Classmates and Educational Decisions:

The Role of Peers in Educational Aspirations and Student Achievement

By

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Abstract

I present new evidence on the role of peers in educational expectations and subsequent educational achievement using Hungarian administrative test scores and survey data. I show that certain elements of class culture are strongly related to educational and career expectations. I also confirm the association between peers' and one's own expectations by estimating a leave-out-mean model in which students' own expectations are related to peers' expectations. I provide evidence that educational aspirations instrumented with peers' average aspirations affect student achievement as measured by standardized tests. The results imply that orientation programs at schools to increase awareness about the importance and benefits of education could mitigate the issue of early school leaving and youth idling through adjusting expectations. Assuming that peer effects operate through the identity utility mechanism, schools may normalize striving for better performance and higher achievement by rewarding not only educational results but educational effort as well.

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1 Introduction

Central to the entire discipline of educational economics is the concept of increasing educational attainment, yet there is a lack of systematic understanding of what drives students' educational decisions. Early school leaving and dropping out behavior continues to be a concern for educational policy. While there are a handful of studies that investigate the potential determinants of schooling decisions – including those based on peer interactions – much less is known about the effect of educational aspirations on student achievement, and about the channels through which they are formed. A better understanding of these mechanisms could help form better educational policies that consider the socio-cultural aspects of one's own capacity to aspire and its relationship to subsequent student achievement.

In this paper, I ask the following two research questions: (1) do peers affect each other's educational aspirations, and (2) do educational aspirations affect student achievement? I show that (1) certain elements of class culture, as perceived by the student, are strongly related to educational and career expectations and that peers' expectations are significantly associated with one's own expectations. I investigate this relationship by estimating models with the Ordinary Least Squares method. I relate class culture variables, such as bullying or teacher behavior, to the reported probability of positive career or educational outcomes occurring to the student, as well as grades and test scores. Then, going beyond the simple OLS models, I confirm the association between peers' and students' own expectations by estimating a leave-out-mean model in which students' own expectations are related to their peers' expectations. From this, I also show that (2) educational aspirations of students strongly affect educational achievement by estimating a leave-out-mean instrumental variables model. In the model, students' own expectations are instrumented with their

peers' average expectations while I control for various covariates, including demographic characteristics, family background, and GPA.

In Section 2, I present the background of my research and provide a brief review of related literature. In Section 2.1, I describe the recent trends in the education and employment of the youths in Hungary from where I obtained the data for my analysis. To provide context, compared to the EU average, Hungary has a larger share of early school leavers and young people who are not participating either in education or in employment. Hungary also performs worse on standardized tests that measure basic competencies and has a strong association between socioeconomic background and performance. Students with disadvantaged backgrounds also have more unrealistic career expectations, as they are more likely to expect to have a managerial or professional career without completing higher education.

In Section 2.2, I review the literature on returns to education and the potential determinants of educational decisions. It is widely accepted that education has enormous pecuniary and non-pecuniary benefits, however, despite these returns, drop-out behavior persists. Potential reasons include time preferences, myopic behavior, psychological costs of attending school, and lack of motivation, among others.

The focus of this research is whether peers and social interactions play a role in educational decisions, therefore, in Section 2.3 I review what has been established on the effects of peers and the mechanisms through which they operate. Several seminal studies have found evidence of the effects of social interactions through the channel of peers' current characteristics and behavior and parental background. Another line of research investigated the mechanisms more precisely, and also provided evidence on the identity utility mechanism of peer effects. The identity theory states

that individuals have the desire to fit into a group because they derive utility from group membership. In my research, I consider each of these theories, including peers' current characteristics, parental background, and the identity utility mechanism.

In Section 2.4, I synthesize the research on educational aspirations, achievement, and their relationship to peers. There are relatively few studies on the relationship between educational aspirations and achievement, but it has been stated that educational aspirations are positively related to performance. There is even less evidence on the association between educational expectations and peers, but peers appear to affect each other's expectations in the same direction.

In Section 3, I describe the data sources and measurement and discuss the details of my final sample. Throughout this research, I use two Hungarian data sources. I use the first (2006) and third waves (2008) of the Hungarian Life Course Survey (HLCS) of the Tárki Research Institute of Hungary and data from the National Assessment of Basic Competencies (NABC) from 2006. I estimate various regression specifications which measure average class culture, expectations, and educational achievement for students who have at least 5 classmates surveyed in the sample.

In Section 4, I discuss the research design of this paper. My analysis consists of two parts: in part (1), I estimate the association between expectations, grades, test scores, and classroom cultures as perceived by the student; in part (2), I address the causal relationship between educational aspirations and test scores. In Section 4.1, I present the OLS estimation approach used for part (1). In Section 4.2, I present the IV estimation approach used for part (2). The instrumental variable used for this analysis is a leave-one-out mean of classmates' expectations. Finally, in Section 4.3, I discuss the IV validity assumptions and potential scenarios under which these assumptions would not hold.

In Section 5, I present the main findings of my analysis. The findings of the part (1) analysis provide support for the hypothesis that less supportive class cultures are negatively associated with students' performance and expectations. I also found that grades and scores exhibit smaller and a less clear correlation with class cultures. The estimation results also provide support for the propositions in part (2). I found empirical support for the peer effect mechanism of expectations diffusion and a causal relationship between expectations and student performance.

These results contribute to three strands of literature. First, I contribute to the educational peer effects literature by examining specific class culture characteristics and their relationship to expectations and educational achievement. Second, I add to the literature on the potential determinants of educational decisions by providing evidence on the role of educational aspirations in achievement. Third, I complement the literature by finding empirical support for a positive association between peers' and individuals' educational aspirations.

2 Background and literature review

2.1 Education, employment, and the youths in Hungary

The share of early leavers from education and training[1] in Hungary remains at 12.1 percent in 2020 which is well above the European Union average of 9.9 percent, though it has been slightly decreasing over the last few years. Similarly, the number of young people not in employment nor education (NEET) compared to the population in the same age group is 11.7 percent which is among the highest in the EU (Eurostat, 2021b). The 2018 survey of the Programme for International Student Assessment (PISA) showed that a large fraction of those who remained in education failed to reach basic skill levels on the tests for core school subjects (OECD, 2021). Socioeconomic status (SES) is strongly related to student achievement and in Hungary, it is a stronger predictor of performance than the OECD average (Avvisati et al., 2019). Segregation of students with low SES is also common in Hungary and the segregation index between schools has been slightly increasing over the past few years (Varga et al., 2019). Kertesi and Kézdi have shown that students are exposed to both between school and within-school segregation, which mainly affects Roma minorities and increases their gap in their educational achievement (Kertesi & Kézdi, 2011, 2012). The PISA survey also found that Hungary is one of the countries with the largest discrepancies in career expectations between students with advantaged and disadvantaged

[1] "The share of the population aged 18 to 24 with at most lower secondary education who were not involved in any education or training during the four weeks preceding the survey. Lower secondary education refers to ISCED (International Standard Classification of Education) 2011 level 0-2 for data from 2014 onwards and to ISCED 1997 level 0-3C short for data up to 2013." (Eurostat, 2021a)

backgrounds (Mann et al., 2020). Disadvantaged students are more likely to expect a professional career without completing higher education.

