Peers effects on high school aspirations: non-reciprocating relations

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Abstract

In this paper we investigate peer effects on dropping out intentions high school in Catalonia. For this purpose we make use of a unique survey containing information about: personal data, scholar characteristics, parental background and the real composition of cliques within classrooms. We emphasize on the importance of asymmetric peer effects (non-reciprocating relations) on school aspirations. Additionally, we seek further on this examining whether average classmates anthropometric features have also a significant impact on individual dropping out intention besides analyzing the gender composition effects. Our results

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1. Introduction

Many researchers have found evidence of deleterious effects from dropping out of high school. Dropping out may not only affect job opportunities and wages, but also self-reported health, welfare use, unemployment, and even subjective well-being [Oreopoulos, 2007].

While most educators, policy makers, and especially parents, aim to avoid dropout outcomes, there is lack of general consensus on how to encourage this. Family factors, whether genetic or environmental or both, obviously play a key role [e.g. Solon, 1992; Zimmerman, 1992; Sacerdote, 2007]. But school-related factors, which are more easily modifiable through policy, may also affect dropping out. These include exposure to peers [Hoxby, 2000; Hanushek et al. 2003; Figlio, 2007].

Research on the importance of classroom peers has been confounded by the fact that students are not often randomly exposed to other students. Most poor families are constrained to public schools attended by other disadvantaged children based on what neighborhoods they can afford, while richer families often have some discrepancy over whether to attend a public or private school. Parsing out these sorting behaviors from peer effects has been addressed by some researchers using idiosyncratic variation from year to year differences in classroom assignment [e.g. Boozer and Cacciola, 2001; Graham, 2008; Hoxby, 2000; Lavy and Schlosser, 2007; Hanushek et al., 2003]. Hoxby, for example, finds that assignment to a class with relatively more females in the class raises expected test scores for both females and males.

These previous approaches attempt to estimate peer effects from being exposed to particular groups, rather than particular individuals. Exposure to more females, for example, or more students of a particular type increases the chances of social interactions with them. But peer effects may depend more on the extent to which individuals identify others as friends. Bishop et al. (2004), for example, documents the enormous importance of cliques, (e.g. jocks and nerds) in affecting every aspect of high school life. Cliques are not easily identifiable using basic demographic characteristics. Information to identify cliques, within the classroom, is needed to measure these types of more direct peer effect. This paper attempts to do this using a unique dataset that identifies classroom friends, along with exogenous classroom variation, and detailed information about personality, motivation, and school satisfaction. Our main approach

differs from earlier peer effects research in disentangling the influence on pupil's intention to dropout by matching students to the specific friends within classroom out of the whole composition of classroom. Our survey contains a sample of Catalan (Spanish) students and their self-identified peers in class. Pupils were asked to identify those classmates they consider friends. In some cases, one student identifies another student as a friend, but that friend does not reciprocate by also identifying him. Assuming in these asymmetric cases that peer effects flow in one direction – from 'friend' to 'non-friend' – allows us to estimate peer effects in the classroom that occur from interaction with self-reported friends, rather than from interaction with overall groups.

We also explore whether our measured peer effects are driven by particular kinds of student characteristics by matching friends to traits such as height, and weight. Recent investigations point out the relevance of these anthropometric characteristics on academic outcomes and later on wage earnings profile (e.g. Bowles et al. 2001; Carneiro and Heckman, 2003; Persico et al. 2004). Most studies focusing on consequences of height and weight in school conclude that relatively small or heavy students perform worse in school than other students because they are belittled and isolated. In addition, Case and Paxson (2006) point to a likely causal link between a child's height and longer term social-economic outcome, which holds even after conditioning on family wealth, health, and adult height.

The Spanish region where our data come from is of interest in its own right. High school Dropout rates there are particularly high compared to other regions and other OECD countries. Figure 1 shows the evolution of the Catalan dropping out rate during the period 1992-2006. Although this rate decreases over time, it flattens out after 2002, at around 18% for male students and 12% for female ones. Furthermore, statistically significant differences by gender are strongly prevalent. However, this gender differential has also decreased in time (whereas in 1992 it was 8.3%, in 2006 it is almost the half 4.5%).

[Insert Figure 1 here]

Spanish governments have implemented a large amount of legislation on education in the past twenty years. These reforms extended the period of compulsory education from 14 to 16 years old and reorganized the educational system in a bid to raise the standards. In general, however, the effects on students' performance have not met the

expectations. In addition, these reforms have been accompanied by an intensive process of decentralization, to the extent that, by 2003, Spain's 17 regional governments (or Autonomous Communities, ACs) administered more than 90% of the educational budget (MEC, 2006). Likewise, performance problems are not distributed equally among the ACs (see Mora, Escardíbul and Espasa, 2009). A large extent the differences may be attributed to the characteristics of each AC (for example, its level of economic development, the nature of its labor market, rural/urban distribution, etc.) and to the specific educational policies pursued by regional governments. These features allow us to analyze dropping out intentions in a specific Spanish region.

