How Important is Secondary School Duration for Post-school Education Decisions? Evidence from a Natural Experiment

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Abstract

This paper investigates how post-school education decisions are affected by a one-year reduction of secondary school duration with an unchanged curriculum. Until recently, Germany had had a longstanding tradition of 13 years of schooling in preparation for university. During the last decade, however, most states abolished the 13th year. The implementation of the reform in 2003 in the state of Saxony-Anhalt provides a natural experiment for identification. Based on data from the double cohort of graduates, our estimates show significant effects of the reform. Affected female students in particular significantly delay university enrollment by one year, show a slightly lower participation in university education overall and are more likely to start a vocational education course. We can also reveal effect heterogeneity with respect to the fields of study. Due to the reform the probability of affected males studying mathematics or natural sciences is significantly reduced.

Keywords: school duration, learning intensity, education decision, natural experiment, Germany

JEL Classification: I21, J18, C21

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1 Introduction

In order to enable the earlier labor market participation of university graduates, the overall duration of higher secondary schooling has been reduced in Germany by one year. Until recently, (West) Germany had possessed an educational system with 13 years of mandatory schooling for obtaining the university admittance qualification *(Abitur)* for more than 50 years.[1] During the last decade, most federal states decided to abolish the 13th year while keeping academic requirements for final graduation constant, i.e. the curriculum was not to be changed. Since schooling is administered by the federal states, the reform was not implemented nationwide, but was left to the discretion of the states. This was one of the most fundamental and most controversial reforms of the German school system in the recent past.

In the state of Saxony-Anhalt the reform was implemented in 2003, eliminating the 13th year of university preparatory secondary school (*Gymnasium*) for students enrolled in school year 9 at that time. This first cohort to be affected took the *Abitur* after 12 years in 2007 together with the last cohort graduating after 13 years. Since the reform was announced and implemented in a timely manner and the affected students had already been enrolled in secondary school for several years, assignment into treatment and control groups can be assumed as being random. This provides a clean natural experiment for analyzing the effects of shortening school duration with a maintained curriculum.

We analyze the impact of the reform on further education decisions, namely the enrollment decision and enrollment probability of post-secondary and, in particular, tertiary education. In general, education decisions of high-school graduates are influenced by a wide range of determinants (see section 2), such as individual ability or familial socioeconomic background. Quality and curriculum of secondary schooling are also recognized as relevant determinants of these decisions. However, little is known about the role of school duration or learning intensity for post-secondary education. This paper contributes to the literature by investigating the role of secondary school duration for post-school education decisions, and by examining the effects of a reduction of instructional time for further education outcomes.

The effects of the reform on the choice of post-secondary education are estimated by using primary data from the double cohort of graduates. We focus on the decision of starting a vocational education course and of studying at university. In addition, we consider the probability of dropping out of university or vocational education in the empirical analysis. As a third aspect, we examine the choice of a specific field of study. Fields of study are categorized into three areas (humanities and educational sciences; social and economic sciences; and science, technology, engineering and mathematics - the so-called STEM subjects), which cover almost the entire range of academic subjects. Since female and male students differ with respect to school education (see, for example, Green and Oxford, 1995; De Bellis et al., 2001) and post-secondary education decisions (see, for example, Buchmann et al., 2008; Vincent-Lancrin, 2008;

[1] The duration of 13 years of university preparatory schooling was introduced in the 1920s, shortened to 12 years in 1936, but reintroduced with the founding of the Federal Republic of Germany in 1949.

Zafar, 2009), gender differences are considered in the estimation approach. After estimation of a simple discrete choice model we also estimate interacted effects in order to investigate effect heterogeneity according to students' cognitive abilities.

Shortening secondary school duration could have an effect through at least two channels: the first one, a *performance effect*, works through learning intensity. Because the curriculum was kept constant, students were faced with a higher learning intensity, i.e. they had to learn the same curriculum in a shorter time, having to learn more curriculum content per unit of instructional time. Büttner and Thomsen (2010) have shown that this fact negatively affects students' skills and achievement in mathematics. The second effect works through age or duration of schooling and represents an *orientation effect*. Since students affected by the reform graduated from school at a younger age, they had less experience of life and one less year (in school as well as in leisure) to discover their talents and occupational interests. This could have adverse effects on post-school education decisions in the sense that they were less oriented than students with 13 years of schooling.

The empirical findings show that the reform of shortening secondary school duration has affected post-school education decisions. Females decide less often to study at university in the first year after graduation and delay university enrollment by one year. For females with higher cognitive ability this effect is even more pronounced. Moreover, this effect is quite persistent. Affected females still show lower enrollment at university even in the second year after graduation. Regarding the whereabouts of the affected females, the reform has increased the probability of females starting a vocational education course in the German apprenticeship system. Although this effect is only slightly significant, it remains constant over the period analyzed. In addition, this effect is driven by students with lower cognitive ability. Regarding the drop-out probabilities, only initial indications can be observed, namely a slight increase in the probability of dropping out of university education. With respect to the choice of the field of study, we find further reform effects. The probability of studying social and economic sciences slightly increases for females. For the field of natural science, technology, engineering and mathematics no significant effect is identified on the whole, but the reform significantly reduces the probability for males of studying mathematics and natural sciences by about 15 percentage points.

The remainder of the paper is structured as follows. Section 2 provides a short overview of the relevant literature. The German education system, the reform and the natural experiment are presented in section 3. A description of the data is provided in section 4. Section 5 presents the empirical strategy and results. Some robustness checks are contained in section 6. The paper concludes with a discussion of the results and a conclusion in sections 7 and 8.

