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STUDENT PROGRESSION IN UPPER SECONDARY EDUCATION: THE EFFECT OF ACADEMIC ABILITY, GENDER, AND SCHOOLS

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Student progression in upper secondary education: The effect of academic ability, gender, and schools

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Abstract

This paper studies how students' prior academic ability, gender, and family background affect performance in upper secondary schools in terms of lack of progression and dropout probability. The link between dropout and lack of progression in post-compulsory schooling is important as graduating from upper secondary school is a prerequisite to attend universities and other higher education institutions. Using an extremely rich data set from Norway covering all students starting upper secondary school education in the fall 2002, we find that earlier school performance is the main predictor of dropout and lack of progression. This holds controlling for a number of family background variables, study tracks and a full set of school fixed effects.

* The data used in this paper have been collected as part of projects for the Ministry of Education and the Norwegian Directorate for Education and Training. This paper to a large extent builds upon Byrhagen et al (2006). We thank Karen N. Byrhagen for excellent assistance on the project.

1. Introduction

As a part of the European Union's effort to become "the most competitive and dynamic knowledge-based economy in the world" (the Lisbon strategy), the Union has established "Education and Training 2010" to integrate all actions in the fields of education and training. The Education Council adopted five European benchmarks described in EU (2002). The first benchmark is to reduce the EU average ratio of early school leavers, defined as the people between 18 and 24 years of age with no more than lower secondary education, from 19 percent in 2002 to 10 percent in 2010. Another benchmark is that at least 85 percent of 22-year-olds have successfully completed upper secondary education. Already at the outset the Union acknowledged that the benchmarks would be difficult to achieve by 2010, and by 2007, the objectives above, and in particular upper secondary school completion, seem unattainable (EU, 2008).

Graduation from upper secondary education is a prerequisite for enrolment into higher education and certification in a number of occupations. Thus, lack of progression and dropout is likely to reduce individual future earnings and employment opportunities. This is of particular importance as the demand for unskilled labor decrease in most European countries. Having a good understanding of the determinants of the propensity to drop out of upper secondary school is necessary in order to implement adequate policy measures to increase educational attainment. This paper adds to the knowledge on this issue by estimating the impact of individual and family characteristics, conditional on school characteristics, using data from upper secondary education in Norway.[1]

We study the determinants of dropout and lack of progression using detailed information on the cohort leaving compulsory schooling in Norway in the spring 2002 at age 16. Slightly above 95 percent of the cohort enrolled in the three-year non-compulsory upper secondary education in the fall, but only about 70 percent had the expected progression at age 18 in the fall 2004, the year they should have started in their 3rd year in upper secondary education. In the empirical analysis we relate the probability of dropout and lack of progression to the students' achievement at the end of compulsory schooling, a host of individual and family characteristics, and school specific factors. We decompose overall lack of progression into different paths; dropouts defined as students that are not enrolled in upper secondary education at age 18, and grade repetition defined as students that are enrolled in 1st or 2nd grade at age 18. We find very similar patterns for the two outcome variables.

[1] Regarding the EU benchmarks, Norway is doing better than the EU average in terms of early school leavers and completion of upper secondary education. However, EU (2008) statistics regarding upper secondary education (ISCED 3) is related to less than having a degree from a Norwegian upper secondary school.

Other studies of dropout behavior as Rice (1999) for UK , Maani and Kalb (2007) for Australia, and Traag and van der Velden (2008) for the Netherlands have found, that students' cognitive skills clearly reduces the probability to drop out of non-compulsory secondary education[2]. These papers include in their analysis a large number of family and student control variables. However, they typically include only crude measures of school characteristics, if such variables are included at all. For example, Maani and Kalb (2007) include class size, the percentage of respondent's class that continues at 16, an indicator of being in a rural area and the local unemployment rate. If students are sorted based on unobserved school variables which may be correlated with the included family, individual and school and regional variables, this can bias the estimated effects. Consider the case where high ability students tend to be located in schools or areas with higher teacher quality than low ability students. If we do not control for teacher quality differences, this means that the effect of student's prior academic performance is biased upward. Our detailed data from Norwegian registers where each student can be linked to both his/her lower secondary and upper secondary school enables us to condition on a full set of fixed school effects when estimating the impact of prior academic performance and family and gender variables. Thus, we can estimate the impact from these variables comparing students exposed to the same school environment. Further, the linked register data enables us to assess the overall contribution of upper secondary school factors to dropout propensity conditional on the students' performance in lower secondary school.

The paper is organized as follows. The next section gives an overview over institutional features of the Norwegian schooling system. Section 3 discusses some theoretical considerations, and Section 4 presents the data. Section 5 includes the empirical analysis, while Section 6 concludes and discusses some interpretations and policy implications of our results..

2. Institutional features

The Norwegian school system consists of a compulsory seven year primary and three year lower secondary education. After finishing lower secondary school the students can either choose to leave school or they can enter one of 15 different study tracks in upper secondary schools. The general academic track, the major study track qualifying for enrolment in universities, is most popular and includes about 40 percent of the students. The other study tracks are denoted vocational tracks. Industrial design, health and social work, mechanics, and electrical trades are the largest vocational tracks and enroll each about eight percent of the student cohort. The academic track is a three-year-long education. Most of the vocational

[2] Other studies, for example Clark (2002) for UK and Black et al. (2005) for the US, find that the state of the local labor market influences the degree of dropouts.

tracks include an apprentice system, either in the third and final year or in the third and fourth year, where the training is combined with commercial work in firms.

