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Fair and unfair educational inequality in a developing country: The role of pupil's effort

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Abstract

Inequality of opportunity builds upon the distinction between fair inequality related to responsibility variables and unfair inequality related to circumstances. This distinction is meaningful as long as responsibility variables are not fully determined by circumstances. We attempt to check the magnitude of the correlation between child effort and family background when measuring inequalities of opportunity in education using a purposefully designed survey on secondary-school education in rural Bangladesh. The analysis comprises decomposition exercises of the predicted variance of school performance in mathematics and English by source and subgroup based on parametric estimates of educational production functions. Pupils' effort, preferences, and talents contribute between a third and 40% of the total predicted variances in performance scores. The correlation between overall effort and circumstances does not matter much since the contribution of overall effort only falls by 10% when the correlation is taken into account. All in all, these results cast doubt on the common practice of reducing education to a circumstance when estimating inequality of opportunity in income attainment.

Keywords: inequality of opportunity, education, effort, decomposition, school.

JEL Classification: C01, I24, O12.

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1 Introduction

The last few decades have witnessed the remarkable development of new quantitative methods for the measurement of inequality of opportunity in different social settings, including income attainment, health status and education (see Ferreira and Peragine, 2016, Roemer and Trannoy, 2015, Ramos and Van de Gaer, 2016, for reviews). All versions around the notion of inequality of opportunity distinguish between fair and unfair sources of inequality. The former are due to factors for which the individual can be held responsible, whereas the latter stem from factors beyond the individual's control. In Roemer's terminology, these are efforts and circumstances, respectively (Roemer, 1998). The typical ethical prescription is that inequalities due to circumstances should be compensated for (principle of compensation); whereas those due to efforts, and hence fair, should be respected when designing the redistribution policies (principle of liberal reward; Fleurbaey (2008)). A common practice (see for instance Bourguignon et al., 2007, Checchi and Peragine, 2010, Lefranc et al., 2009) is to include educational achievement among circumstances when appraising inequality of opportunity in income attainment. There are two ways to defend this viewpoint.

The first one is to stick to an ethical stance first proposed by Arneson (1990), who emphasised the importance of referring to an 'age of consent' that acts as a threshold below which people cannot be held responsible for their effort. The concept of age of consent is particularly relevant in the case of education as primary and secondary education mainly happens in childhood and teenage years (Roemer and Trannoy, 2015). This paper does not discuss the pros and cons of this stance. However, the view on the cut between fair and unfair inequality in school performance seems to be somewhat at variance with the age of consent view. Lu et al. (2013) undertook a questionnaire to contrast views on salesmen's and students' responsibility for their performance. Whereas salesmen were found responsible for their talent, risk-taking, effort and luck, students were only held responsible for their effort in undertaking homework by half of the respondents.

The second argument is more positive in essence. It is based on the empirical fact that effort plays only a minor role in educational outcome and thus can be neglected in a first

approximation. And indeed, when looking at the literature on educational outcomes, it seems that this should be the case (Feinstein, 2003, Cunha and Heckman, 2007). Students' school performance has been found to be highly correlated with parental income, education, cognitive abilities, and parents' own effort as measured by their aspirations for, communication, and participation in their children's school matters (Haveman and Wolfe, 1995, Ermisch and Francesconi, 2001, De Fraja et al., 2010). Efforts at school may themselves be related to more or less conducive circumstances, which by definition are beyond the individuals' control.

In this paper, we revisit the issue of the importance of school effort in determining school outcomes and inequality. More precisely, we aim at evaluating empirically the importance of the correlation between effort at school and circumstances when measuring the magnitude of inequality of opportunity in school performance. Roemer (1998), for instance, argues that only the 'cleaned' contribution of effort should be considered as fair. By contrast Barry (2005) praises the effort exerted, whether induced by circumstances or not. Therefore, in this view, the rewards of efforts (or lack thereof) should not be tampered with. The issue is likely to be important in every country, but to some extent it is even more pressing in developing countries where the lack of equality of opportunity in education can lead to worse outcomes in terms of poverty rates. Here, we use data from a unique survey, the Quality of Secondary School Madrasash Education in Bangladesh (QSSMEB) data set, undertaken among students attending secular schools and Islamic secondary schools in rural Bangladesh. It is important to observe that the choice or the availability of school types in the neighbourhood may constitute a channel of inequality of opportunity. Additionally, detailed data on family and social background characteristics for more than 300 schools are available. Besides, the QSSMEB dataset provides an accurate picture of the degree of dispersion in several outcomes of interest like mathematics and English test scores and student efforts, given their well-documented distributional differences between different types of schools, secular schools and registered-aided Islamic schools[1] (e.g. Asadullah et al. (2007), Asadullah (2016)).

[1]What we describe as state schools in QSSMEB data include both secular and registered-aided Islamic schools.

In the education literature, effort at school has basically been measured by homework and study time either from the students' perspective (De Fraja et al., 2010, Kuehn and Landeras, 2014) or the teachers' (Eren and Henderson, 2011). Some studies have also considered variables combining study and effort together along with an identification variable in the statistical sense. For instance, Stinebrickner and Stinebrickner (2008) focused on variables such as class attendance, sleeping, drinking, study efficiency, paid employment in combination with the availability of a roommate's computer game, while Metcalfe et al. (2011) identified effort using school performance according to television viewing and matches of the English football team. The QSSMEB dataset provides us with a rich set of variables measuring pupils' effort as well as proxies for their preferences and talent for two study subjects, mathematics and English. Here, we stick to an encompassing view of *overall effort* at school, which includes dimensions of preference and talent. In the social justice literature, two competing views debate on how preferences should be treated. Some philosophers following Ronald Dworkin (1981a,b) consider that preferences should be fully respected so that individuals are considered responsible for their preferences, while others like Gerald Cohen (1989) see individuals as only responsible for what they can control. We then endorse both views. The place of talent has not be discussed extensively in the literature about equality of opportunity. Vallentyne (1997) argues that a self-ownership argument may entitle agents for the full benefits of their natural personal endowments. Roemer et al. (2003) put talent on the effort side. Trannoy (2018) argues that talent and effort are quite complementary in many cases. In this paper's context, understanding well mathematics is generally correlated with enjoying maths class and doing maths exercises. Feedback effects between talent, preference and effort render disentangling the impact of each factor risky. We therefore consider here that preferences for leisure and eagerness to study, as well as social skills at class, and talent for mathematics and English are related dimensions of overall effort, thereby belonging in the same broad category of overall effort at school. By the way, since each factor, effort, preferences and talent is individualized in the statistical analysis, it is easy to adopt another view about the responsibility cut and to obtain the corresponding quantitative result.

We find that the contribution of overall effort (i.e. including talents and preferences) comes first in explaining within-school variations in test scores, whereas the contribution

of circumstances (including family and parental background) is crucial for between-school variations. Many may argue that in the context of developing countries the main issue is not individual inputs such as student effort, but poor overall school quality. However, it is meaningful to study effort in a context where the overall learning level is low and our analysis demonstrates the importance of effort on performance scores. For instance, excluding religion and demographic indicators in the case of mathematics, the share of the contribution of effort in within-school variations is around three times more important than the contribution of family background (Barry view). This ratio is still around 2:1 in the Roemer view (i.e. when we only consider efforts 'cleaned' from the effect of circumstances on them). We have the same pattern and the same order of magnitude in English achievements. The main difference between mathematics and English is that demographics (age, gender) are of primary importance in mathematics while playing only a minor role in English. As the numbers suggest, we find that the normative position on how to treat the correlation between circumstances and effort makes a small difference in rural education in Bangladesh, remarkably similar to the case of health in France (Jusot et al., 2013).

The picture is the opposite in explaining between-school inequality. In maths, the respective contribution of circumstances (vis-a-vis effort) is 1.2 times more important in the Barry scenario, and the ratio rises to 1.4 when we switch to the Roemer viewpoint. The numbers are a little bit higher for English (1.8 and 1.9 in the two viewpoints, respectively). The bottom line is that the variation in average school results is strongly associated with differences in pupils' family background and only moderately with variation in average effort at the school level. Demographics and religion play almost no role in English, whereas they are important in mathematics. School traits are not very important in mathematics while they are in English; the latter possibly related to English not being the main language of instruction and English teachers needing specific resources (computer, training, etc).

The degree of fair inequality due to students' effort is sizeable, but significantly smaller than the degree of unfair inequality, and it is slightly larger for English test scores (40% to 34%) than it is for mathematics test scores (35% to 31%). The remaining sources of

variation are clearly circumstances beyond pupils' control, whether family background or school characteristics, whose combined share is significantly higher (49%-63%); and demographics combined with religion, which only matters for maths (13%-16%, versus 3%-4% in English). Does this result support the view that educational achievement should be considered as a circumstance in the assessment of inequality of opportunity in income acquisition? In the case of rural Bangladesh, such a practice would omit the role of effort, which accounts for about one third of total explained inequality. These results do not depend much on the choice between a fixed- and a random-effect estimation strategy. They are also robust to purging the correlation between effort and circumstances. The contribution of effort does not decrease by more than a few percentage points in mostly all cases.

The rest of the paper proceeds as follows. Section 2 explains the rural Bangladesh context, and section 3 describes key features of the dataset and the chosen performance outcomes, effort indicators, and circumstances. Section 4 describes our new measurement method. Section 5 presents our results. Then the paper concludes with some final remarks.

2 Context

The secondary education system in rural Bangladesh is characterized by a duality, with secular schools on one side and Islamic schools on the other. Islamic schools enrolment is modest at the primary level (about 14%) but more substantial, 30%, at the secondary level (Asadullah, 2016). While Islamic schools are thought to be run by motivated religious personnel and credited to offer a cheaper alternative to poorer people, they are also feared for the potential nurturing of militancy, but fundamentally criticized for offering education of poorer quality, thereby potentially perpetuating a poverty cycle (Asadullah, 2016).

However, in reality, there are two types of Islamic schools in rural Bangladesh. Starting in the early 1980s, the government offered financial incentives to Islamic schools in exchange for teaching the state curriculum and accepting female students. Most Islamic schools took up the offer and became recognised Islamic schools[2]. A minor unregulated sector called unrecognised Islamic schools remained. These unrecognised Islamic schools

[2]Noticeably the initiative helped reduce the gender gap in female education (Asadullah and Chaudhury, 2009).

are not included in our analysis as they do not teach the same curriculum. According to the QSSMEB 2008 Census, Islamic schools in rural Bangladesh have market shares of 13.8% and 22.1% in primary and secondary education, respectively. The corresponding enrollment shares for unrecognised Islamic schools are 5.4% (primary) and 3.6% (secondary) (Asadullah et al., 2015, Table 1).

Admittedly, there may be a selection issue in view of the dual school system operating in Bangladesh. It is clear that school choice is a circumstance at any rate, beyond children's control, if we acknowledge that it may be a choice from a parental viewpoint, depending on the availability of various types of schools in the vicinity of children's homes. Unquestionably, it is important for educational policy to know whether parents are making poor enrolment decisions or are just poorly located regarding school availability. Yet here our concern is not about designing a strategy to improve educational outcomes in Bangladesh. Consequently, we will not address the selection problem. Moreover, a previous study (Asadullah et al., 2015) shows that, while both economic and religious factors affect parents' decision to send children to Islamic schools, the former are more important. Considering that school quality in rural Bangladesh is generally poor across the board, there is no significant performance gap between secular schools and registered Islamic schools once school sorting is accounted for (Asadullah et al., 2007). However a trade-off between performance in English and in religious studies remain, whereby secular schools perform better at English while Islamic schools do better at Islamic knowledge (Asadullah, 2016). In this paper our interest rather lies in quantifying the degree of fair and unfair sources of inequality in observed indicators of students' performance, under two different views prescribing how to draw the line between these two sources.

3 Data

The data come from a survey called "Quality of Secondary School Madrasah Education in Bangladesh" (QSSMEB) whose collection started in 2008 under the auspices of the World Bank in order to gauge the quality of education in recognised Islamic schools vis-a-vis secular schools. The survey was co-designed by one of this paper's co-authors. Detailed information about the sampling procedure, scope and range of information provided by

the survey can be found in Asadullah and Chaudhury (2016) and in Asadullah (2016).[3] In this section we will focus on describing the data aspects pertaining to the choice of variables relevant to our inequality of opportunity assessment.

3.1 School-level data

The school-level samples by English and mathematics performance scores (standard deviations appear in parenthesis, where applicable) are presented in Table 1. The subject samples differ little in terms of sample size and pupil-per-school distributions. About a quarter of schools in the sample are recognised Islamic schools. [4] Significant minorities of schools do not have either libraries or computer. About two thirds of schools admit students from any primary school. For each of these characteristics we define dummy variables (e.g. equal to 1 if recognised Islamic schools (0 if secular school), equal to 1 if admits pupils from any primary school, equal to 1 if school has library, equal to 1 if school has computer).

A number of behaviours of the English and maths teachers are used in the performance score models. 'Meet parents every X months' is a dummy variable taking the value of 1 if the teacher meets parents every 'X' months with X being 1 month, 3 months, and 6 months. Similarly for 'Meet parents if needed'. The 'Meet parents' indicators are mutually exclusive and exhaustive. 'At least 4 tests a year' is a dummy variable taking the value of 1 if the teacher administers at least four tests per year. Remarkably, a higher proportion of English teachers do this. Finally, 'All pupils attend class' is a dummy variable taking the value of 1 if the teacher reports that almost all students attend class. Roughly similar proportions of English and maths teachers report near full attendance.

In one of the variance-decomposition models used below, we model within-school and between-school variations in performance scores separately (and respectively for English and maths). In the within-school model we control for any potential source of variation in scores associated with differences between schools by adding school fixed effects as we have information on the particular school attended by each student (in addition to de-

[3]The survey should not be confused with the QSSMEB census cited above. Both were co-designed by one of this paper's co-authors.

[4]We also provide the descriptive statistics per school type in Tables A1 and A2 in Appendix.

tailed information on these schools' characteristics). However, in the within-school models we are not interested in unpacking the specific features that are more associated with performance score, i.e. we are not estimating the parameters of an 'education production function'; we just control for between-school variation in the aforementioned manner. Then, in the between-school models we will use the vector of five dummy variables described previously to measure school-specific traits along with school-level averages of the other variables (pupils' effort, preferences, and talent; social background; demographics and religion; and teacher characteristics).

3.2 Educational outcomes

In every sampled union (a Bangladeshi sub-district larger than a village but smaller than sub-districts called upazilas) all secondary schools were surveyed. In each of them the surveyors administered a mathematics and an English language cognitive performance tests to 8th grade students. The mathematics performance test uses the 25 items of the Trends in Mathematics and Science Study (TIMSS);[5] and the English proficiency test with 20 items was devised by the surveyors and based on the country's national curriculum (Asadullah, 2016).

The distributions of scores for both tests by secular schools and recognised Islamic schools are presented in figures A1 and A2 in appendix. In line with the aforementioned evidence of poor quality of education in rural Bangladesh, most students failed to score above 50% of correct answers in each test. Also consistent with the cited evidence, the histograms for maths are not significantly different between secular schools and Islamic schools. By contrast, the distribution of English performance scores in secular schools features higher proportions of high-performing students and lower proportions of low-performing students vis-à-vis recognised Islamic schools' respective distribution.

3.3 Pupils' efforts, preferences, and talents

We now report on different variables that may be deemed fair sources of inequality according to different authors in the literature on equality of opportunity: effort by John Roemer (1998), preferences by Marc Fleurbaey (2008), and talent by Peter Vallentyne (1997).

[5]For further details see www.timss.com.

Pupils' school effort is measured with a combination of pupils' and teachers' reported variables. Each pupil reports whether they have ever been punished for discipline or bad work by the teacher and whether they have missed one day of school in the last two weeks. Then, based on the 1988 National Education Longitudinal Study (NELS, 1988), both the mathematics and English teachers filled a subjective assessment of every sampled student on seven aspects of students' behaviour in the classroom which we use as indicators of effort: (1) how often student performs below ability; (2) how often student submits incomplete homework; (3) how often student is tardy or lazy; (4) how often student is disinterested in class; (5) how often student makes noise (disruptive). Interestingly, these measures of effort are clearly related to self-discipline, which has been shown to matter significantly for educational success by psychologists (see, for instance, Duckworth and Seligman, 2005). However we do not measure homework and study time at home, which have been used in past literature to measure effort at school (De Fraja et al., 2010, Kuehn and Landeras, 2014), yet indicator (2) regarding homework is useful in this respect.