2 Related Literature

There are only a few examples in the literature recognizing the influence of school duration or learning intensity on further education decisions. By analyzing the effects of the introduction of

two short school years in German primary schools in 1966/67, which was characterized by the reduction of schooling of about two-thirds of a year and a notably increased learning intensity, Pischke (2007) finds a negative effect of the reform on further track choice, namely a significant decline in the proportion of students subsequently attending intermediate secondary school track. Llach et al. (2009) show that prolonging school days in Argentinian primary schools in 1971 had a positive effect on the graduation rate of secondary schools. They identify positive as well as negative effects on tertiary education, concluding that it is not instructional time per se, but rather its content which is decisive.

The importance of upper secondary schooling for post-secondary outcomes is further investigated by a number of studies analyzing the effects of an education reform in the Canadian province of Ontario, where the last year of high school was eliminated in 1999. Krashinsky (2006) identifies a significant and robust negative effect of the reform on students' performance at university. Furthermore, he reports that the reform has significantly reduced wages of the graduates who received one year less schooling (Krashinsky, 2009); this effect persists two years after graduation for individuals with lower ability. Morin (2010) emphasizes that the marginal return to the last school year is small when only college-bound students are considered, which is evidence for heterogenous treatment effects across students with different ability levels.

Investigating the role of high school curriculum, Levine and Zimmerman (1995) found that taking more math classes can raise the probability of college enrollment and of choosing a technical field of study. Empirical evidence indicates some external validity that mathematical skills are important determinants of post-school education decisions (Paglin and Rufolo, 1990; Arcidiacono, 2004). Additionally, mathematical ability seems to be sensitive to changes in instructional time (Bellei, 2009; Büttner and Thomsen, 2010; Lavy, 2010; Lee and Barro, 2001; Marcotte, 2007; OECD, 2007).[2]

In addition to providing skills, a second important role of schooling is to help students in discovering their tastes and talents, thereby inreasing the match quality of further education and occupational decisions (Johnson, 1978; Malamud, 2011; Schultz, 1968). Although Malamud (2011) focuses on undergraduate students, the results may be indicative for higher secondary education, implying that shortening school duration can have adverse effects on further education outcomes not only through the channel of skills, but also through "worse" decision-making.

In theory, participation in post-secondary education can be seen as an investment in future returns (Becker, 1975), as a consumption good by providing a value per se (Kodde and Ritzen, 1984) or as a signal of the more productive individuals (Arrow, 1973). Theoretical approaches have worked out three major determinants of education decisions: expected returns and costs

[2]Several studies document a positive relationship between instructional time and performance in mathematics. Büttner and Thomsen (2010) find, on the basis of the same data used in this paper, a significant negative effect of shortening the length of secondary school on final achievement in mathematics. Marcotte (2007) shows that heavy snowfall, which reduces the number of school days, reduces examination scores especially in mathematics. Bellei (2009) finds that prolonging school days in Chilean high schools increased students' achievement in mathematics. Furthermore, Lee and Barro (2001), OECD (2007) and Lavy (2010) report a positive impact of instructional time on performance in mathematics and science. However, it should be mentioned that not all studies find a causal relationship between instructional time and achievement in mathematics (Skirbekk, 2006; Wössmann, 2010).

of a specific level of education as well as the expected probability of successfully completing it (Becker, 1975; Boudon, 1974; Breen and Goldthorpe, 1997; Erikson and Jonsson, 1996). The expectations are formed on the basis of personal characteristics (e.g. ability, preferences), previous achievement and experiences in school, and family background characteristics (e.g. parental income and education).

Post-secondary education decisions can be explained as a two-step procedure. In a first stage, high-school graduates decide between several tracks, in particular university education, vocational education, or entering the labor market without continuing education. The second step involves the choice of a specific occupation or field of study.

With respect to the first stage of the decision, it is confirmed by empirical studies that university enrollment is more likely (compared to vocational education) the higher current and future benefits of university education are assessed to be and the higher the personal probability of success is estimated to be (e.g. Becker, 2000). In contrast, the anticipated costs associated with tertiary education have a negative effect on enrollment probability (e.g. Fuller et al., 1982; Becker and Hecken, 2007). Family background, such as parents' education level, social status or financial resources, has a substantial influence on students education in general (Björklund and Salvanes, 2010) and on tertiary educational choice in particular. High school graduates from privileged families are more likely to opt for university education, although this influence operates directly and indirectly through several channels (Becker, 2000; Kodde and Ritzen, 1988).

Further determinants for participating in post-secondary education are, for example, labor market conditions (Becker, 2000), geographical accessibility to institutions of tertiary education (Sa et al., 2004) or peer group effects, which means that the decisions of at least some high school graduates are influenced by the decisions of their schoolmates (Fuller et al., 1982). Additionally, high school or regional effects could also be relevant.

With respect to choosing a specific field of study, Arcidiacono et al. (2012) find that expected earnings and students' abilities are important determinants. Their estimation results from a model of choice probability, which depends on expected utility, difficulty of coursework and career preferences, show that students prefer first of all to study a subject that they are good at. Mathematical ability is found to be much more important than verbal ability (Paglin and Rufolo, 1990; Arcidiacono, 2004). Other relevant factors influencing the choice of the field of study are preferences and tastes, in particular enjoying coursework at university and work at potential jobs, as well as parents' approval. Differences in these preferences can explain a large fraction of observed gender gaps across fields of study (Zafar, 2009).