The counties are responsible for upper secondary education while the municipalities are responsible for lower secondary and primary education. Upper secondary education is the most important service provided by the 19 counties in the country, and accounts for over 50 percent of total spending. The counties are financed by grants from the central government. Youths that have completed lower secondary education have a legal right to enroll in upper secondary education in one out of three individually ranked study tracks, a rule that is followed without exceptions by each county. The students have the right to complete the upper secondary education, but only for a period of five years after enrolled the first time. It is possible for the students to apply for transfer to another study track after being enrolled. A transfer will delay the progression because they have to start in the 1st grade in the new track, which we include in the term "grade repetition" below.

The ranking of the students for a specific study track when there are more applicants than study places is solely based on the grades from compulsory lower secondary education.[3] At the end of lower secondary school, the students are given grades set by the teachers in 11 subjects on a scale from 1 (low) to 6 (high). The average grade varies slightly between subjects, from about 3.5 in Mathematics to 4.3 in Physical education. In addition, the students have to conduct a central exit exam in either Mathematics, Norwegian, or English. The overall grade used for ranking of applicants to upper secondary education is the average over all subjects.[4] We use this overall average grade in the empirical analysis below.

3. Theoretical considerations and policy issues.

Point of departure is the standard theory on investment in human capital as formulated by Becker (1964) and Ben-Porath (1967). According to this investment theory, the students compare the benefits of one year of education with the costs, where the benefits and costs include, among other things, the monetary return to education and the disutility of study effort, respectively. Both benefits and costs are expected to depend on individual characteristics as ability and gender.

Ideally, we would like to model both the decision to enter upper secondary education or not, and, given that education is chosen, which type of study track. This is demanding both in

[3] In addition, the algorithm takes into account that each student must be enrolled in one of the three study tracks on their list.

[4] For the subject in which the student has the exit exam, the average over the teacher set grade and the grade on the exam is used when the overall average grade is calculated.

terms of modeling and data requirements, and without the scope of the present paper.[5] Instead our approach is to model to which extent the student's deviates from expected progression the first two years in non-compulsory upper secondary education

Underlying policy-makers concern that the youth undertake too little education must be an understanding that individuals do not take optimal decisions, at least not in a social welfare perspective. The private return to education as considered by a proportion of the youth is smaller than social return to education as considered by policy-makers.

A related argument for policy-makers is that the risk of unemployment is much higher among people with low education level, the risk of being on welfare is higher, and that the return to education at the upper secondary level is high. For example, Oreopoulos (2007) finds for UK and Ireland that one year of high school has a monetary return of 12 percent, in addition to positive effects on health and general satisfaction. Rouse (2005) find that dropout from high school in the US has large income consequences both for the individual and the society. If high private return to completing upper secondary school or high school is an argument for policy intervention, it must be the case that what seems rational for the individual ex-ante is not rational ex-post. Several theoretical arguments may generate differences between ex-ante and ex-post rationality. For example, the educational market includes elements of imperfect information, and the individuals may make inconsistent discounting of future benefits. Inconsistent discounting as hyperbolic discounting, see O'Donoghue and Rabin (1999), is probably more widespread among young people than among adults.

4. Data description

The data is obtained from the National Educational Database in Statistics Norway[6] and consist of all students finishing the compulsory lower secondary education in the spring 2002 and enrolling in upper secondary education in the fall 2002, including slightly above 95 percent of all graduates from lower secondary education. The student information is matched with information of their parents and school identifiers for both the lower secondary school in which they graduated and the upper secondary school in which they enrolled.[7]

Table 1 presents descriptive statistics. At the start of the third year in upper secondary education, 13.5 percent of the sample is not enrolled in an upper secondary school (dropouts). 14.1 percent of the sample is enrolled in 1st or 2nd grade, which implies that they have not had

[5] Eckstein and Wolpin (1999) estimate a structural model for sequential choices within high school education in the US.

[6] http://www.ssb.no/english/mikrodata_en/datacollection/nudb/

the expected progression (grade repetition). Thus, a total of 27.6 percent of the enrolled students have lack of progression.

The lowest grade in a subject in lower secondary education is 1 and the highest grade is 6. Our variable "Average grade in lower secondary education" is the average over 11 subjects, and is the measure used in the intake at upper secondary schools.[8] This include exam in one core subject. Figure 1 shows the density of the average grade. Figure 1A shows that girls are performing better than the boys. The average grade of girls is 4.1, compared to 3.7 for boys. Concerning the lower end of the distribution, the number of students having an average grade below three is 2.6 times higher for boys than for girls. Similarly, at the upper end, the number of students with average grade above five is 2.4 times higher for girls than for boys. Figure 1B shows than the density of average grade for students with lack of progression is clearly to the left of the density for students with the expected progression. 70 percent of the students with average grade below three have lack of progression, while that is the case for only 6 percent of the students with grade of at least five.