Early leaving and youth idling is more prevalent in the regions of the Northern Great Plain, Northern Hungary, and Southern Transdanubia. The 2012 educational law reduced the compulsory school leaving age from 18 to 16 years, which may have enabled a worse educational status quo, as we can see a large increase in the share of early leavers in each of these regions (Eurostat, 2022a). The NEET rates remained large as well, which may suggest that the increased supply of lower-skilled labor was not met with the demand for lower-skilled labor (Eurostat, 2022b). Based on this gap, the youth's returns to schooling expectations may have been misaligned.

The results of the PISA survey and the trends in early school leaving and unemployment of the younger population suggest that a large fraction of Hungarian students' expectations regarding their future might not reflect the reality of their prospects. To better understand the mechanisms of educational choice, I will now move on to discuss what has been concluded in the literature up to this point, regarding returns to education and potential reasons why high school dropouts decide to discontinue their studies early.

2.2 Returns to education and why dropouts leave school

A widely known theoretical model of human capital was developed by Becker (1964, 1994) in which years of schooling are regarded as an investment and are positively related to the discounted present value of earnings. This model motivated empirical studies to develop a framework for estimating the monetary returns to schooling (Card, 1999; Griliches, 1977; Mincer, 1974). More recently, the returns to education have been estimated to be around 10 to 14 percent which heavily varies by context (Angrist & Keueger, 1991; Card, 1993; Duflo, 2001; Heckman et

al., 2018; Oreopoulos, 2006). Besides the substantial income gains from education, several studies have described the role of education in improving other kinds of life outcomes as well. For example, it has been documented that education contributes to improved health outcomes and reduces mortality (Arendt, 2005; Cutler & Lleras-Muney, 2006; Heckman et al., 2010). Education and participation in criminal activity appear to be closely linked as well, as crime rates decrease with educational attainment (Lochner & Moretti, 2004; Machin et al., 2011). The large evidence of the numerous and substantial returns to education motivates my investigation of the potential determinants of educational achievement.

It is not clear whether students are aware of the aforementioned benefits of education, however, there may be other considerations that students ascribe to when choosing to continue their education. As suggested by Oreopoulos (2007), the investment model of educational attainment may not be accurate to describe educational decisions, especially when adolescents' schooling decisions are influenced by their time preferences or if they simply ignore the future pecuniary and non-pecuniary pay-offs of their studies. He proposes to include non-pecuniary costs in models which explain drop-out behavior. In his discussion, he lists increased costs due to uncertainty stemming from the increased variance of college graduates' earnings. Another example is the psychological costs of attending school, including the costs of fitting in which I will allude back to in the next section. Being uninterested in school and unmotivated to perform may also contribute to dropping out early. Adolescents are also reported to be more myopic and have a higher degree of delay discounting (Doremus-Fitzwater et al., 2010; Steinberg et al., 2009). This being so, students may perceive the greater but delayed return of staying in school less attractive than the immediate payoff of not attending school. Students may decide to not continue into higher

education if the application process is too complicated. It has been shown that reduced uncertainty in the college application process may yield more applicants (Dynarski et al., 2021). However, the administrative barriers to continuing to higher education may not be as relevant in Hungary. The Hungarian higher education application process is centralized, and students can apply through an online application platform, therefore it is very unlikely that students would incur high administrative costs associated with the application.

2.3 Peer effects

Another non-pecuniary factor that may play a role in educational decisions and achievement is the influence of social interactions, which is the central topic of this research.

According to Sacerdote's (2011, p. 250) definition, peer effects "encompass nearly any externality in which peers' backgrounds, current behavior, or outcomes affect an outcome". In an earlier contribution, Manski (1993) formally decomposed social effects into three types, from which two are relevant to discuss for this research.

First, endogenous effects are those that stem from peers' current outcomes and behavior. For example, if classmates have high baseline ability, the student may learn directly from them or benefit from teachers teaching more advanced material. On the other hand, if the student's classmates have lower ability, the teacher's attention may be consumed by them to such an extent that the student gets less help which would reduce her test scores. Second, Manski defines exogenous effects which emanate from peers' baseline characteristics and backgrounds. If classmates' parents hold the teachers accountable for student performance, the student may benefit from a higher quality education as a result of having peers with more motivated parents.

Myriad peer effect studies have found evidence for the exogenous effects where peers' background influences one's own test scores (Boozer & Cacciola, 2001; Hanushek et al., 2003; Hoxby, 2000; J. L. Vigdor, 2006; J. Vigdor & Nechyba, 2007). However, there have been some studies that could not confirm this particular channel of peer effects (Angrist & Lang, 2004; Burke & Sass, 2013; Imberman et al., 2012). In his review, Sacerdote (2011) argues that these contradictory results are due to the linear-in-means design of identification of peer effects. Studies that do not assume that peer effects work through the mean and allowed for heterogeneous treatment effects that vary by own achievement and background found large effects (Burke & Sass, 2013; Imberman et al., 2012; Lavy et al., 2012). While this thesis does not engage with non-linear models, I control for various covariates which proxy own achievement and background, and I also investigate heterogeneous treatment effects for females and students with low parental education.

There is also substantial evidence in the literature on the prevalence effects endogenous to peers. These effects have been investigated in research designs that exploited the random assignment of roommates in dorm rooms (Sacerdote, 2001; Stinebrickner & Stinebrickner, 2006; Zimmerman, 2003).

Another line of research attempts to identify the mechanisms more precisely through which peer effects may operate. According to the identity economics model of utility functions, individuals derive utility from adhering to the norms of a group and also enjoy gains from the acts themselves that make them fit in (Akerlof & Kranton, 2000, 2010). In this framework, "social categories" or identities guide the behavior of the members of such groups which may lead to the punishment of "out-group" individuals and to the rewarding of those that are "in-group" (Chen & Li, 2009). Each category has norms and ideals that individuals would like to adhere to. For example,

individuals may have the desire to maintain their self-image as suggested by Bénabou and Tirole (2006, 2011), or social position proposed by Horst et al. (2007).

Given social categories and norms, individuals maximize their "identity utility". In the context of education, students form small communities and are organized into social categories which have their own distinct norms. Abiding by these norms signals group membership which translates into gains and losses in their identity utility. The degree of gains and losses depends on how well the student fits the ideal of a certain social category. This utility is further complicated by the hierarchy of categories in which belonging to a certain group is more desirable.