For all teacher-reported questions, except noise making, the possible answers are: 'Never', 'Rarely', 'Sometimes', 'Somewhat', and 'Always' (for noise making the answers are 'never' or 'rarely'). The descriptive statistics are presented in Table 1, respectively for English and mathematics. The most common categories are 'never', 'rarely', and 'sometimes'. We dichotomise these questions' categories (except noise making) by merging 'Never' and 'Rarely', and then combining 'Sometimes' with 'Somewhat' and 'Always' in order to generate the second binomial category.[6] Between two-thirds and about three-quarter majorities of students never or rarely display signs of low effort levels. However, only about a third report not being absent during the past two weeks.

In order to capture pupils' preferences toward effort we used two binary indicators based on pupils' agreement (equal to 1) with the following two statements, respectively: 'people who do not work become idle' and 'work is more important than leisure'. We also used three proxy measures of pupils' talents based on the following dichotomous indica-

[6]This way of proceeding spares us the need to implement ordered multinomial models that do not rely on the proportional odds assumption, which is violated in our dataset whenever we model the effort indicators as a function of family circumstances. Interestingly the original 1988 NELS only allowed for binary responses (NELS, 1988, p. 2-3).

tors: reporting fear of mathematics/English lessons (equal to 0) ; reporting being popular in class (non-cognitive talent); reporting they would be sad not to continue studying (talent connected to cognitive skills). Just below 60% of students believe that lack of work leads to idleness, and about two thirds of students deem work more important than leisure. Fewer than 9% of students report class fears, while about three quarters of students report both being popular and wanting to study further. Interestingly, all these measures of pupil's effort, preferences or talent are not highly correlated as shown in Table A3 (mathematics) and Table A4 (English).

3.4 Social background

We measure family social background using dummies of educational attainment for both fathers and mothers. For each parent the dummies are: (1) if completed only primary education; (2) if did some secondary education; (3) if completed up to secondary education; (4) if did some tertiary education. The omitted category is incomplete primary education (or less).

We also included indicators of household living conditions as further circumstances potentially associated with student performance. We add up purchases of newspapers and magazines and define the dummies: (1) household has one of the two items; (2) household has both newspapers and magazines. The omitted category is having none of them. Additionally we include a dummy taking the value of 1 if the household does not own any farming livestock ('poor farmer'). We also consider measures of parental effort toward children's education in the form of dummies for: (1) pupils reporting having a house tutor; (2) pupils reporting going to read in a coaching centre; (3) pupils reporting receiving help for homework from parents.

The descriptive statistics for household circumstances for the maths and English samples are in Table 2. About 40% of children have mothers with less than complete primary education. Meanwhile about a third of fathers have at least secondary education. About two thirds of households do not have any news items. About a third of rural households do not own livestock. Regarding parental effort in children's education, about a third of students do not benefit from either a house tutor or attending a coaching center. Only

slightly more than a fifth of students receive parental help for homework.

3.5 Demographic characteristics and religion

We additionally consider student's age, gender, and religion (Table 1). The sample is nearly 63% girls. We use four age dummies: (1) 13 years old; (2) 14 years old; (3) 15 years old or older, and the omitted category is 12 years old or younger. Households from religious minorities account for about 7% of the sample.

4 Methodology

We attempt to get robust results both from a statistical and ethical viewpoint. Our study belongs to the branch of the literature which measures inequality of opportunity when effort variables are actually available, an approach labelled *ex post* (meaning after effort has been exercised) by Fleurbaey and Peragine (2013). Several methods have been proposed in this context (see the surveys in Ramos and Van de Gaer (2016) and Roemer and Trannoy (2015)) combining econometrics, measurement of inequality and inequality decomposition. The method used in this paper follows the same tradition and expands that of Jusot et al. (2013), who proposed a tractable method for absolute inequality measurement and decomposition.

In the case of test scores, the absolute view of inequality is arguably more sensible than the relative view[7]. If the gap in tests scores remains constant between two groups, even if the results have improved for both groups, it is likely that people will agree that inequality is more or less stable. We then choose the variance as an absolute inequality measure. In addition, the variance presents the technical advantage of belonging to a class of additively decomposable absolute inequality indices (Bosmans and Cowell, 2010), in the sense that it can be decomposed into within-group and between-group components in the same way that Bourguignon (1979), Cowell (1980), and Shorrocks (1980) showed for a class of relative inequality indices.

The methodology consists of a parametric estimation strategy and a decomposition of the predicted variance of school performance by source and by subgroup. To deal with heterogeneity in school quality, we consider both a fixed-effect model and a multi-level,

[7]For alternative views of inequality see Kolm (1976) and Zoli (1999).

random-effect model. We also take care of different ethical views regarding effort, where Brian Barry (2005) wants to respect the effect of effort even if it is tainted by circumstances, whereas John Roemer (1998) expresses concerns about this correlation and argues that the latter is itself a circumstance. We first present the estimation strategy before presenting the decomposition procedure.

4.1 Estimation phase

The ethical viewpoint of Barry (2005) is the simplest case for the estimation strategy, we will then show how to handle the viewpoint of Roemer where the effort's impact is purged from the correlation with circumstances.

4.1.1 The Barry case

We implement and expand on the proposal by Jusot et al. (2013), exploiting the special features of our dataset, chiefly the rich information on schools attended. Since we want to gauge the empirical relevance of the different views as to how the correlation between efforts and circumstances should affect the magnitude of fair and unfair sources of inequality in education in rural Bangladesh, we model the variation of indicators of educational achievement in mathematics (A^m) and in English language (A^l), as functions of a vector of students' demographic and religion variables (D), a vector of their social background circumstances (C), a vector of parental effort in their offspring's education (P), a vector of school characteristics (F), a vector of teacher's characteristics in mathematics (T^m) only included in the equation for mathematics achievement (and a respective vector T^l for the English achievement equation), and a vector of efforts in mathematics (E^m) only included in the equation for mathematics achievement (respectively vector (E^l) of efforts in English). For the sake of simplicity we discuss the models in terms of one achievement (A), one vector of teacher's characteristics in that achievement (T), and one vector of efforts in that achievement (E). For each equation there is also an error term (u^m and u^l, but we will consider just u for the sake of presentation):

$$A = f(C, P, E, D, F, T, u) \tag{1}$$

Since the dependent variables of performance scores are deemed continuous, we can estimate Eq. (1) with a linear model. As mentioned in the data section, D includes age, sex, and religion, i.e. non-material personal and family characteristics. C includes parental and household circumstances: the dummies for parents' education, dummies for number of news outlets, the dummy for lack of farming livestock. P includes the dummies for parental effort toward children's education (homework help, coaching centre, private tutor). T includes the dummies for teacher characteristics described in the data section. F includes dummies for school-specific characteristics, which vary between the within-school and the between-school models. In the case of the within-school variation model, F comprises a set of school-specific dummies controlling for school fixed effects. Meanwhile, in the between-school model, F includes school dummies for being a recognised Islamic schools, admitting students from any primary school, having a library, and having a computer, therefore we will use Q instead of F to differentiate between the two vectors. Finally E contains the effort, preferences, and talent dummies described in the data section for the mathematics and English performance scores, respectively.

We deem the contributions of parental and household circumstances to total inequality, as well as demographics/religion, school traits and teachers' behaviours, unfair as inequality of opportunity, in contrast to fair inequality due to pupils' effort, preferences and talent. However in the light of the previous discussion involving the views of Roemer and Barry, we need separate estimation strategies reflecting how each viewpoint treats the correlation between circumstances and efforts.

Fixed-effect and between-school variation models

In the case of Barry's view, performance differences due to students' effort, preferences, and talent would need to be fully respected. Therefore, we can estimate the following equation:

$$A_{is} = \lambda^B + \alpha^B C_{is} + \beta^B E_{is} + \gamma^B D_{is} + \delta^B F_s + u_{is} \tag{2}$$

where the i subscripts represent students' individual values for the variables in the respective vectors, and the Greek letters superscripted by B for Barry are coefficients. The

s subscript stands for school. In Eq. (2) the vector F_s stands for school fixed-effects, which enable us to capture as much as possible of the part of the explained variation in the outcome attributable to between-school effects (in terms of association rather than causation). Yet for this very reason these fixed effects are a sort of 'black box' since between-school fixed effects may be embodying effects related to: school quality differences, between-school circumstances (e.g. affecting school choice), between-school effort differentials, and between-school demographics. We will discuss a proposal to unpack this 'box' below. In the meantime it is worth checking how Eq. (2) looks when we try to estimate the parameters of the explanatory variables other than the school dummies:

$$A_{is} - A_s = \alpha^B(C_{is} - C_s) + \beta^B(E_{is} - E_s) + \gamma^B(D_{is} - D_s) + u_{is} - u_s \tag{3}$$

where A_s, C_s, E_s, and D_s represent school-level averages for the respective sets of variables. Essentially, Eq. (3) shows that with this current model, we are mainly capturing the *associated* effects of within-school variations in efforts, circumstances, and demographics/religion characteristics on within-school variations in performance scores.

We model, in parallel, between-school variations in the two outcomes, as functions of between-school differences in circumstances, efforts, and school-specific characteristics (denoted by the vector of school-specific traits Q_s) and the school-level teacher's behaviours T_s:

$$A_s = \pi^B + \zeta^B C_s + \eta^B E_s + \upsilon^B D_s + \omega^B Q_s + \epsilon^B T_s + v_s \tag{4}$$

Given the nature of our educational outcome variables we can use their predicted values from the linear models above as linearly decomposable measures of educational attainment:

$$\widehat{A_{is} - A_s} = \widehat{\alpha^B}(C_{is} - C_s) + \widehat{\beta^B}(E_{is} - E_s) + \widehat{\gamma^B}(D_{is} - D_s) \tag{5}$$

$$\widehat{A_s} = \widehat{\pi^B} + \widehat{\zeta^B} C_s + \widehat{\eta^B} E_s + \widehat{\upsilon^B} D_s + \widehat{\omega^B} Q_s + \widehat{\epsilon^B} T_s \tag{6}$$

where $\widehat{A_{is} - A_s}$ are the predicted deviations of test scores for each individual i from their respective school means, under Barry (B) view, while $\widehat{A_s}$ are the predicted average scores in school s. The accented coefficients are the estimates from each respective model.

Multi-level, random effects model

The fixed-effect model is demanding in terms of degrees of freedom. An alternative is to choose a random-effect specification, which is more parsimonious but assumes that the random school-quality is not correlated to the regressors, which is also a demanding assumption. We perform the previously described variance decomposition, but relying on multi-level, random effects models.

In order to track the effect of school-level variables on the variance decomposition, we introduce them in stages. We start with the random-effects baseline model in Eq. (7):

$$A_{is} = \lambda^B + \alpha^B C_{is} + \beta^B E_{is} + \gamma^B D_{is} + \delta^B Q_s + \kappa^B T_s + u_s + u_{is}, \tag{7}$$

where u_s is a school-level random intercept, T_s represents school-level teacher's behaviours and Q_s stands for other school-specific characteristics (described in section 3.1). For comparison purposes we estimate two variants of Eq. (7): (a) an OLS regression with the same vector of dependent and explanatory variables as Eq. (7); and (b) a multilevel, random-effect model adding school averages of pupils' effort, preferences, talents; plus school averages of social background, demographics and parental effort as covariates.

4.1.2 The Roemer case

In Roemer's view we only need to respect differences due to effort, preferences and talents, which cannot be attributed to circumstances (i.e. social background, demographics/religion characteristics, etc.). Hence, as a first step, Jusot et al. (2013) proposed using a set of auxiliary equations in which the effort variables (here expanded to include preferences and talents) are modelled as a function of circumstances:

$$E_{is} = \xi + \mu^R C_{is} + \ni^R D_{is} + \phi^R F_s + e_{is}, \tag{8}$$

where e_{is} is a vector of residual terms. Eq. (8) refers to the fixed-effect specification for the within-school model. Since our efforts, preferences and talents are binary variables we estimate Eq. (8) with Probit models. Then, as a second step, we replace E_{is} in Eq. (3) with $\widehat{e_{is}}$

the estimated vector of residuals from Eq. (8) [8]. These are actually generalised residuals stemming from a non-linear model[9]. In the case of Roemer's view, Eq. (2) becomes:

$$A_{is} = \lambda^R + \alpha^R C_{is} + \beta^R e_{is} + \gamma^R D_{is} + \delta^R F_s + u_{is} \tag{9}$$

The procedure then yields:

$$A_{is} - A_s = \alpha^R (C_{is} - C_s) + \beta^R (\widehat{e_{is}} - \widehat{e_s}) + \gamma^R (D_{is} - D_s) + u_{is} - u_s \tag{10}$$

For both the multi-level random-effects model and the between-group variation models we replace F_s with Q_s, the school-quality traits in Eq. (9) and we additionally include T_s. Then we introduce the respective predicted residuals into the equations of subsection 4.1.1 and Eq. (4), instead of the respective vectors of effort, preferences and talents. In that way we obtain equations akin to Eq. (9) for the multi-level and the between-school variation models.

4.2 Decomposition phase

In order to decompose the inequality into fair and unfair components, we measure absolute inequality with the variance or relative inequality with the squared coefficient of variation, since these are the only inequality measures which are linearly decomposable by sources and fulfil a set of desirable decomposition properties (Shorrocks, 1982). Since the square coefficient of variation is just the variance divided by the squared mean, then the decomposition for both is the same. We use the variance, which belongs in a class of additively decomposable absolute inequality index (Bosmans and Cowell, 2010), in the sense that it can be decomposed into within-group and between-group components in the same way that Shorrocks (1980) showed for a class of relative inequality indices.

Now we decompose the variances of the predicted test scores by source. Let $\widehat{C_i^B} = \widehat{\alpha^B}(C_{is} - C_s)$ and $\widehat{C_s^B} = \widehat{\zeta^B} C_s$ be the parts of the predicted score attributable to social background and parental circumstances in the within-school and the between-school models,

[8] If we were in a linear model, then, for instance, α^R would be exactly the same as α^B in Eq. (2) according to the Frisch-Waugh-Lowell theorem. However, α^R and α^B are different because in Roemer's approach, the coefficients of circumstances incorporate the indirect effect of circumstances on efforts that is estimated via non linear regressions.

[9] See Appendix A in Jusot et al. (2013) for the technical details.

respectively, both in the Barry case. We allow for similar definitions for the other vector elements. Then the decomposition of the variance of the predicted scores from the within-school variation model is given by:

$$\widehat{\sigma^2_{WS}} = cov(\widehat{A_{is} - A_s}, \widehat{C^B_i}) + cov(\widehat{A_{is} - A_s}, \widehat{E^B_i}) + cov(\widehat{A_{is} - A_s}, \widehat{D^B_i}) \tag{11}$$

Meanwhile, the decomposition of the variance of the predicted scores from the between-school variation model is given by:

$$\widehat{\sigma^2_{BS}} = cov(\widehat{A_s}, \widehat{C^B_s}) + cov(\widehat{A_s}, \widehat{E^B_s}) + cov(\widehat{A_s}, \widehat{D^B_s}) + cov(\widehat{A_s}, \widehat{Q^B_s}) \tag{12}$$

The contribution of effort (plus preferences and talent) to overall explained within-school and between-school variability, respectively, in the Barry view is given by:

$$cov(\widehat{A_{is} - A_s}, \widehat{E^B_i}) = \sigma^2(\widehat{E^B_i}) + \rho_{CE}\sigma(\widehat{E^B_i})\sigma(\widehat{C^B_i}) + \rho_{DE}\sigma(\widehat{E^B_i})\sigma(\widehat{D^B_i}) \tag{13}$$

where ρ_{CE} is the correlation coefficient between the circumstance and effort parts of the predicted score (and same definition for ρ_{DE}, etc.) in the within-school variation model; and:

$$cov(\widehat{A_s}, \widehat{E^B_s}) = \sigma^2(\widehat{E^B_s}) + \rho^s_{CE}\sigma(\widehat{E^B_s})\sigma(\widehat{C^B_s}) + \rho^S_{DE}\sigma(\widehat{E^B_s})\sigma(\widehat{D^B_s}) + \rho^s_{QE}\sigma(\widehat{E^B_s})\sigma(\widehat{Q^B_s}) \tag{14}$$

where ρ^s_{CE} is the correlation coefficient between the circumstance and effort parts of the predicted score (and same definition for ρ^s_{DE}, etc.) in the between-school variation model.