3 The Education Reform

3.1 Schooling and Post-school Education in Germany

The education system in Germany is the responsibility of the federal states. However, there are only minor differences between the states. In general, students are enrolled in primary school

at the age of six and attend this school in most states for four years. Afterwards, students are assigned, according to their performance, to one of three types of secondary schooling. The basic secondary school (*Hauptschule*) and the intermediate school (*Realschule*) provide schooling through to grade 9 or 10. After completion, graduates from these schools usually begin a vocational education course, mostly an apprenticeship. The highest level of secondary school, which prepares for university, is the grammar or high school (*Gymnasium*). Until recently, it contained nine years of schooling through to the 13th grade and leads to the university admittance qualification (*Abitur*).[3]

Having obtained the university admittance qualification, German high school graduates can choose between two main courses of post-secondary education.[4] On the one hand, they can study at a university or at a university of applied sciences (*university education*). On the other hand, there is the possibility to start a vocational training course in the German apprenticeship system (*vocational education*).[5] The German apprenticeship system is fairly unique compared to most other countries, but is acknowledged as providing high quality education (see, for example, OECD, 2010).[6] An apprenticeship consists of practical on-the-job training in a company or an institution where the trainee is employed, along with attendance at a part-time vocational school. It is important to note that vocational education does not belong to tertiary but rather to secondary education. The apprenticeship degree corresponds to an ISCED qualification level of 3 (UNESCO, 1997). In contrast, tertiary education is defined as enrollment at a university or university of applied sciences. In this study, professional colleges are also considered as a part of tertiary education.[7] According to UNESCO (1997), degrees from professional colleges belong to an ISCED qualification level of 5B, whereas degrees from universities and universities of applied sciences are assigned to 5A (qualifications of 5B are shorter and more occupation-specific than those of 5A).

In Germany, nearly 85% of high school graduates are enrolled in university education (about 65% at universities, 15% at universities of applied sciences, and 5% at professional colleges). This share is significantly higher for males than for females, and also significantly higher in West Germany than in East Germany. In addition, almost 25% of high school graduates start

[3]After the German political reunification in 1990, the existing West German school system was adopted by the former East German states, where the university entrance qualification had previously been achieved after 12 years of schooling. However, two East German states, Saxony and Thuringia, retained the 12-year graduation policy.

[4]Until 2011, males were principally obliged to engage in military or civilian service for nine months, which was mostly carried out immediately following high school graduation.

[5]In addition to these two options, there are a small number of education possibilites at professional colleges or schools, which represent a kind of intermediate stage between vocational and university education.
Entering the labor market directly without further education is another possibility after completion of secondary school, but is chosen only by very few high school graduates.

[6]Several occupations, which require university education in many countries are qualified in Germany through vocational training. Therefore, international rates of university enrollment are only partly comparable to those of Germany.

[7]Whether professional colleges can be considered as universities has not been clearly established. However, the *Kultusministerkonferenz* (KMK, a conference consisting of the Secretaries of Education and Cultural Affairs) decided to equate the accredited Bachelor degrees from professional colleges to those from universities of applied sciences (Kultusministerkonferenz, 2004).

a vocational education course.[8]

3.2 Implementation of the Reform

The debate on the elimination of the 13th year of the *Gymnasium* was supported mainly by the observation that German university graduates were older than their counterparts from other countries, which was the result of a longer duration of schooling and a longer university curriculum. Additionally, the observation that students from Saxony and Thuringia, the federal states with the 12-year *Gymnasium*, achieved above-average scores in comparative assessments (e.g. PISA), raised the question of whether it was possible to abolish one school year without the loss of skills. Moreover, the pressure on Germany to reform its education system was increased by the Bologna Declaration, which was signed in 1999 by the countries of the European Union in order to create a European Higher Education Area by 2010 that includes the adoption of the academic degrees (Bachelor, Master, and Doctorate).

Saxony-Anhalt was the first German state which implemented the education policy reform that shortened the length of secondary schooling by one year. The reform was announced and introduced in 2003 within a few months. The first students to be affected by the change, i.e. graduating after 12 years of schooling, were in the ninth grade at the beginning of the 2003/2004 academic year. Students in grade ten at that time were unaffected by the reform, which means that they were the last cohort graduating after 13 years of schooling. In April and June 2007, Saxony-Anhalt students in the 12th grade (henceforth referred to as G12) and the 13th grade (G13) participated together in the same final examinations.[9] The reform included the elimination of the 13th year for G12 students, holding academic requirements for final graduation constant. The course of instruction of the eliminated year was distributed throughout the other grades. Hence, students affected by the reform had to learn the same curriculum in less time. This implies a significant increase in the learning intensity, which is the central effect of the reform. In addition to the increased learning intensity, one could imagine that affected students had fewer possibilities for revising the subject matter or that the curriculum could not be taught in the necessary depth.

3.3 The Natural Experiment

Shortening secondary school duration in Saxony-Anhalt provides a natural experiment[10], which allows us to identify the causal effects of a substantial variation of learning intensity and school duration on several education outcomes. The causal effect is the change in the outcome of interest, which is only due to the reform. For estimating this effect, it is fundamental that the

[8] Data provided by the Higher Education Information System (HIS), in addition to Spangenberg et al. (2011). Note that these numbers refer to several years after secondary school graduation; two years after graduation, as in this paper, numbers are thus lower. Note also that some individuals enroll in university education as well as in vocational education one after the other.

[9] Currently, all German states except one have decided to eliminate the last year of secondary schooling. The *Kultusministerkonferenz* (KMK) accentuated the importance: "The responsible handling of the lifetime and the educational time spent by young people is of central concern" (Kultusministerkonferenz, 2008).

