavior (shoplifting) and depression are milder for students with higher levels of household education. The effects we find are in general small: a standard-deviation increase in peers' average has at most an effect of 0.21 standard deviations in shoplifting, 0.13 and 0.12 standard deviations for grades and self-satisfaction, respectively, and 0.08 and 0.05 standard deviation in the case of depression and involvement in fights. Unlike other studies, we do not find that peer effects are stronger for non-cognitive than for cognitive skills.

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Table A1. Peer Effects in the Cognitive ability proxied by average of grades

		Peer Group: students in the same class				
		A.	B. Female interaction	C. Education Interaction	D. Indegree Interaction	E. Incentrality Interaction
Grade in baseline survey		0.854*** (0.032)	0.853*** -0.032	0.853*** -0.033	0.850*** -0.032	0.849*** -0.032
Peer group average grade		0.422** (0.187)	0.495* -0.273	0.400** -0.185	0.642*** -0.214	0.383 -0.231
Peer group average*Interaction			-0.124 -0.244	0.021 -0.041	-0.359* -0.207	-0.074 -0.184
Contextual effects: variables of peers	Household head's education	1606 -1.502	1.537 -1.498	1.625 -1.479	1.767 -1.475	1.596 -1.352
	Household head's education squared	-0.060 (0.055)	-0.058 -0.055	-0.061 -0.055	-0.067 -0.054	-0.059 -0.05
	% single-mother family	-0.783 (0.620)	-0.755 -0.63	-0.779 -0.616	-0.693 -0.623	-0.839 -0.603
	% Other (non two parents) family structure	-1.094 (0.921)	-1.076 -0.919	-1.087 -0.917	-0.991 -0.841	-1.205 -0.918
	Average class characteristics	Age	0.433 (0.932)	0.428 -0.935	0.436 -0.932	0.262 -0.892
% females	-1.013 (0.782)	-0.97 -0.769	-1.022 -0.772	-0.983 -0.77	-0.885 -0.723	
Average class size	-0.005 (0.026)	-0.004 -0.026	-0.005 -0.026	-0.005 -0.024	-0.001 -0.027	
Individual controls	Age	-0.027 (0.115)	-0.03 -0.114	-0.025 -0.116	-0.044 -0.113	0.011 -0.13
	Female	-0.031 (0.122)	0.862 -1.821	-0.029 -0.122	-0.045 -0.124	-0.009 -0.131
	Single-mother family	-0.071 (0.125)	-0.07 -0.124	-0.069 -0.125	-0.113 -0.118	-0.061 -0.13
	Other (non two parents) family structure	-0.151 (0.216)	-0.163 -0.217	-0.152 -0.216	-0.167 -0.213	-0.153 -0.231
	Number of siblings	-0.005 (0.053)	-0.001 -0.054	-0.005 -0.054	-0.011 -0.055	-0.011 -0.057
	Household head's education	0.151 (0.143)	0.147 -0.143	0.23 -0.207	0.166 -0.14	0.141 -0.165
	Household head's education squared	-0.005 (0.005)	-0.004 -0.005	-0.008 -0.009	-0.005 -0.005	-0.004 -0.006
	Father works	0.625** (0.308)	0.620* -0.31	0.621* -0.308	0.586* -0.307	0.711** -0.332
	Mother works	0.079 (0.102)	0.076 -0.104	0.081 -0.103	0.063 -0.101	0.123 -0.103
	Father white collar	-0.092 (0.115)	-0.09 -0.117	-0.089 -0.117	-0.1 -0.114	-0.11 -0.123
	Asset index	-0.037 (0.165)	-0.043 -0.164	-0.036 -0.165	-0.057 -0.166	-0.015 -0.182
	Constant	-19 -18.418	-18.598 -18.477	-19.066 -18.239	-18.231 -17.785	-15.868 -17.52
	Dummy for high Indegree				2.786* -1.534	
	Dummy for high Centrality					0.551 -1.369
	Observations	561	561	561	561	528
Number of clusters	40	40	40	40	40	
R squared	0.662	0.662	0.662	0.667	0.657	

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level. Clustered standard errors are in parentheses. All regressions control for school-grade fixed effects. The relevant peer group is all students in i's class, excepting i.