Likewise we can also define the contributions of the other vectors of variables. Then, we define and compute the total contributions by adding each model-specific contribution weighted by the relative size of their corresponding model's predicted score variance. For example, the total contribution of effort is given by the following formula:

$$E_{total} \equiv cov(\widehat{A_{is} - A_s}, \widehat{E^B_i})\frac{\widehat{\sigma^2_{WS}}}{\widehat{\sigma^2_{WS}} + \widehat{\sigma^2_{BS}}} + cov(\widehat{A_s}, \widehat{E^B_s})\frac{\widehat{\sigma^2_{BS}}}{\widehat{\sigma^2_{WS}} + \widehat{\sigma^2_{BS}}} \tag{15}$$

We define the total contributions of the other vectors of variables in the same way as

in Eq. (15).

5 Results

First, we show the estimation results for Barry (Tables 4-5) and Roemer (Tables 6-8) views. Then, we present the variance decomposition results according to the within-between school divide. We end up with a global picture of how effort, circumstances and demographics are related to the disparity in schooling results.

5.1 Performance score equations in the two ethical viewpoints

Here we report and comment the results of the within-between approach and the multilevel random-effect analysis, respectively. Interestingly, we do not find significant results which are at odds with the intuition. Before a detailed commentary, the following is a summary of key important messages coming out of our estimation results: first, the correlation between effort and circumstances is weak, rendering the distinction between Barry's and Roemer's stances less meaningful empirically in the Bangladesh context than in the realm of philosophical ideas. Even if this is a 'negative result', it is important information nonetheless. A second important empirical finding is that effort variables (including talent and preferences) are always statistically significant, which is not the case of all circumstances variables. Among the latter, paternal education stands out with larger and more often statistically significant coefficients vis-à-vis maternal variables. Thirdly, in the between-school models, demographic and cultural variables (religion) as well as specific school characteristics matter more than differences in average individual characteristics (peer effects). Finally, the subject matters. The schooling return technology does not seem to be the same for the study of maths and English. To some extent, demographics seems to play a bigger role in maths than in English.

Let us now comment all the results in a more detailed way. We place more weight on the fixed-effect model since we found that for both performance scores, and in both Barry and Roemer cases, the fixed-effects specification is at least as consistent and thus preferred according to Hausman tests[10].

[10]The Hausman test displayed Chi2(34)=79.63 with P-value=0.000 (English - Barry), Chi2(34)=464.41 with P-value=0.000 (English - Roemer); Chi2(34)=332.03 with P-value=0.000 (mathematics - Barry), and

5.1.1 Barry view

Tables 3, 4 and 5 shows the results for Eq. (3), i.e. for the models reflecting Barry's view within-schools and for both test scores. Under Barry's view, all effort variables are positively and significantly associated with the mathematics score. Parental education dummies are positively related to the score in that any level is associated with better scores vis-à-vis the omitted category of less than complete primary education (with the exception of father's unknown education which is not statistically significant). Regarding individual demographic variables, being a female student significantly decreases by more than one point the mathematics score, and higher age is parabolically associated with mathematics score but not significantly. Being from a minority religious group is negatively associated with the score. Finally, while house tutors and coaching centres relate positively and significantly to the score, parental help for homework does not.

Concerning the English language score, all effort dummies are statistically significant and positively related to the score. Both father and mother's education levels are positively associated with higher scores vis-a-vis the baseline category (except for mother's unknown education level). As with the case of mathematics, girls from religious minority households perform worse than their male and/or religious majority peers. Parental efforts in the form of tutors, coaching centres and help with homework are all positively associated with higher English test scores.

Regarding the between-schools regression results for each score in Barry's view, it is worth noting that these estimations seek to model the between-school variance and are undertaken on a small sample of observations (311 schools); therefore few significant associations are observed. For the mathematics score, punishment, incomplete homework and disinterest are all statistically significant at 10% or less and positively associated with the score. Parental education variables are not generally statistically significant, except for mother's higher education. Between-schools variation in mathematics score is negatively and significantly associated with lack of livestock ownership. A higher proportion of boys correlates positively and significantly with higher average mathematics scores. Among the school-specific characteristics, availability of a computer, being a secular school (vis-à-vis

Chi2(34)=126.72 with P-value=0.000 (mathematics - Roemer).

Islamic schools) and entry selection criteria are all positively and significantly associated with the mathematics score.

As for the English score, none of the efforts are significantly associated with the score with the exception of punishment, which is positively and significantly associated with the English score between schools. Schools with higher proportions of girls perform more poorly on average in English test scores. A number of school traits are significantly associated with the variance in English score: being an Islamic school is negatively associated with the score, while the availability of a computer is positively associated with the score.

Tables 5 shows the results for the multi-level regressions with school averages for English and mathematics, respectively under Barry's view. In the case of mathematics all individual effort variables associate positively with scores, and only punishment is not statistically significant. Most parental education variables correlate positively with scores, but only higher education indicators for parents appear statistically significant. Restrictive entry selection criteria, presence of computer, house tutoring, coaching centre, and male gender all associate positively with higher mathematics scores. In the case of English, the results are very similar but now more parental education indicators appear statistically significant. Additionally recognised Islamic schools carry a statistically significant penalty in the form of lower English scores.

5.1.2 Roemer view

Tables A5-A6 and A7-A8 show the respective auxiliary equations of effort, preferences and talent for mathematics and English related to Eq. (8) as functions of the circumstances (including parental, household, school effects, and own demographic/religion characteristics); this is a prerequisite procedure for the implementation of the model reflecting Roemer's position.

Regarding effort in mathematics, there are few consistently significant patterns in terms of marginal effects of the same variable across different efforts as dependent variables. However, interestingly, all the father's education dummies bear positive marginal effects (albeit not always statistically significant at 10%) across equations.

As in the case of the mathematics auxiliary equations, few significant patterns of marginal effects can be found across equations in effort in English; however, all the father's education dummies, again, have positive marginal effects. Given the nature of the omitted educational category, these effects mean that having complete primary education or more is associated with better efforts. Interestingly, our first empirical finding is that effort is only loosely related to parental background. We are not very far from an orthogonal effort vis-à-vis circumstances.

Tables 6, 7 and 8 shows the results for the model of both scores under Roemer's view. In view of the results of the auxiliary equations, it is not surprising that for both scores, the results are remarkably similar to the results in the Barry case in terms of direction of association (parental help at homework is now positively associated with higher mathematics scores). As expected, the estimated coefficients of the residual effort variables are deflated compared to the Barry case. On the other hand, the estimated coefficients of the variables labelled as circumstances, including parental and household background, are larger than in the Barry case.

Regarding the results for the between-schools regression model of mathematics and English scores under Roemer's view, they are remarkably similar to the results in the Barry case for both scores. As underlined in the within-school estimations, Roemer's view leads to deflated estimated coefficients for the residuals variables and inflated estimated coefficients for the circumstances-related variables.

Tables 8 shows the results for the multi-level regressions with school averages for mathematics and English under Roemer's view. As before, the results are very similar to those of the multi-level regression in Tables 6 and 7, but effort variables feature marginally smaller association coefficients. At the end of the day, the important message in relation with the aim of the paper that stands out from all the estimations is that there are always effort variables that are significant at both stages.

5.2 Relative contributions to educational inequality from variance decomposition: within-school and between-school variations

Table 9 shows the results of the decomposition exercise for each test score relying on the within-school and between-school variation models. For further illustration and comparison purposes, we introduce the vectors of variables in blocks. As usual, as long we go from the left to the right, the model is more complete. The first two columns of results to the left show an OLS model using the same variables as in the within-school variation, fixed effects model (same as the "within school" rows of the two right-most columns) plus vectors of school-specific teacher behaviours and school characteristics. Then these same variables are considered in a multilevel, random-effects model whose results are in the third and fourth columns of results. Then, to that set of variables we add a vector of school-average variables (in the rows right below the "between school" headings) and estimate multilevel, random-effects models with decomposition results in the fifth and sixth columns of results. Finally, the two right-most columns show results from combining a within-school, fixed effects model with an OLS model of school averages (i.e. a between-school variation model).

We have pairs of results, because for each model we distinguish between the Roemer view, in which we purge the effort levels from any impact of circumstances, and the Barry view (in which no such purge takes place). A first prominent feature coming out from Table 9 is that, whatever the model, there is no much difference between the decomposition results based on Barry's and Roemer's views. The differences never represent more than a few percentage points. This is in line with the results of the estimation phase where we do not find many circumstances substantially altering pupils' effort (plus preferences and talent) indicators.

Focusing on the most complete models (four rightmost columns), a first noteworthy result is that most contributions are quite similar between the two models. In particular, between-school inequality represents roughly $2/3$ of total inequality. This result is in tune with what we know about schooling inequality in developing countries where between-school variation dominates (see OECD, 2013, Figure II.2.7, p. 47). The breakdown of the contributions of each source into within-schools and between-schools contexts underlines

that pupils' efforts, preferences, and talents are the major source of the within-schools variation in English, whereas demographics (age and gender) and religion play that role in the decomposition of the within-schools variation in mathematics. By contrast, the variables' relative contributions to between-school variation are much more similar between the two scores, with the main differences being in the roles of pupils' efforts more prominent in mathematics, and school characteristics more important in English. Average family circumstances play a prominent role in the between-school share for the two scores.

Strikingly, the relative importance of demographics (and religion) depends on the subject. In the case of mathematics, demographic characteristics are equally or more important (depending on the model) than the sum of the contributions of effort, talent, and preferences in their contribution to within-school variation, explaining almost half of the predicted score variance within schools. By contrast, demographics/religion characteristics explain less than 10% of within-school variation in predicted English scores. Meanwhile, for both scores, the contribution of demographics/religion characteristics to between-school variation is negligible.

School traits and teacher behaviours contributed about 30% of the variance in between-school mathematics score, and about 38% in English score, without major difference between the two views. The overall combined contribution to total variance stands at about 22% for maths and 28% for English.

5.3 Full relative contributions to educational inequality from variance decomposition

Table 10 shows the relative contribution of each vector of variables to the predicted variances of scores for mathematics and English, under the Barry and the Roemer scenarios following the procedure laid out in subsection 4.1.1. The four pairs of results correspond to the models considered in Table 9 and described in section 4. We note that, as expected, both the complete multi-level model and the combined within-plus-between school variation models produce larger predicted variances. Interestingly, the combined within-plus-between model (where within-school variation is modelled using school fixed effects) yields a larger predicted variance vis-à-vis the complete multi-level model, albeit at the cost of

fewer degrees of freedom.

We learn several interesting lessons from Table 10, focusing on the most complete models. Firstly, social background combined with parental effort (together labeled as "family circumstance") explain about a quarter of total predicted variation, climbing up to around 30% in Roemer's viewpoint. Secondly, gender, age, and religion play a significantly larger role in mathematics (14%-16% in Barry's view to 13%-15% in Roemer's) than in English (3%-4% in Barry's view to 3%-3% in Roemer's). This is compensated by the more prominent roles played by teacher and school characteristics (an extra 5-7 percentage points) as well as pupil's efforts, talent and preferences (an extra 3-5 percentage points) in English vis-à-vis mathematics.

Thirdly, all the decompositions based on the most complete models deliver the same message: in both test scores and across both views, the main contributor to total predicted inequality is pupil efforts, preferences, and talent, i.e. the component of fair inequality. They are followed by family circumstances and school and teacher characteristics in second and third position depending on the subject (family circumstances being second in mathematics, but third in English). Meanwhile, as mentioned, demographic and religious traits play only a noteworthy role in mathematics. Finally, the distinction between Roemer's and Barry's views does not change the picture by more than a few percentage points; hence it can be neglected in a first approximation.

6 Conclusion

We used a unique dataset on secondary schools' inputs and outcomes in rural Bangladesh to challenge the common view that education outcomes can be deemed a circumstance in the empirical literature on equality of opportunity in income and similar adult outcomes. We find that various measures of effort, preferences, and talent, jointly explain between one third and two fifths of the explained variance in mathematics and English. Does this result support the view that educational achievement should be considered as a circumstance in the assessment of inequality of opportunity in income acquisition (or related adult advantages)? In the case of rural Bangladesh, such practice will introduce an overestimation bias of the role of circumstances, which is noteworthy since we are generally

concerned about the role of circumstances being undervalued (Hufe and Peichl, 2015).

These results should be put in perspective, as they refer to a developing country. It would be highly speculative to translate them into the context of developed countries. For instance, in OECD countries, within-school variation dominates whilst the opposite is true for developing countries (see OECD, 2013, Figure II.2.7, p. 47)). In the context of some developing countries, the main issue is not individual-specific inputs such as student effort, but poor overall school quality. Asadullah and Chaudhury (2015) document in the context of Bangladesh that the level of learning is quite flat across grades, and completed years of schooling do not lead to significant gains in learning. Also regarding contextual specificities, it is worth mentioning that in some (mainly Eastern) Asian societies or their respective diaspora communities in some Western countries, extrinsic effort is generally attributable to the circumstances of authoritative or authoritarian parenting style (Brown and Iyengar, 2008). However, in rural Bangladesh effort is mostly intrinsic and/or driven by school instead of parental authority, and this is confirmed in our results with efforts having a relatively high share in between-school variation.

The remaining explained part is clearly beyond children's control, whether they be parental-background variables, gender, age or school quality. The latter is important since it might be thought that there is a possibility of manoeuvre for an improvement in educational public policy. If we were able to level up the playing field in terms of school quality, the explained inequality of opportunity would decrease by about at least a quarter. We must remain prudent here, because we explicitly avoid claiming that we have anything above and beyond evidence of association between educational input and outcome.

Our results also underlined substantial gender and age differences in mathematics score, by contrast to the case of English scores where these demographic characteristics have a clearly minor contribution. It would be quite interesting to investigate further this result and look into studies on the relationship between gender and age with cognitive abilities, particularly in mathematics. There is empirical regularity in most (albeit not all) developing country data that girls are good at language while boys perform better in mathematics (Ma, 2007).

An important caveat is in order. Our results cannot be interpreted in terms of causal relationships because we lack sources of exogeneity. For example we cannot control for the geographical distances from school. We only claim that we are measuring the strength of associations between variables, arguably a first step toward a causal analysis. We have a rich description of the behaviour of pupils, we observe parental educational effort and we can control for teachers' behaviours providing a proxy for their effort. However IQ is not available and our measure of school performance and pupils' effort, preferences, and talent are based on observable reported variables. IQ would measure cognitive talent and we lack a measure of pure cognitive talent in the school context[11]. Nevertheless, our paper offers a partial solution to address the concerns on IQ and pure cognitive talent: we use three proxies for pupil's personality, cognitive, and non-cognitive talent. We use the self-reported variables of 'no fear of mathematics (respectively English) lesson' as proxy for non-cognitive talent, while 'want to study further' would be a talent connected to cognitive skills. Finally, we consider self-reported 'being popular among others in class' as a personality trait, relying on the finding by Borghans et al. (2016) that personality is a bigger driver of performance than IQ.

The magnitude of each main factor seems quite robust to the use of a statistical method or ethical view regarding the correlation between effort and circumstances. Indeed, a main surprise comes from the fact that effort is almost orthogonal to parental background. The dilemna raised by the controversy between Brian Barry and John Roemer here lacks an empirical content. Some may argue that effort could be owing to differences in family investment in school readiness through early childhood education especially in relation with research confirming the importance of prior inputs or pre-school education for success in later stages of schooling (e.g. secondary) (Heckman, 2008). We did not control for those circumstances that might be key in Roemer's viewpoint; however there are hardly any kindergartens in rural Bangladesh and early parental investment in childhood education is also shown to be highly correlated with the family's socio-economic status, that we do

[11]However Borghans et al. (2016) argue that grades and achievement scores are better predictors of market outcomes than IQ, because educational achievement captures personality traits that have independent predictive power beyond IQ's. Additionally psychologists have shown that IQ result is not immune from motivation (see Duckworth et al. (2011) and Almlund et al. (2011)) and that IQ explains school achievement much less successfully than self-discipline (see Duckworth and Seligman (2005)).

control for.