The relationship between the average grade and lack of progression is presented in Figure 2. In the figure the students with similar grades are grouped together.[9] Figure 2A shows the strong relationship between average grade and lack of progression. The share of students with lack of progression decreases almost linearly up to an average grade of about five. The relationships for dropouts and grade repetition are similar, but for the lowest grades dropout is more common than grade repetition. Figure 2B shows that the relationship between grade and lack of progression is very similar for girls and boys. If anything, for given grade, the progression is slightly better for boys than for girls. Combined with Figure 1, this indicates that the larger deviation from expected progression in upper secondary school among boys than among girls is strongly related to the fact that boys have lower average grade from lower secondary compulsory education.[10]

Figure 3 presents the density of average lack of progression at the school level. The dotted line shows the density across lower secondary schools, while the solid line shows the density across upper secondary schools. The variation in average lack of progression is much larger across upper secondary schools than across lower secondary schools. While it is premature to give this relationship a causal interpretation, it may indicate that school quality varies more at the upper secondary level than at the lower secondary level.

[8] For 34 students the average grade is below one, probably because they not have completed all required courses. We drop these students from the analysis.
[9] The first group has average grade below 1.2, the next group from 1.2 to 1.4, and so on.
[10] Average lack of progression is 23 percent for girls and 32 percent for boys. The probability of dropout and grade repetition is 11 and 12 percent, respectively, for girls, and 16 percent for both outcomes for boys.

Table 1 shows that 3.3 percent of the students' mothers have a master or doctoral degree, 25.7 percent have a university or college degree at lower level (bachelor), over 50 percent have 1-3 years of upper secondary education as their highest education, while 10.9 percent have only education at the lower secondary level. 96.3 percent of the sample is born in 1986.[11] The data include information on several other individual and parental characteristics that is not reported in the table but included in the analysis below, including immigration status, father's education, parents' labor market status, and whether the mother and father live together. Our school variables include the number of students and the number of study tracks at the school. In addition we have indicators for the study track the individual was enrolled into when starting upper secondary education.

Almost 50 percent of the students enroll in a study track that qualifies for enrolment in universities. The upper secondary schools have on average around 530 students and approximately 6 different study tracks.

In order to analyze the impact of individual and family background variables on dropout and propensity to deviate from expected progression in upper secondary schools, our starting point is to estimate variates of the following linear probability model.[12]

$$P_{ij} = \beta_1 X_i + \beta_2 G_i + \beta_3 Y_j + \varepsilon_{ij} \quad (1)$$

In most of the specification estimated, the dependent variable, P_{ij} is a dummy variable equal to unity if student i enrolled at school j in the fall 2002 is not in the third grade in the fall 2004, either at school j or another upper secondary school, i.e., P denotes the probability to deviate from expected progression in the beginning of the third year of upper secondary education . We also estimate models where the dependent variable is a dummy variable for dropout or a dummy variable for grade repetition. X is a vector of individual and family characteristics, G is the average grade in lower secondary school, and Y is a vector of characteristics of the school for which the student enrolled in the fall 2002, including dummy variables for labor market region. In further variants of the model we replace the school characteristics by upper secondary school fixed effects or lower secondary school fixed effects.

It is of interest to compare our model with the education production function approach. In an empirical education production function, a standard value added model measures student

[11] Grade repetition in lower secondary school does not take place in Norway. 2.0 percent of the sample is born in 1985, which is mostly due to delayed school start. 0.8 percent is born before 1985. They are likely to be dropouts from lower secondary education that have returned to get the lower secondary degree. 0.9 of the sample is under-aged (born in 1987) because they started school one year earlier than normal.

[12] We have also estimated probit models, but he marginal effects for mean values of the independent variables are very close to the results from the linear model. The results are available on request.

performance as achievement instead of progression, and then the effect of past performance is large, i.e. β_2 is close to unity. When the outcome variable is progression, however, as in the present paper, the expected effect of β_2 is not straightforward. Regarding dropouts, an essential issue is the student's destination when leaving upper secondary education. If the student's destination is an ordinary job, and the local labor market is tight, students with high grades are likely to have better job opportunities, which partially increases the likelihood that such students drop out relatively to students with low grades and few labor market opportunities. Regarding the second component of the outcome variable, grade repetition, it is important to note that this mostly involves students changing study track. Suppose a student changes study track because he/she obtain new information regarding during the first year of upper secondary education. New information and corresponding change in track may not be related to his/her performance at lower secondary education. Thus, at the outset, the relationship between lower secondary performance and the probability to drop out or repeat a grade in upper secondary education is an empirical question. Our main hypothesis is, however, that students lack progression because they do not master the subjects, and then either drop out or change study track.

5. Empirical results

Table 2 presents the estimation results. The table focuses on the effect of skills, gender, mother's education,[13] and characteristics of the upper secondary school for which the student enrolled the first year. Consider first as a benchmark column (1), where the average grade in lower secondary school is excluded from the model. This specification produces large effects from individual and family characteristics. According to the estimates, the conditional probability for lack of progression is 4.6 percentage points higher for boys than for girls. This is about half of the raw difference, which is mainly due to the conditioning on academic track in column (1). Girls generally tend to enroll in tracks with better progression than boys. Regarding mother's education, all effects are negative when compulsory lower secondary education is the reference category. The differences between the categories of non-compulsory education are, however, relative small. What matters is to have a mother with more than compulsory education, and the effect is 8-10 percentage points. As to the school variables, the results show that lack of progression is on average highest in small upper secondary schools and in schools with many study tracks.

[13] The effects of father's education are slightly lower than the effects of mother's education, but the effects are qualitatively similar, see Appendix Table A1.