2. Peers exposure

As Manski (1993) points out, there are three reasons why peers might be observed to have similar outcomes: (i) correlated effects; (ii) exogenous effects and; (iii) endogenous effects. Correlated effects occur from peers having common traits. In this case, peers do not actually influence other peers, they just share similar backgrounds. Exogenous effects occur when individuals are influenced by features of their peers. Endogenous effects occur when peers influence each other in a reinforcing way – Ariel may influence Linda, and Linda may in turn influence Ariel. One of the main challenges when analyzing peer effects at school is the fact that schools, classrooms and peer groups are not assigned to students randomly. While school and class composition is determined by neighborhood characteristics such as average income per capita, the make-up of the real reference group (peers within classroom) relies on other sociological factors (Bishop et al., 2004).

To separate social effects in the classroom (which are the combination of endogenous and exogenous peer effects) from correlated effects, researchers often seek experimental or quasi-experimental designs (e.g. Lavy and Schlosser, 2007, Sacerdote, 2001; Zimmerman, 2003; Hanushek et al., 2003; Hoxby and Weingarth, 2005, Ammermueller and Pischke, 2006 and; Gibbons and Telhaj, 2006; Kang, 2007; amongst others). However, treating peer effects as a consequence solely of predetermined peer features, such as ability, only captures any effect including relationships that may exist. But this approach captures peer effects from being exposed to particular groups, rather

than particular individuals. Theoretically, making up peers arise through unobservable characteristics such as behavior or effort.[1]

True random assignment variation at the school or neighborhood level almost never happens. Some recent empirical studies instead rely on fluctuations in gender and racial composition. Following Hoxby (2000)' strategy, few recent papers (such as Lavy and Schlosser, 2007 or Proud, 2008), have made use of the variation in the distribution of females across cohorts using the proportion of girls within a grade as a measure of the peer group. The interaction of this variable with variables representing outcomes of an educational production function (usually ability) is plausibly exogenous.

Our proposal is to use the exogenous variation in the average height and weight within classroom since these differences affect the outcome variable (dropout). Alternatively, we combine both anthropometric measures using Body Mass Index (BMI)[2] variation at the classroom level.[3] Dropping out intention differ between taller and smaller (normal weighted and obese). In this regard, Case and Paxson (2006) point out that the common mechanisms that induce a greater cognitive achievement are self esteem, social dominance, and discrimination.

In our opinion, twice reasons can be argued for the relevance of these anthropometric measures. First, being a *small size* pupil ore being a *fat* classmate are ones of the reasons for making fun, so to produce harassment and rejection from classmates (Bishop et al., 2004). The later has consequences on not feeling comfortable either with their classroom or their school centre. Thus, both situations would lead to achieving lower grades and revealing an intention to leave high school. The later relies on stigmatized pupils because of their stature or weight finding more difficult to develop interpersonal skills or positive self-esteem (Persico et al., 2004). Throughout our empirical analysis, anthropometric effects are estimated conditionally exogenous to pupil's personality. Hence, we are able to distinguish between those really pessimistic (low self-esteem) and those pupils that might be stigmatized in classrooms.

Secondly, height and weight have a causal effect on achieving higher grades. In this regard, Case and Paxson (2006) argue that discrimination seems not be feasible because

[1] Whereas ability is an innate characteristic that school reveals or transforms, individual effort and misbehaviour are contemporaneous influences.

[2] The BMI measure is calculated as the ratio of individual weight, measured in kilograms, to squared height, measured in metres.

[3] We exploit variations at the classroom level because learning and socializing takes place there and principals won't assign students based on equalizing height or weight between classrooms within the same grade.

of the influence of height on academic achievement starts at early educational stages. Likewise, Persico et al. (2004) assert that a higher height when being an adolescent[4] has a premium on labor market due to a higher level of achievement. These authors evidence that this teen premium height holds when controlling wealth, health and adult's height.[5] As for weight's impact, those pupils who are obese are more prone to be less productive, at least through an indirect channel, their health status degree. In line with these comments, our results are estimated controlling by health status degree, parental background[6] and neighboring (residential and school location) effects. In here, a relevant point is that we are also able to include cognitive skills.

It is well known that, on one hand, height and thus adolescence growth spurt[7] depend on a combination of factors, including: genes, environmental conditions (such as nutrition and illness) and interactions between both factors. On the other hand, as for weight's pattern, Cohen-Cole and Fletcher (2008) evidence the spread of obesity related to environmental reasons (individual's residence). Thus, both anthropometric measures are associated to socioeconomic status (family resources).[8] In this regard, we include controls for parental background (educational attainment, labor status and job occupation) and make use of information of those attending semi-public or private schools (instrumentalized through the percentage of this kind of schools in the same postal code zone). Likewise, nutrition school policies being shared by all students will lead to correlated effects. Then, school fixed effects control for influences such as school lunch diet decisions[9] or dissimilar included physical activities in the curriculum. Additionally, height or weight present correlated effects since neighborhood characteristics would condition extracurricular activities and there might be amenities supply conditioning individual height. Throughout the empirical analysis, the wealth of data allows us to control by neighboring residence and high school location fixed

[4] Adolescent's height is an excellent predictor for adult's height.
[5] These results are in line with labour economics literature, the greater adolescent's height the higher the future salaries. Earning differences have been analysed for the US and the UK labour market (see Sargent and Blanchflower, 1994; Averett and Korenman, 1995 and Harper, 2000, among others).
[6] In fact, the extensive list of covariates includes: having experienced a change in residence, grandparents cohabiting, parent's civil status, age difference regards each parent, school selection decision, obtaining rewards from parents for schooling grades, parental background characteristics (number of books at home, educational attainment, labour status and health status degree), the ownership of the attained school centre and satisfaction scores with each parent.
[7] Adult height is approximately attained at 16 for girls and 18 for boys.
[8] Peers background parental features have no direct consequences either on a pupil's height or weight.
[9] Lunch diets in Catalonia are controlled by the regional government through regular inspections.

effects, illnesses problems[10] and the number of extracurricular activities. Finally, ethnic differences might be controlled, especially because of adopting and immigration waves influenced recent schooling profiles.