Of course, we cannot pretend that the relative contribution of each main factor, effort, parental background, school quality and demographics in explaining inequality of opportunity of educational outcome is representative of any general pattern in any other context different from rural Bangladesh. But the results are sufficiently new to call for similar studies in other social settings. In particular, it will be worth testing for confirmation the almost orthogonality of the effort indicators with respect to social circumstances in education. This result may be shaped by some contextual features specific to rural Bangladesh such as the relative low level of inequality in some monetary indicators of wellbeing (Osmani and Sen, 2011), and the relative cultural homogeneity of the population (as exemplified by the prominence of Islam).

This study also contributes to the larger debate on student learning in developing countries. There is a growing literature on the role of student-focused incentives (as opposed to teacher-focused), which in theory works by extracting more effort from students. Our results suggest that policies that promote student efforts instead of spending on school facilities would contribute more to closing inequality of opportunity in education, which is consistent with the larger literature on school quality (Kremer et al., 2013, Masino and Nino-Zarazua, 2016, Bracha and Fershtman, 2013, Snilstveit et al., 2016). As it happens, we thus see many avenues for further research induced by the findings of this paper.

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References

Almlund, M., A. Duckworth, J. Heckman, and T. Kautz (2011). *Handbook of the Economics of Education*, Volume 4, Chapter Personality Psychology and Economics, pp. 1–181. Elsevier.

Arneson, R. (1990). Liberalism, distributive subjectivism, and equal opportunity for welfare. *Philosophy and Public Affairs 19*, 158–194.

Asadullah, N. (2016). The effect of islamic secondary school attendance on academic achievement. *Singapore Economic Review 61*(4).

Asadullah, N., R. Chakrabarti, and N. Chaudhury (2015). What determines religious school choice? theory and evidence from rural Bangladesh. *Bulletin of Economic Research 67*(2), 186–207.

Asadullah, N. and N. Chaudhury (2009). Holy alliances: public subsidies, islamic high schools, and female schooling in Bangladesh. *Education Economics 17*(3), 377–94.

Asadullah, N. and N. Chaudhury (2015). The dissonance between schooling and learning: Evidence from rural Bangladesh. *Comparative Education Review 59*(3), 447–72.

Asadullah, N. and N. Chaudhury (2016). To madrasahs or not to madrasahs: The question and correlates of enrolment in islamic schools in Bangladesh. *International Journal of Educational Development 49*, 55–69.

Asadullah, N., N. Chaudhury, and A. Dar (2007). Student achievement conditioned upon school selection: Religious and secular secondary school quality in Bangladesh. *Economics of Education Review 26*(6), 648–59.

Barry, B. (2005). *Why social justice matters*. Policy Press.

Borghans, L., B. Golsteyn, J. Heckman, and J. Humpries (2016). What grades and achievement tests measure. *PNAS 113*(47), 13354–9.

Bosmans, K. and F. Cowell (2010). The class of absolute decomposable inequality measures. *Economic Letters 109*, 154–6.

Bourguignon, F. (1979). Decomposable income inequality measures. *Econometrica 47*, 901–2.

Bourguignon, F., F. Ferreira, and M. Menendez (2007). Inequality of opportunity in Brazil. *Review of Income and Wealth 53*(4), 585–618.

Bracha, A. and C. Fershtman (2013). Competitive incentives: Working harder or working smarter? *Management Science 59*, 771–81.

Brown, L. and S. Iyengar (2008). Parenting styles: The impact on student achievement. *Marriage & Family Review 43*, 14–38.

Checchi, D. and V. Peragine (2010). Inequality of opportunity in Italy. *Journal of Economic Inequality 8*(4), 429–50.

Cohen, G. (1989). On the currency of egalitarian justice. *Ethics 99*, 906–944.

Cowell, F. (1980). On the structure of additive inequality measures. *Review of Economic Studies 47*, 521–31.

Cunha, F. and J. Heckman (2007). The technology of skill formation. *American Economic Review 97*(2), 31–47.

De Fraja, G., T. Oliveira, and L. Zanchi (2010). Must try harder: Evaluating the role of effort in educational attainment. *Review of Economics and Statistics 92*(3), 577–97.

Duckworth, A., P. Quinn, D. Lynam, R. Loeber, and M. Stouthamer-Loeber (2011). Role of test motivation in intelligence testing. *Proceedings of the National Academy of Sciences of the United States of America 108*(19), 7716–20.

Duckworth, A. and M. Seligman (2005). Self-discipline outdoes IQ predicting academic performance in adolescents. *Psychological Science 16*(12), 939–44.

Dworkin, R. (1981a). What is equality? part i: equality of welfare. *Philosophy and Public Affairs 10*, 185–246.

Dworkin, R. (1981b). "what is equality? part ii: Equality of resources. *Philosophy and Public Affairs 10*, 283–345.

Eren, O. and D. Henderson (2011). Are we wasting our children's time by giving them more homework? *Economics of Education Review 30*(5), 950–61.

Ermisch, J. and M. Francesconi (2001). Family matters: Impacts of family background on educational attainments. *Economica 68*, 137–56.

Feinstein, L. (2003). Inequality in the early cognitive development of British children in the 1970 cohort. *Economica 70*(277), 73–97.

Ferreira, F. and V. Peragine (2016). *The Oxford Handbook of Well-Being and Public Policy*, Chapter Individual responsibility and equality of opportunity, pp. 746–84. Oxford University Press.

Fleurbaey, M. (2008). *Fairness, Responsibility and Welfare*. Oxford University Press.

Fleurbaey, M. and V. Peragine (2013). Ex-ante versus ex-post equality of opportunity. *Economica 80*(317), 118–30.

Haveman, R. and B. Wolfe (1995). The determinants of children's attainments: A review of methods and findings. *Journal of Economic Literature 33*(4), 1829–78.

Heckman, J. J. (2008). Schools, skills, and synapses. *Economic Inquiry 46*(3), 289–324.

Hufe, P. and A. Peichl (2015). Lower bounds and the linearity assumption in parametric estimations of inequality of opportunity. *IZA Discussion Paper Series IZA DP No. 9605*.

Jusot, F., S. Tubeuf, and A. Trannoy (2013). Circumstances and efforts: how important is their correlation for the measurement of inequality of opportunity in health? *Health Economics 22*(12), 1470–95.

Kolm, S. (1976). Unequal inequalities I. *Journal of Economic Theory 12*, 416–42.

Kremer, M., C. Brannen, and R. Glennerster (2013). The challenge of education and learning in the developing world. *Science 340*(6130), 297–300.

Kuehn, Z. and P. Landeras (2014). The effect of family background on student effort. *The B.E. Journal of Economic Analysis & Policy 14*(4), 1337–1403.

Lefranc, A., N. Pistolesi, and A. Trannoy (2009). Equality of opportunity and luck: definitions and testable conditions, with an application to income in France. *Journal of Public Economics 93*, 1189–1207.

Lu, X., O. Chanel, S. Luchini, and A. Trannoy (2013). Responsibility cut in education and income acquisition: An empirical investigation. AMSE WP 2013-47.

Ma, X. (2007). Gender differences in learning outcomes. Technical report, UNESCO. Background paper prepared for the Education for All Global Monitoring Report 2008 Education for All by 2015: will we make it?

Masino, S. and M. Nino-Zarazua (2016). What works to improve the quality of student learning in developing countries? *International Journal of Educational Development 48*, 53–65.

Metcalfe, R., S. Burgess, and S. Proud (2011). Student effort and educational attainment: Using the England football team to identify the education production function. CMPO Working Paper 11/276.

NELS (1988). *National Education Longitudinal Study of 1988. Teacher questionnaire NELS 88: Base year*. US Department of Education,.

OECD (2013). *PISA 2012 Results: Excellence Through Equity: Giving Every Student the Chance to Succeed (Volume II)*. PISA OECD Publishing.

Osmani, S. and B. Sen (2011). Inequality in rural bangladesh in the 2000s: Trends and causes. *Bangladesh Development Studies 34*(4), 1–36.

Ramos, X. and D. Van de Gaer (2016). Approaches to inequality of opportunity: principles, measures and evidence. *Journal of Economic Surveys 30*(5), 855–83.

Roemer, J. (1998). *Equality of Opportunity*. Harvard University Press.

Roemer, J., R. Aaberge, U. Colombino, J. Fritzell, S. Jenkins, A. Lefranc, I. Marx, M. Page, E. Pommer, J. Ruiz-Castillo, M. San Segundo, T. Tranaes, A. Trannoy, G. Wagner, and I. Zubiri (2003). To what extent do fiscal regimes equalize opportunities for income acquisition among citizens? *Journal of Public Economics 87*(3-4), 539–65.

Roemer, J. and A. Trannoy (2015). Equality of opportunity. In A. Atkinson and F. Bourguignon (Eds.), *Handbook of Income Distribution*, Volume 2, pp. 217–300. Elsevier.

Shorrocks, A. (1980). The class of additively decomposable inequality measures. *Econometrica 48*, 613–25.

Shorrocks, A. (1982). Inequality decomposition by factor components. *Econometrica 50*(1), 193–211.

Snilstveit, B., J. Stevenson, R. Menon, D. Phillips, E. Gallagher, M. Geleen, H. Jobse, T. Schmidt, and E. Jimenez (2016). The impact of education programmes on learning and school participation in low- and middle-income countries. *3ie Systematic Review Summary 7*.

Stinebrickner, T. and R. Stinebrickner (2008). The causal effect of studying on academic performance. *The B.E. Journal of Economic Analsysis & Policy 8*(1), 1935–82.

Trannoy, A. (2018). Talent, equality of opportunity and optimal non-linear income tax. *Journal of Economic Inequality*. Forthcoming.

Vallentyne, P. (1997). Self-ownership and equality: brute luck, gifts, universal dominance, and leximin. *Ethics 107*(2), 321–343.

Zoli, C. (1999). A generalized version of the inequality equivalence criterion: a surplus sharing characterization, complete and partial orderings. In H. de Swart (Ed.), *Logic, Game Theory and Social Choice*, pp. 427–41. Tilburg University Press.

8 Tables

Table 1: Descriptive statistics

Variables	English sample	Maths sample
School characteristics		
Number of pupils	7,923	7,949
Number of schools	311	311
Minimum pupils per school	3	3
Average pupils per school (SD)	38.61 (24.44)	39.29 (25.27)
Maximum pupils per school	140	137
School-specific traits		
Islamic schools (SD)	24.90 (0.43)	25.69 (0.44)
Admission any primary school (SD)	66.52 (0.47)	65.86 (0.47)
School has a library (SD)	57.21 (0.49)	57.35 (0.49)
School has a computer (SD)	51.82 (0.50)	52.48 (0.50)
Teacher-specific behaviours		
Meet parents every 1 month (SD)	24.66 (0.43)	26.09 (0.44)
Meet parents every 3 months (SD)	15.48 (0.36)	17.95 (0.38)
Meet parents every 6 months (SD)	10.51 (0.31)	7.28 (0.26)
Meet parents if needed (SD)	49.33 (0.50)	48.67 (0.50)
Do at least 4 tests a year (SD)	86.73 (0.34)	26.95 (0.44)
All pupils attend class (SD)	41.76 (0.49)	42.13 (0.49)
Pupil's effort, preferences, and talent		
Pupil's school effort		
Never/rarely perform low (SD)	69.00 (0.46)	62.94 (0.48)
Never/rarely incomplete work (SD)	69.65 (0.46)	68.58 (0.46)
Never/rarely lazy (SD)	73.57 (0.44)	77.80 (0.42)
Never/rarely disinterested (SD)	67.53 (0.47)	76.17 (0.43)
Never noisy vs. rarely (SD)	21.38 (0.41)	69.75 (0.46)
Never punished (SD)	79.28 (0.40)	78.94 (0.41)
Not absent past 2 weeks (SD)	35.10 (0.48)	35.21 (0.48)
Pupil's preferences		
No work becomes idle (SD)	58.98 (0.49)	59.00 (0.49)
Work preferred to leisure (SD)	66.07 (0.47)	65.86 (0.47)
Pupil's talent		
Fear class (SD)	8.60 (0.28)	8.56 (0.23)
Being popular in class (SD)	75.38 (0.43)	75.98 (0.43)
Want to study further (SD)	76.19 (0.43)	76.26 (0.43)
Demographic characteristics and religion		
Average age in years (SD)	13.10 (1.00)	13.10 (1.01)
Non Muslim (SD)	7.29 (0.26)	7.27 (0.26)
Female (SD)	62.85 (0.48)	62.59 (0.48)

Table 2: Social background characteristics per performance sample

Maths sample			
Variables	% (SD)	**Variables**	% (SD)
Mother's education		**Father's education**	
No education	16.83 (0.37)	No education	14.36 (0.35)
Incomplete primary	23.53 (0.42)	Incomplete primary	15.29 (0.36)
Complete primary	18.60 (0.39)	Complete primary	11.77 (0.32)
Incomplete secondary	16.68 (0.37)	Incomplete secondary	16.83 (0.37)
Complete secondary	12.96 (0.34)	Complete secondary	15.95 (0.37)
Some tertiary	6.60 (0.25)	Some tertiary	17.67 (0.38)
Education unknown	4.77 (0.21)	Education unknown	8.10 (0.27)
Number of news items		**Parent's effort**	
No news item	62.90 (0.48)	House Tutor	28.32 (0.45)
One news item	26.98 (0.44)	Coaching centre	35.40 (0.48)
Two news items	10.12 (0.30)	Neither	36.28 (0.48)
Farmer family		**Parent's help homework**	
Poor farmer	34.14 (0.47)	Help for homework	22.30 (0.42)
English sample			
Variables	% (SD)	**Variables**	% (SD)
Mother's education		**Father's education**	
No education	16.34 (0.37)	No education	14.21 (0.35)
Incomplete primary	23.34 (0.42)	Incomplete primary	14.94 (0.36)
Complete primary	19.23 (0.39)	Complete primary	11.83 (0.32)
Incomplete secondary	16.70 (0.37)	Incomplete secondary	17.04 (0.38)
Complete secondary	13.12 (0.34)	Complete secondary	15.98 (0.37)
Some tertiary	6.68 (0.25)	Some tertiary	17.90 (0.38)
Education unknown	4.56 (0.21)	Education unknown	8.06 (0.27)
Number of news items		**Parent's effort**	
No news item	63.34 (0.48)	House Tutor	28.42 (0.45)
One news item	26.80 (0.44)	Coaching centre	36.02 (0.48)
Two news items	9.86 (0.30)	Neither	35.58 (0.48)
Farmer family		**Parent's help homework**	
Poor farmer	34.34 (0.47)	Help for homework	22.38 (0.42)