[10] An overview of the analysis of natural experiments is provided by Meyer (1995).

treatment and control groups do not differ systematically, with the exception of being affected by the reform.

For the policy reform in Saxony-Anhalt, the assignment of students to the treatment group (G12) and to the control group (G13) can be assumed to be random, for at least two reasons. Announcement and implementation of the reform took place within five months. Furthermore, the affected students had already been enrolled in secondary school for a number of years and simply received the notification without being required or having the option to initiate any actions.

Nevertheless, there may be some concerns with respect to the *internal validity* of the natural experiment. Inferences would be limited if a selection bias between both groups were present. This could be the case if students (or their parents) evaded the reform, for instance by moving to a different state within Germany. However, this is not very likely, since the opportunity costs of such a move would be very high, in particular given the rapid implementation of the reform. Moreover, many parents were familiar with the shorter school duration of twelve years, which had existed in Saxony-Anhalt until 1997.[11] Another possibility for students to avoid the reform could be commuting to a school in a neighboring state, but this option is also unattractive, because for the sample analyzed in this paper the closest border is quite far away (about 50 km). If there had been a selection bias, however, this should be observable when comparing the pre-treatment characteristics of the sample.

After having established that internal validity is fulfilled, the question of *external validity* of the natural experiment arises. At first, the generalizability of the results could be impaired if the sample used in the study were not representative for the basic population. This question will be addressed in the robustness analysis (section 6.1). Another obstacle could be the existence of transition or learning effects, which means that teachers needed some time to gain experience in coping with the increased instructional requirements. In this case the reform effects could diminish for subsequent cohorts. However, while for some teachers this might be relevant, the majority of teachers in Saxony-Anhalt had previously been involved in the old 12-year graduation policy, making implementation effects less likely. Finally, the reform effects may differ across institutional environments. Although the East German states were more familiar with the 12-year graduation policy than the states in West Germany, only slight differences exist between the education systems of the federal states. Therefore, we conclude that the reform effects presented in this study are of quite general significance.

[11] In the former German Democratic Republic, to which Saxony-Anhalt had belonged to, the university admittance qualification was achieved after 12 years of schooling. After German reunification in 1990, Saxony-Anhalt maintained this policy at first, but then introduced the 13-year graduation policy in 1997. In 2003 they decided to return to 12 years.

4 The Data

4.1 The Sample

The empirical analysis is based on primary data gathered from 724 students of the 2007 double *Abitur* cohort from a sample of 12 secondary schools in Saxony-Anhalt. The estimation sample includes 363 students from the treatment group (G12) and 361 students from the control group (G13). It contains more female students (63%) than male students (37%), which is not due to different response rates, but rather to an increasing share of female students participating in university preparatory schooling.[12]

The survey questionnaire contained about 100 questions regarding students' personality, family background, education career, experiences in school and post-school education decisions. With respect to the latter, the questionnaire covers the first 21 months after school graduation. A description of the items collected by the questionnaire is provided in the appendix. The questionnaires were sent to the graduates from the double *Abitur* cohort by mail in February and March 2009.

The reform effects on post-school education decisions are measured by several outcome variables. For the probability of enrollment in university education and in vocational education we consider the overall decisions using binary outcome measures in a first step. In order to capture potential differences in the time pattern, we also use dummy variables indicating participation in both types of post-school education at four distinct points in time when the respective semester was already underway: November 2007, May 2008, November 2008 and March 2009.

The second aspect of interest is choice of the field of study, which is only investigated for persons being enrolled in university in March 2009, because information on subjects of study was only collected for this point in time. Due to the fact that some subjects are only studied by a small number of people, and due to the possibility that respondents were allowed to report more than one subject, three broader fields of study are defined: (1) humanities and educational sciences (which include, for example, cultural studies, languages, pedagogy, social work), (2) social and economic sciences (including, for example, business administration, economics, law, political science, sociology), and (3) technical and natural sciences (the so called STEM[13] subjects, which include, for example, computer science, engineering, mathematics, natural science).

4.2 Descriptive Statistics

Mean values of selected variables are provided in Table 1. Schooling achievements are presented once at year 7 and once at final graduation (*Abitur*). The first group reports achievement before the reform was implemented, whereas the latter is affected by the reform. The average grade in year 7 is considered as a proxy of general intellectual capability, whereas the grade in

[12]The Federal Statistical Office of Saxony-Anhalt reports for 2007 that 8,717 female students from a total of 14,756 students obtained the university admittance qualification, which corresponds to a share of 59% (Statistisches Landesamt Sachsen-Anhalt, 2011).

[13]The acronym STEM is an abbreviation for science, technology, engineering and mathematics.

mathematics is taken into account because of its specific importance for education decisions. Grades in year 7 do not show significant differences, which strengthens the assumption of a natural experiment. Contrary to grades in year 7, performance at final graduation[14] indicates differences between cohorts. The performance in mathematics is significantly lower for affected female and male students, which has been identified by Büttner and Thomsen (2010) as being a causal negative reform effect. With respect to average grade, only female students from the treatment group have significantly lower achievement, whereas there is only a small difference for male students. With respect to the chosen subject focus in upper secondary school,[15] the probability of having mathematics or science as an advanced course is slightly lower for G12 students, but not statistically significant.

In the lower part of Table 1, some variables related to students' family background are presented. Educational background of parents or siblings are maybe the most important determinants of one's own decision on enrollment at university or in vocational education. But only a few insignificant differences can be observed with respect to the occupational qualification of parents or an academic degree of siblings. Moreover, the number of books at home, which is accepted as another good indicator of parental education (Fuchs and Wössmann, 2007), is not significantly different between groups. Female G12 students are less likely to have parents who have been unemployed for some time. However, this variable plays a minor role, since many people in East Germany have experienced unemployment at least once during their working life.