3. Data

The data for this analysis comes from a sample of secondary school students in Catalonia (one of the richest Spanish regions). The data sampling took place between February and June of 2008. The survey was designed for describing secondary students in a few aspects. A first contact was made with math teachers[11] in Catalonia in four degrees (the last two years of compulsory secondary education and the two years of upper secondary) so as to participate in the survey. The final sample contains information of more than 3,000 students of 91 high schools. The questionnaire was supplied on-line with randomness in questions appearance. Since not all the high schools had computer room facilities or enough time schedules some of those who agree to participate received the questionnaire in paper format. As for requested information, the questionnaire contained six blocks of questions: personal data, scholar characteristics, math's teaching questions, parental background information, consciousness and motivation questions and lifestyle conditions. Administrative data was asked to principals as for describing school-level environment.

Table 1 shows descriptive characteristics for self-reported dropping out intentions based on a few significant covariates. Note that 18.2% of pupils responded affirmatively to the question if they have ever wondered about leaving high school before graduation. This percentage is higher than dropout official rates since it is denoting an intention not a final decision. One concern is that this is a self-reported measure and so some students may not being truthfully reporting they actually do plan to drop out, or are 'in denial' that they will drop out.

[10] Pupil's indicated their self reported health-degree and the one of each of their parents.

[11] We have information of maths grades in an internacional award (Cangur 2008). We are indebted to the Catalan Society in Mathematics and namely to Antoni Gomà for supplying contacts in each high school in which at least one student participates. So as to avoid sample selection bias in a primary step we decided to contact to all Catalan high schools. None of the students had access to the questionnaire prior to responding which permits us to avoid attrition effects but students were free to not respond some questions. Anyway, there could appear sample selectivity due to underrepresenting some specific areas or schools based on their managerial characteristics (public, semi-private or private). For this purpose, some administrative information was asked to the Catalan Ministry of Education for sample representing reasons.

It is worthy of mention a few comments about covariates conditioning descriptive. This analysis is relevant for the Catalan (Spanish) case since dropout rates are excessively high compared to other developed countries. First, as expected, there exists a statistically significant difference between boys (23.2%) and girls (14.9%). Second, although compulsory academic years might show a higher percentage, this difference is not statistically significant. Third, a recent change in residence or school (or both) is associated with lower school aspirations.[12] Fourth, self-assessed health status is strongly associated with minor school aspirations. The same applies for obese and overweighted pupils,[13] which is a signal of poor health status degree. These categories show a result which is in consequence to the percentages shown by school aspirations based on the number of extracurricular activities. Fifth, having siblings who dropped out high school is related to a higher intention to leave high school. Sixth, as expected, pupils attending public schools show a higher tendency to leave high school, although it is closely related to parental background features. Finally, as for regularly spoken language, those speaking more Catalan than Castilian (Spanish) are less prone to intend dropout whilst speaking Catalan as both Castilian shows similar results to regularly speaking more in Castilian.

[Insert Table 1 here]

4. Econometric strategy

Our analysis uses self-reported friends to identify possible peers. We first estimate the effects of education aspirations from 'non-reciprocating friends' aspirations on students' own education aspirations. By 'non-reciprocating', we mean individuals who are identified by a particular student as a friend, but do not themselves report being friends with these individuals. We then investigate whether the estimated effects are driven by friends' height, weight, BMI, or gender. We also estimate these peer effects with and without conditioning on a large list of covariates, in an attempt to disentangle peer effects from these specific characteristics, holding other traits like personality, cognitive skills, health status, family disruption or family welfare constant.

[12] This relationship arises because moving decisions are driven by poor child performance in previous schools or that the school where primary and lower-secondary studies were attended does not offer upper-secondary studies.
[13] BMI categories for teenagers have been calculated following Hernández et al. (1988).

The initial model considers the determinants of high school students' intention to dropout (d_i, being a dichotomous variable) for each student (i). As a consequence of the non-reciprocating friends' characteristics, the reduced form can be expressed as:

$$d_i = \beta_0 + \beta_1 \overline{X}_C + pz_{1,i} + pz_{2,i} + hs_i + \varepsilon_i \quad (1)$$

where ($\overline{X}_C$) is the average peer characteristics at the clique (non-reciprocating friend) level, among students that don't report being friends with student i. We examine peer effects based on three different characteristics: dropping out intentions, body type, gender, and previous year's mathematics grade (ability proxy). Importantly, equation (1) includes high school and local neighborhood fixed effects (captured by the residential postal code and the school centre post zone code) and high-school fixed effects (hs_i).[14] Doing so leads to peer effects variation within schools and neighborhoods.[15]

The identifying assumption in equation (1) is that peer characteristics ($\overline{X}_C$) are independent of other factors affecting d_i. This occurs when matches between friends and non-reciprocating friends occur exogenously. To relax this assumption further, we condition the peer effect estimate on a large set of other individual background characteristics: consciousness, age, gender, immigrant, self-reported health status degree, regular spoken language, having experienced a change in residence or school, parent's civil status, age difference regards each parent, parental background characteristics, academic year, last year math's grade, number of brothers being graduated or having dropped out and number of extracurricular activities. We also condition on non-cognitive skills as an additional proxy for individual ability. Heckman et al. (2006) argue that cognitive and non-cognitive skills are both important in explaining a variety of aspects of social and economic life. In fact, our survey data asked information on motivation and consciousness (one out of the five components of personality, the one related to ability). These variables were constructed through a

[14] Note that schools are relevant per se since schools centres can push students out. See Lee and Burkam (2003) for a comprehensive survey on the mechanisms between dropping out and the organization and structure of school centres: school structure, academic organizations and social organizations.