Table 3: Barry regression results - Mathematics sample

	OLS + school/teacher variables		Multilevel + school/teacher variables		Fixed effects within regression		OLS School Level	
Variables	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Pupil effort, preferences, talent								
Never/rarely perform low	0.206 **	0.090	0.326 ***	0.072	0.327 ***	0.073	0.989	0.692
Never/rarely incomplete work	-0.019	0.097	0.207 ***	0.073	0.217 ***	0.073	-1.613 *	0.903
Never/rarely lazy	0.389 ***	0.102	0.250 ***	0.080	0.240 ***	0.080	0.513	0.904
Never/rarely disinterested	0.456 ***	0.102	0.237 ***	0.079	0.227 ***	0.079	1.665 *	0.970
Never noisy (vs. rarely)	0.305 ***	0.089	0.456 ***	0.085	0.468 ***	0.086	-0.103	0.550
Never punished	0.519 ***	0.096	0.115	0.073	0.094	0.073	2.809 ***	0.898
Not absent past 2 weeks	0.292 ***	0.082	0.290 ***	0.065	0.282 ***	0.066	1.051	0.651
Fear math class	0.703 ***	0.141	0.297 ***	0.104	0.283 ***	0.105	1.920	1.447
Being popular in class	0.285 ***	0.092	0.239 ***	0.068	0.241 ***	0.068	0.137	1.015
Want to study further	0.451 ***	0.093	0.385 ***	0.070	0.385 ***	0.070	-0.373	0.908
No work becomes idle	0.612 ***	0.086	0.372 ***	0.066	0.367 ***	0.067	0.194	0.833
Work preferred to leisure	0.131	0.088	-0.076	0.067	-0.085	0.067	0.706	0.910
Social background								
Mother incomplete primary	0.244 *	0.131	0.127	0.095	0.120	0.095	2.136	1.690
Mother complete primary	0.394 ***	0.139	0.028	0.102	0.010	0.102	2.773 *	1.678
Mother incomplete secondary	0.488 ***	0.147	0.115	0.107	0.099	0.107	3.725 **	1.830
Mother complete secondary	0.620 ***	0.160	0.199 *	0.116	0.179	0.117	2.658	2.052
Mother some tertiary	0.949 ***	0.198	0.341 **	0.143	0.316 **	0.143	7.471 ***	2.958
Mother education unknown	0.349	0.222	0.226	0.164	0.221	0.165	3.043	2.511
Father incomplete primary	0.043	0.150	0.022	0.107	0.018	0.107	-0.990	2.190
Father complete primary	0.183	0.160	0.129	0.115	0.122	0.115	0.706	2.237
Father incomplete secondary	0.104	0.148	0.106	0.107	0.109	0.107	-1.388	1.882
Father complete secondary	0.243	0.153	0.150	0.110	0.145	0.110	0.820	2.160
Father some tertiary	0.453 ***	0.159	0.268 **	0.114	0.262 **	0.115	2.064	2.261
Father education unknown	-0.101	0.186	-0.080	0.135	-0.078	0.136	-1.949	2.265
One news item	0.058	0.091	-0.011	0.070	-0.009	0.070	0.572	0.896
Two news items	0.260 **	0.135	0.244 **	0.106	0.251 **	0.107	-1.172	1.075
Poor farmer	-0.042	0.083	0.050	0.063	0.058	0.063	-2.047 ***	0.815
Parental effort								
House Tutor	0.102	0.101	0.326 ***	0.079	0.339 ***	0.079	-1.725 **	0.849
Coaching centre	0.227 **	0.094	0.366 ***	0.074	0.378 ***	0.074	-1.685 **	0.782
Parent's help homework	0.182 *	0.096	-0.017	0.079	-0.022	0.080	0.464	0.707
Age, gender, religion								
Age	0.857 *	0.446	0.013	0.344	0.020	0.346	-1.094	4.329
Age^2	-0.031 *	0.016	-0.004	0.012	-0.004	0.013	0.058	0.162
Non Muslim	-0.285 *	0.152	-0.184 *	0.113	-0.184	0.114	-1.212	1.441
Female	-1.260 ***	0.082	-1.288 ***	0.064	-1.285 ***	0.064	-1.431 **	0.636
Teacher behaviour								
Meet parents every 1 month	-0.091	0.097	-0.353	0.374			-0.343	0.382
Meet parents every 3 months	0.238 **	0.112	0.385	0.463			0.438	0.493
Meet parents every 6 months	-0.477 ***	0.159	-0.871	0.624			-1.115 *	0.638
All pupils attend class	0.828 ***	0.083	0.756 **	0.323			0.618 *	0.339
At least 4 tests a year	0.137	0.092	-0.463	0.362			-0.600	0.376
School characteristics								
Admission any primary school	1.047 ***	0.086	0.780 **	0.347			0.823 **	0.375
Islamic school	-0.682 ***	0.094	-0.494	0.332			-0.790 **	0.408
School has a library	-0.111	0.087	-0.253	0.334			-0.288	0.369
School has a computer	0.475 ***	0.084	0.850 ***	0.333			0.785 **	0.344
Constant	-2.876	3.060	5.005 **	2.418	6.208 ***	2.401	4.529	28.82
sigma_u			2.668	0.112	2.865			
sigma_e			2.398	0.019	2.403			
rho			0.553	0.021	0.587			
Number of obs	7949		7949		7949		311	
Number of groups			311		311			
Observations per group								
min			3		3			
avg			25.6		25.6			
max			137		137			

*** 1%; **5%; *10%

Table 4: Barry regression results - English sample

	OLS + school/teacher variables		Multilevel + school/teacher variables		Fixed effects within regression		OLS School Level	
Variables	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Pupil effort, preferences, talent								
Never/rarely perform low	0.695 ***	0.095	0.651 ***	0.080	0.643 ***	0.081	0.887	0.792
Never/rarely incomplete work	0.420 ***	0.095	0.394 ***	0.080	0.393 ***	0.081	0.158	0.912
Never/rarely lazy	0.459 ***	0.101	0.623 ***	0.084	0.633 ***	0.085	0.001	0.995
Never/rarely disinterested	0.578 ***	0.090	0.274 ***	0.091	0.257 ***	0.093	0.819	0.519
Never noisy (vs. rarely)	-0.101	0.097	-0.224 ***	0.089	-0.229 ***	0.090	-0.276	0.652
Never punished	0.543 ***	0.097	0.282 ***	0.082	0.255 ***	0.082	2.694 ***	0.840
Not absent past 2 weeks	0.398 ***	0.083	0.338 ***	0.074	0.323 ***	0.075	0.717	0.609
Fear English class	-0.688 ***	0.141	-0.599 ***	0.115	-0.599 ***	0.116	-0.220	1.481
Being popular in class	0.510 ***	0.092	0.436 ***	0.076	0.436 ***	0.076	0.345	0.919
Want to study further	0.597 ***	0.094	0.512 ***	0.078	0.504 ***	0.079	1.129	0.843
No work becomes idle	0.554 ***	0.087	0.554 ***	0.074	0.549 ***	0.075	0.211	0.765
Work preferred to leisure	0.192 **	0.090	0.017	0.075	0.004	0.075	0.756	0.840
Social background								
Mother incomplete primary	0.162	0.131	0.038	0.106	0.036	0.106	0.023	1.562
Mother complete primary	0.353 ***	0.140	0.176	0.114	0.176	0.115	-0.234	1.532
Mother incomplete secondary	0.554 ***	0.147	0.332 ***	0.119	0.326 ***	0.120	1.970	1.718
Mother complete secondary	0.667 ***	0.161	0.427 ***	0.130	0.419 ***	0.131	1.257	1.874
Mother some tertiary	0.738 ***	0.199	0.276 *	0.160	0.255	0.161	5.555 **	2.754
Mother education unknown	0.121	0.221	-0.238	0.183	-0.281	0.184	3.949 *	2.278
Father incomplete primary	0.207	0.150	0.216 *	0.120	0.213 *	0.120	-0.060	2.053
Father complete primary	0.150	0.161	0.098	0.129	0.089	0.129	2.085	2.038
Father incomplete secondary	0.198	0.149	0.236 **	0.119	0.233 **	0.120	0.209	1.790
Father complete secondary	0.274 *	0.154	0.373 ***	0.123	0.375 ***	0.123	-1.529	1.976
Father some tertiary	0.667 ***	0.160	0.603 ***	0.129	0.590 ***	0.129	1.574	1.967
Father education unknown	0.182	0.188	0.194	0.153	0.186	0.154	-1.035	2.073
One news item	0.024	0.092	0.009	0.079	0.002	0.079	-0.017	0.849
Two news items	0.354 ***	0.135	-0.095	0.118	-0.141	0.120	2.563 ***	0.987
Poor farmer	0.146 *	0.084	0.245 ***	0.071	0.253 ***	0.071	-1.227	0.766
Parental effort								
House Tutor	0.015	0.101	0.223 ***	0.088	0.227 ***	0.089	-0.534	0.784
Coaching centre	0.342 ***	0.095	0.408 ***	0.083	0.412 ***	0.084	-0.351	0.736
Parent's help homework	0.205 **	0.097	0.125	0.089	0.123	0.090	0.316	0.642
Age, gender, religion								
Age	-0.784 *	0.473	-0.783 ***	0.406	-0.789 **	0.410	-0.603	3.910
Age^2	0.024	0.017	0.022	0.015	0.022	0.015	0.030	0.145
Non Muslim	-0.313 **	0.153	-0.265 **	0.127	-0.254 **	0.128	-2.081	1.304
Female	-0.345 ***	0.083	-0.209 ***	0.071	-0.189 ***	0.072	-1.133 *	0.594
Teacher behaviours								
Meet parents every 1 month	0.163 *	0.099	0.014	0.348			0.283	0.374
Meet parents every 3 months	1.040 ***	0.116	1.027 **	0.429			0.965 **	0.453
Meet parents every 6 months	0.073	0.139	0.013	0.504			0.056	0.528
All pupils attend class	0.717 ***	0.081	0.598 **	0.288			0.716 **	0.315
At least 4 tests a year	1.013 ***	0.120	1.294 ***	0.434			0.989 **	0.456
School characteristics								
Admission any primary school	-0.506 ***	0.086	-0.333	0.313			-0.490	0.345
Islamic school	-1.929 ***	0.096	-1.587 ***	0.300			-1.542 ***	0.379
School has a library	0.195 **	0.086	-0.101	0.299			-0.411	0.342
School has a computer	0.423 ***	0.084	0.679 **	0.297			0.660 **	0.312
Constant	8.154 ***	3.236	8.926 ***	2.853	10.29	2.825	3.412	26.47
sigma_u			2.368	0.104	2.736			
sigma_e			2.700	0.022	2.705			
rho			0.435	0.022	0.506			
Number of obs	7923		7923		7923		311	
Number of groups			311		311			
Observations per group								
min			3		3			
avg			25.5		25.5			
max			140		140			

*** 1%; **5%; *10%.

Table 5: Barry regressions with school averages results - mathematics and English sample

	Mathematics		**English**	
	Multilevel + school/teacher averages		Multilevel + school/teacher averages	
Variables	Coeff.	SE	Coeff.	SE
Pupil effort, preferences, talent				
Never/rarely perform low	0.326 ***	0.073	0.643 ***	0.081
Never/rarely incomplete work	0.218 ***	0.073	0.393 ***	0.080
Never/rarely lazy	0.240 ***	0.080	0.633 ***	0.085
Never/rarely disinterested	0.226 ***	0.079	0.256 ***	0.092
Never noisy (vs. rarely)	0.468 ***	0.086	-0.229 ***	0.090
Never punished	0.093	0.073	0.255 ***	0.082
Not absent past 2 weeks	0.282 ***	0.066	0.323 ***	0.074
Fear math class	0.283 ***	0.104	-0.598 ***	0.115
Being popular in class	0.241 ***	0.068	0.436 ***	0.076
Want to study further	0.385 ***	0.070	0.504 ***	0.079
No work becomes idle	0.367 ***	0.067	0.549 ***	0.075
Work preferred to leisure	-0.085	0.067	0.004	0.075
Social background				
Mother incomplete primary	0.121	0.095	0.036	0.106
Mother complete primary	0.010	0.102	0.176	0.115
Mother incomplete secondary	0.099	0.107	0.326 ***	0.119
Mother complete secondary	0.179	0.116	0.419 ***	0.131
Mother some tertiary	0.317 **	0.143	0.255	0.161
Mother education unknown	0.222	0.165	-0.281	0.184
Father incomplete primary	0.019	0.107	0.214 *	0.120
Father complete primary	0.122	0.115	0.090	0.129
Father incomplete secondary	0.109	0.107	0.234 **	0.120
Father complete secondary	0.146	0.110	0.376 ***	0.123
Father some tertiary	0.262 **	0.115	0.591 ***	0.129
Father education unknown	-0.077	0.136	0.186	0.154
One news item	-0.010	0.070	0.002	0.079
Two news items	0.251 **	0.107	-0.142	0.119
Poor farmer	0.058	0.063	0.252 ***	0.071
Parental effort				
House Tutor	0.339 ***	0.079	0.227 ***	0.089
Coaching centre	0.379 ***	0.074	0.412 ***	0.083
Parent's help homework	-0.022	0.080	0.124	0.090
Age, gender, religion				
Age	-0.789 *	0.409	-1.079 ***	0.409
Age^2	0.022	0.015	0.029 *	0.015
Non Muslim	-0.252 **	0.128	-0.297 ***	0.128
Female	-0.189 ***	0.072	-0.179 ***	0.071
Teacher behaviours				
Meet parents every 1 month	-0.334	0.353	0.289	0.340
Meet parents every 3 months	0.443	0.454	0.968 ***	0.412
Meet parents every 6 months	-1.096 *	0.593	0.033	0.485
Meet parents if needed	0.635 **	0.313	0.730 ***	0.287
At least 4 tests a year	-0.585 *	0.348	0.988 **	0.416
All pupils attend class	0.836	0.346	-0.508	0.314
School characteristics				
Admission any primary school	0.809 **	0.378	-1.633 ***	0.349
School has a library	-0.275	0.342	-0.355	0.312
School has a computer	0.769 **	0.318	0.639 **	0.285

*** 1%; **5%; *10% *continuing*

Roemer view: Generalised residuals of the auxiliary equations are substituted to observed effort, preferences and talent.

continuing

	Mathematics		**English**	
	Multilevel + school/teacher averages		Multilevel + school/teacher averages	
Variables	Coeff.	SE	Coeff.	SE
Average pupil effort, preferences, talent at school-level				
Never/rarely perform low	0.634	0.649	0.266	0.742
Never/rarely incomplete work	-1.855 **	0.849	-0.255	0.842
Never/rarely lazy	0.318	0.845	-0.655	0.922
Never/rarely disinterested	1.412	0.906	0.568	0.484
Never noisy (vs. rarely)	-0.553	0.514	0.004	0.606
Never punished	2.735 ***	0.839	2.422 ***	0.779
Not absent past 2 weeks	0.782	0.607	0.375	0.563
No work becomes idle	-0.171	0.778	-0.311	0.708
Work preferred to leisure	0.825	0.853	0.766	0.780
Fear math class	1.746	1.357	0.181	1.378
Being popular in class	-0.081	0.946	0.025	0.848
Want to study further	-0.803	0.853	0.538	0.790
Average social background at school-level				
Mother incomplete primary	1.897	1.583	0.181	1.454
Mother complete primary	2.784 *	1.572	-0.134	1.431
Mother incomplete secondary	3.570 **	1.711	1.857	1.592
Mother complete secondary	2.531	1.927	1.186	1.748
Mother some tertiary	7.064 ***	2.765	5.639 *	2.555
Mother education unknown	2.733	2.344	4.115 *	2.113
Father incomplete primary	-0.912	2.050	-0.347	1.907
Father complete primary	0.573	2.099	1.755	1.907
Father incomplete secondary	-1.376	1.767	-0.190	1.670
Father complete secondary	0.882	2.025	-1.862	1.842
Father some tertiary	1.876	2.126	0.631	1.850
Father education unknown	-1.798	2.122	-1.326	1.931
One news item	0.637	0.839	-0.023	0.786
Two news items	-1.362	1.010	2.631 ***	0.923
Poor farmer	-2.167 ***	0.768	-1.538 **	0.719
Average parental effort at school-level				
House Tutor	-2.092 ***	0.792	-0.891	0.728
Coaching centre	-2.049 ***	0.731	-0.865	0.684
Parent's help homework	0.507	0.662	0.254	0.598
Average age, gender, religion at school-level				
Age	-1.017	4.037	0.182	3.615
Age^2	0.059	0.152	0.008	0.134
Non Muslim	-1.062	1.359	-1.725	1.238
Female	-0.157	0.595	-0.954	0.554
Constant	3.602	26.78	3.507 *	24.30
sigma_u	2.411	0.103	2.162	0.096
sigma_e	2.398	0.019	2.700	0.022
rho	0.503	0.022	0.391	0.022
Number of obs	7949		7923	
Number of groups	311		311	
Observations per group				
min	3		3	
avg	25.6		25.5	
max	137		140	