Altogether the variables on students' characteristics and background[16] do not indicate systematical differences between the treatment and control groups, and therefore confirm the assumption of a natural experiment.

Insert Table 1 about here

Figures 1 - 6 show the participation rates in post-secondary education up to 21 months after school graduation.[17] These descriptive results provide initial indications for the effects of the reform. Affected female students are less likely to enroll in university at all considered points in time, although the difference is only significant for the first year after graduation. On the other hand, they are more likely to participate in vocational training (mostly in an apprenticeship). For male students there are hardly any differences, except for an insignificantly higher share of students in vocational education in the second year. In the first year after graduation, males are notably less likely to be enrolled in post-secondary education, but this is due to military or

[14] Normally, grades in upper secondary schooling in Germany range from 15 (excellent) to 0 (failed), whereas grades up to year 9 or 10 run in the other direction, ranging from 1 (excellent) to 6 (failed). For the sake of comparability and uniformity, all grades are presented according to the 1-6-scale, i.e. lower grades indicate higher achievement.

[15] In the last two years of secondary school, students had to choose two subjects, which were studied at an advanced level, whereas all other subjects were studied at a basic level.

[16] Büttner and Thomsen (2010) provide a more detailed discussion of background variables of the sample in use.

[17] Table A.1 in the appendix provides a tabulation of these outcomes.

civilian service of nine months, which was mandatory for males in Germany at that time. In the second year, university enrollment rates are quite similar for males and females and in line with other statistics, which report shares of about 70% for East German high school graduates (Heine et al., 2008; Heine et al., 2010; Spangenberg et al., 2011). With respect to the question of whether students participate in any post-school education, no significant differences between the treatment and control groups can be found. One and a half years after graduation, more than 90% are enrolled in post-school education.

Insert Figures 1 - 4 about here

The choice of a specific field of study of university students shows some differences across gender and G12/G13 groups. Overall, females decide more often to study humanities or educational sciences, whereas males are notably more often enrolled in mathematics, engineering and natural sciences. Affected students are more likely to study a subject from humanities or educational sciences. Social and economic sciences are more likely to be chosen by affected female students, but less likely by affected male students. Concerning the STEM subjects there is an insignificantly lower share of affected male students. All in all, the distribution of university subjects coincides with other statistics (Heine et al., 2008; BMBF, 2011; Spangenberg et al., 2011), which supports the representativity of the sample.

Insert Figures 5 and 6 about here

5 Empirical Results

5.1 Estimation Strategy

From the implementation of the reform, we can suppose that we face a clean natural experiment for the identification of the treatment effects. This perception is also sufficiently supported by the descriptive results presented above. Hence, we can estimate the treatment effect of shortening secondary schooling by comparing the outcomes of the G12 and G13 groups. Therefore, the above-mentioned differences indicate some reform effects. Nevertheless, several influencing variables should be considered in further empirical analysis in order to obtain efficient estimates of the reform effect.

The dependent variable in the following estimations is the probability of enrollment in (or dropping out of) a specific course of education, in particular university or vocational education, and the probability of choosing a given field of study. Besides the treatment, i.e. being affected by the reform, several exogenous variables, which influence post-school education decisions, are included in order to make estimates more efficient. First of all, grades in year 7 (average and mathematics) are used as proxies for cognitive ability. These grades are, contrary to final examination grades, unaffected by the reform. Secondly, the educational background of students' families is considered using dummy variables indicating whether at least one parent has an academic degree, whether at least one sibling has an academic degree and by the number

of books in the parental home. Furthermore, a variable indicating unemployment of parents at some time during students' childhood is included as well as age at school enrollment. For the estimation of the reform effect on the choice of the field of study, the subject focus chosen by the student in upper secondary school is considered additionally using a dummy variable which indicates whether at least one of the subjects mathematics, physics or chemistry was chosen as an advanced course. Higher-education decisions are also influenced by labor market conditions, however, this is not regarded in the estimation procedure, because economic circumstances are the same for the treatment and control groups.

Since it is likely that the reform has affected male and female students differently, a gender variable is included in the pooled estimation, and separate estimations for male and female students are carried out as well.

Post-school education decisons are presumably influenced by school characteristics. Schools differ with respect to institutional characteristics, socio-economic background of the student body, quality of teaching or the regional location. The sample analyzed here contains 12 different schools, and therefore some unobserved heterogeneity across schools could exist. Due to the natural experimental setting, this does not have a systematic influence on the outcomes. Nevertheless, in order to obtain precise estimates, school-fixed effects capturing all variation between schools are included in the regressions. Similarly, peer group effects may be relevant, which means that education decisions of at least some students are influenced by the decisions of their schoolmates. In order to take this correlation of outcomes within classes into account and obtain consistent variance estimates, class-level clustering is implemented by applying a cluster-robust sandwich estimator of variance.

The treatment effect of the reform is then estimated using the following probit model

$$Prob(E_{i,c} = 1|D_i, X_i) = \Phi(\alpha_c + \beta_c D_i + \gamma_{j,c} + \delta_c' \mathbf{X}_i). \tag{1}$$

$E_{i,c}$ denotes the outcome of interest, i.e. enrollment of individual i in a specific type of education c (university education, vocational education). $Prob(E_{i,c} = 1)$ is then the probability of enrollment. D_i indicates the treatment, which is a binary dummy variable taking the value 1 if the individual is a G12 student (treatment group) and 0 if the individual is a G13 student (control group). β_c is the parameter of interest, from which the average treatment effect (ATE) is derived. The ATE denotes the average marginal change in the dependent variable that is solely due to the reform, i.e. the average change in the outcome E over all individuals if D is increased from 0 to 1, holding all other variables constant. $\gamma_{j,c}$ indicates the school-fixed effects of schools j, α_c is the constant, and $\mathbf{X}_i$ is a matrix including all other explaining variables, with the corresponding coefficient vector δ_c.