Table A2. Peer Effects in probability of having shoplifted in the last 3 months

		Peer Group: students in the same class				
		A.	B. Female interaction	C. Education Interaction	D. Indegree Interaction	E. Incentrality Interaction
Dummy if shoplifted in 3 months prior to baseline survey		0.284*** (0.052)	0.283*** -0.053	0.286*** -0.051	0.283*** -0.052	0.295*** -0.048
Peer group average in shoplifting dummy		0.599*** (0.153)	0.634*** -0.224	0.816*** -0.238	0.540*** -0.19	0.849*** -0.186
Peer group average*Interaction			-0.062 -0.277	-0.337* -0.195	0.109 -0.212	-0.460* -0.228
Contextual effects: variables of peers	Household head's education	-0.368** (0.161)	-0.367** -0.162	-0.365** -0.162	-0.389** -0.161	-0.428** -0.165
	Household head's education squared	0.013** (0.006)	0.013** -0.006	0.013** -0.006	0.013** -0.006	0.014** -0.006
	% single-mother family	0.297*** (0.100)	0.295*** -0.099	0.306*** -0.1	0.304*** -0.099	0.349*** -0.095
	% Other (non two parents) family structure	0.312** (0.140)	0.311** -0.14	0.288** -0.141	0.320** -0.138	0.395*** -0.137
Average class characteristics	Age	-0.592*** (0.182)	-0.592*** -0.182	-0.590*** -0.176	-0.591*** -0.182	-0.586*** -0.182
	% females	-0.211 (0.133)	-0.216 -0.131	-0.215 -0.13	-0.215 -0.131	-0.223 -0.148
	Average class size	-0.017*** (0.004)	-0.017*** -0.004	-0.019*** -0.004	-0.017*** -0.004	-0.018*** -0.004
Individual controls	Age	0.042 (0.041)	0.043 -0.041	0.042 -0.041	0 -0.042	0 -0.042
	Female	-0.097*** (0.028)	-0.088** -0.034	-0.096*** -0.028	-0.096*** -0.028	-0.105*** -0.03
	Single-mother family	0.035 (0.038)	0.035 -0.038	0.034 -0.038	0.037 -0.038	0.037 -0.04
	Other (non two parents) family structure	0.068 (0.059)	0.068 -0.059	0.068 -0.058	0.07 -0.059	0.066 -0.062
	Number of siblings	-0.012 (0.015)	-0.012 -0.015	-0.012 -0.015	-0.012 -0.015	-0.017 -0.017
	Household head's education	-0.019 (0.045)	-0.018 -0.044	-0.042 -0.044	-0.02 -0.046	-0.028 -0.046
	Household head's education squared	0.000 (0.002)	0 -0.002	0.002 -0.002	0.001 -0.002	0.001 -0.002
	Father works	-0.044 (0.077)	-0.044 -0.077	-0.046 -0.078	-0.04 -0.077	-0.042 -0.086
	Mother works	0.026 (0.027)	0.026 -0.027	0.025 -0.028	0.028 -0.028	0.037 -0.03
	Father white collar	0.040 (0.025)	0.04 -0.025	0.041 -0.025	0.043* -0.025	0.044* -0.026
	Asset index	0.071 (0.055)	0.07 -0.055	0.07 -0.055	0.072 -0.055	0.057 -0.054
	Constant	11.278*** -2.972	11.260*** -2.98	11.344*** -2.897	11.398*** -2.976	11.706*** -2.942
	Dummy for high In degree				-0.038 -0.037	
	Dummy for high Centrality					0.024 -0.032
	Observations	654	654	654	654	612
	Number of clusters	40	40	40	40	40
R squared	0.214	0.214	0.216	0.215	0.226	

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level. Clustered standard errors are in parentheses. All regressions control for school-grade fixed effects. The relevant peer group is all students in i's class, excepting i.

Table A3. Peer Effects in probability of having been involved in a fight in the last 3 months