*** 1%; **5%; *10%

Table 6: Roemer regression results - Mathematics sample

	OLS + school/teacher variables		Multilevel + school/teacher variables		Fixed effects within regression		OLS School Level	
Variables	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Pupil effort, preferences, talent								
Never/rarely perform low	0.030 **	0.019	0.047 ***	0.011	0.047 ***	0.011	0.166	0.156
Never/rarely incomplete work	-0.002	0.053	0.068 ***	0.023	0.072 ***	0.023	0.159	0.512
Never/rarely lazy	0.189 ***	0.049	0.118 ***	0.039	0.109 ***	0.039	-0.052	0.478
Never/rarely disinterested	0.196 ***	0.015	0.102 ***	0.033	0.098 ***	0.033	0.132	0.085
Never noisy (vs. rarely)	0.112 ***	0.012	0.160 ***	0.030	0.161 ***	0.030	-0.034	0.079
Never punished	0.220 ***	0.023	0.050	0.034	0.043	0.033	0.634 ***	0.207
Not absent past 2 weeks	0.068 ***	0.018	0.067 ***	0.015	0.063 ***	0.015	0.148	0.131
Fear math class	0.149 ***	0.026	0.064 ***	0.023	0.061 ***	0.023	-0.019	0.273
Being popular in class	0.173 ***	0.056	0.144 ***	0.041	0.139 ***	0.041	0.252	0.560
Want to study further	0.057 ***	0.009	0.048 ***	0.009	0.047 ***	0.009	0.111	0.085
No work becomes idle	0.244 ***	0.025	0.148 ***	0.027	0.151 ***	0.026	0.095	0.223
Work preferred to leisure	0.028	0.021	-0.016	0.014	-0.016	0.014	0.143	0.193
Social background								
Mother incomplete primary	0.413 ***	0.131	0.222 **	0.095	0.200 **	0.094	0.255	1.569
Mother complete primary	0.602 ***	0.140	0.146	0.102	0.116	0.102	0.008	1.536
Mother incomplete secondary	0.644 ***	0.146	0.214 **	0.107	0.178 *	0.106	2.081	1.723
Mother complete secondary	0.747 ***	0.161	0.273 **	0.116	0.251 **	0.116	1.383	1.886
Mother some tertiary	1.112 ***	0.199	0.444 ***	0.143	0.410 ***	0.142	5.789 **	2.768
Mother education unknown	0.450 **	0.222	0.268 *	0.165	0.242	0.164	4.031 *	2.286
Father incomplete primary	0.088	0.150	0.070	0.107	0.055	0.106	-0.024	2.060
Father complete primary	0.194	0.162	0.155	0.115	0.141	0.114	2.048	2.044
Father incomplete secondary	0.236	0.149	0.192 *	0.107	0.197 *	0.106	0.260	1.796
Father complete secondary	0.380 ***	0.154	0.260 **	0.110	0.254 **	0.109	-1.430	1.981
Father some tertiary	0.670 ***	0.160	0.434 ***	0.115	0.426 ***	0.114	1.755	1.972
Father education unknown	-0.061	0.188	-0.064	0.135	-0.065	0.135	-0.944	2.088
One news item	0.124	0.092	0.026	0.070	0.025	0.070	-0.007	0.850
Two news items	0.405 ***	0.135	0.361 ***	0.106	0.354 ***	0.106	2.568 ***	0.983
Poor farmer	-0.009	0.084	0.082	0.063	0.099	0.063	-1.220	0.768
Parental effort								
House Tutor	0.179 *	0.101	0.400 ***	0.079	0.410 ***	0.079	-0.557	0.788
Coaching centre	0.385 ***	0.096	0.487 ***	0.074	0.505 ***	0.074	-0.194	0.756
Parent's help homework	0.365 ***	0.097	0.098	0.079	0.105	0.079	0.490	0.664
Age, gender, religion								
Age	0.577	0.473	-0.194	0.344	-0.219	0.345	-1.231	3.952
Age^2	-0.023	0.017	0.002	0.012	0.003	0.013	0.050	0.146
Non Muslim	-0.355 **	0.153	-0.222 **	0.113	-0.221 **	0.112	-2.135	1.312
Female	-1.189 ***	0.082	-1.287 ***	0.064	-1.308 ***	0.064	0.841	0.597
Teacher behaviours								
Meet parents every 1 month	-0.091	0.099	-0.353	0.374			0.267	0.375
Meet parents every 3 months	0.236 **	0.117	0.384	0.463			0.966 **	0.455
Meet parents every 6 months	-0.486 ***	0.139	-0.872	0.624			0.036	0.531
All pupils attend class	0.827 ***	0.081	0.755 **	0.323			0.708 **	0.317
At least 4 tests a year	0.144	0.120	-0.461	0.362			0.993 **	0.457
School characteristics								
Admission any primary school	1.051 ***	0.086	0.782 **	0.347			-0.481	0.346
Islamic school	-0.685 ***	0.096	-0.493	0.332			1.542 ***	0.381
School has a library	-0.108	0.086	-0.252	0.334			-0.402	0.343
School has a computer	0.473 ***	0.084	0.849 ***	0.333			0.662 **	0.314
Constant	-0.057	3.231	7.040 ***	2.411	8.499 ***	2.386	8.752	26.56
sigma_u			2.668	0.112	2.898			
sigma_e			2.399	0.019	2.400			
rho			0.553	0.021	0.593			
Number of obs	7949		7949		7949		311	
Number of groups			311		311			
Observations per group								
min			3		3			
avg			25.6		25.6			
max			137		137			

*** 1%; **5%; *10%. Roemer view: Generalised residuals of the auxiliary equations are substituted to observed effort, preferences and talent.

Table 7: Roemer regression results - English sample

	OLS + school/teacher variables		Multilevel + school/teacher variables		Fixed effects within regression		OLS School Level	
Variables	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Pupil effort, preferences, talent								
Never/rarely perform low	0.136 ***	0.019	0.128 ***	0.016	0.127 ***	0.016	0.166	0.156
Never/rarely incomplete work	0.247 ***	0.053	0.229 ***	0.045	0.228 ***	0.045	0.159	0.512
Never/rarely lazy	0.213 ***	0.049	0.295 ***	0.041	0.300 ***	0.041	-0.052	0.478
Never/rarely disinterested	0.094 ***	0.015	0.044 ***	0.015	0.041 ***	0.015	0.132	0.085
Never noisy (vs. rarely)	-0.012	0.012	-0.027 ***	0.011	-0.027 ***	0.011	-0.034	0.079
Never punished	0.124 ***	0.023	0.067 ***	0.020	0.060 ***	0.020	0.634 ***	0.207
Not absent past 2 weeks	0.085 ***	0.018	0.071 ***	0.016	0.068 ***	0.016	0.148	0.131
Fear English class	-0.128 ***	0.026	-0.112 ***	0.021	-0.112 ***	0.021	-0.019	0.273
Being popular in class	0.312 ***	0.056	0.266 ***	0.046	0.265 ***	0.046	0.252	0.560
Want to study further	0.060 ***	0.009	0.051 ***	0.008	0.051 ***	0.008	0.111	0.085
No work becomes idle	0.160 ***	0.025	0.160 ***	0.022	0.159 ***	0.022	0.095	0.223
Work preferred to leisure	0.046 **	0.021	0.005	0.017	0.002	0.017	0.143	0.193
Social background								
Mother incomplete primary	0.352 ***	0.131	0.201 *	0.106	0.197 *	0.106	0.255	1.569
Mother complete primary	0.517 ***	0.140	0.305 ***	0.114	0.303 ***	0.115	0.008	1.536
Mother incomplete secondary	0.697 ***	0.146	0.452 ***	0.119	0.444 ***	0.120	2.081	1.723
Mother complete secondary	0.753 ***	0.161	0.490 ***	0.130	0.480 ***	0.131	1.383	1.886
Mother some tertiary	0.869 ***	0.199	0.384 **	0.160	0.361 **	0.161	5.789 **	2.768
Mother education unknown	0.130	0.222	-0.238	0.183	-0.281	0.184	4.031 *	2.286
Father incomplete primary	0.225	0.150	0.239 **	0.120	0.237 **	0.120	-0.024	2.060
Father complete primary	0.219	0.162	0.178	0.129	0.170	0.129	2.048	2.044
Father incomplete secondary	0.293 **	0.149	0.337 ***	0.119	0.334 ***	0.120	0.260	1.796
Father complete secondary	0.456 ***	0.154	0.551 ***	0.123	0.553 ***	0.124	-1.430	1.981
Father some tertiary	0.926 ***	0.160	0.856 ***	0.129	0.844 ***	0.129	1.755	1.972
Father education unknown	0.246	0.188	0.254 *	0.153	0.246	0.154	-0.944	2.088
One news item	0.114	0.092	0.102	0.079	0.095	0.079	-0.007	0.850
Two news items	0.492 ***	0.135	0.051	0.118	0.005	0.120	2.568 ***	0.983
Poor farmer	0.184 **	0.084	0.282 ***	0.071	0.289 ***	0.071	-1.220	0.768
Parental effort								
House Tutor	0.103	0.101	0.315 ***	0.088	0.320 ***	0.089	-0.557	0.788
Coaching centre	0.527 ***	0.096	0.581 ***	0.083	0.584 ***	0.084	-0.194	0.756
Parent's help homework	0.341 ***	0.097	0.244 ***	0.089	0.241 ***	0.090	0.490	0.664
Age, gender, religion								
Age	-1.149 **	0.473	-1.079 ***	0.406	-1.079 ***	0.410	-1.231	3.952
Age^2	0.034 **	0.017	0.029 **	0.015	0.029 **	0.015	0.050	0.146
Non Muslim	-0.364 **	0.153	-0.310 **	0.127	-0.299 **	0.128	-2.135	1.312
Female	-0.305 ***	0.082	-0.195 ***	0.071	-0.179 ***	0.072	-0.841	0.597
Teacher behaviours								
Meet parents every 1 month	0.163 *	0.099	0.012	0.349			0.267	0.375
Meet parents every 3 months	1.038 ***	0.117	1.025 **	0.429			0.966 **	0.455
Meet parents every 6 months	0.067	0.139	0.010	0.505			0.036	0.531
All pupils attend class	0.717 ***	0.081	0.597 **	0.288			0.708 **	0.317
At least 4 tests a year	1.016 ***	0.120	1.294 ***	0.435			0.993 **	0.457
School characteristics								
Admission any primary school	-0.503 ***	0.086	-0.334	0.314			-0.481	0.346
Islamic school	-1.928 ***	0.096	-1.587 ***	0.300			-1.542 ***	0.381
School has a library	0.197 **	0.086	-0.099	0.300			-0.402	0.343
School has a computer	0.421 ***	0.084	0.677 **	0.297			0.662 **	0.314
Constant	10.98 ***	3.231	11.14 ***	2.845	12.44	2.816	8.752	26.56
sigma_u			0.104		2.738			
sigma_e			0.022		2.706			
rho			0.022		0.506			
Number of obs	7923		7923		7923		311	
Number of groups			311		311			
Observations per group								
min			3		3			
avg			25.5		25.5			
max			140		140			

*** 1%; **5%; *10%. Roemer view: Generalised residuals of the auxiliary equations are substituted to observed effort, preferences and talent.

Table 8: Roemer regressions with school averages results - Mathematics and English sample

	Mathematics		**English**	
	Multilevel + school/teacher averages		Multilevel + school/teacher averages	
Variables	Coeff.	SE	Coeff.	SE
Pupil effort, preferences, talent				
Never/rarely perform low	0.047 ***	0.011	0.127 ***	0.016
Never/rarely incomplete work	0.071 ***	0.023	0.228 ***	0.045
Never/rarely lazy	0.113 ***	0.039	0.300 ***	0.041
Never/rarely disinterested	0.097 ***	0.033	0.041 ***	0.015
Never noisy (vs. rarely)	0.164 ***	0.030	-0.027 ***	0.011
Never punished	0.041 ***	0.034	0.060 ***	0.020
Not absent past 2 weeks	0.065 ***	0.015	0.068 ***	0.016
Fear English class	0.061 ***	0.023	-0.112 ***	0.021
Being popular in class	0.145 ***	0.041	0.265 ***	0.046
Want to study further	0.048 ***	0.009	0.051 ***	0.008
No work becomes idle	0.145 ***	0.027	0.159 ***	0.022
Work preferred to leisure	-0.018	0.014	0.002	0.017
Social bakground				
Mother incomplete primary	0.213 *	0.095	0.197 *	0.106
Mother complete primary	0.125 ***	0.102	0.302 ***	0.115
Mother incomplete secondary	0.195 ***	0.107	0.444 ***	0.119
Mother complete secondary	0.250 ***	0.117	0.480 ***	0.131
Mother some tertiary	0.416 **	0.143	0.362 **	0.161
Mother education unknown	0.260	0.165	-0.281	0.184
Father incomplete primary	0.068 **	0.107	0.237 **	0.120
Father complete primary	0.149	0.115	0.170	0.129
Father incomplete secondary	0.194 ***	0.107	0.335 ***	0.120
Father complete secondary	0.255 ***	0.110	0.554 ***	0.123
Father some tertiary	0.425 ***	0.115	0.844 ***	0.129
Father education unknown	-0.064	0.136	0.246	0.154
One news item	0.026	0.070	0.094	0.079
Two news items	0.368	0.107	0.004	0.119
Poor farmer	0.090 ***	0.063	0.288 ***	0.071
Parental effort				
House Tutor	0.413 ***	0.079	0.320 ***	0.089
Coaching centre	0.498 ***	0.074	0.584 ***	0.083
Parent's help homework	0.091 ***	0.080	0.242 ***	0.089
Age, gender, religion				
Age	-0.185 ***	0.346	-1.079 ***	0.409
Age^2	0.001 *	0.013	0.029 *	0.015
Non Muslim	-0.219 ***	0.114	-0.297 ***	0.128
Female	-1.289 ***	0.064	-0.179 ***	0.071
Teacher behaviours				
Meet parents every 1 month	-0.341	0.355	0.275	0.341
Meet parents every 3 months	0.425 ***	0.456	0.969 ***	0.413
Meet parents every 6 months	-1.090	0.594	0.020	0.487
Meet parents if needed	0.619 ***	0.315	0.728 ***	0.289
At least 4 tests a year	-0.577 **	0.350	0.995 **	0.417
All pupils attend class	0.841	0.348	-0.506	0.315
School characteristics				
Admission any primary school	0.801 ***	0.380	-1.631 ***	0.350
School has a library	-0.270	0.343	-0.346	0.313
School has a computer	0.768 **	0.319	0.636 **	0.286

*** 1%; **5%; *10% *continuing*

In Roemer view, generalised residuals of the auxiliary equations are substituted to observed effort, preferences and talent.

continuing

	Mathematics		English	
	Multilevel + school/teacher averages		Multilevel + school/teacher averages	
Variables	Coeff.	SE	Coeff.	SE
Average pupil effort, preferences, talent at school-level				
Never/rarely perform low	0.091	0.098	0.045	0.146
Never/rarely incomplete work	-0.546	0.263	-0.087	0.473
Never/rarely lazy	0.215	0.413	-0.359	0.443
Never/rarely disinterested	0.536	0.374	0.092	0.079
Never noisy (vs. rarely)	-0.201	0.187	-0.001	0.073
Never punished	1.213 ***	0.399	0.567 ***	0.192
Not absent past 2 weeks	0.181	0.138	0.076	0.121
No work becomes idle	-0.029	0.311	-0.057	0.207
Work preferred to leisure	0.148	0.179	0.147	0.179
Fear English class	0.367	0.300	0.059	0.254
Being popular in class	-0.020	0.577	0.054	0.516
Average social background at school-level				
Want to study further	-0.095	0.108	0.051	0.080
Mother incomplete primary	2.309	1.591	0.255	1.461
Mother complete primary	3.291	1.564	-0.006	1.433
Mother incomplete secondary	3.908	1.711	1.880	1.595
Mother complete secondary	2.875	1.945	1.243	1.758
Mother some tertiary	7.439 *	2.784	5.757 *	2.567
Mother education unknown	3.252 *	2.337	4.173 *	2.118
Father incomplete primary	-1.028	2.056	-0.341	1.912
Father complete primary	0.421	2.098	1.637	1.912
Father incomplete secondary	-1.213	1.770	-0.247	1.676
Father complete secondary	0.900	2.025	-1.884	1.845
Father some tertiary	1.877	2.111	0.570	1.855
Father education unknown	-1.667	2.130	-1.269	1.944
One news item	0.689	0.847	-0.117	0.787
Two news items	-1.367 ***	1.015	2.517 ***	0.920
Poor farmer	-2.238 **	0.771	-1.583 **	0.720
Average parental effort at school-level				
House Tutor	-2.126	0.806	-0.995	0.731
Coaching centre	-1.891	0.754	-0.869	0.701
Parent's help homework	0.701	0.685	0.323	0.617
Average age, gender, religion at school-level				
Age	-1.500	4.071	-0.202	3.653
Age^2	0.072	0.153	0.022	0.135
Non Muslim	-1.120	1.372	-1.730	1.245
Female	0.403	0.609	-0.683	0.556
Constant	10.152	26.86	9.050	24.38
sigma_u	2.421	0.103	8.659	3.409
sigma_e	2.399	0.019	2.198	0.097
rho	0.505	0.022	2.701	0.022
Number of obs	7949		0.398	0.022
Number of groups	311		7923	
Observations per group			311	
min	3		3	
avg	25.6		25.5	
max	137		140	

*** 1%; **5%; *10%

In Roemer view, generalised residuals of the auxiliary equations are substituted to the observed effort, preferences and talent.