Several empirical studies investigate the identity utility mechanism of peer effects. Most recently, Bursztyn et al. (2019) found that peer pressure reduced educational effort through separate mechanisms, such as the desire to hide effort or the desire to hide low ability in pursuit of fitting into a group. Austen-Smith and Fryer (2005) propose the hypothesis of "acting white" which may negatively affect black students' educational decisions. Acting white is investing in behaviors that are usually attributed to white students and may cause group rejection as peers take this as the reduced group loyalty of the deviating student (Austen-Smith & Fryer, 2005; Bursztyn et al., 2019; Fryer & Torelli, 2010). Nevertheless, the acting white hypothesis has not been confirmed among Roma students in Hungary (Hajdu et al., 2019).

In my thesis, I would like to examine whether peer effects operate through the channel of educational aspirations. Akerlof (2010) argues that the allocation of students to certain groups depends on certain identity elements of that group. I argue that educational aspirations may be such an identity element. Going beyond the mechanisms identified in previous literature, I propose another potential channel through which peer effects may operate. I hypothesize that a group's

expectations regarding their educational attainment or career outcome may affect the expectations of an individual who wishes to fit into that group. This is because students may want to avoid aiming "too high" or "too low" to conform to the average expectation level of their classmates.

2.4 Educational aspirations and achievement

To meet the identity element of a group, students may alter their behavior as well. For example, if class-level expectations are low, students may be more likely to expect less from themselves and may also be less ambitious about their future. In this case, the norm may be to avoid or hide exerting effort and those who do not adhere to this norm are discriminated against. If the mean class-level expectations are high, students may be more likely to exert effort on schoolwork in general and have better results on the assessments. Therefore, the second aim of my analysis is to uncover the relationship between expectations and student performance.

Early contributions in the field of sociology and psychology documented that educational aspirations are positively related to educational attainment (Brookover et al., 1967; Rothon et al., 2011; Sewell & Shah, 1967; Trusty, 2000). However, there has been little discussion and quantitative analysis about the relationship between social interactions and aspirations. Oreopoulos and Mora (2011) investigated the effects of friends on the intention to drop out. They found that students who had stronger relationships with their friends are more likely to intend to drop out if their friends also had dropout intentions. Using the Longitudinal Study of Young People in England dataset, Dickerson et al. (2018) found positive and significant peer effects for males on school leaving behavior, but not for females. Peer effects were also found to be mitigated when students were provided advice and guidance. They also reported heterogeneous treatment effects for higher

ability and high SES students and found that peers' intentions are less informative in explaining their educational aspirations.

My results add to this literature on peer effects in two distinct ways. First, due to the exceptional dataset I obtained for my analysis, I am able to examine particular class culture characteristics and their relationship to expectations. Second, I do not only consider the relationship between peers' and individual's own educational aspirations but also examine whether these expectations translate into subsequent educational achievement.

3 Data and measurement

3.1 Data sources and sample selection

I use Hungarian data from two main sources: the first (2006) and third waves (2008) of the Hungarian Life Course Survey (HLCS) of the Tárki Research Institute of Hungary and administrative and survey data from the National Assessment of Basic Competences (NABC) in 2006.

The HLCS data is a panel survey containing a rich set of information on school and individual characteristics of 10,000 youths between 2006 and 2012. The NABC is a standardized assessment in Hungary to measure 6th, 8th, and 10th-grade students' mathematical and reading literacy skills, except for students with special educational needs. In addition, the NABC dataset includes class identification numbers so I can distinguish students from the same class in 2006. From the full sample, I select students who have at least 5 classmates in the HLCS sample to obtain more reliable estimates of peer effects[2].

[2] The average class size in Hungary was 20 in 2006 according to data from the Hungarian Central Statistical Office (Hungarian Central Statistical Office, 2022). While restricting my sample to a subset of students who have at least 9 classmates in the sample would provide more reliable estimates, by doing so, the sample size would decrease to a degree which would substantially reduce the power of my estimations. To my knowledge, the authors draw observations randomly from classes, therefore I assume that students who have less classmates represented in the dataset are not significantly different from those who have more.

3.2 Measurement

My analysis consists of two parts: in part (1), I estimate the association between expectations, grades, test scores, and classroom cultures as perceived by the student, in part (2), I examine the causal relationship between educational aspirations and test scores.

The outcome variables in part (1) are measured as follows. Using data from the third wave of the HLCS dataset, students' expectations are measured as the average probabilities that students assign to future career and educational achievements. For example, they are asked to write down a number between 0 and 100 for the probability of successfully passing the maturity exam, getting a university degree, finding a job, having a higher salary compared to the average, and future satisfaction with their lives. In addition, I use a variable that measures the expected educational attainment level in years from the 2006 NABC dataset.

Examining grades and scores is important to disentangle whether class culture ultimately translates into student achievement. End-of-the-year grades in 2006 and 2008 are recorded for the following subjects: mathematics, literature, and grammar and are measured on a scale of 1 to 5, where 1 is the lowest and 5 is the highest grade. Grades for behavior and negligence are measured on a scale of 2 to 5. Additionally, I also use the 2006 NABC scores in reading and mathematics as outcomes which I transformed into standard deviations.

The independent variables in part (1) measure the class culture perceived by the student. To measure students' experience with harassment, I construct an index from the third wave of the HLCS dataset which is the average of the reported frequency of different types of harassment. For example, students were asked to report whether they have been hurt, mocked, bullied, or had a disadvantage because of their weight, clumsiness, poor school results, being a "geek", appearance,

origin, and speech impediment, or physical disability. An alternative to the average frequency is a dummy variable which is 1 if the student has ever experienced any of the above forms of harassment.

Another variable to measure harassment is constructed from students' answers given to how often they were bullied at school or how often they participate in bullying others at school in 2008. To measure the relationship between the school environment and student expectations as well as achievement, I compress these two variables into one. This relies on the hypothesis that for students who are in an unsupportive environment, either because they are bullies themselves or they are victims of bullying, it may be more costly to deviate from their group or to fit into another, as they are likely to be bullied for not fitting in. In pursuit of adhering to the class identity, students may alter their expectations or lower their educational effort, if the mean class-level expectations are low.

Class culture may also depend on teacher behavior. Students were asked to report the degree to which they agree with the statements of whether their teachers encourage them: to tell their opinion in class, if their teachers treat them fairly, if they need extra help they can get it from their teachers, and if their teachers are interested in their personality. The answers were reported on a Likert scale. I took the average of these responses to construct a variable where the greater the

value is the worse the teacher's behavior is. To ease the interpretability of these results, I transformed this variable to standard deviations.[3]

In addition to this, I measure the presence of physical altercation and violence between teachers and students with a variable that changes from zero to half if either a teacher hit a student or a student hit a teacher, and from half to 1 if both have occurred in the past.

In part (2), I use the educational aspirations variable and the standard deviations of test scores in mathematics and reading from the NABC dataset. I construct an instrumental variable which is the mean of expectations in a class except for the student for whom I estimate the outcome, which I will discuss in detail in Section 4.