[15] Complementarily, we dropped the neighbourhood fixed effects because including them leaved out friends in school from different neighbourhoods.

factorial analysis.[16] Although motivation can be affected by peers, personality traits are specific to each individual and are not as easily influenced.

As abovementioned, we also define peer characteristics in terms of average peer body type. An advantage of this approach is that, classroom variation of these characteristics likely occurs from more idiosyncratic reasons than deliberate selection. Figure 2 shows that the within-classroom variation of these variables is substantial. The latter is strongly significant because the identification of the diverse peer effects will not rely solely on variation in one feature (such as BMI or gender composition), but will rely also on random characteristics.

[Insert Figure 2]

Complementarily, we can make use of the proportion of female students in classroom, along the lines as Hoxby (2000)'s approach. In addition to using average gender variation at the classroom level, we also consider variation across sets of peers. For instance, let's suppose that one student relates with four students being just one female although the proportion of females within the classroom is above the fifty per cent. Then, the composition of his/her network differs to the one evidenced from the classroom. Figure 3 shows that real peer groups are mixed composed although a considerable share of pupils relates with the same gender (26.31%). Notwithstanding, in our opinion, gender composition among peers remains a skeptical random assumption.

[Insert Figure 3 here]

5. Empirical results

Table 2 outlines marginal effects for school aspirations determinants based on non-reciprocating influence. Whereas the first column includes peer effects separately based

[16] Pupils were questioned to capture either their motivation or their personality. We conducted interviews with psychologists to include only relevant questions due to time constraints on applying the survey. Indeed, 7 questions were considered for personality (those related to consciousness) and 15 items for motivation. For the later, we followed Alonso-Tapia and Arce-Sáez (1992) -specific for Spanish teenagers. Then, we computed Cronbach's alpha statistic for the scale formed from the pairs of variables (0.76). A factorial analysis allowed us to construct two factors related to personality and four regards motivation questions. The Kaiser-Meyer-Olkin measure of sampling adequacy depicts a meritorious value (0.81). Factors' scores were re-scaled to variables ranged from 0 to 1 so indicating the probability of being motivated and the degree of personal consciousness.

on the diverse measures alternatively at the classroom or the cliques' level, the second column is obtained through the inclusion of the exhaustive list of covariates. Results are robust to the different specifications. None of the considered peer characteristics (school aspirations, BMI and gender) have a statistically significant effect on individual school aspirations. Hence, peers influence turns out to be non relevant when explaining individual school aspirations determinants.

[Insert Table 2 here]

Notwithstanding, at this stage, we wondered whether non-reciprocating relations might be considered as a real influence. The latter relies on the fact that a distinction should be made between colleagues/friends (non-reciprocating) and very good friends (reciprocating). For this purpose, we relaxed peer influence to include those effects derived to exposure to the whole classroom and to the complete composition of cliques (allowing for symmetries, that is, the presence of reciprocating relationships). Hence, whilst the first one accounts for classmates' influence, the second one denotes the specific influence from all self-identified friends within the classroom. Following our prior application, both kind of peer exposure were interacted with considered characteristics (school aspirations, body type and gender). Results are shown in table 3.

[Insert Table 3 here]

As expected, the greater proportion of dropping out intentions within the friends' network, the higher probability of intending to leave high school. Note that the later is accounting for all real peers since non-reciprocating relationships only capture partially peers influence. Additionally, it is evidenced that classmates' dropping out intentions are not determinant.

Next, the proportion of females within the network (real peers) is negatively related to school aspirations. That is, the higher proportion of females within the clique the lower the intention to leave high school. This finding corroborates previous findings as for the positive influence of females within classrooms (Hoxby, 2000; Ammermueller and Pischke, 2006; and Lavy and Schlosser, 2007).

Regards anthropometric exogenous variations effects, the average weight and BMI's average at the classroom level are always statistically significant. The greater the weight

at the classroom level, the higher the intention to dropout. The same applies for the average BMI, being this measure more informative (weight corrected by height). Note that this effect remains statistically significant after the inclusion of a large list of covariates such as neighborhood fixed effects, health status degree and parental background. However, we have to stress that the *beauty*'s effect is lower either compared to the gender composition impact or peers' dropping out intentions one.