Table 9: Decomposition of educational inequality by sources, between and within school variations

Variables	OLS + school/teacher variables		Multilevel + school/teacher variables		Multilevel + school-level averages		Combined Within and Between	
English	**Barry**	**Roemer**	**Barry**	**Roemer**	**Barry**	**Roemer**	**Barry**	**Roemer**
Within schools	**52.66**	**52.47**	**50.20**	**50.11**	**39.16**	**39.13**	**27.34**	**27.72**
Pupil effort (%)	22.16	19.05	22.25	19.00	17.70	15.17	12.99	11.95
Pupil preferences (%)	6.55	6.09	5.90	5.43	4.89	4.56	2.75	2.39
Pupil talent (%)	8.61	6.59	7.85	5.98	6.21	4.77	4.44	3.84
Social background (%)	9.89	12.58	7.31	9.75	5.14	7.25	3.90	5.27
Parental effort (%)	2.71	4.37	3.35	5.00	2.70	4.02	1.39	1.90
Age, gender, religion (%)	2.74	3.78	3.55	4.94	2.51	3.37	1.87	2.37
Between schools	**47.34**	**47.53**	**49.80**	**49.89**	**60.84**	**60.87**	**72.66**	**73.21**
Pupil effort (%)					6.48	7.00	13.94	15.25
Pupil preferences (%)					1.20	1.30	2.91	1.86
Pupil talent (%)					1.08	0.91	3.11	2.47
Social background (%)					19.56	19.57	23.17	24.43
Parental effort (%)					-2.73	-2.76	-0.73	-0.28
Age, gender, religion (%)					0.75	-0.08	2.03	1.54
Teacher behaviours (%)	14.99	15.07	19.84	19.87	12.45	12.61	9.69	10.58
School characteristics (%)	32.35	32.46	29.93	30.02	22.05	22.30	18.53	17.36
Mathematics	**Barry**	**Roemer**	**Barry**	**Roemer**	**Barry**	**Roemer**	**Barry**	**Roemer**
Within schools	**64.23**	**64.02**	**56.66**	**56.51**	**36.23**	**36.48**	**27.09**	**27.46**
Pupil effort (%)	13.56	12.26	15.28	13.29	10.16	9.01	7.57	6.68
Pupil preferences (%)	9.57	8.53	3.77	3.20	2.74	2.38	1.51	1.28
Pupil talent (%)	8.69	6.27	5.03	3.75	3.53	2.71	2.25	1.57
Social background (%)	10.23	13.41	3.65	5.36	2.52	3.81	1.67	2.40
Parental effort (%)	2.32	4.23	3.35	4.68	1.54	2.27	1.52	2.16
Age, gender, religion (%)	19.88	19.31	25.57	26.23	15.75	16.31	12.58	13.37
Between schools	**35.77**	**35.98**	**43.34**	**43.49**	**63.77**	**63.52**	**72.91**	**72.54**
Pupil effort (%)					12.94	13.34	17.94	17.84
Pupil preferences (%)					1.89	2.01	2.89	2.78
Pupil talent (%)					2.04	1.13	3.04	2.02
Social background (%)					21.77	23.00	23.08	24.89
Parental effort (%)					-0.78	-0.39	0.60	1.01
Age, gender, religion (%)					-1.31	-2.98	3.05	1.58
Teacher behaviours (%)	11.75	11.80	17.60	17.63	10.39	10.26	9.25	9.20
School characteristics (%)	24.01	24.19	25.74	25.86	16.83	17.15	13.05	13.22

Pupil effort includes seven binary indicators, pupil's preferences is based on two binary indicators, and pupil talent comprises three binary indicators. They are all described in section 3.3. Social background includes 4 dummy variables of educational level completed for each parent, plus newspaper purchases, and a binary indicator of livestock ownership. Parental effort uses three binary indicators: having a house tutor, reading in coaching center, and receiving parental help. Teacher's behaviours includes indicators of frequency of meetings with parents, frequency of tests and pupil attendance. Finally, school characteristics include: a binary indicator for being a recognised Islamic school, a binary indicator of school admission policy, and binary indicators for possessions of computer and library.

Table 10: Decomposition of educational inequality by sources

	OLS + school/teacher variables		Multilevel + school/teacher variables		Multilevel + school-level averages		Combined Within and Between	
English	**Barry**	**Roemer**	**Barry**	**Roemer**	**Barry**	**Roemer**	**Barry**	**Roemer**
Total predicted variance	2.90		2.40		3.28		4.08	
Pupil effort, talent preferences (%)	37.32	31.73	36.01	30.41	37.56	33.73	40.14	37.76
Family circumstances (%)	12.60	16.95	10.67	14.76	24.67	28.08	27.73	31.33
School, teacher characteristics (%)	47.34	47.53	49.77	49.89	34.51	34.91	28.22	27.94
Pupil age, gender religion (%)	2.74	3.78	3.55	4.94	3.27	3.29	3.91	3.44
Mathematics	**Barry**	**Roemer**	**Barry**	**Roemer**	**Barry**	**Roemer**	**Barry**	**Roemer**
Total predicted variance	1.95		1.68		2.77		3.32	
Pupil effort, talent, preferences (%)	31.81	27.07	24.08	20.24	33.31	30.57	35.20	32.16
Family circumstances (%)	12.54	17.64	7.00	10.04	25.05	28.69	26.87	30.46
School, teacher characteristics (%)	35.77	35.98	43.34	43.49	27.22	27.41	22.30	22.43
Pupil age, gender religion (%)	19.88	19.31	25.57	26.23	14.44	13.33	15.63	14.95

Pupil effort includes seven binary indicators, pupil's preferences is based on two binary indicators, and pupil talent comprises three binary indicators. They are all described in section 3.3. Social background includes 4 dummy variables of educational level completed for each parent, plus newspaper purchases, and a binary indicator of livestock ownership. Parental effort uses three binary indicators: having a house tutor, reading in coaching center, and receiving parental help. Teacher's behaviours includes indicators of frequency of meetings with parents, frequency of tests and pupil attendance. Finally, school characteristics include: a binary indicator for being a recognised Islamic school, a binary indicator of school admission policy, and binary indicators for possessions of computer and library.

9 Appendix

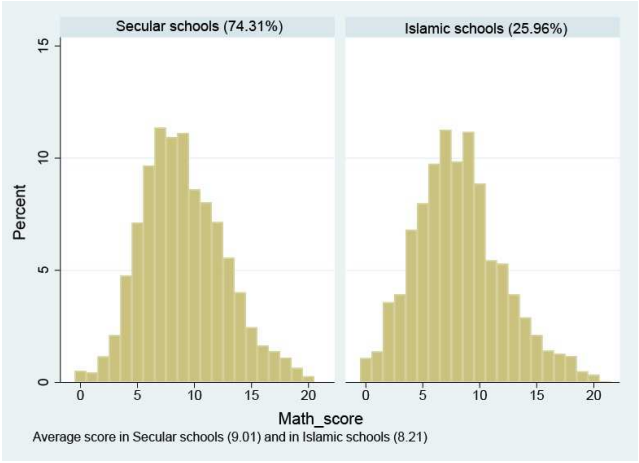

Figure A1: Distribution of Mathematics test scores

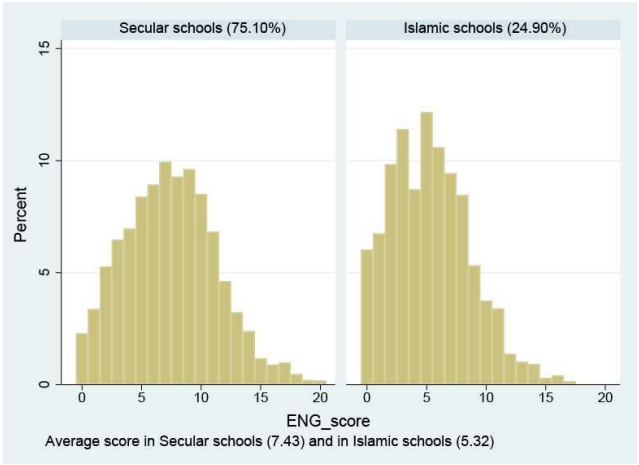

Figure A2: Distribution of English test scores

Table A1: Variables by type of schools - English sample

English	**Secular schools**		**Islamic schools**	
Sample size	n=5,950		n=1,973	
Variables	**Mean**	**SD**	**Mean**	**SD**
Average English score	7.43	3.88	5.32	3.35
Average pupils per school	43.55	25.25	23.72	13.45
Variables	**%**	**SD**	**Mean**	**SD**
Pupil effort, preferences, talent				
Never/rarely perform low	0.69	0.46	0.69	0.46
Never/rarely incomplete work	0.70	0.46	0.68	0.47
Never/rarely lazy	0.72	0.45	0.78	0.41
Never/rarely disinterested	0.65	0.48	0.76	0.43
Never noisy (vs. rarely)	0.23	0.42	0.17	0.37
Never punished	0.79	0.41	0.80	0.40
Not absent past 2 weeks	0.35	0.48	0.34	0.47
No work becomes idle	0.61	0.49	0.53	0.50
Work preferred to leisure	0.68	0.47	0.61	0.49
No fear English class	0.08	0.28	0.09	0.29
Being popular in class	0.74	0.44	0.81	0.39
Want to study further	0.77	0.42	0.75	0.43
Social background				
Mother no education	0.16	0.37	0.19	0.39
Mother incomplete primary	0.23	0.42	0.25	0.43
Mother complete primary	0.18	0.39	0.20	0.40
Mother incomplete secondary	0.17	0.37	0.17	0.37
Mother complete secondary	0.13	0.34	0.12	0.32
Mother some tertiary	0.08	0.26	0.04	0.19
Mother education unknown	0.05	0.21	0.05	0.21
Father no education	0.14	0.34	0.17	0.37
Father incomplete primary	0.15	0.36	0.16	0.37
Father complete primary	0.12	0.32	0.12	0.33
Father incomplete secondary	0.17	0.38	0.16	0.37
Father complete secondary	0.16	0.37	0.16	0.37
Father some tertiary	0.19	0.39	0.14	0.35
Father education unknown	0.08	0.27	0.08	0.27
No news item	0.61	0.49	0.67	0.47
One news item	0.28	0.45	0.25	0.43
Two news items	0.11	0.31	0.07	0.26
Poor farmer	0.35	0.48	0.32	0.46
Parental effort				
House Tutor	0.31	0.46	0.21	0.41
Coaching centre	0.38	0.48	0.29	0.45
Parent's help homework	0.23	0.42	0.19	0.39
Age, gender, religion				
Age	13.04	0.95	13.30	1.14
Non Muslim	0.09	0.29	0.01	0.09
Female	0.62	0.49	0.66	0.47
Teacher behaviours				
Meet parents every 1 month	0.25	0.44	0.22	0.42
Meet parents every 3 months	0.17	0.38	0.10	0.30
Meet parents every 6 months	0.09	0.29	0.14	0.35
Meet parents if needed	0.48	0.50	0.54	0.50
At least 4 tests a year	0.86	0.35	0.90	0.30
All pupils attend class	0.43	0.50	0.37	0.48
School characteristics				
Admission any primary school	0.67	0.47	0.64	0.48
School has a library	0.56	0.50	0.59	0.49
School has a computer	0.54	0.50	0.46	0.50

Table A2: Variables by type of schools - Maths sample

Maths	**Secular schools**		**Islamic schools**	
Sample size	n=5,907		n=2,042	
Variables	**Mean**	**SD**	**Mean**	**SD**
Average English score	9.01	3.63	8.22	3.88
Average pupils per school	44.64	26.19	23.83	13.46
Variables	**%**	**SD**	**Mean**	**SD**
Pupil effort, preferences, talent				
Never/rarely perform low	0.63	0.48	0.64	0.48
Never/rarely incomplete work	0.69	0.46	0.68	0.47
Never/rarely lazy	0.77	0.42	0.79	0.41
Never/rarely disinterested	0.75	0.44	0.81	0.40
Never noisy (vs. rarely)	0.67	0.47	0.77	0.42
Never punished	0.78	0.41	0.80	0.40
Not absent past 2 weeks	0.36	0.48	0.33	0.47
No work becomes idle	0.62	0.49	0.52	0.50
Work preferred to leisure	0.68	0.47	0.60	0.49
No fear math class	0.08	0.28	0.09	0.29
Being popular in class	0.74	0.44	0.81	0.39
Want to study further	0.77	0.42	0.74	0.44
Social background				
Mother no education	0.16	0.36	0.18	0.39
Mother incomplete primary	0.23	0.42	0.24	0.43
Mother complete primary	0.19	0.39	0.21	0.41
Mother incomplete secondary	0.17	0.37	0.17	0.37
Mother complete secondary	0.14	0.34	0.12	0.32
Mother some tertiary	0.08	0.27	0.04	0.19
Mother education unknown	0.05	0.21	0.05	0.21
Father no education	0.13	0.34	0.17	0.37
Father incomplete primary	0.15	0.35	0.15	0.36
Father complete primary	0.12	0.32	0.12	0.33
Father incomplete secondary	0.17	0.38	0.17	0.38
Father complete secondary	0.16	0.37	0.16	0.37
Father some tertiary	0.19	0.39	0.14	0.35
Father education unknown	0.08	0.27	0.08	0.27
No news item	0.62	0.48	0.67	0.47
One news item	0.27	0.45	0.26	0.44
Two news items	0.11	0.31	0.08	0.27
Poor farmer	0.35	0.48	0.32	0.47
Parental effort				
House Tutor	0.31	0.46	0.21	0.41
Coaching centre	0.38	0.48	0.30	0.46
Parent's help homework	0.24	0.43	0.17	0.38
Age, gender, religion				
Age	13.04	0.95	13.31	1.14
Non Muslim	0.09	0.29	0.01	0.09
Female	0.61	0.49	0.66	0.47
Teacher behaviours				
Meet parents every 1 month	0.25	0.43	0.28	0.45
Meet parents every 3 months	0.20	0.40	0.12	0.32
Meet parents every 6 months	0.08	0.27	0.05	0.23
Meet parents if needed	0.47	0.50	0.54	0.50
At least 4 tests a year	0.26	0.44	0.30	0.46
All pupils attend class	0.40	0.49	0.47	0.50
School characteristics				
Admission any primary school	0.67	0.47	0.63	0.48
School has a library	0.57	0.50	0.59	0.49
School has a computer	0.55	0.50	0.44	0.50

Table A3: Correlation matrix of pupil's effort, preferences, and talent in Mathematics

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Pupil's school effort											
(1) Nev/rarely perform low	1										
(2) Nev/rarely incomplete work	0.41	1									
(3) Nev/rarely lazy	0.22	0.30	1								
(4) Nev/rarely disinterested	0.28	0.33	0.31	1							
(5) Nev noisy (vs. rarely)	0.13	0.20	0.19	0.25	1						
(6) Nev punished	-0.00	0.01	0.04	0.03	0.05	1					
(7) Not absent past 2 weeks	0.07	0.06	0.03	0.04	0.07	0.03	1				
Pupil's preferences											
(8) No work becomes idle	0.06	0.06	0.06	0.04	0.01	0.05	0.06	1			
(9) Work preferred to leisure	0.00	0.04	0.05	0.02	-0.02	0.03	-0.00	0.36	1		
Pupil's talent											
(10) No fear math class	0.05	0.05	0.05	0.05	0.02	0.04	0.03	0.06	0.05	1	
(11) Being popular in class	0.05	0.07	0.05	0.06	0.01	0.03	0.03	0.03	0.04	0.08	1
(12) Wants to study further	0.05	0.07	0.06	0.05	0.01	0.02	0.02	0.13	0.12	0.05	0.09

Table A4: Correlation matrix of pupil's effort, preferences, and talent in English