3.3 Descriptive statistics

Table 1 shows the summary statistics for my final samples. Panel A presents descriptive statistics for the IV estimation sample, which consists of 2168, 8th-grade students. Half of the students are female, and their average age is 15 years. Families with low average spending are overrepresented in the sample with average spending of HUF 140,313.[4] Parents have around 11 years of education on average, with a standard deviation of 2 years. This suggests that the average parents do not hold a university degree, instead, they completed a professional degree without completing their

[3] I constructed another variable to measure teacher unsupportiveness which records the same answers into an ordinal variable which is on the scale 1 to 5 and increases with the strength of the statement only if the student reported the same answer to more than half of the questions. However, this variable contained a number of missing values, therefore, I do not report on these estimation results due to lack of reliability.

[4] According to the 2006 EUR/HUF exchange rates this corresponds to EUR 535 (European Central Bank, 2022).

Matura,[5] or they finished secondary education and passed their Matura. Roma students are also overrepresented in the sample, as about 7.05% of the population is Roma in Hungary (European Commission, 2014). Students from Northern Hungary, the Northern and the Southern Great Plain are strongly overrepresented, whereas Central Hungary is strongly underrepresented in my sample compared to the actual population by region in Hungary. The population in Transdanubia is somewhat underrepresented as well (see Appendix A1).

According to their grades, students are better performing in grammar and literature, and slightly worse in mathematics. Students' average grade on behavior is 4.13 while their grade on diligence is 3.78. The dispersion of grades is large, it is around 1 for academic performance, whereas it is around 0.8 for behavior and diligence. The expected educational attainment level is 13 years, which implies that the average student expects to finish secondary education. Students' average score on the NABC reading test is 452, and on mathematics, it is 461. The variation in test scores is larger for mathematics than for reading, 200 and 118, respectively. The mathematics assessment was completed by 93 fewer students than the reading assessment, therefore, I conducted a joint orthogonality test (F-test) to assess whether the mean of covariates is significantly different for those who did complete the test and for those who did not. I rejected the hypothesis that

[5] Matura or Érettségi is the secondary school leaving exam which must be passed to apply to a higher educational institution.

coefficients are jointly zero (F = 11.94, df = 10), and found that those who are older were less likely to take the mathematics assessment, significant at 1%.

Panel B shows the summary characteristics of the sample I used to analyze the Life Course Survey results. The sample in 2006, which is also the IV sample, consists of 2,166 students, and the sample in 2008 includes 1,657 students. As can be seen from the table, there are a handful of missing observations in both subsets of data. For this reason, I conducted joint orthogonality tests (F-test) to assess whether the means of those with missing values are significantly different from the means of those who have non-missing values for the specific variables. I rejected the H_0 for almost all class culture variables at 1% significance level and concluded that the variables are jointly significant, except for harassment (F = 0.49, df = 10).[6]

While there is limited evidence that these values are missing at random, after observing the significance of the coefficients individually, I conclude that students with missing observations mostly differ in their age. Older students may be grade repeaters, which could explain why they are less willing to answer all the survey questions, as they may be generally less motivated to perform well or to fulfill all their obligations. Similarly, these students may have rejected to complete the mathematics assessment due to lack of motivation, or because they are older, they

[6] The results of the F-test are as follows. Average teacher unsupportiveness: F = 3.73, df = 10; physical altercation between teacher and student: F = 4.38, df = 10; bullying: F = 3.84, df = 10. The mean of average teacher unsupportiveness, physical altercation and bullying is significantly larger for older students at 1% significance. The mean of average expectations is signficantly larger for older students, and for those who have worse grades in mathematics at 5% significance level.

may have more time to be identified with learning difficulties, therefore they may have gotten a pass to fill out the test. If so, my results must be taken with caution, as it is likely that students who are among the most vulnerable are not included in my estimations.

Table 1: Descriptive statistics

	Observation	Mean	Standard deviation	Range Min	Max
Panel A: IV sample					
Demographics					
Female	2166	.4976916	.5001101	0	1
Age	2166	14.8638	.6634023	13	19
Monthly family spending	2166	140313.6	62347.82	2000	650000
Parents' average education (educational level in yrs.)	2166	10.69229	2.024978	7	17.5
Roma	2166	.1634349	.3698474	0	1
Grades					
Mathematics	2166	3.227608	1.036692	1	5
Grammar	2166	3.462142	.9826193	1	5
Literature	2166	3.633426	.9953564	1	5
Behavior	2166	4.138042	.8261671	2	5
Diligence	2166	3.773777	.8717137	2	5
NABC results					
Expectation: educational attainment level	2166	13.77331	2.553962	8	20
Reading score	2166	452.5448	100.8428	118.0742	760.9203
Math. score	2073	461.3855	99.74704	200.9431	804.2085

Table 2: Descriptive statistics (continued)

Panel B: Life course survey analysis sample					
Class culture variables					
2006					
Harassment average	2139	1.092567	.1506322	1	2.777778
Harassment ordinal	1231	1.003249	.0697673	1	3
Ever harassed	2166	.4284395	.4949669	0	1
2008					
Bullying	1549	1.066817	.2564849	1	4.5
Std. Average teacher unsupportiveness	1569	-.0846773	.9717282	-1.764949	3.220459
Physical altercation btw. teacher and student	1589	.0349276	.1448345	0	1
Physical altercation dummy	1657	.057936	.233693	0	1
Expectation: probability of pos. events	1487	53.47041	17.96215	0	98.75

4 Research design

In this section, I present my research design to answer the two main research questions of my thesis: (1) do peers affect each other's educational aspirations, and (2) are educational aspirations causally related to student achievement? In Section 4.1, I present the estimation approach that I use to examine the relationship between class cultures and various outcomes. In Section 4.2, I present the instrumental variables estimation approach. Finally, in Section 4.3, I discuss the instrumental variable validity assumptions and potential scenarios when these assumptions would not hold.

4.1 Part 1: Life course survey analysis

In estimation equation (1), I measure the association between class culture and various individual-level outcomes in the following form:

$$(1) \qquad y_{ij} = \alpha + \beta\, class\ culture_{ij} + X_{ij}'\gamma + v_j + \epsilon_{ij}\,,$$

where β captures the association between class culture and outcomes of student *i* in class *j*.

The outcome variables are students' assigned probabilities of having a good career or educational event occurring to them; their average grade in math, grammar, and literature, separately; and their NABC scores. The model controls for a vector of observable individual characteristics where X_{ij}' includes age (in years), female binary variable, ethnicity, region, GPA (except for models where the dependent variable is GPA), parental income, and average parental educational attainment. I also examine a specification that includes classroom dummies v_j to account for unobserved class-specific attributes common for all students in that classroom. However, because I do not have class identifiers for the year 2008 – when the students in my sample were already in 10th grade and most probably had different classmates – I only control for class

fixed effects when estimating the relationship between harassment and grades, and harassment and test scores. I estimate (1) using OLS.

In consideration of how my sample was selected, I cluster standard errors on the class level. As Abadie et al. (2017) point out, in a two-stage sampling process where clusters, and then individuals were randomly selected, it is reasonable to think that unobservables may be correlated with each other within the clusters. In the context of this analysis, a subset of classes was sampled randomly from the population of all classes in Hungary, and then students were selected from the sampled classes. The estimated standard errors adjusted for clustering allow for the correlation of errors within classes but not across classes.