Column (2) in Table 2 includes the student's average grade in lower secondary school as an explanatory variable. Full results for this model are presented in Appendix Table A1.[14] When average grade is included, R^2 increases from 0.17 to 0.27. A rise in the average grade of one unit, which is slightly above one standard deviation, increases the probability of normal progression with as much as 22.6 percentage points. This mirrors Figure 2A. Thus, the model more or less reproduces the raw correlations between lower secondary school performance and the propensity to deviate from expected progression. This means that conditioning on individual and family characteristics, upper secondary school characteristics, and dummy variables for regional labor markets, does not at all influence the overall relationship between student achievement and progression.

On the other hand, when the student's average grade is included in the model, the effects of all other explanatory variables drop considerably. The effect of gender does, in fact, change sign. The direct effect of gender is in favor of boys and statistically significant at conventional levels. For given average grade from lower secondary school and choice of study track, the probability of expected progression is 1.4 percentage points higher for boys. The fact that boys have lower progression in the raw data is due to their low achievement in lower secondary schools. Regarding mother's education, there is no difference between students with mothers with compulsory lower secondary education and a master degree, but the progression is 2-4 percentage points better for the medium educational levels. The effect of the characteristics of the upper secondary schools, the number of students and the number of study tracks becomes, insignificant.[15]

As pointed out in the introduction, the effect of prior academic performance on the propensity to drop out from upper secondary school may be biased if students are sorted systematically across schools. In an attempt to control for such sorting, columns (3) and (4) in Table 2 include a full set of fixed effects for upper and lower secondary schools, respectively. The results in column (3) can be interpreted as the estimated impact of individual and family variables for students exposed to the same school environment in upper secondary education. Thus, this version should account for unobserved teacher and peer quality differences across these schools. Similarly, column (4) reports the estimated impact of individual and family variables for students coming from the same lower secondary school. This should account for possible differences in grading practices in lower secondary schools. Interestingly, the inclusion of fixed school effects does not alter the estimated impact of the included student specific variables in the model. We cannot rigorously determine whether this is due to

[14] The effects of the family background variables are mainly as expected. There are strong beneficial effects of parents living together and parents' labor market participation. However, the effects of immigration status, conditional on average grade and parents' education, are weak. The dummy variables for regional labor market are jointly highly significant.

[15] The effects of the dummy variables for regional labor market are jointly highly significant also in this model.

characteristics of the schools being unimportant, or whether the included variables are uncorrelated with unobserved school characteristics. Some indication of the importance of the schools may be inferred from the change in R^2, keeping in mind that R^2 has non-standard properties in a linear probability model. There is a relatively small increase in R^2 when school effects are included, at least compared to the change when average grade is included. Excluding all variables except the school fixed effects, R^2 is as low as 0.05 and 0.10 when dummy variables for lower and upper secondary schools are included, respectively. If anything, this suggests that the effect of school characteristics on dropout probability and grade repetition is relatively small.

Another way to judge the importance of schools versus other variables is to compare the distribution of the effects of individual schools in different models. As a benchmark, we choose the distribution of the fixed upper secondary school effects when no other variables are included in the model. The dotted line in Figure 4 shows the benchmark distribution, while the solid line shows the distribution of the fixed school effects in the model with a full set of individual characteristics estimated in column (3) in Table 2. The fixed effects are scaled to have the sample mean of lack of progression, and the figure presents densities weighted with the number of students at school. The figure shows that the distribution of lack of progression across upper secondary schools can partly be explained by the individual student characteristics. Combined with the fact that R^2 in the model including only upper secondary school fixed effects is only 0.10, while the full model has an R^2 equal to 0.27, the results imply that the schools are of relative little importance with regard to students progression.

The final column of Table 2 includes fixed effects both for lower and upper secondary schools. This neither affects the coefficients reported in the table. The F-values for joint significance of the fixed effects are 1.59 and 2.50 for lower and upper secondary schools, respectively, which are both highly significant.

As a robustness check, we decompose the overall lack of progression into dropouts and grade repetition. Table 3 reports the results from the separate models for each of these components. The effect of the student's average grade in lower secondary school is of similar magnitude in the two models. Above, we found that conditional on performance in lower secondary school, the overall probability of deviating from expected progression was lower for boys than for girls. Splitting the dependent variable into the two components shows that this is due to more grade repetition among girls. The effect of mother's education on lack of progression, on the other hand, is only related to the dropout behavior. As shown in Appendix Table A1, the same pattern for father's education. Students with better educated parents have lower dropout probability.

6. Discussion and concluding remarks

Our results show that the most important determinant of progression in non-compulsory secondary education is the skill level of the students at the end of compulsory schooling measured by their average grade. Thus, one main policy implication of our analysis is that the most effective way to reduce dropout in upper secondary school is to improve the skills acquired in compulsory schooling. For example, the gender difference in dropout observed in the raw data is solely related to the fact that boys have lower achievement in compulsory schooling than girls. In addition, the importance of parental background is relatively small when we condition on prior academic achievement. The difference between the dropout probabilities for students having a mother with master degree compared to those having a mother with only compulsory education completely disappears when prior achievement of the students is included in the model.