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Pupil's school effort											
(1) Nev/rarely perform low	1										
(2) Nev/rar. incomplete work	0.36	1									
(3) Nev/rarely lazy	0.34	0.35	1								
(4) Nev/rarely disinterested	0.20	0.16	0.28	1							
(5) Nev noisy (vs. rarely)	-0.09	-0.05	-0.08	-0.11	1						
(6) Nev punished	0.01	0.02	0.02	0.02	0.01	1					
(7) Not absent past 2 weeks	0.04	0.05	0.00	0.03	-0.01	0.03	1				
Pupil's preferences											
(8) No work becomes idle	0.06	0.04	0.03	0.05	0.00	0.06	0.05	1			
(9) Work preferred to leisure	0.03	0.03	0.02	0.01	-0.02	0.03	0.00	0.36	1		
Pupil's talent											
(10) No fear English class	-0.04	-0.05	-0.05	-0.02	0.05	-0.03	-0.04	-0.04	-0.04	1	
(11) Being popular in class	0.04	0.05	0.07	0.05	-0.02	0.04	0.03	0.02	0.03	-0.04	1
(12) Wants to study further	0.04	0.03	0.04	0.01	-0.03	0.01	0.01	0.13	0.11	-0.05	0.08

Table A5: Roemer auxiliary regression with school fixed effects - Mathematics sample

Variables	Never/rarely perform low		Never/rarely incomplete work		Never/rarely lazy		Never/rarely disinterested		Never noisy (vs. rarely)		Never punished	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Social background												
Mother incomplete primary	0.220 **	0.097	0.062	0.095	0.093	0.106	0.177 *	0.106	0.092	0.117	0.350 ***	0.100
Mother complete primary	0.140	0.104	0.089	0.103	0.011	0.117	0.217 *	0.115	0.264 **	0.127	0.306 ***	0.110
Mother incomplete secondary	0.246 **	0.110	0.102	0.108	0.211 *	0.121	0.180	0.121	0.184	0.132	0.260 **	0.114
Mother complete secondary	-0.006	0.119	-0.009	0.118	0.220 *	0.132	0.029	0.129	0.198	0.145	0.213 *	0.124
Mother some tertiary	0.335 **	0.151	0.209	0.153	0.198	0.165	0.187	0.164	0.116	0.178	0.307 **	0.155
Mother education unknown	-0.066	0.168	-0.047	0.169	0.216	0.191	0.369 *	0.192	0.248	0.210	0.351 **	0.177
Father incomplete primary	0.040	0.110	0.164	0.107	0.033	0.120	0.112	0.121	0.196	0.135	-0.152	0.116
Father complete primary	0.116	0.117	0.151	0.115	0.179	0.133	0.044	0.130	0.112	0.144	-0.163	0.125
Father incomplete secondary	0.254 **	0.109	0.180 *	0.106	0.181	0.120	0.161	0.121	0.044	0.134	-0.087	0.116
Father complete secondary	0.209 *	0.111	0.131	0.110	0.075	0.124	0.203	0.125	0.291 **	0.138	-0.077	0.119
Father some tertiary	0.377 ***	0.117	0.357 ***	0.117	0.307 **	0.130	0.230 *	0.129	0.425 ***	0.143	-0.018	0.125
Father education unknown	-0.036	0.137	0.018	0.135	-0.123	0.151	-0.099	0.152	0.029	0.173	0.216	0.152
One news item	0.046	0.072	-0.003	0.072	0.174 **	0.081	0.024	0.080	-0.071	0.090	-0.029	0.077
Two news items	0.133	0.110	0.289 ***	0.114	0.375 ***	0.125	0.206 *	0.124	0.117	0.132	-0.107	0.113
Poor farmer	-0.033	0.064	0.037	0.065	0.036	0.073	0.223 ***	0.072	0.140 *	0.079	-0.087	0.069
House Tutor	0.229 ***	0.081	0.238 ***	0.081	0.308 ***	0.092	0.195 **	0.091	0.149	0.101	-0.147 *	0.084
Coaching centre	0.276 ***	0.075	0.271 ***	0.075	0.305 ***	0.086	0.211 ***	0.083	0.226 **	0.093	0.060	0.080
Parent's help homework	0.141 *	0.083	0.153 *	0.081	0.033	0.090	0.015	0.090	0.201 **	0.101	0.150 *	0.087
Age, gender, religion												
Age	-0.852 **	0.350	-0.346	0.339	-0.174	0.381	-0.282	0.400	0.356	0.434	-0.106	0.357
Age^2	0.025 **	0.013	0.007	0.012	0.002	0.014	0.007	0.015	-0.016	0.016	0.000	0.013
Non Muslim	-0.141	0.115	0.126	0.118	-0.029	0.132	0.086	0.138	-0.041	0.143	-0.037	0.123
Female	-0.023	0.065	-0.089	0.065	-0.087	0.075	0.058	0.073	0.074	0.081	0.600 ***	0.069
Number of obs	6,909		6,833		6,065		6,094		5,223		7,376	
Number of groups	253		252		219		207		167		261	
Observations per group												
min	3		3		3		3		5		4	
avg	27.3		27.1		27.7		29.4		31.3		28.3	
max	137		137		137		137		137		137	

Table A6: Roemer auxiliary regression results - Mathematics sample

Variables	Not absent past 2 weeks		No work becomes idle		Work preferred to leisure		No fear math class		Being popular in class		Want to study further	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Social background												
Mother incomplete primary	0.080	0.093	0.118	0.088	0.046	0.088	0.140	0.137	0.306 ***	0.093	0.016	0.095
Mother complete primary	0.043	0.102	0.194 **	0.096	0.098	0.097	0.376 **	0.159	0.301 ***	0.102	0.026	0.105
Mother incomplete secondary	0.060	0.105	0.158	0.101	0.159	0.102	0.030	0.162	0.181 *	0.107	0.077	0.111
Mother complete secondary	0.115	0.114	0.118	0.109	0.079	0.110	0.123	0.180	0.212 *	0.116	-0.114	0.118
Mother some tertiary	0.124	0.138	0.187	0.134	0.149	0.136	0.036	0.226	0.158	0.142	-0.093	0.148
Mother education unknown	-0.021	0.158	-0.011	0.152	-0.076	0.154	-0.096	0.236	-0.108	0.161	-0.206	0.165
Father incomplete primary	0.202 *	0.107	0.058	0.101	0.133	0.102	0.185	0.153	0.062	0.106	0.101	0.108
Father complete primary	0.057	0.119	-0.023	0.109	0.060	0.110	0.068	0.166	-0.040	0.115	0.058	0.117
Father incomplete secondary	0.200 *	0.106	-0.022	0.100	-0.006	0.101	0.642 ***	0.167	0.029	0.106	0.151	0.108
Father complete secondary	0.312 ***	0.110	0.019	0.103	-0.112	0.103	0.384 **	0.164	0.318 ***	0.112	0.151	0.111
Father some tertiary	0.323 ***	0.113	0.129	0.108	0.055	0.109	0.456 ***	0.179	0.195 *	0.115	0.346 ***	0.119
Father education unknown	0.302 **	0.132	-0.052	0.126	-0.055	0.129	0.165	0.200	0.045	0.136	0.157	0.137
One news item	0.200 ***	0.068	0.070	0.066	0.011	0.066	0.205 *	0.111	-0.025	0.071	0.107	0.071
Two news items	0.138	0.100	0.113	0.096	0.142	0.097	0.101	0.161	0.206 *	0.108	0.364 ***	0.110
Poor farmer	0.189 ***	0.063	0.091	0.061	0.097	0.062	-0.084	0.099	-0.041	0.065	0.146 **	0.067
House Tutor	0.019	0.078	-0.004	0.074	-0.092	0.075	0.067	0.118	0.088	0.079	0.065	0.081
Coaching centre	0.103	0.073	-0.060	0.070	-0.090	0.071	0.222 **	0.114	0.343 ***	0.075	0.090	0.076
Parent's help homework	0.115	0.077	0.359 ***	0.074	0.117	0.075	0.457 ***	0.138	0.258 ***	0.082	-0.032	0.080
Age, gender, religion												
Age	-0.631 **	0.327	-0.306	0.314	0.682 **	0.336	-0.555	0.498	-0.109	0.354	-1.096 ***	0.387
Age^2	0.021 *	0.012	0.010	0.011	-0.026 **	0.012	0.014	0.018	0.003	0.013	0.036 ***	0.014
Non Muslim	0.015	0.110	-0.192 *	0.106	0.027	0.109	-0.235	0.176	-0.103	0.112	-0.028	0.120
Female	0.202 ***	0.063	0.155 ***	0.061	0.193 ***	0.061	-0.019	0.105	-0.060	0.066	-0.017	0.067
Number of obs	7,324		7,333		7,215		5,615		7,643		7,256	
Number of groups	276		277		273		202		277		269	
Observations per group												
min	3		3		3		4		3		4	
avg	26.5		26.5		26.4		27.8		27.6		27	
max	108		137		137		137		137		137	

Table A7: Roemer auxiliary regression results - English sample (continued)

Variables	Never/rarely perform low		Never/rarely incomplete work		Never/rarely lazy		Never/rarely disinterested		Never noisy (vs. rarely)		Never punished	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Social background												
Mother incomplete primary	0.180 *	0.094	0.229 ***	0.093	0.146	0.098	0.170	0.115	0.036	0.111	0.348 ***	0.100
Mother complete primary	0.118	0.102	0.151	0.101	-0.037	0.106	0.057	0.122	0.051	0.120	0.320 ***	0.111
Mother incomplete secondary	0.074	0.107	0.074	0.105	0.090	0.112	0.137	0.128	-0.137	0.128	0.251 **	0.114
Mother complete secondary	-0.016	0.117	0.056	0.116	-0.103	0.122	-0.057	0.139	-0.013	0.139	0.192	0.125
Mother some tertiary	0.099	0.149	0.108	0.147	0.092	0.154	0.081	0.173	0.062	0.171	0.355 **	0.157
Mother education unknown	-0.004	0.162	0.046	0.168	-0.006	0.176	0.026	0.192	-0.038	0.202	0.265	0.173
Father incomplete primary	0.041	0.105	0.025	0.105	-0.007	0.111	-0.217 *	0.129	-0.284	0.127	-0.098	0.116
Father complete primary	0.181	0.114	0.179	0.115	0.196 *	0.120	0.112	0.140	-0.340 ***	0.138	-0.163	0.125
Father incomplete secondary	0.206 **	0.105	0.250 **	0.106	0.158	0.111	-0.016	0.128	-0.158	0.124	-0.085	0.116
Father complete secondary	0.341 ***	0.109	0.216 **	0.108	0.169	0.115	-0.098	0.131	-0.155	0.128	-0.031	0.120
Father some tertiary	0.387 ***	0.115	0.456 ***	0.115	0.396 ***	0.121	0.214	0.136	-0.064	0.133	-0.017	0.126
Father education unknown	0.175	0.137	0.233 *	0.139	0.110	0.145	0.052	0.166	-0.068	0.161	0.095	0.151
One news item	0.063	0.072	0.139 **	0.072	0.196 ***	0.076	0.140 *	0.085	-0.044	0.084	-0.054	0.077
Two news items	0.116	0.108	0.077	0.107	0.329 ***	0.115	0.021	0.128	-0.241 *	0.130	-0.158	0.113
Poor farmer	-0.020	0.064	0.095	0.064	0.063	0.068	0.203 ***	0.074	-0.070	0.075	-0.058	0.070
House Tutor	0.142 *	0.080	0.149 *	0.080	0.178 **	0.085	0.174 *	0.095	0.061	0.092	-0.128	0.084
Coaching centre	0.320 ***	0.075	0.150 **	0.074	0.195 ***	0.079	0.130	0.088	-0.190 **	0.088	0.056	0.081
Parent's help homework	0.208 ***	0.082	0.067	0.082	-0.027	0.084	0.040	0.096	-0.057	0.097	0.124	0.087
Age, gender, religion												
Age	-0.670 *	0.395	0.171	0.380	-0.145	0.463	-0.783	0.558	-1.144 ***	0.410	-0.566	0.403
Age^2	0.020	0.014	-0.011	0.014	0.000	0.017	0.024	0.021	0.041 ***	0.015	0.018	0.015
Non Muslim	0.018	0.116	0.074	0.119	0.003	0.125	0.030	0.137	-0.053	0.138	-0.061	0.125
Female	0.035	0.065	0.099	0.065	-0.043	0.068	-0.190 ***	0.077	0.063	0.078	0.611 ***	0.069
Number of obs	7,089		6,967		6,517		5,323		5,941		7,336	
Number of groups	267		258		231		175		214		265	
Observations per group												
min	3		3		3		3		3		3	
avg	26.6		27		28.2		30.4		27.8		27.7	
max	140		140		140		140		140		140	

Table A8: Roemer auxiliary regression results - English sample

Variables	Not absent past 2 weeks		No work becomes idle		Work preferred to leisure		No fear English class		Being popular in class		Want to study further	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Social background												
Mother incomplete primary	0.076	0.093	0.058	0.087	0.002	0.088	-0.180	0.134	0.268 ***	0.092	0.013	0.094
Mother complete primary	0.063	0.103	0.138	0.096	0.026	0.097	-0.320 **	0.155	0.262 ***	0.102	-0.011	0.105
Mother incomplete secondary	0.064	0.105	0.138	0.100	0.156	0.102	-0.253	0.161	0.152	0.106	0.109	0.111
Mother complete secondary	0.106	0.114	0.075	0.109	0.033	0.110	-0.316 *	0.180	0.190	0.116	-0.074	0.118
Mother some tertiary	0.098	0.139	0.192	0.134	0.113	0.137	-0.037	0.217	0.142	0.141	-0.095	0.149
Mother education unknown	0.013	0.159	-0.036	0.151	-0.172	0.153	-0.052	0.232	-0.055	0.160	-0.129	0.165
Father incomplete primary	0.166	0.107	0.092	0.100	0.096	0.101	-0.040	0.154	0.056	0.106	0.113	0.107
Father complete primary	-0.022	0.119	0.030	0.109	0.076	0.110	-0.146	0.173	-0.058	0.115	0.069	0.117
Father incomplete secondary	0.164	0.107	0.000	0.100	0.029	0.101	-0.210	0.159	-0.013	0.105	0.122	0.108
Father complete secondary	0.231 **	0.110	0.039	0.103	-0.090	0.103	-0.314 *	0.167	0.265 **	0.111	0.159	0.111
Father some tertiary	0.317 ***	0.114	0.085	0.108	0.067	0.109	-0.282	0.177	0.143	0.115	0.328 ***	0.119
Father education unknown	0.274 **	0.134	-0.110	0.127	-0.039	0.130	0.053	0.200	-0.053	0.136	0.161	0.138
One news item	0.194 ***	0.069	0.067	0.066	-0.020	0.066	-0.125	0.107	0.011	0.070	0.095	0.071
Two news items	0.225 **	0.100	0.070	0.097	0.108	0.098	-0.032	0.150	0.184 *	0.107	0.388 ***	0.110
Poor farmer	0.201 ***	0.064	0.105 *	0.061	0.075	0.062	0.012	0.099	-0.040	0.065	0.110 *	0.067
House Tutor	0.011	0.078	0.016	0.074	-0.056	0.075	0.658	0.479	-0.089	0.363	-1.406 ***	0.439
Coaching centre	0.134 *	0.073	0.003	0.070	-0.023	0.071	-0.017	0.017	0.002	0.013	0.048 ***	0.016
Parent's help homework	0.108	0.077	0.376 ***	0.074	0.116	0.075	0.229	0.169	-0.094	0.112	-0.003	0.120
Age, gender, religion												
Age	-0.710 **	0.352	-0.435	0.336	0.595 *	0.356	-0.024	0.101	-0.052	0.065	-0.020	0.066
Age^2	0.025 **	0.013	0.014	0.012	-0.022 *	0.013	-0.109	0.118	0.072	0.078	0.053	0.081
Non Muslim	0.057	0.111	-0.201 *	0.106	0.040	0.109	-0.190 *	0.111	0.303 ***	0.075	0.091	0.076
Female	0.225 ***	0.064	-0.162 ***	0.061	0.183	0.061	-0.052	0.122	0.264 ***	0.082	-0.020	0.081
Number of obs	7,232		7,353		7,134		5,473		7,578		7,237	
Number of groups	275		280		274		198		279		275	
Observations per group												
min	3											
avg	26.3		3		3		3		3		3	
max	97		26.3		26		27.6		27.2		26.3	
			140		140		140		140		140	