4.2 Part 2: Expectations and student achievement

After examining the relationship between class cultures and student outcomes I turn to the investigation of how expectations are affected by peers and whether this translates into student achievement. In estimating equation (2), I estimate linear regressions by OLS as follows:

$$(2) \quad scores_{ij} = \alpha + \beta\, exp_{ij} + X'_{ij} + \bar{X}_{-ij} + \epsilon_{ij}$$

where the coefficient of interest, β, captures the average association between educational attainment expectations and the standard deviation of test scores achieved on the 2006 NABC test of student i in class j. The model also includes X'_{ij} which is a vector of control variables as in Equation (1). Additionally, $\bar{X}_{-ij}$ includes the mean characteristics of student i's peers. I do not include class fixed effects in Equation (2) because class-level means introduce a nearly perfect multicollinearity into the estimations.

The simple regression estimator $\hat{\beta}$ is likely to have an asymptotic bias even conditional on baseline attributes. This bias is likely to stem from omitted variables. For example, it has been well documented that helicopter parenting may contribute to students' decreased psychological well-being and increased stress, as well as lower educational performance (LeMoyne & Buchanan, 2011; Nelson et al., 2015; Schiffrin & Liss, 2017). Due to the omitted variable of parenting style, the OLS estimator of the effect of students' expectations on test scores may be downward biased. Another potential scenario can be attributed to teachers' expectations. According to Weinstein (2009), if the teacher often articulates in front of the class how individual students perform, students' self-esteem may diminish and consequently, their expectations may decrease. If at the same time, the teacher has higher standards, the students may exert more effort which would translate into improved test scores. If this is so, the omission of the latent variable measuring the relationship between teachers and specific students could lead to a negative bias in $\hat{\beta}$.

In the following, I turn to an instrumental variables estimation approach which seeks to partial out the potential endogeneity bias in Equation (2). The instrumental variable is a leave-one-out mean, the average class-level expectations, leaving out student *i*'s expectations. The first-stage equation of the model relates the leave-one-out mean to student *i*'s own expectations and includes the same covariates as specification (2). In Equation (3), the coefficient of interest is κ which captures the association between student *i*'s and her peers' expectations.

$$exp_{ij} = \alpha + \kappa\overline{exp}_{-ij} + X'_{ij} + \bar{X}_{-ij} + + u_{ij}. \quad (3)$$

Expectations may translate into students' performance, as students who have lower expectations regarding their education may exert less effort and invest less in their education. To

examine the relationship between expectations and student achievement I estimate the following second stage equation:

$$scores_{ij} = \alpha + \gamma\, exp_{ij} + X'_{ij} + \bar{X}_{-ij} + \epsilon_{ij} \quad (4)$$

Where the coefficient of interest γ measures the effect of a level increase in the educational attainment expectation in years on the standard deviation of test scores of individual *i* in class *j*. In the following, I argue that the coefficient measures the Local Average Treatment Effect for the compliers under various assumptions. Estimating Equation (4) also includes X'_{ij} and $\bar{X}_{-ij}$ which are vectors of covariates, including individual and mean peer characteristics.

4.3 IV validity

In this section, I summarize how the IV validity assumptions apply to my research design based on Angrist and Pischke (2008) and Wooldridge (2009).

For the instrumental variable to be valid, the leave-one-out mean should be a strong predictor of individual expectations such that student *i*'s expectations are strongly correlated with peer expectations. The IV relevance can be tested by estimating Equation (3).

The instrument should also be as good as randomly assigned; peer expectations should be independent of the error term, u_{ij}. The independence assumption may be violated if both exp_{ij} and $\overline{exp}_{-ij}$ are affected by class-level random shocks which are implicitly part of u_{ij}. For example, $\hat{\kappa}$ may be estimating spurious peer effects if students with higher ability self-select into classes or if certain classes have more efficient teachers. Higher ability students may expect to have higher educational attainment, and more efficient teachers may encourage students more, so they expect more from themselves. In Hungary, there is no institutionalized tracking into classes, except for

students with learning difficulties or for classes that specialize in certain subjects. However, in practice, students are sometimes clustered into classes based on ethnicity and family background, and there is also anecdotal evidence on tracking based on ability. The main identifying assumption of the IV is that other than observed characteristics, students are randomly assigned to classes. This leads to the conditional independence assumption (CIA) which assumes that conditional on the vector of controls X'_{ij} and $\bar{X}_{-ij}$, the selection bias disappears.

The specification in Equation (3) controls for a wide range of variables that may be endogenous to the estimator $\hat{\kappa}$. To account for the high-ability student selection problem, I include individual and mean peer GPA. Family background may also be a confounder if students with more affluent backgrounds cluster into the same classes. Therefore, I include variables for the average education level of parents and income. There is substantial evidence that Roma students suffer from discrimination at school which influences their educational achievement (Kertesi & Kézdi, 2011, 2012). Roma students may interact differently with their classmates because they are discriminated against based on their ethnicity. The effect of discrimination may bias the estimator downwards if students exhibit behaviors similar to the acting white hypothesis. Since discrimination is a latent variable, I instead control for a binary variable which indicates whether the student in the sample is Roma or non-Roma. I also control for region to account for spatial variation in characteristics which may determine expectations or educational performance. In addition, age and gender may also be a potential confounder, as it is well documented in the literature that having different age and gender profiles is associated with educational outcomes.

In the following, I will assume that peer expectations are "as good as randomly assigned" conditional on X'_{ij} and $\bar{X}_{-ij}$, so that $exp_{ij} \perp \overline{exp}_{-ij} \mid X'_{ij}, \bar{X}_{-ij}$.

Another key assumption for the IV to be valid is the exclusion restriction, according to which the effect of peer expectations would only operate through the single channel of own expectations. To violate the exclusion restriction, peer expectations should affect test scores through another channel than own expectations. A potential scenario would be, for instance, if peer expectations are higher than student *i*'s expectation, and the student increases effort to conform to a potential class norm that arises from the average expectations. Due to increased effort, her test score may improve even if her expectation does not change. However, I find it very unlikely that a norm that originates from peer expectations would affect an unobserved variable but not own expectations. Nonetheless, apart from mathematics, grammar and literature, I included in the model controls for students' grades given for diligence and behavior. The grade for diligence is determined based on how hard-working and organized the student is, while the behavior grade is determined based on students' discipline. Should expectations affect scores through another channel, I expect these variables to pick up any variation related to behavioral changes other than expectations.

The monotonicity assumption of the instrumental variables framework in this context entails that the peer expectations instrument affects own expectations in the same direction. Only in this case is true that the IV estimator estimates a weighted average of the underlying individual causal effects. If monotonicity does not hold, some students with peers who have higher expectations would lower their expectations as a result. This scenario may be plausible for students with low ability for whom the cost of abiding by the class norms would be too high. These students may want to identify with another, a within-class group whose members reject the behavior of the majority of the class. While I cannot control for unobserved characteristics which predetermine

these behaviors, I can control for grades that are expected to partial out the effect of ability differences among students.