Secondly, we estimate the effect on the probability of dropping out using

$$Prob(O_{i,c} = 1|D_i, X_i) = \Phi(\alpha_c + \beta_c D_i + \gamma_{j,c} + \delta_c' \mathbf{X}_i). \tag{2}$$

Analogous to equation (1), $Prob(O_{i,c} = 1)$ indicates the probability of individual i to drop out

of a chosen type of education c (university education, vocational education).

Thirdly, the treatment effect on the above defined university subjects is estimated using

$$Prob(E_{i,m} = 1|D_i, X_i) = \Phi(\alpha_m + \beta_m D_i + \gamma_{j,m} + \delta'_m \mathbf{X}_i). \quad (3)$$

Here $E_{i,m}$ denotes enrollment of individual i in a specific field of study m (humanities and educational sciences, social and economic sciences, technical and natural sciences). It should be noted that equations (1) to (3) are estimated separately for each course of education and subject category.

Estimation of Interacted Effects

From estimating equations (1) to (3), we derive the average treatment effect of the reform. In order to shed light on effect heterogeneity with respect to ability differences, we can use grades in year 7 as proxies for students' cognitive ability. To obtain the reform effects for different ability levels, the estimation model is augmented by interaction terms between the treatment dummy and grades in year 7:

$$Prob(E_{i,c} = 1|D_i, X_i) = \Phi(\alpha_c + \beta_c D_i + \theta'_c[D_i \times Grade7_i] + \gamma_{j,c} + \delta'_c \mathbf{X}_i). \quad (4)$$

Since interaction effects in nonlinear models depend on other covariates (Ai and Norton, 2003), magnitude and significance of the interaction effects are identified by applying the findings of Norton et al. (2004). In addition, we run regressions of the models (1) to (3) separately for students with higher ability (indicated by good or very good average grade in year 7) and lower ability (indicated by satisfactory or lower average grade in year 7).

The Role of Final Examination Grades

In addition to the estimation model presented above, a further explaining variable for post-school education decisions is achievement in final examinations. For example, eligibility for specific fields of study at university depends in Germany on final examination grades. However, these grades are endogenous to the reform. To check their relevance, we have applied a linear instrumental variable estimation (2SLS) by using grade in year 7 as an instrument for the grade at final graduation. However, the obtained IV estimates as well as the application of a Durbin-Wu-Hausman test indicate that endogeneity is not likely to exist. Instead, a problem of multicollinearity is relevant. Final examination grades are not endogenous to an unobserved variable, but are associated with another explaining variable, namely the treatment dummy. As a consequence, the reform effect is then divided into both variables (treatment dummy and final grade). Therefore, we leave final examination grades out of the regressions and concentrate on the model presented above, in which the entire reform effect is captured by the treatment variable.

5.2 Enrollment in University and Vocational Education

University enrollment of females is negatively affected by the reform. Their probability of being enrolled at university (or at a university of applied sciences) at least once between October 2007 and March 2009 is significantly reduced by 0.07 on average (Table 2).[18] The reform effect becomes even more pronounced when considering the timing pattern of university enrollment (Table 3). The probability of females to be enrolled at university in the first year after *Abitur* graduation (i.e. November 2007 and May 2008) is significantly reduced by -0.08 and -0.10 on average (Table 3). In the second year after graduation, enrollment probability of affected females is still negatively influenced, although less significantly. For male students, the reform does not affect overall university enrollment.

Insert Tables 2 and 3 about here

The lower participation of females in university education is associated with a higher probability of starting vocational education. When affected by the reform, female students become more likely by 0.06 on average to start a vocational training course than in the reference situation (Table 4). Although this effect is insignificant with respect to the overall decision to start vocational education at least once between October 2007 and March 2009, it becomes significant for participation in May 2008, November 2008 and March 2009 (Table 5). For affected males there is no effect in the first year, but they are less likely to be enrolled in vocational education in the second year after *Abitur* graduation.

Insert Tables 4 and 5 about here

The coefficients of the control variables coincide with the expected direction and significance. On average, university studies require higher cognitive ability than vocational education. The parameter coefficient for grades in year 7, which can be interpreted as proxies for these ability differences, reflect this perception. Having only satisfactory (or worse) grades in year 7 significantly decreases the probability of university attendance, but increases the probability of participation in vocational training. Very good grades in year 7 work in the opposite direction. Grades in mathematics are more predictive than average grades, at least for female students. Coming from a family in which at least one parent has an academic degree significantly raises the probability of enrollment in university and significantly reduces the probability of starting a vocational education course, which is in line with the literature on the impact of parental education (Björklund and Salvanes, 2010). The other measure of parental education (books at parents' home) reveals a similar result. The probability of studying at university increases while the probability of participating in vocational education decreases with the number of parents' books.

Results from the estimation of interacted effects (not reported, available upon request) and from separate estimations for different ability levels (Tables A.2 and A.3 in the appendix)

[18] Estimation of equation (1) for enrollment at university at least once between October 2007 and March 2009.

indicate some heterogeneity in the treatment effects. Although females of all ability levels have a lower probability of university enrollment, the negative effect is significant and of greater magnitude for affected females with higher ability (i.e. having a very good or good average grade in year 7). On the other hand, the positive effect on vocational education is larger and only significant for females with lower cognitive ability (i.e. having an average grade in year 7 of satisfactory or below).