A tricky question is to what extent high level of dropouts and grade repetition in upper secondary education should be regarded as an important problem for society. Regarding dropouts, the answer depends critically on the destination of the students that drop out. If the destination is ordinary jobs one should not be too worried, while destination for welfare and unemployment most likely will imply rapid depreciation of human capital and lower employment and income opportunities throughout life. In future research, we will expand the data with information on destinations for the students that drop out in order to give a more complete picture of the economic consequences of high dropout rates on society. In addition, we will be able to analyze whether the dropouts return to schools in order to complete their education.

Delayed progression due to grade repetition or transfer to another study track is clearly costly for both the individuals and the society since the individual loses at least one year of potential labor income while the government has to pay the educational costs for one additional year. On the other hand, changes in study track may increase the student's productivity and expected future labor income if the new track better matches his/her ability. We leave more detailed analysis of determinants and consequences of grade repetition to future research.

The European Union benchmark regarding completion of upper secondary education is related to 22-age-olds, while the analysis in the present paper only follows the individuals to the age of 18. The cohort we have used in the present paper is 22 years of age in 2008. In the future we will also analyze updated data in order to investigate determinants of completed upper secondary education at age 22. In addition, we plan to investigate the transition from upper secondary education to the labor market or higher education. The vocational tracks are mainly designed as an education qualifying for directly for jobs, so most of the students with

this type of education should be in ordinary jobs at the age 22. The academic track is mainly designed as a preparation for higher education, and it will be interesting to investigate the transition from upper secondary education to universities.

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Table 1. Descriptive statistics

	Observations	Mean	Std. dev.
Lack of progression	52,447	0.276	.
Dropout	52,447	0.135	.
Grade repetition	52,447	0.141	
Average grade in lower secondary education	51,223	3.91	0.83
Boy	52,447	0.515	.
Mother's education			
Lower secondary	52,447	0.109	.
Upper secondary	52,447	0.576	.
Bachelor (up to 4 years of higher education)	52,447	0.257	.
Master or PhD (above 4 years of higher education)	52,447	0.033	.
Education missing	52,447	0.026	.
Born in 1986	52,447	0.963	.
Academic track	52,447	0.481	.
Number of students at upper secondary school enrolled	52,251	529	274
Number of study tracks at upper secondary school enrolled	52,251	5.66	3.02

Table 2. Determinants of lack of progression. Linear probability models

	(1)	(2)	(3)	(4)	(5)
Average grade in lower secondary education	-	-0.229 (51.5)*	-0.229 (53.0)*	-0.237 (52.5)*	-0.237 (53.8)*
Boy	0.070 (14.6)*	-0.014 (3.35)*	-0.013 (2.95)*	-0.016 (3.78)*	-0.015 (3.28)*
Academic track	-0.195 (25.1)*	-0.058 (8.47)*	-0.056 (6.77)	-0.050 (7.37)*	-0.047 (5.70)*
Mother's education: Upper secondary	-0.080 (11.1)*	-0.039 (6.01)*	-0.038 (5.97)*	-0.034 (5.44)*	-0.035 (5.52)*
Mother's education: Bachelor	-0.111 (13.5)*	-0.024 (3.26)*	-0.025 (3.48)*	-0.018 (2.51)	-0.020 (2.80)*
Mother's education: Master or PhD	-0.097 (7.72)*	0.008 (0.66)	0.001 (0.06)	0.017 (1.48)	0.008 (0.76)
Mother's education: Missing	0.031 (1.48)	0.014 (0.81)	0.015 (0.83)	0.013 (0.72)	0.012 (0.68)
Number of students at upper secondary school * 1000	-0.092 (4.16)*	-0.020 (1.18)	-	-0.016 (1.06)	-
Number of study tracks at upper secondary school	0.008 (4.76)*	0.002 (1.57)	-	0.001 (1.06)	-
Fixed effect for upper secondary school (No of schools)	No	No	Yes (461)	No	Yes (461)
Fixed effects for lower secondary schools (No of schools)	No	No	No	Yes (1,141)	Yes (1,141)
Observations	52,251	51,156	51,156	50,833	50,833
R^2	0.155	0.258	0.277	0.287	0.302

Note. t-values adjusted for clustering at upper secondary school are reported in parentheses. * indicates significance at one percent level. In addition to reported variables, the models include dummy variables for father's education, year of birth, immigration status, civil status of father and mother, labor market status of father and mother, and labor market region. The full model results for models (2) and (5) are reported in Appendix Table A1.

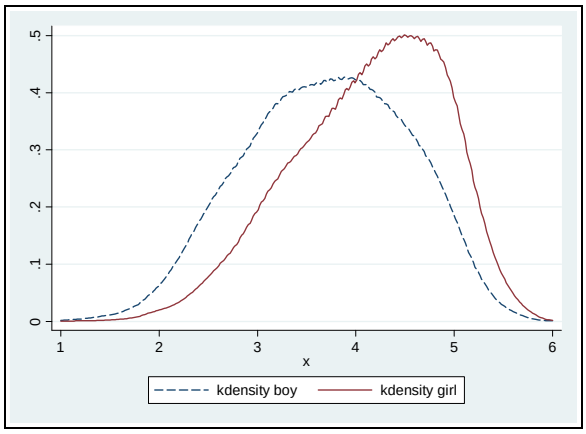
Table 3. Determinants of dropout and grade repetition. Linear probability models