Finally, several studies have considered the challenges of the leave-out mean estimation strategy. For example, $\hat{\kappa}$ may be subject to an endogeneity bias called "reflection bias" which is because causality may run in both directions: student *i*'s outcome (exp_{ij}) affects her peers' mean outcome ($\overline{exp}_{-ij}$) which introduces an endogeneity bias to the estimates (Manski, 1993; Sacerdote, 2011). Nonetheless, I argue that the reflection bias does not pose a threat to identification, because causality is not required in the first-stage relationship for the IV estimator to be identified.

5 Results

This section summarizes the estimation results of the two main estimation approaches detailed in the previous section. In section 5.1 I discuss the results of the estimations which relate class cultures and various outcomes to each other. In section 5.2 I show my findings for the instrumental variables estimations. Lastly, in section 5.3 I present the results of my heterogeneous effects analysis for females and students with low parental education.

5.1 Estimates of the association between class culture, expectations, grades, and test scores

5.1.1 Expectations

The classroom culture appears to be an important factor when it comes to expectations as measured by the assigned probabilities of a positive career or educational outcome.

Most striking is the relationship between the perception of teachers' behavior and expectations. If the teacher is perceived less supportive by a standard deviation, the individual is expected to assign a 2.761 percentage points lower probability to positive events, on average, holding age, gender, region, grades, family background, and ethnicity constant. The estimate is significant at 1% level.

The relationship between expectations and physical altercation between teacher and student is less clear. If the student has been hit or beaten or if the student has hit or beat their teacher, her average probability assigned to good events occurring is 2.099 percentage points lower, on average, not significant at the 1% level.

Bullying has a stronger negative relationship with expectations. If a student has been more often bullied or has bullied people, her average probability assigned to good events is expected to be lower by a noisy and insignificant 2.345 percentage points, on average.

Table 3: OLS estimation results for class culture and expectations regarding positive events

	(1)	(2)	(3)
Std. Average teacher unsupportiveness	-2.761***		
	(0.534)		
Physical altercation		-2.099	
		(3.028)	
Bullying			-2.345
			(1.727)
Baseline characteristics	Yes	Yes	Yes
Observations	1460	1473	1433

Notes. This table reports OLS estimates of the relationship between students' perceived classroom culture and *expectations regarding positive events occurring in their future*. The variable *teacher average* is the average of the answers given on how students perceive teachers' behavior where 4 means the students agree with all four statements, 20 means the student disagrees and where the greater the value of the variable, the worse the perception of the teacher is. The variable *beating* is 0 if the student has beat the teacher or has been beaten, 0.5 if one of these, and 1 if both. The variable *bullying* stands for the average bullying frequency (either has been bullied or has bullied, min=1, max =5). Standard errors are clustered at the class level. * p<0.10, ** p<0.05 *** p<0.01.

5.1.2 Grades

This section shows that class culture is related to average student achievement expressed by their end-of-year grades.

The perceived behavior of teacher is significantly and negatively associated with grades. When the teacher is perceived as less supportive by a standard deviation, holding baseline characteristics constant, the average math grade is expected to be lower by 0.169, significant at 1% level (see Appendix A2.1). The grammar grade is expected to be lower by 0.182 whereas the literature grade is expected to be lower by 0.181, both significant at 1% (see Appendix A2.2 and Appendix A2.3, respectively). Physical altercations between teachers and students have a negative association of -0.202 between math grades, suggesting that if there was such violence in the class, the grade of the student is expected to be lower by 0.202, on average. The association between grammar grades and physical altercations is -0.241. None of these estimates are statistically significant. The average literature grade is more strongly associated with physical altercations. If

the student has experienced physical altercation in her class, her expected literature grade is predicted to be lower by 0.395, on average. However, I could not reject the hypothesis that the coefficient is equal to zero at 1% significance level.

Students who are more frequently harassed are expected to have a lower grade in mathematics by 0.620, on average, which is significant at 1% significance level. Ever being harassed also has a negative relationship with mathematics grade. The magnitude of the association for grammar grades is somewhat smaller, while for literature it decreases to -0.465. The inclusion of class dummies decreases the point estimates, which may signal that the coefficients have an omitted variable bias. This bias could be an alternative channel through which social interactions operate.

Bullying, either having been victim or abuser, has a negative relationship with grammar and literature grades, although the estimates are not statistically significant.

5.1.3 Scores

This section discusses the estimation result of the NABC test scores achieved in 2006 and harassment in school. The main finding is that scores are not related to harassment, whereas expectations are marginally associated with it. The estimation results are shown in Appendix A2.

If the frequency of harassment increases the reading score of the student is expected to be larger by a statistically significant 0.403 standard deviations, on average, conditional on covariates. The association of harassment with math scores is 0.318. The magnitude of the estimates decreases when including class dummies.

While harassment and scores do not relate to each other as I previously predicted, I found that expectations regarding educational attainment vary with changes in harassment. If an

individual has ever been harassed, their expected years of schooling are predicted to be less by a significant 0.0106 years, on average, conditional on baseline characteristics. Including class-level dummies in the specification, the coefficient of interest increases, but remains statistically insignificant.

The findings of the Life Course Survey analysis provide support for the hypothesis that classroom cultures are associated with students' performance and expectations. The relationship between expectations and classroom cultures was confirmed in almost all estimations and was robust to the alternative measurement of expectations.

Grades and scores exhibit smaller and a less clear correlation with class cultures. The inclusion of class dummies when estimating the relationship between harassment and different outcome variables resulted in a decrease in the point estimate in almost all the cases. The fact that class fixed effects altered the point estimates provides suggestive evidence of certain unidentified class level mechanisms. The strong relationship between expectations and class culture variables may signal the presence of the expectation channel of peer effects, which I examine in more detail in the next section.

5.2 Instrumental variables estimates

Individual expectations of educational attainment are strongly related to peers' mean expectations, which is captured by the first stage equation (3) of the IV estimation approach. Expectations translate into actual student achievement which is measured by estimating the second stage equation (4). This section presents the main result of this thesis, specifically, that if students have

more ambitious expectations, they are predicted to achieve higher test scores on the NABC, on average.

Table 3 shows the estimation results of the IV model (Equation (3) and (4)) and the OLS model (Equation (2)). In column 1, I present the estimates for the first stage regression. Controlling for individual characteristics and peers' mean characteristics, including age, gender, ethnicity, region, GPA, parental income, and education, I found that if peers expected educational attainment level increases by one, the individual will expect to complete 0.2681 more years of schooling, on average, conditional on covariates. The first stage relationship is statistically significant at 1% significance level.