		Peer Group: students in the same class				
		A.	B. Female interaction	C. Education Interaction	D. Indegree Interaction	E. Incentrality Interaction
Dummy if was involved in fight in 3 months prior to baseline survey		0.203*** (0.074)	0.202*** -0.074	0.202*** -0.074	0.201*** -0.074	0.215** -0.085
Peer group average in fight dummy		0.294* (0.170)	0.424** -0.205	0.244 -0.288	0.06 -0.335	0.294 -0.276
Peer group average*Interaction			-0.267 -0.405	0.077 -0.317	0.409 -0.443	0.025 -0.458
Contextual effects: variables of peers	Household head's education	0.003 (0.143)	0.01 -0.144	0.01 -0.154	0.02 -0.144	0.02 -0.124
	Household head's education squared	-0.001 (0.005)	-0.001 -0.005	-0.001 -0.006	-0.002 -0.005	-0.002 -0.005
	% single-mother family	-0.152* (0.089)	-0.16 -0.095	-0.151* -0.088	-0.143 -0.085	-0.109 -0.083
	% Other (non two parents) family structure	0.090 (0.118)	0.084 -0.122	0.091 -0.119	0.091 -0.116	0.128 -0.135
Average class characteristics	Age	0.042 (0.101)	0.04 -0.101	0.04 -0.101	0.05 -0.103	0.06 -0.109
	% females	0.244** (0.105)	0.233** -0.101	0.245** -0.107	0.226** -0.106	0.237** -0.102
	Average class size	-0.001 (0.003)	-0.001 -0.003	-0.001 -0.003	-0.001 -0.003	-0.003 -0.003
Individual controls	Age	-0.023 (0.020)	-0.02 -0.02	-0.02 -0.02	-0.02 -0.021	-0.040** -0.018
	Female	-0.046** (0.021)	-0.025 -0.029	-0.046** -0.022	-0.045** -0.021	-0.051** -0.022
	Single-mother family	0.020 (0.022)	0.02 -0.022	0.02 -0.022	0.02 -0.023	0.025 -0.022
	Other (non two parents) family structure	0.013 (0.033)	0.012 -0.033	0.012 -0.033	0.015 -0.033	0.006 -0.035
	Number of siblings	0.010 (0.011)	0.009 -0.011	0.009 -0.011	0.009 -0.011	0.009 -0.013
	Household head's education	-0.006 (0.015)	-0.004 -0.015	-0.003 -0.017	-0.004 -0.016	-0.007 -0.018
	Household head's education squared	0.000 (0.001)	0 -0.001	0 -0.001	0 -0.001	0 -0.001
	Father works	0.020 (0.041)	0.022 -0.041	0.02 -0.043	0.022 -0.043	0.015 -0.041
	Mother works	0.009 (0.027)	0.008 -0.028	0.009 -0.027	0.01 -0.028	0.015 -0.027
	Father white collar	-0.009 (0.026)	-0.009 -0.026	-0.008 -0.026	-0.006 -0.026	0.001 -0.027
	Asset index	-0.005 (0.036)	-0.004 -0.036	-0.004 -0.036	-0.001 -0.035	-0.006 -0.034
	Constant	-0.147	-0.195	-0.161	-0.399	-0.228
	Dummy for high In degree	-1.864	-1.882	-1.902	-1.893	-1.935
	Dummy for high Centrality				-0.046 -0.032	-0.024 -0.03
	Observations	657	657	657	657	615
Number of clusters	40	40	40	40	40	
R squared	0.112	0.112	0.112	0.115	0.118	

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level. Clustered standard errors are in parentheses. All regressions control for school-grade fixed effects. The relevant peer group is all students in i's class, excepting i.