Finally, we should point out that these kinds of applications (within classrooms and within cliques) are not completely exogenous because simultaneity relationships are present. For this purpose, we instrumentalized cliques reciprocating exposure by means of non-reciprocating effects. Asymmetries might be considered a valid instrument since it is no related to the individual school aspiration and very low correlated with the dropout variable (e.g. 0.06 for school aspirations case, being the highest value), but it is a part of the cliques' exposure. Notwithstanding, no statistical significant relationship was found although we should note that standard errors are larger for the IV application as a consequence of the weak correlation of cliques exposure variable with the non-reciprocating variable. Additionally, although the Wald test evidenced that cliques influence must be considered exogenous, in any case, simultaneity is present since individuals are also affecting their peers when reciprocating is allowed.

Finally, some other statistically significant covariates are worthy of mention: ageing and the grade level, previous grades in Mathematics, motivation, the number of extracurricular activities and consciousness.

6. Discussion

TO BE COMPLETED

The present paper

References

Alonso-Tapia, J. and Arce-Sáez, E. (1992) Expectativas de control y motivación: el cuestionario ECO. In Alonso Tapia, J. (ed.) *Motivar en la adolescencia: Teoría, evaluación e intervención*. pp. 135-175. Madrid: Servicio de Publicaciones de la Universidad Autónoma.

Ammermueller, A. and Pischke, J.S. (2006) Peer effects in European primary schools: evidence from PIRLS. IZA, Discussion Paper No. 2077.

Akerlof, G.A. and Kranton, R.E. (2002) Identity and schooling: some lessons for the Economics of Education. *Journal of Economic Literature*, 40, 1167-1201.

Averett, S. and Korenman, S. (1995) The economic reality of the beauty myth. The *Journal of Human Resources*, 31(2), 304-330.

Bishop, J.H., Bishop, M., Bishop, M., Gelbwasser, L., Green, S., Peterson, E., Rubinsztaj, A. and Zuckerman, A. (2004) Why we harass nerds and freaks: a formal theory of student culture and norms. *Journal of School Health*, 74(7), 235-251.

Boozer, M. A. and S. E. Cacciola, 2001. Inside the 'black box' of Project STAR: estimation of peer effects using experimental data. Economic Growth Center Discussion Paper 832, Yale University.

Bowles, S. Gintis, H. and Osborne, M. (2001) The determinants of earnings: a behavioral approach. *Journal of Economic Literature*, 34, 1137-1176.

Carneiro, P. and Heckman, J.J. (2003) Human capital policy. In J.J. Heckman and A.B. Krueger (eds.) Inequality in America: what role for human capital policies, pp. 77-239. Cambridge, MA: MIT Press.

Case, A. and Paxson, C. (2006) Stature and status: height, ability and labor market outcomes. NBER Working Papers No 12466, National Bureau of Economic Research, Inc.

Cohen-Cole, E. and Fletcher, J.M. (2008) Is obesity contagious? Social networks vs. environmental factors in the obesity epidemic. *Journal of Health Economics*, forthcoming.

Figlio, D.N. (2007) Boys named Sue: disruptive children and their peers. *Education Finance and Policy*, 2, 376-394.

Gibbons, S. and Telhaj, S. (2006) Peer effects and pupil attainment: evidence from secondary school transition. Discussion Papers Centre for Economic Performance, London School of Economics.

Graham, B.S. (2008). Identifying social interactions through conditional variance restrictions. Econometrica, forthcoming.

Heckman, J.J., Stixrud, J. and Urzua, S. (2006) The effects of cognitive and non-cognitive abilities on labor market outcomes and social behavior, *Journal of Labor Economics*, 24(3), 411-482.

Hanushek, E.A., Kain, J.F., Markman, J.M., and Rivkin, S.G. (2003) Does peer ability effect student achievement? *Journal of Applied Econometrics*, 18(5), 527-544.

Harper, B. (2000) Beauty, stature and the labour market: a British cohort study. *Oxford Bulletin of Economics and Statistics*, 62, 771-800.

Hernández M., Castellet J., Narvaiza J.L., Rincón J.M., Ruiz I., Sánchez, E., Sobradillo B., Zurimendi A. (1988) *Curvas y tablas de crecimiento. Instituto de Investigación sobre Crecimiento y Desarrollo*. Fundación F. Orbegozo. Garsi: Madrid.

Hoxby, C.M. (2000) Peer Effects in the Classroom: Learning from Gender and Race Variation, NBER Working Papers 7867, National Bureau of Economic Research, Inc.

Hoxby, C.M. and Weingarth, G. (2005) Taking race out of the equation: school reassignment and the structure of peer effects. Mimeo, Harvard University.

Kang, Ch. (2007) Classroom peer effects and academic achievement: quasi-randomization evidence from South Korea. *Journal of Urban Economics*, 61, 458-495.

Lavy, V. and Schlosser, A. (2007) Mechanisms and impacts of gender peer effects at school. NBER Working Papers 13292, National Bureau of Economic Research, Inc.

Lee, V.E. and Burkam, D.T. (2003) Dropping out of high school: the role of school organization and structure. *American Educational Research Journal*, 40(2), 353-393.

Manski, Ch. (1993) Identification of endogenous social effects: the reflection problem. *Review of Economic Studies*, 60(3), 531-542.

Mora, T. Escardíbul, J.O. and Espasa, M. (2009) The effects of regional educational policies on school failure in Spain.

Oreopoulos, P. (2007) Do dropouts out too soon? Wealth, health and happiness from compulsory schooling. *Journal of Pubic Economics*, 91, 2213-2229.

Persico, N., Postlewaite, A. and Silverman, D. (2004) The effect of adolescent experience on labor market outcomes: the case of height. *Journal of Political Economy*, 112(5), 1019-1053.