Columns 2 and 3 show the estimation results of the second stage regressions of the instrumented own expectations on reading score and math score, respectively. I found that if the individual expectation instrumented with mean peer expectations increases by one educational attainment level, the average reading score increases by 0.3219 standard deviations, holding individual and peers' characteristics constant. The effect for math scores is somewhat smaller, that of 0.299 standard deviations. The estimates are significant at 1% significance level.

Table 3 also reports on the simple OLS estimates for students' own expectations and test scores in columns 4 and 5. The estimates are almost identical, a level increase in expected educational attainment is associated with an increase in reading and math scores of approximately 0.09 and 0.08 standard deviations, respectively. The OLS estimates are smaller in magnitude compared to the 2SLS estimates, but they are significant at 1% significance level.

The difference in the OLS and IV estimates can be explained in part by the presence of certain individual characteristics which may bias the OLS estimator downward. High parental

expectations and pressure may increase students' anxiety and stress which in turn may result in lower performance. Poor teaching practices, for example, the open exposition of low performers in a class may lead to an asymptotic negative bias in the OLS estimator. This difference in the IV and OLS estimators is reassuring in that the OLS estimator is likely to be endogenous which is controlled for in the 2SLS estimation. It also provides suggestive evidence that the 2SLS estimator estimates the effect of an increase in educational aspirations for students whose expectations are influenced by their peers and not other factors.

Table 4: Instrumental variables estimation results

	First stage	2SLS		OLS	
	(1)	(2)	(3)	(4)	(5)
	Expectations	Reading score	Math score	Reading score	Math score
Peer expectations	0.2681***				
	(0.05806)				
Expectations instrumented		0.3219***	0.2986***		
		(0.08703)	(0.1040)		
Expectations				0.09285***	0.07977***
				(0.009573)	(0.009143)
Baseline characteristics	Yes	Yes	Yes	Yes	Yes
Peer baseline characteristics	Yes	Yes	Yes	Yes	Yes
Observations	2166	2166	2073	2166	2073

Notes. This table reports instrumental variables estimation results. The variable peer expectations is the mean of peers' expected educational attainment level in years leaving out student *i*'s expectations. The variable expectations instrumented is student i's expected educational attainment level in years predicted by peer expectations. The variable expectations is student i's expected educational level. Baseline characteristics include age in years, female binary variable, region, ethnicity, GPA, average log parental income, and average educational attainment level in years. Peer baseline characteristics include the leave-one-out mean of peers' baseline characteristics. Standard errors are clustered at the class level. * p<0.10, ** p<0.05 *** p<0.01.

5.3 Test for heterogeneity

The fact that there is substantial empirical evidence on different educational outcomes among males and females, as well as students with low and high socioeconomic backgrounds, motivates an analysis of treatment effect heterogeneity. I run two different 2SLS models, in which not just individual expectations are considered endogenous but the interaction of expectations and female binary variable, and the interaction of expectations and low parental educational background.

Table 4 shows the results obtained from the instrumental variables estimations with two endogenous regressors. It can be seen in columns (1) and (3) that there is a negative relationship between expectations and low parental education, implying that for each additional higher expected educational attainment level, students with parents who have not finished secondary education are predicted to have 0.1553 standard deviations lower reading scores, and 0.1975 lower mathematics scores, on average, compared to students with high parental education. While none of the estimated interaction terms are significantly different from 0, the negative relationship implies that expectations matter less for those who have parents with low education.

In columns (2) and (3) I show the estimation results for female students. I found no clear evidence of a differential average relationship between the expected educational attainment levels of females compared to males.

Table 5: Estimation of heterogeneous treatment effects

	Reading score		Math score	
	(1)	(2)	(3)	(4)
Expectations	0.4457***	0.3144***	0.5287**	0.4151***
	(0.1444)	(0.09668)	(0.2060)	(0.1376)
Expectations x Low Parental Educ.	-0.1553		-0.1975	
	(0.09775)		(0.1226)	
Low Parental Education	2.3203*		2.9196*	
	(1.4003)		(1.7726)	
Expectations x Female		0.01230		-0.07059
		(0.04015)		(0.05046)
Female	0.1573***	0.006438	-0.2882***	0.7202
	(0.04180)	(0.5560)	(0.04490)	(0.7046)
Baseline characteristics	Yes	Yes	Yes	Yes
Peer baseline characteristics	Yes	Yes	Yes	Yes
Observations	2166	2166	2073	2073

Notes. This table reports the instrumental variables estimation results for the heterogenous estimation of peer effects. The variable *expectations* is student *i*'s expected educational attainment level in years predicted by peer expectations. The variable *expectations x low parental educ*. is the interaction of student *i*'s expected educational attainment level and low parental education (≤11) instrumented by peer expectation x low parental education. *Low parental education* is a dummy turning 1 if the parents' average educational level is ≤11. *Expectations x female* is the interaction of student *i*'s expected educational attainment level and female dummy instrumented with mean peer expectation x female. Baseline characteristics include age in years, female binary, region, ethnicity, GPA, average log parental income, and average educational attainment level in years. Peer baseline characteristics include the leave-one-out mean of peers' baseline characteristics. Standard errors are clustered at the class level. * p<0.10, ** p<0.05 *** p<0.01.

Taken together, these results suggest that there is an association between peer cultures and expectations, which have the potential to translate into actual student achievement. The Life Course Survey results provided important insights into which social interactions matter the most when it comes to expectations, grades, and test scores. These estimates imply that harassment is likely to be associated with more negative expectations and student performance measured by grades, but not NABC test scores. Teachers perceived level of support is also crucial, students who report that their teachers are less supportive have lower grades and expectations, on average.

The strong relationship between expectations and class culture variable signals the presence of the expectation channel of peer effects, which I examined in more detail with an instrumental variables estimation approach. I found empirical support for this peer effect mechanism and a potential causal relationship between expectations and student performance.

6 Conclusion

This research provides new evidence on the role of peers in educational aspirations, and the relationship between educational aspirations and achievement.

Firstly, I examine particular class culture characteristics and their relationship to expectations and educational achievement and find that more unsupportive class cultures are associated with lower expectations and grades. However, I found no clear relationship with NABC test scores. Secondly, I bring additional evidence on the role of educational aspirations in educational achievement. I show that educational aspirations strongly predict test scores on the NABC for those whose expectations are correlated with their peers' expectations. Third, I present and empirically support a new channel of peer effects. Specifically, I found a strong positive relationship between peers' and individuals' educational aspirations.

The results of this research have several policy implications. As educational and career expectations appear to be strongly associated with educational achievement, orientation programs to increase awareness about the importance and benefits of education could mitigate the issue of early school leaving and youth idling. Assuming that peers' effect on expectations works through the identity mechanism, schools should engage in programs that reward high educational effort besides educational achievement. The main aim of these programs should be to adjust the norms and consequently the identity utility function of students. Rewarding educational effort which is not contingent on the result – as in the case of grades – may balance the cost of deviation from a group identity element. Indeed, this may normalize striving for better performance and higher achievement.