Table A4 Peer Effects in probability of having been drunk in the last 30 days

		Peer Group: students in the same class				
		A.	B. Female interaction	C. Education Interaction	D. Indegree Interaction	E. Incentrality Interaction
Dummy if was drunk last 30 days prior to baseline survey		0.375*** (0.063)	0.372*** -0.064	0.375*** -0.062	0.375*** -0.063	0.364*** -0.065
Peer group average in drunk dummy		0.143 (0.224)	0.332 -0.262	0.015 -0.289	0.095 -0.312	0.088 -0.248
Peer group average*Interaction			-0.336 -0.212	0.215 -0.197	0.066 -0.262	0.12 -0.233
Contextual effects: variables of peers	Household head's education	-0.634 (0.380)	-0.671* -0.379	-0.644* -0.381	-0.608 -0.399	-0.586 -0.397
	Household head's education squared	0.022* (0.013)	0.024* -0.013	0.023* -0.013	0.021 -0.014	0.02 -0.014
	% single-mother family	0.167 (0.220)	0.153 -0.225	0.152 -0.222	0.174 -0.229	0.176 -0.235
	% Other (non two parents) family structure	0.040 (0.455)	0.081 -0.453	0.074 -0.45	0.034 -0.455	0.073 -0.453
Average class characteristics	Age	-0.494 (0.310)	-0.45 -0.312	-0.46 -0.31	-0.50 -0.312	-0.44 -0.337
	% females	-0.223 (0.395)	-0.201 -0.393	-0.195 -0.391	-0.227 -0.399	-0.045 -0.423
	Average class size	0.009 (0.012)	0.009 -0.012	0.008 -0.012	0.009 -0.013	0.004 -0.013
Individual controls	Age	0.049 (0.048)	0.05 -0.047	0.05 -0.048	0.05 -0.05	0.05 -0.051
	Female	0.040 (0.041)	0.139* -0.08	0.036 -0.041	0.038 -0.041	0.051 -0.042
	Single-mother family	0.042 (0.038)	0.046 -0.038	0.046 -0.039	0.04 -0.038	0.043 -0.039
	Other (non two parents) family structure	0.037 (0.080)	0.036 -0.08	0.04 -0.079	0.039 -0.079	0.055 -0.085
	Number of siblings	0.040** (0.018)	0.038** -0.018	0.041** -0.018	0.040** -0.019	0.051*** -0.018
	Household head's education	-0.016 (0.036)	-0.016 -0.035	0.008 -0.038	-0.017 -0.036	-0.023 -0.034
	Household head's education squared	0.000 (0.001)	0 -0.001	-0.001 -0.002	0 -0.001	0.001 -0.001
	Father works	-0.055 (0.096)	-0.047 -0.097	-0.059 -0.099	-0.059 -0.098	-0.099 -0.101
	Mother works	0.094 (0.066)	0.099 -0.065	0.092 -0.065	0.095 -0.066	0.126* -0.064
	Father white collar	0.104** (0.049)	0.105** -0.049	0.103** -0.049	0.103** -0.048	0.118** -0.05
	Asset index	0.032 (0.076)	0.04 -0.073	0.038 -0.076	0.033 -0.076	0.022 -0.078
	Constant	10.880* -5.831	10.363* -5.849	10.415* -5.771	10.846* -5.944	9.804 -6.199
	Dummy for high In degree				0.002 -0.083	
	Dummy for high Centrality					-0.007 -0.068
	Observations	457	457	457	457	437
Number of clusters	43	43	43	43	43	
R squared	0.223	0.227	0.226	0.224	0.234	

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level. Clustered standard errors are in parentheses. All regressions control for school-grade fixed effects. The relevant peer group is all students in i's class, excepting i.

Table A5. Peer Effects in probability of having consumed drugs in the last 3 months

		Peer Group: students in the same class				
		A.	B. Female interaction	C. Education Interaction	D. Indegree Interaction	E. Incentrality Interaction
Dummy if was consumed drugs 3 months prior to baseline survey		0.752*** (0.040)	0.752*** -0.04	0.752*** -0.04	0.752*** -0.041	0.763*** -0.04
Peer group average in drugs consumption dummy		-0.073 (0.133)	-0.004 -0.115	-0.046 -0.144	-0.036 -0.14	-0.025 -0.165
Peer group average*Interaction			-0.125 -0.168	-0.053 -0.134	-0.082 -0.091	-0.104 -0.142
Contextual effects: variables of peers	Household head's education	-0.208 (0.132)	-0.202 -0.131	-0.209 -0.133	-0.209 -0.128	-0.267* -0.135
	Household head's education squared	0.008* (0.005)	0.008 -0.005	0.008* -0.005	0.008* -0.005	0.011** -0.005
	% single-mother family	0.109** (0.050)	0.109** -0.051	0.109** -0.05	0.105** -0.05	0.094 -0.059
	% Other (non two parents) family structure	0.093 (0.132)	0.094 -0.133	0.092 -0.133	0.092 -0.131	0.045 -0.144
Average class characteristics	Age	0.045 (0.124)	0.046 -0.125	0.044 -0.126	0.052 -0.124	0.020 -0.137
	% females	0.223* (0.131)	0.21 -0.132	0.222 -0.132	0.227* -0.131	0.267* -0.149
	Average class size	-0.000 (0.003)	0 -0.003	0 -0.003	0 -0.003	0.002 -0.003
Individual controls	Age	-0.008 (0.023)	-0.009 -0.023	-0.009 -0.022	-0.009 -0.023	-0.003 -0.023
	Female	-0.044** (0.022)	-0.025 -0.031	-0.044** -0.021	-0.044** -0.022	-0.046** -0.022
	Single-mother family	0.050** (0.021)	0.052** -0.021	0.050** -0.021	0.050** -0.021	0.045** -0.022
	Other (non two parents) family structure	0.096*** (0.032)	0.097*** -0.032	0.095*** -0.032	0.094*** -0.032	0.089** -0.034
	Number of siblings	0.000 (0.010)	0 -0.01	0 -0.01	0 -0.01	0 -0.011
	Household head's education	-0.002 (0.020)	-0.001 -0.02	-0.005 -0.02	-0.002 -0.021	-0.017 -0.017
	Household head's education squared	-0.000 (0.001)	0 -0.001	0 -0.001	0 -0.001	0 -0.001
	Father works	-0.088 (0.071)	-0.085 -0.073	-0.088 -0.071	-0.09 -0.07	-0.092 -0.071
	Mother works	0.007 (0.018)	0.008 -0.017	0.007 -0.018	0.006 -0.018	0.007 -0.019
	Father white collar	0.036* (0.020)	0.034 -0.021	0.036* -0.02	0.035* -0.02	0.021 -0.02
	Asset index	0.002 (0.045)	0.003 -0.045	0.002 -0.045	0.002 -0.045	-0.012 -0.047
	Constant	0.597	0.547	0.639	0.487	1.288
	Dummy for High In degree	-2399	-2.414	-2.428	-2.401	-2.52
	Dummy for High Centrality				0.023 -0.021	0.001 -0.025
	Observations	825	825	825	825	773
Number of clusters	43	43	43	43	43	
R squared	0.601	0.601	0.601	0.601	0.604	