Proud, S. (2008) Girl power? An analysis of peer effects using exogenous changes in the gender make-up of the peer group. CMPO Working Paper Series No. 186, Centre for Market and Public Organisation, Bristol, England.

Sacerdote, B.I. (2001) Peer effects with random assignment. *Quarterly Journal of Economics*, 116, 681-704.

Sacerdote, B.I. (2007) How large are the effects from changes in family environment? A study of Korean-American adoptees. *Quarterly Journal of Economics*, 122(1), 119-157.

Sargent, J.D. and Blanchflower, D.G. (1994) Obesity and stature in adolescence and earnings in young adulthood: analysis of a British birth cohort. *Archives of Pediatrics and Adolescent Medicine,* 148, 681-687.

Solon, G. (1992) Intergenerational mobility in the labor market. In: Ashenfelter, O. and Card, D. (eds.), Handbook of labor economics, vol. 3A. Elsevier, pp.1761-1800.

Zimmerman, D.J. (2002) Regression toward mediocrity in economic stature. *American Economic Review*, 82(3), 409-429.

Zimmerman, D.J. (2003) Peer effects in academic outcomes: evidence from a natural experiment. *The Review of Economics and Statistics*, 85(1), 9-23.

Table 1 Descriptive based on covariates for the intention to leave high school.

	Not intention to dropout	Intention to dropout
School year degree (scale 1 to 4)	1.94 (0.88)	1.89 (0.89)
Pupil's age	15.93 (1.07)	16.22 (1.18)
Gender (female=1)	0.53 (0.50)	0.39 (0.49)
Immigrant (being immigrant=1)	0.08 (0.27)	0.12 (0.33)
Having moved residence	0.24 (0.43)	0.32 (0.47)
Marital status parents (not being married)	0.19 (0.39)	0.26 (0.44)
Pupil's health status degree (scale 1 to 5)	4.39 (0.66)	4.16 (0.82)
Regularly speaking Castilian	0.31 (0.46)	0.44 (0.50)
Pupil's height in meters	1.69 (0.09)	1.71 (0.11)
Pupil's weight in kg	59.77 (10.73)	62.87 (13.73)
Pupil's Body Mass Index	20.87 (3.01)	21.51 (3.82)
Having same peers to last year (yes=1)	0.79 (0.41)	0.70 (0.46)
Number of extracurricular activities	1.15 (0.78)	0.86 (0.70)
Having siblings being graduated (yes=1)	0.36 (0.48)	0.38 (0.48)
Having siblings dropping studies (yes=1)	0.03 (0.17)	0.05 (0.22)
Feeling school centre as a family (scale 1 to 5)	2.35 (0.84)	2.12 (0.89)
Satisfaction score Math (scale 1 to 5)	3.44 (1.08)	2.91 (1.25)
Satisfaction score Math's teacher (scale 1 to 5)	3.80 (1.02)	3.53 (1.18)
Satisfaction score Other teachers (scale 1 to 5)	3.61 (0.72)	3.24 (0.90)
Satisfaction score with evaluation of teachers (scale 1 to 5)	3.51 (0.85)	2.94 (1.05)
Satisfaction score atmosphere classroom (scale 1 to 5)	3.89 (0.96)	3.67 (1.06)
Satisfaction score school centre (scale 1 to 5)	3.19 (0.94)	3.14 (1.06)
Satisfaction score relationship with father (scale 1 to 5)	4.29 (0.94)	3.91 (1.19)
Satisfaction score relationship with mother (scale 1 to 5)	4.48 (0.75)	4.16 (1.04)
Satisfaction score with atmosphere at home (scale 1 to 5)	4.23 (0.88)	3.89 (1.13)
Grade last year in Math (1 to 5 categories)	3.24 (1.14)	2.36 (1.10)
Number of books at home (scale 0 to 4)	2.58 (1.40)	2.21 (1.54)
Educational attainment level father (scale 0 to 7)	3.51 (1.99)	3.03 (1.95)
Educational attainment level mother (scale 0 to 7)	3.51 (1.87)	3.24 (1.88)
Doing sport activity (yes=1)	0.72 (0.45)	0.67 (0.47)
Kind of attended school centre (not public=1)	0.56 (0.50)	0.45 (0.50)

Note: The measures consist on average and percentages whilst standard deviation is reported into brackets.

Table 2 Marginal effects of probit estimation results including fixed effects, peers influence and control variables

	(1) FE	(2) FE & Controls
Fraction of dropout intentions of non-reciprocating friends	0.0239 (0.027)	0.0336 (0.027)
Fraction of females of non-reciprocating friends	-0.0083 (0.017)	-0.0167 (0.018)
Average height of non-reciprocating friends	-0.0158 (0.044)	-0.0837 (0.161)c
Average weight of non-reciprocating friends	0.0005 (0.001)	0.0022 (0.001)c
Average BMI of non-reciprocating friends	0.0029 (0.004)	0.0002 (0.001)
Average last year Math's grade of non-reciprocating friends	-0.0179 (0.007)b	-0.0125 (0.007)c

Notes: All regressions include school fixed effects (FE): school location fixed effects and residence fixed effects. Adjusted robust standard errors for clustering at the classroom level are reported in brackets. a, b and c denote significance at 1, 5 and 10% respectively. Controls include an extensive list of covariates: consciousness, age, gender, immigrant, self-reported health status degree, spoken language, having experienced a change in residence or school, parent's civil status, age difference regards each parent, parental background characteristics, academic year, last year math's grade, number of brothers being graduated or having dropped out and the number of extracurricular activities.