	(1)	(2)	(3)	(4)
Dependent variable	Dropout		Grade repetition	
Average grade in lower secondary education	-0.106 (29.1)*	-0.110 (29.1)*	-0.123 (40.5)*	-0.127 (40.2)*
Boy	-0.001 (0.18)	-0.004 (1.19)	-0.014 (4.30)*	-0.010 (3.20)*
Academic track	-0.067 (13.5)*	-0.069 (11.4)*	0.009 (1.65)	0.022 (3.45)*
Mother's education: Upper secondary	-0.032 (5.12)*	-0.031 (4.91)*	-0.006 (1.09)	-0.004 (0.70)
Mother's education: Bachelor	-0.027 (3.94)*	-0.027 (3.91)*	0.003 (0.54)	0.007 (1.08)
Mother's education: Master or PhD	-0.007 (0.74)	-0.008 (0.93)	0.015 (1.53)	0.017 (1.72)
Mother's education: Missing	-0.004 (0.28)	-0.004 (0.25)	0.019 (1.12)	0.017 (0.96)
Number of students at upper secondary school * 1000	-0.009 (0.66)	-	-0.011 (1.04)	-
Number of study tracks at upper secondary school	0.001 (0.49)	-	0.002 (1.56)	-
Fixed effects for lower secondary schools (No of schools)	No	Yes (461)	No	Yes (461)
Fixed effect for upper secondary school (No of schools)	No	Yes (1,141)	No	Yes (1,141)
Observations	51,156	50,833	51,156	50,833
R^2	0.127	0.176	0.103	0.149

Note. t-values adjusted for clustering at upper secondary school are reported in parentheses. * indicates significance at one percent level. In addition to reported variables, the models include dummy variables for father's education, year of birth, immigration status, civil status of father and mother, labor market status of father and mother, and labor market region. The full model results for models (2) and (4) are reported in Appendix Table A1.

Figure 1. The distribution of average grades in lower secondary education

A. Girls and boys



B. Progression

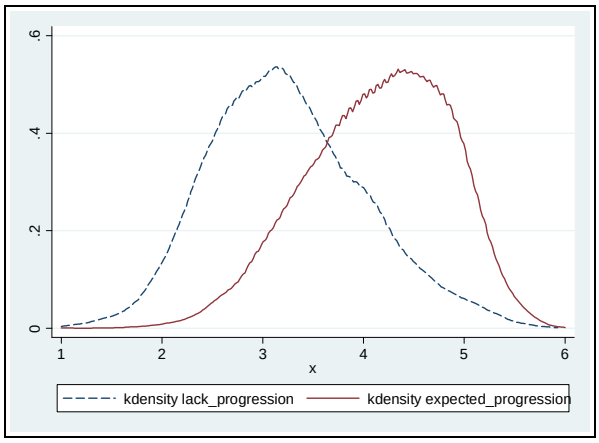
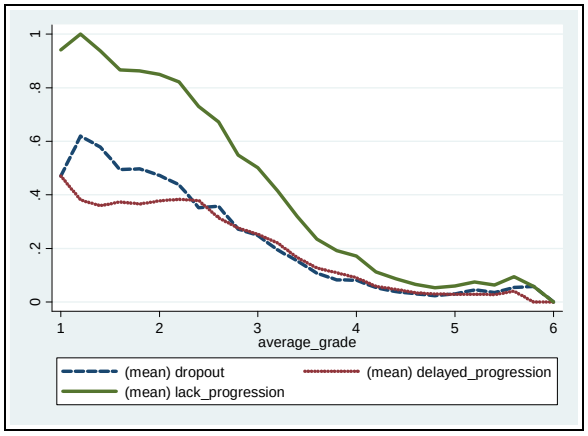