5.3 General Enrollment in Post-school Education and Voluntary Service

With respect to the question of whether *Abitur* graduates are enrolled in any post-school education (university and vocational education) at the four specific points in time, no significant effects are observed (results not shown). However, interacted effects and separate estimations for different ability levels yield the result that for affected females with higher cognitive ability, the probability of being enrolled in any post-school education in the first year after graduation is significantly reduced by -0.08 on average (compared to females with higher ability from the control group). For females with lower cognitive ability and males in general no significant effects can be observed.

The decision to undertake a voluntary year of social or ecological service is also affected by the reform. Although no effect can be observed for the whole sample, affected females with higher cognitive ability have a significantly higher probability of undertaking a year of voluntary service ($+0.10$), whereas this probability is significantly reduced by -0.08 for affected females with lower ability (see Table A.4 in the appendix).

5.4 Dropping out of Post-school Education

Besides enrollment decisions, persistence in the chosen course of education is another important outcome of interest. Although we can only look at the first two years after graduation from high school, initial indications can be observed.

Insert Tables 6 and 7 about here

The treatment effect on the probability of an individual dropping out of university education at least once up to March 2009 is positive, but small and only significant in the pooled sample (Table 6). It should be noted that only individuals leaving university are considered as dropouts. Individuals quitting their field of study and starting another one at university cannot be identified in the data. With respect to dropping out of vocational education only insignificant effects can be observed (Table 7).

5.5 Choice of the Field of Study

In a highly regulated labor market such as Germany, formal professional degrees are required for eligibility in the majority of occupations. Hence, the chosen subject area is of importance, since it is closely linked to future occupational careers. Due to the fact that it is difficult

to find a clear and generally accepted demarcation of university subjects, the reform effect is estimated separately for three larger fields of study, which are intended to cover the whole range of sciences, but allow sufficient differentiation with regard to occupational fields. These large fields are: humanities and educational sciences, social and economic sciences, and technical and natural sciences (STEM).

With respect to humanities and educational sciences, only small and insignificant effects are discovered (Table 8). The estimated coefficients show a slight increase of about 0.05 in the pooled and female samples, and a slight decrease of 0.03 in the male sample.

Insert Table 8 about here

The treatment effect on the choice of social and economic sciences (Table 9) is small and insignificant in the pooled and male samples, but for females, the reform has increased the probability of studying this field by 0.09, which is significant at the 10% level.

Insert Table 9 about here

The decision to study a STEM subject is not significantly affected by the reform, although the coefficient for male students is not inconsiderable. The probability is reduced by -0.04 in the pooled sample, but gender differences are apparent. For females there is nearly no effect, whereas the probability for male students decreases by -0.11 (Table 10). Nevertheless, all effects are insignificant. This could be due to the large proportion, particularly of male students, choosing this field of study (see Figure 6).

Insert Table 10 about here

Because of their specific relevance for labor supply and economic growth, the STEM subjects are investigated in more detail. Table 11 shows detailed results for mathematics, natural sciences and engineering. A significant treatment effect of -0.07 in the probability of studying science and maths is identified. In the female sample this effect is small (-0.03) and insignificant, but for males, there is a significant negative treatment effect of -0.15. With respect to engineering no significant effect of the reform can be identified. However, there is a slight increase in the probability of studying engineering by 0.09 for male students.

Insert Table 11 about here

A glance at the coefficients of the control variables confirms the important role of mathematical skills for post-school education decisions. Having a very good maths grade in year 7 significantly increases the probability of studying a STEM subject, but significantly decreases the probability of studying humanities. This effect is revealed especially in the male sample. Furthermore, having studied mathematics or natural science on an advanced level in upper secondary school operates in the same way, i.e. it increases the probability of choosing a STEM

subject, but decreases the probability of studying humanities. Interestingly, the education level of the family is not significantly important for the choice of the field of study.

Estimation of interaction effects (i.e. interacting treatment with average grade in year 7) and separate estimations for students with high or low ability (not reported) confirm the above-mentioned findings. Only the reform effect on studying mathematics and natural sciences includes some effect heterogeneity, namely that the effect mainly occurs for male students with lower cognitive ability.

6 Robustness Analysis

6.1 Representativity of the Sample

In order to evaluate the generalizability of the empirical results, it is important to check the representativeness of the sample. Are the students in the surveyed sample comparable to the whole population of high school graduates in Germany? In order to answer this question, we use the German Socio-Economic Panel (GSOEP) to compare students' characteristics in our sample. The comparison group is generated from the waves 2000 to 2008 of the GSOEP and consists of individuals below the age of 25 with a university admittance qualification. In order to consider regional differences, the comparison is carried out once with respect to Germany as a whole and once with respect to East Germany. The resulting GSOEP sample includes almost 3,000 observations (and 1,070 observations for the subsample of East Germany).

First, we compare the means of selected sociodemographic and family background characteristics from our student survey and from the GSOEP sample (see table A.6 in the appendix). It can be seen that quite a number of background variables do not show significant differences, for example school-leaving qualification or occupational position of the father. Other variables have similar means, although a very low p-value from t-test on equality of means or χ^2-test of independence is reported, for example country of birth or occupational degree of father. We suggest though that these statistically significant differences are not of economical significance. However, there are also background characteristics in which our sample is different from the GSOEP, but this can be explained by the fact that our sample is drawn mainly from an urban population, where the share of parents with higher education and occupational qualifications is above-average.