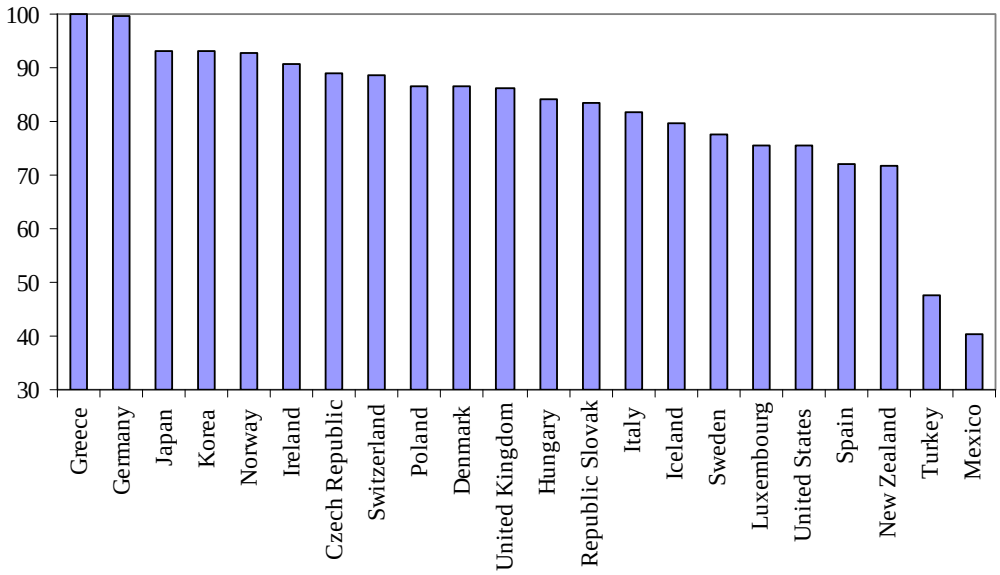
Table 3 Marginal effects of alternative estimations including fixed effects, peers influence and control variables

		(1) FE	(2) FE & Controls
Fraction of dropout intentions	Classroom influence	-0.0116 (0.047)	-0.0257 (0.038)
	Cliques influence (including reciprocating)	0.1898 (0.037)a	0.0949 (0.036)a
	Cliques influence (including reciprocating) Instrumental Variables	0.0585 (0.064)	0.0318 (0.073)
Fraction of females	Classroom influence	-0.0080 (0.052)	0.0143 (0.052)
	Cliques influence (including reciprocating)	-0.0510 (0.022)b	-0.0493 (0.023)b
	Cliques influence (including reciprocating) Instrumental Variables	-0.0202 (0.045)	-0.0311 (0.056)
Average Height & Weight	Height classroom influence by gender	-0.0183 (0.256)	-0.3328 (0.306)
	Weight classroom influence by gender	0.0053 (0.002)b	0.0045 (0.002)b
	Height cliques influence (including reciprocating)	-0.0419 (0.060)	-0.0182 (0.061)
	Weight cliques influence (including reciprocating)	0.0016 (0.002)	0.0006 (0.002)
	Height cliques influence (including reciprocating) Instrumental Variables	-0.0115 (0.028)	-0.0024 (0.038)
	Weight cliques influence (including reciprocating) Instrumental Variables	0.0004 (0.001)	0.0006 (0.010)
Average BMI	Classroom influence by gender	0.0208 (0.006)a	0.0120 (0.007)c
	Cliques influence (including reciprocating)	0.0013 (0.001)	0.0001 (0.001)
	Cliques influence (including reciprocating) Instrumental Variables	0.0011 (0.002)	0.0001 (0.004)
Average last year Math's grade	Classroom influence	-0.0890 (0.013)a	-0.0270 (0.014)b
	Cliques influence (including reciprocating)	-0.0067 (0.003)b	-0.0075 (0.004)b
	Cliques influence (including reciprocating) Instrumental Variables	-0.0375 (0.015)b	-0.0309 (0.017)c

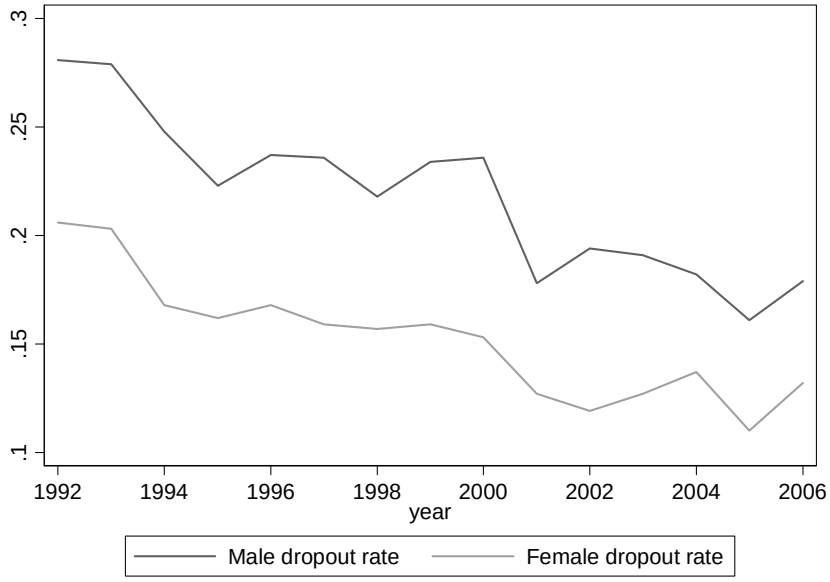
Notes: All regressions include school fixed effects (FE): school location fixed effects and residence fixed effects. Adjusted robust standard errors for clustering at the classroom level are reported in brackets. a, b and c denote significance at 1, 5 and 10% respectively. Controls include an extensive list of covariates: consciousness, age, gender, immigrant, self-reported health status degree, spoken language, having experienced a change in residence or school, parent's civil status, age difference regards each parent, parental background characteristics, academic year, last year math's grade, number of brothers being graduated or having dropped out and the number of extracurricular activities.