Figure 2. Average grade and lack of progression

A. Type of lack of progression



B. Gender differences

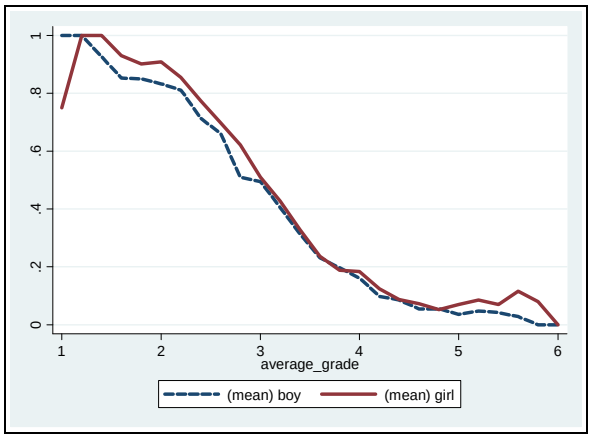


Figure 3. Density of lack of progression at the school level

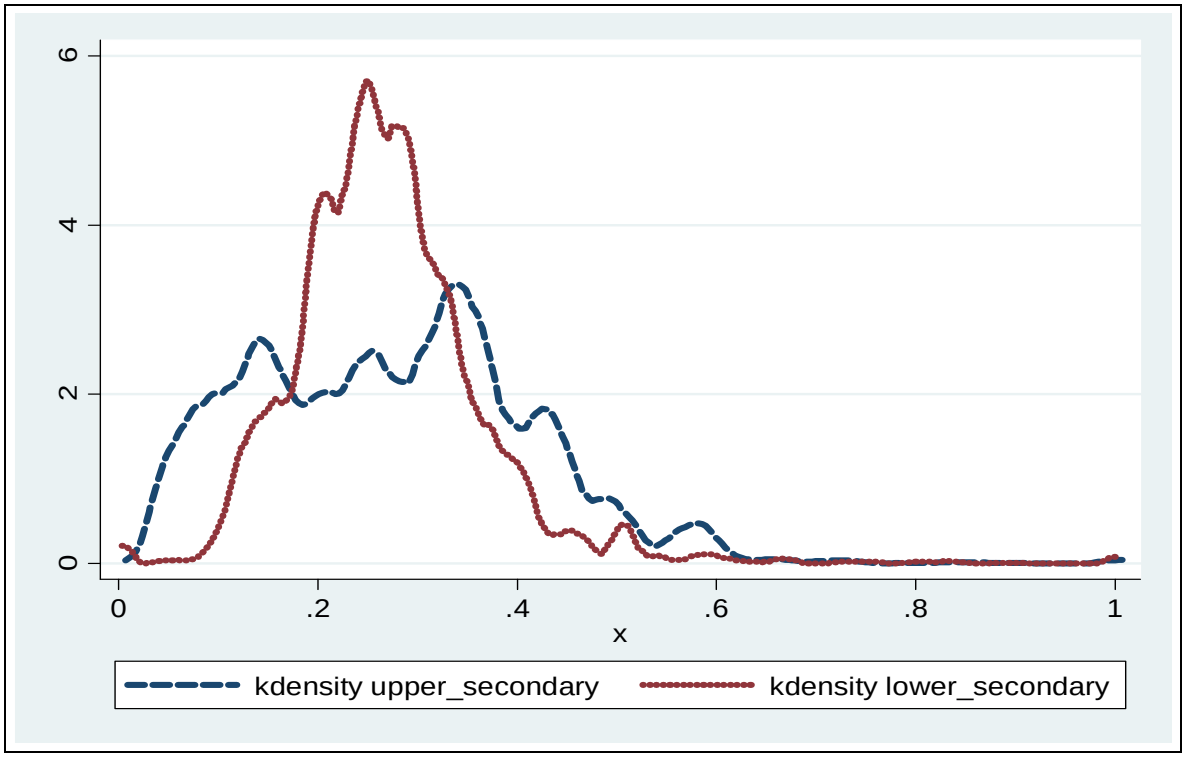
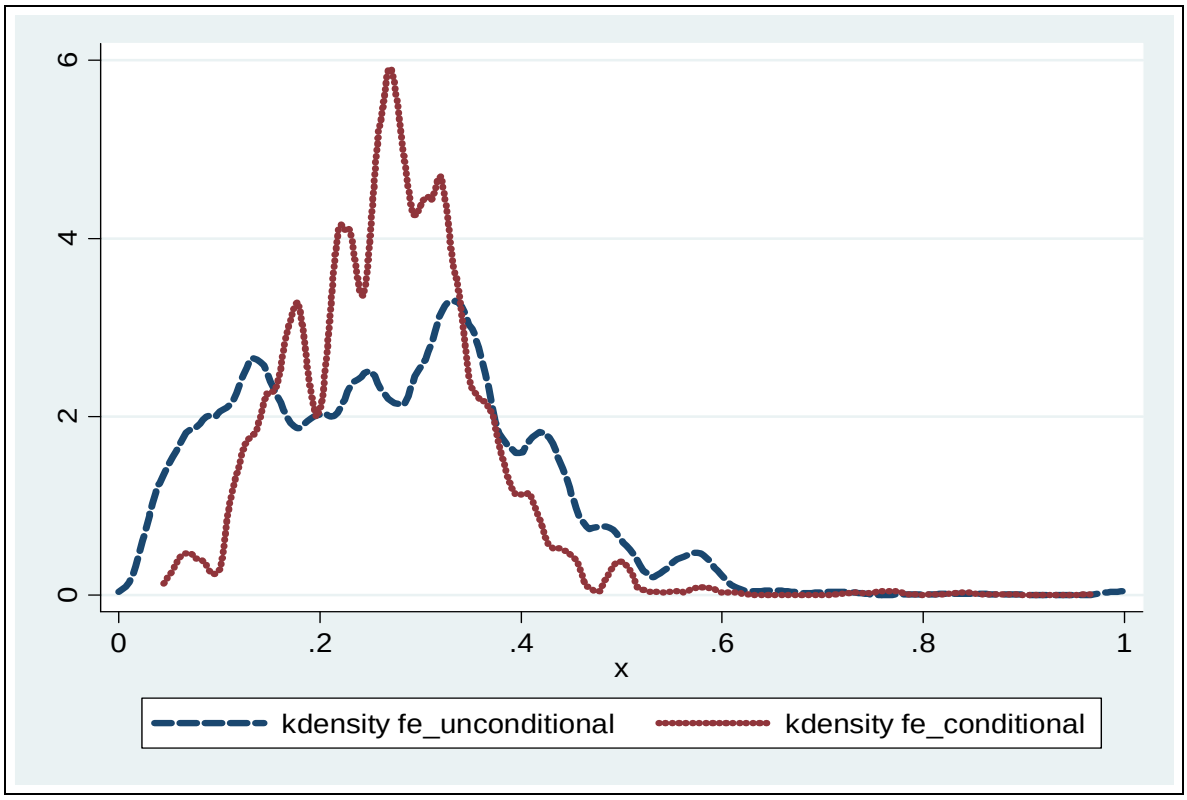