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level. Clustered standard errors are in parentheses. All regressions control for school-grade fixed effects. The relevant peer group is all students in i's class, excepting i.

Table A6. Peer Effects in probability of being very satisfied with himself

		Peer Group: students in the same class				
		A.	B. Female interaction	C. Education Interaction	D. Indegree Interaction	E. Incentrality Interaction
Dummy if was very satisfied with himself in baseline survey		0.490*** (0.032)	0.489*** -0.032	0.487*** -0.032	0.487*** -0.032	0.479*** -0.032
Peer group average satisfaction with himself		0.421*** (0.100)	0.388** -0.145	0.315** -0.134	0.325** -0.137	0.474** -0.21
Peer group average*Interaction			0.066 -0.241	0.176 -0.202	0.182 -0.165	-0.081 -0.243
Contextual effects: variables of peers	Household head's education	0.606** (0.246)	0.610** -0.246	0.620** -0.241	0.622** -0.242	0.633** -0.266
	Household head's education squared	-0.022** (0.009)	-0.022** -0.009	-0.022** -0.009	-0.023** -0.009	-0.023** -0.01
	% single-mother family	0.065 (0.129)	0.065 -0.13	0.053 -0.131	0.058 -0.13	0.103 -0.146
	% Other (non two parents) family structure	-0.322 (0.223)	-0.324 -0.225	-0.283 -0.227	-0.333 -0.224	-0.289 -0.235
Average class characteristics	Age	0.297** (0.143)	0.295** -0.144	0.318** -0.141	0.290* -0.145	0.258* -0.149
	% females	-0.682*** (0.246)	-0.688*** -0.25	-0.684*** -0.241	-0.682*** -0.249	-0.677** -0.26
	Average class size	-0.005 (0.005)	-0.005 -0.005	-0.006 -0.005	-0.006 -0.005	-0.007 -0.006
Individual controls	Age	0.041 (0.046)	0.041 -0.047	0.041 -0.047	0.039 -0.046	0.052 -0.047
	Female	-0.035 (0.040)	-0.059 -0.096	-0.035 -0.04	-0.037 -0.04	-0.039 -0.042
	Single-mother family	0.023 (0.050)	0.023 -0.05	0.023 -0.05	0.022 -0.05	0.018 -0.052
	Other (non two parents) family structure	-0.013 (0.060)	-0.013 -0.059	-0.01 -0.059	-0.014 -0.059	0.002 -0.063
	Number of siblings	0.002 (0.022)	0.002 -0.022	0 -0.023	0 -0.022	0.009 -0.024
	Household head's education	0.046 (0.061)	0.046 -0.061	0.083 -0.074	0.05 -0.061	0.026 -0.067
	Household head's education squared	-0.002 (0.002)	-0.002 -0.002	-0.004 -0.003	-0.002 -0.002	-0.001 -0.003
	Father works	0.035 (0.092)	0.036 -0.093	0.029 -0.091	0.033 -0.09	-0.006 -0.099
	Mother works	0.010 (0.056)	0.011 -0.056	0.009 -0.057	0.007 -0.056	0.004 -0.059
	Father white collar	0.045 (0.047)	0.044 -0.046	0.046 -0.046	0.041 -0.047	0.034 -0.048
	Asset index	0.089 (0.085)	0.088 -0.085	0.087 -0.085	0.087 -0.085	0.063 -0.095
	Constant	-8.625***	-8.618***	-9.175***	-8.575***	-8.098***
	Dummy for high In degree	-2.591	-2.592	-2.605	-2.607	-2.734
	Dummy for high Centrality				-0.044 -0.085	0.035 -0.092
	Observations	654	654	654	654	613
Number of clusters	40	40	40	40	40	
R squared	0.259	0.259	0.26	0.261	0.25	