To mitigate the potential issues arising from teacher-student interactions, it is also advisable to introduce regular training for teachers to develop their interpersonal skills so they can provide the necessary mentoring and guidance for students. In addition, increasing teachers' accountability for corporal punishment should be considered a priority for policymakers to enable students to learn in a safe and supportive environment.

This research was limited by the absence of true random variation in class composition. As such, the estimation results can only be interpreted under various assumptions. While my estimations controlled for a variety of covariates, it is possible that I could not account for all endogenous effects. Consequently, these results could be considered useful in providing an upper bound for the effects of peers on educational achievement in the IV estimation and should only be taken as simple associations in all other estimations.

The precise mechanism of peers' effects on expectations remains to be elucidated. A natural progression of this research would be the organization of a randomized controlled trial in which the treatment would induce exogenous variation in students' expectations. Such an experiment would also provide more definitive evidence on educational aspirations' effect on educational achievement. In such an experiment, more precise identification of peer groups would be advisable as well, since students may wish to adhere not just to the norms of an entire class but to their closer group of friends.

Appendices

A1: IV sample by region

Table 6: IV sample by region, frequency, and relative frequency (%)

Region	Frequency	Percent
Central Hungary	244	11.27
Central Transdanubia	206	9.51
Western Transdanubia	141	6.51
Southern Transdanubia	154	7.11
Northern Hungary	445	20.54
Northern Great Plain	581	26.82
Southern Great Plain	395	18.24
Total	2,166	100

A2: Relationship between class culture and grades

Table 7: Mathematics grade and class culture variables

Panel A: Mathematics grade, not including class dummies						
	(1)	(2)	(3)	(4)	(5)	(6)
Std. Average teacher unsupportiveness	-0.169***					-0.169***
	(0.0286)					(0.0286)
Physical altercation		-0.202				
		(0.178)				
Harassment			-0.620***			
			(0.141)			
Ever harassed				-0.174***		
				(0.0446)		
Bullying					-0.0161	
					(0.111)	
Observations	1569	1589	2221	2248	1549	1569
Panel B: Mathematics grade, including class dummies						
Harassment			-0.571***			
			(0.163)			
Ever harassed				-0.154***		

				(0.0508)		
Observations	1569	1589	2221	2248	1549	1569

Notes. This table reports OLS estimates of the relationship between students' perceived *classroom culture* and end-of-the-year mathematics grades. The variable *teacher average* is the average of the answers given on how students perceive teachers' behavior where 4 means the students agree with all four statements, 20 means the student disagrees and where the greater the value of the variable, the worse the perception of the teacher is. The variable *beating* is 0 if the student has beat the teacher or has been beaten, 0.5 if one of these, and 1 if both. The variable *bullying* stands for the average bullying frequency (either has been bullied or has bullied, min=1, max =5). Standard errors are clustered at the class level. * p<0.10, ** p<0.05 *** p<0.01.

Table 8: Grammar grade and class culture variables

Panel A: Grammar grade, excluding class dummies						
	(1)	(2)	(3)	(4)	(5)	(6)
Std. Average teacher unsupportiveness	-0.182***					-0.182***
	(0.0267)					(0.0267)
Physical altercation		-0.241				
		(0.178)				
Harassment			-0.552***			
			(0.135)			
Ever harassed				-0.146***		
				(0.0393)		
Bullying					-0.169	
					(0.118)	
Observations	1569	1589	2221	2248	1549	1569
Panel B: Grammar grade, including class dummies						
Harassment			-0.354**			
			(0.157)			
Ever harassed				-0.120***		
				(0.0463)		
Observations	1569	1589	2221	2248	1549	1569

Notes. This table reports OLS estimates of the relationship between students' perceived *classroom culture* and *end-of-the-year grammar grades*. The variable *teacher average* is the average of the answers given on how students perceive teachers' behavior where 4 means the students agree with all four statements, 20 means the student disagrees and where the greater the value of the variable, the worse the perception of the teacher is. The variable *beating* is 0 if the student has beat the teacher or has been beaten, 0.5 if one of these, and 1 if both. The variable *bullying* stands for the average bullying frequency (either has been bullied or has bullied, min=1, max =5). Standard errors are clustered at the class level. * p<0.10, ** p<0.05 *** p<0.01.

Table 9: Literature grade and class culture variables

Panel A: Literature grade, excluding class dummies						
	(1)	(2)	(3)	(4)	(5)	(6)
Std. Average teacher unsupportiveness	-0.181***					-0.181***
	(0.0275)					(0.0275)
Physical altercation		-0.395*				
		(0.225)				
Harassment			-0.465***			
			(0.142)			
Ever harassed				-0.122***		
				(0.0422)		
Bullying					-0.235	
					(0.147)	
Observations	1309	1328	1830	1855	1290	1309
Panel B: Literature grade, including class dummies						
Harassment			-0.359**			
			(0.166)			
Ever harassed				-0.123**		
				(0.0505)		
Observations	1309	1328	1830	1855	1290	1309

Notes. This table reports OLS estimates of the relationship between students' perceived *classroom culture* and *end-of-the-year literature grades*. The variable *teacher average* is the average of the answers given on how students perceive teachers' behavior where 4 means the students agree with all four statements, 20 means the student disagrees and where the greater the value of the variable, the worse the perception of the teacher is. The variable *beating* is 0 if the student has beat the teacher or has been beaten, 0.5 if one of these, and 1 if both. The variable *bullying* stands for the average bullying frequency (either has been bullied or has bullied, min=1, max =5). Standard errors are clustered at the class level. * p<0.10, ** p<0.05 *** p<0.01.

A3: Relationship between NABC test scores and class culture

Table 10: NABC test scores and harassment

Panel A: NABC results, excluding class dummies						
	(1)	(2)	(3)	(4)	(5)	(6)
	Reading score		Math score		Expectations	
Harassment	0.403***		0.318***		0.147	

	(0.112)		(0.109)		(0.223)	
Ever harassed		0.114***		0.112***		-0.0106
		(0.0317)		(0.0305)		(0.0764)
Observations	2221	2248	2124	2149	2142	2169

Panel B: NABC results, including class dummies						
Harassment	0.272**		0.299***		0.103	
	(0.106)		(0.103)		(0.266)	
Ever harassed		0.0861***		0.106***		-0.0734
		(0.0307)		(0.0298)		(0.0870)
Observations	2221	2248	2124	2149	2142	2169

Notes. This table reports OLS estimates of the relationship between students' perceived *classroom culture* and *NABC test score results*. The variable teacher average is the average of the answers given on how students perceive teachers' behavior where 4 means the students agree with all four statements, 20 means the student disagrees and where the greater the value of the variable, the worse the perception of the teacher is. The variable beating is 0 if the student has beat the teacher or has been beaten, 0.5 if one of these, and 1 if both. The variable bullying stands for the average bullying frequency (either has been bullied or has bullied, min=1, max =5). Standard errors are clustered at the class level. * p<0.10, ** p<0.05 *** p<0.01.

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