Figure 4. Density of conditional and unconditional fixed effects for upper secondary schools



Appendix Table A1. Full results

	(1)	(2)	(3)	(4)
Dependent variable	Lack of progression		Dropout	Grade repetition
Average grade in lower secondary education	-0.229 (51.5)*	-0.237 (53.8)*	-0.110 (29.1)*	-0.127 (40.2)*
Boy	-0.014 (3.35)*	-0.015 (3.28)*	-0.004 (1.19)	-0.010 (3.20)*
Academic track	-0.058 (8.47)*	-0.047 (5.70)*	-0.069 (11.4)*	0.022 (3.45)*
Mother's education: Upper secondary	-0.039 (6.01)*	-0.035 (5.52)*	-0.031 (4.91)*	-0.004 (0.70)
Mother's education: Bachelor	-0.024 (3.26)*	-0.020 (2.80)*	-0.027 (3.91)*	0.007 (1.08)
Mother's education: Master or PhD	0.008 (0.66)	0.008 (0.76)	-0.008 (0.93)	0.017 (1.72)
Mother's education: Missing	0.014 (0.81)	0.012 (0.68)	-0.004 (0.25)	0.017 (0.96)
Father's education: Upper secondary	-0.022 (3.64)*	-0.017 (2.96)*	-0.021 (4.04)*	0.004 (0.81)
Father's education: Bachelor	-0.015 (2.05)	-0.010 (1.35)	-0.013 (2.15)	0.003 (0.53)
Father's education: Master or PhD	0.011 (1.47)	0.018 (2.30)	-0.005 (0.86)	0.023 (3.63)*
Father's education: Missing	-0.005 (0.36)	-0.001 (0.06)	-0.017 (1.43)	0.016 (1.26)
Immigrant from western country, first generation	0.029 (1.02)	0.027 (0.94)	0.039 (1.54)	-0.012 (0.49)
Immigrant form western country, second generation	0.051 (1.02)	0.050 (1.00)	0.035 (0.89)	0.015 (0.42)
Immigrant from non-western country, first generation	-0.031 (2.95)*	-0.032 (2.95)*	-0.028 (2.66)*	-0.005 (0.46)
Immigrant form non-western country, second generation	-0.025 (1.63)	-0.021 (1.29)	-0.039 (3.03)*	0.018 (1.56)
Live with mother and not with father	0.061 (11.7)*	0.060 (11.5)*	0.024 (5.64)*	0.035 (7.75)*
Live with father and not with mother	0.043 (4.86)*	0.042 (4.69)*	0.016 (2.20)	0.026 (3.44)*
Does not live with either father or mother	0.075 (10.6)*	0.070 (9.76)*	0.029 (5.41)*	0.041 (6.44)*
Mother working full time	-0.043 (8.76)*	-0.038 (7.76)*	-0.021 (5.27)*	-0.017 (4.06)*
Mother working part time	-0.039 (6.99)*	-0.038 (6.59)*	-0.024 (5.17)*	-0.014 (3.18)*
Mother self-employed	-0.029 (3.26)*	-0.028 (3.20)*	-0.014 (1.87)	-0.015 (1.90)
Father working full time	-0.034 (6.42)*	-0.029 (5.49)*	-0.017 (3.68)*	-0.012 (2.45)
Father working part time	-0.011 (1.10)	-0.006 (0.62)	0.001 (0.01)	-0.006 (0.71)
Father self-employed	-0.037 (4.97)*	-0.036 (4.93)*	-0.020 (3.12)*	-0.016 (2.44)

	(1)	(2)	(3)	(4)
Born before 1981	-0.036 (0.45)	-0.011 (0.08)	0.119 (0.58)	-0.130 (0.66)
Born in 1981	0.092 (0.74)	-0.262 (1.14)	-0.243 (3.94)*	-0.019 (0.10)
Born in 1982	-0.056 (0.64)	-0.300 (2.45)	-0.053 (0.40)	-0.267 (2.78)*
Born in 1983	-0.060 (0.88)	-0.149 (1.07)	-0.010 (0.08)	-0.138 (1.22)
Born in 1984	0.099 (1.79)	0.099 (1.79)	-0.066 (0.91)	0.153 (1.63)
Born in 1985	0.093 (6.18)*	0.095 (6.39)*	0.060 (4.28)*	0.035 (2.53)
Born in 1987	0.056 (3.09)*	0.034 (1.97)	0.022 (1.83)	0.012 (0.85)
Number of students at upper secondary school * 1000	-0.020 (1.18)	-	-	-
Number of study tracks at upper secondary school	0.002 (1.57)	-	-	-
Regional labor market specific effects, F-value, F(89, ≈460)	14.4	2.12	3.05	2.34
Fixed effects for lower secondary schools (No of schools)	No	Yes (461)	Yes (461)	Yes (461)
Fixed effect for upper secondary school (No of schools)	No	Yes (1,141)	Yes (1,141)	Yes (1,141)
Observations	51,156	50,833	50,833	50,833
R^2	0.258	0.302	0.176	0.149

Note. t-values adjusted for clustering at upper secondary school are reported in parentheses. * indicates significance at one percent level.