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level. Clustered standard errors are in parentheses. All regressions control for school-grade fixed effects. The relevant peer group is all students in i's class, excepting i.

Table A7. Peer Effects in Health troubles

		Peer Group: students in the same class				
		A.	B. Female interaction	C. Education Interaction	D. Indegree Interaction	E. Incentrality Interaction
Dummy for having health problems		0.240*** (0.030)	0.240*** -0.03	0.242*** -0.031	0.242*** -0.031	0.242*** -0.033
Peer group average of health problems		0.106 (0.236)	-0.03 -0.236	0.032 -0.257	0.304 -0.234	0.46 -0.304
Peer group average*Interaction			0.276 -0.252	0.124 -0.126	-0.36 -0.379	-0.473* -0.245
Contextual effects: variables of peers	Household head's education	0.339 (0.303)	0.322 -0.3	0.344 -0.302	0.337 -0.31	0.397 -0.328
	Household head's education squared	-0.012 (0.011)	-0.012 -0.011	-0.012 -0.011	-0.012 -0.011	-0.014 -0.012
	% single-mother family	-0.083 (0.209)	-0.092 -0.209	-0.093 -0.211	-0.051 -0.217	-0.053 -0.213
	% Other (non two parents) family structure	0.167 (0.336)	0.165 -0.335	0.193 -0.335	0.157 -0.344	0.186 -0.337
Average class characteristics	Age	0.004 (0.269)	0.009 -0.268	0.000 -0.274	0.009 -0.272	-0.047 -0.256
	% females	-0.196 (0.259)	-0.172 -0.26	-0.198 -0.26	-0.2 -0.258	-0.226 -0.296
	Average class size	-0.007 (0.008)	-0.007 -0.008	-0.007 -0.008	-0.007 -0.008	-0.008 -0.008
Individual controls	Age	0.000 (0.041)	-0.003 -0.041	0.001 -0.041	0.001 -0.041	-0.012 -0.045
	Female	0.057** (0.027)	-0.148 -0.202	0.057** -0.028	0.056** -0.028	0.075** -0.028
	Single-mother family	0.074 (0.053)	0.073 -0.053	0.08 -0.054	0.076 -0.053	0.072 -0.058
	Other (non two parents) family structure	-0.029 (0.070)	-0.03 -0.071	-0.028 -0.071	-0.026 -0.07	-0.048 -0.07
	Number of siblings	-0.001 (0.019)	0 -0.019	-0.002 -0.019	-0.001 -0.02	-0.008 -0.02
	Household head's education	0.021 (0.042)	0.019 -0.042	0.059 -0.052	0.02 -0.042	0.028 -0.042
	Household head's education squared	-0.001 (0.002)	-0.001 -0.002	-0.003 -0.002	-0.001 -0.002	-0.001 -0.002
	Father works	-0.117 (0.112)	-0.121 -0.112	-0.116 -0.111	-0.111 -0.114	-0.122 -0.109
	Mother works	-0.011 (0.052)	-0.011 -0.052	-0.011 -0.052	-0.011 -0.052	-0.013 -0.059
	Father white collar	0.036 (0.053)	0.038 -0.053	0.036 -0.052	0.039 -0.054	0.019 -0.056
	Asset index	0.097 (0.090)	0.098 -0.09	0.099 -0.09	0.1 -0.09	0.071 -0.088
	Constant	-1.883	-1.715	-2.028	-2.117	-1.559
	Dummy for high In degree	-5.058	-5.004	-5.123	-5.101	-4.831
	Dummy for high Centrality				0.249 -0.277	0.3 -0.184
	Observations	734	734	734	734	686
Number of clusters	43	43	43	43	43	
R squared	0.125	0.126	0.126	0.127	0.134	

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level. Clustered standard errors are in parentheses. All regressions control for school-grade fixed effects. The relevant peer group is all students in i 's class, excepting i .