Figure 1 Dropout rate figures

1a. Upper secondary graduation rates (2005): International comparison



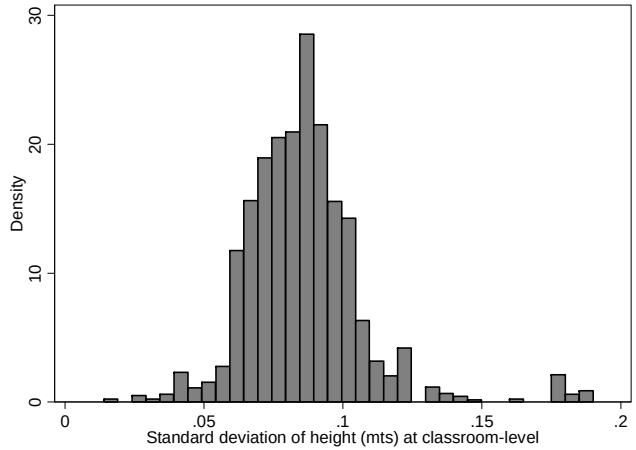
1b. Schooling dropout rate in Catalonia (1992-2006)



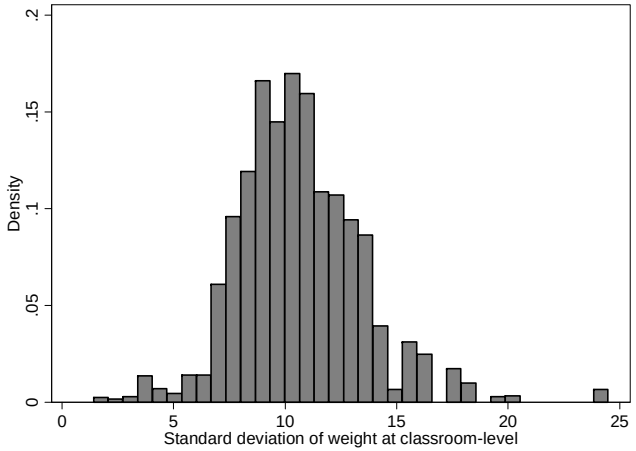
Sources: 1a. OECD- Education at a glance (2007); 1b. Spanish Ministry of Education.

Figure 2 Distribution of standard deviation at the classroom level

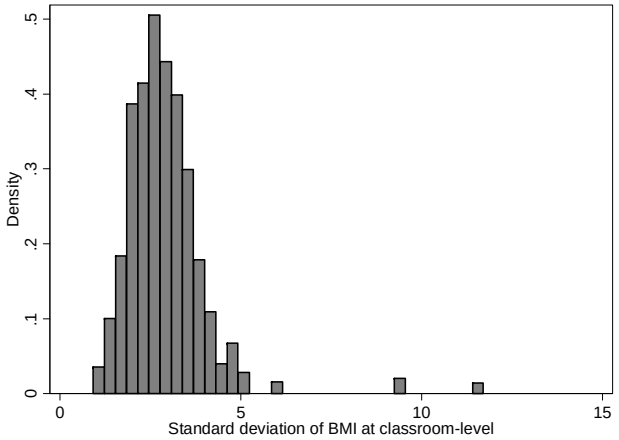
Distribution of height



Distribution of weight



Distribution of BMI



Distribution of last year Math's grade

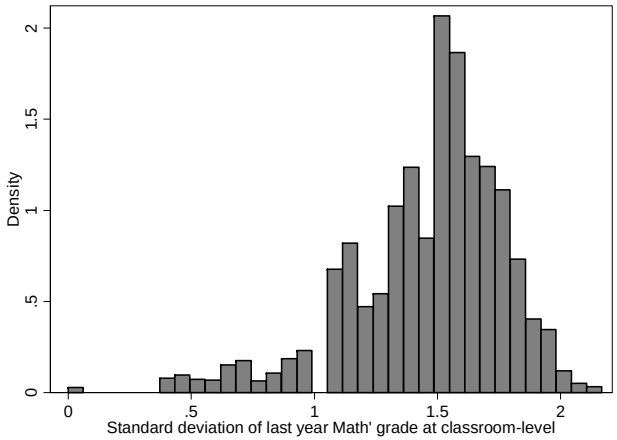


Figure 3 Gender shares composition of cliques within classrooms