Table A8. Peer Effects depression index

		Peer Group: students in the same class				
		A.	B. Female interaction	C. Education Interaction	D. Indegree Interaction	E. Incentrality Interaction
CES-10 Depression index in baseline survey		0.572*** (0.030)	0.574*** -0.031	0.572*** -0.03	0.570*** -0.03	0.575*** -0.034
Peer group average depression index		0.180 (0.120)	0.319** -0.147	0.301** -0.131	0.115 -0.177	0.385* -0.198
Peer group average*Interaction			-0.254 -0.22	-0.205*** -0.07	0.14 -0.2	-0.304 -0.23
Contextual effects: variables of peers	Household head's education	-6.285*** -1.856	-6.128*** -1.845	-6.203*** -1.853	-6.319*** -1.873	-7.084*** -1.75
	Household head's education squared	0.240*** (0.068)	0.235*** -0.068	0.235*** -0.068	0.241*** -0.069	0.267*** -0.064
	% single-mother family	0.326 -1.016	0.304 -1.023	0.563 -1.052	0.338 -1.025	0.049 -1.069
	% Other (non two parents) family structure	5.286** -2.355	5.341** -2.327	5.244** -2.41	5.387** -2.407	6.325** -2.479
	Age	-6.553*** -1.418	-6.742*** -1.458	-6.170*** -1.451	-6.581*** -1.427	-7.463*** -1.439
Average class characteristics	% females	2.830 -1.932	2.673 -1.911	2.681 -1.967	2.791 -1.93	3.188* -1.757
	Average class size	0.041 (0.054)	0.04 -0.054	0.035 -0.055	0.04 -0.054	0.048 -0.056
	Age	-0.051 (0.390)	-0.052 -0.386	-0.042 -0.395	-0.043 -0.385	-0.036 -0.428
Individual controls	Female	0.175 (0.255)	2.047 -1.659	0.166 -0.256	0.186 -0.255	0.231 -0.273
	Single-mother family	-0.373 (0.309)	-0.377 -0.311	-0.447 -0.313	-0.371 -0.309	-0.328 -0.324
	Other (non two parents) family structure	-0.152 (0.464)	-0.17 -0.46	-0.149 -0.469	-0.121 -0.46	-0.183 -0.455
	Number of siblings	-0.054 (0.145)	-0.042 -0.146	-0.038 -0.148	-0.049 -0.146	-0.162 -0.145
	Household head's education	-0.166 (0.251)	-0.154 -0.25	-0.786** -0.318	-0.15 -0.256	-0.313 -0.233
	Household head's education squared	0.005 (0.010)	0.005 -0.01	0.037** -0.014	0.005 -0.01	0.011 -0.009
	Father works	-1.899** (0.775)	-1.857** -0.78	-1.954** -0.771	-1.870** -0.761	-2.184** -0.88
	Mother works	0.003 (0.301)	-0.018 -0.306	-0.018 -0.296	0.01 -0.303	0.054 -0.319
	Father white collar	-0.125 (0.286)	-0.141 -0.288	-0.13 -0.289	-0.117 -0.291	-0.151 -0.297
	Asset index	0.015 (0.556)	0.012 -0.555	-0.021 -0.549	0.017 -0.551	0.177 -0.586
	Constant	139.340*** -27	140.054*** -27.727	135.541*** -27.397	140.293*** -27.968 -1.549	157.567*** -24.953
	Dummy for high In degree				-1.204 -1.549	
	Dummy for high Centrality					2.017 -1.714
	Observations	797	797	797	797	747
	Number of clusters	43	43	43	43	43
R squared	0.432	0.433	0.436	0.432	0.433	

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level. Clustered standard errors are in parentheses. All regressions control for school-grade fixed effects. The relevant peer group is all students in i's class, excepting i.