Secondly, in addition to the mean comparison, we merge our sample with the GSOEP and use this merged data set for estimation of a linear probability model

$$y_i = \alpha + \beta' \mathbf{X}_i + \varepsilon_i. \tag{5}$$

The dependent variable y_i is a dummy variable which indicates whether an observation belongs to GSOEP ($y = 1$) or to our student survey ($y = 0$). The matrix $\mathbf{X}_i$ contains the explaining background variables with the corresponding coefficient vector β. If our sample and GSOEP differ from one another, the coefficients will be expected to become significant. But as table A.7 shows, this is not the case. Only a few variables are significant. For instance, in the main

specification (1), where $\mathbf{X}_i$ contains family background variables, only the occupational degrees of the parents are significant, which reflects differences in labor market participation between West and East Germany and disappears when only East Germany is regarded.

As a third representativity check, we include sampling weights in the empirical analysis of this paper. Observations in our student survey are weighted according to their probability of being included in the GSOEP. As table A.8 shows, the reform effects remain mostly unchanged, although in some cases significance is becoming weaker.

Altogether, we conclude that our sample can be considered as being representative and that the presented results have some degree of general validity.

6.2 What Causes the Effects: Schooling or Age?

Since affected students not only have one year less schooling, but are also one year younger, the question arises as to whether the reform effect is mainly a *schooling effect* or an *age effect*? In order to investigate this issue, the analysis is focused on students who are not very different with respect to age but have a different number of years of schooling. Hence, regressions are run for the subgroup of students born in 1988.[19] One half of this subgroup consists of the younger G13 students (born on or before 30 June), and the other half consists of the older G12 students (born after 30 June). The age difference in this subgroup is much smaller than in the original sample and is not larger than the age difference within each of the G12 and G13 cohorts.[20]

Results are shown in table A.9 in the appendix. The magnitude and significance of the treatment effects with respect to university education and university subjects are nearly the same as before.[21] The only difference is with respect to enrollment in vocational education. The reform effect for females disappears, whereas a significant effect for males appears. However, the significant effect for males only occurs for the overall decision, but not for enrollment in a vocational education course at the different points in time. Furthermore, the significant effect is based only on a small number of observations and is probably due to a certain degree of heterogeneity within the G12 and G13 cohorts.

With respect to females, we conclude that the reform effect on vocational education can be partly referred to an age effect. Descriptive statistics of the female sample show that in the G13 cohort, 25% of the older students (born in 1987) and 32% of the younger students (born in 1988) start a vocational education course, whereas the respective values for the G12 cohort are 35% (older students, born in 1988) and 36% (younger students, born in 1989). This shows that between the G12/G13 cohorts as well as within each cohort the younger students are more likely to start a vocational education course than the older students.[22] This is in

[19] The cut-off birth date for a school year in Germany is 30 June. Hence, G13 students are mostly born between July 1987 and June 1988, whereas G12 students are born between July 1988 and June 1989.

[20] Similar approaches are applied, for example, by Krashinsky (2006) and Morin (2010).

[21] Results with respect to drop-out probabilities are not shown because of the small number of observations for these outcomes.

[22] We also ran separate regressions for the G12 and G13 cohorts. The outcomes are regressed on a dummy variable, which takes the value 1 if a student was born in the first four months of the academic year (i.e. born between July and October of the year in question) and 0 if the student was born in the last four months (between

line with other empirical studies, such as Bedard and Dhuey (2006), Crawford et al. (2010) or Fredriksson and Öckert (2005), which find that older students within a cohort show better education outcomes than younger students, even beyond secondary schooling, for example by having a higher probability of enrolling in college.

7 Interpretation and Discussion of the Results

The empirical findings presented in this paper reveal a mixed picture. Affected females are more likely to delay university enrollment, less likely to start university education, and more likely to start a vocational education course than they would have been with one more year of schooling. Affected males are significantly less likely to choose an university subject from mathematics or natural sciences. But how can these effects be explained and interpreted?

As mentioned in the introduction, we can decompose the reform effect into two channels, namely the *performance effect* and the *orientation effect*. Even though we cannot identify them empirically, the overall picture of results suggests that the reform effects on females' enrollment decisions are likely to be due to the *orientation effect*. A strong argument for this conclusion is the observation that enrollment decisions of affected males are not influenced by the reform, which could be due to the fact that most of them had one year more to make their decisions on post-secondary education (due to compulsory military or civilian service). The relevance of the orientation effect is further supported by the finding that affected females with *higher* ability are significantly more likely to use the "bonus" year for voluntary service or other activities (e.g. spending a year abroad). Moreover, the orientation effect may be intensified by the generally higher risk aversion of females with respect to education and occupational decisions (see, for example, Dohmen et al., 2005; Lörz et al., 2011, p. 40).

The question of whether the enrollment decisions are also affected by the *performance effect* cannot yet be answered with the available data. It is possible that university applications of affected (female) students were more frequently rejected due to the lower achievements at final graduation (see Table A.5 in the appendix). However, universities in Saxony-Anhalt increased the number of study places for graduates from the double *Abitur* cohort in order to avoid this problem (University Magdeburg, 2007). In addition, students had sufficient possibilities to study at a university in one of the surrounding federal states, which did not had a double cohort of graduates at that time. Nevertheless, the orientation effect seems to be more relevant for explaining the results.

Although final and comprehensive conclusions cannot yet be drawn, some doubts arise as to whether the objective of the reform, namely to provide earlier labor market participation of university graduates, will be achieved. The slight increase in the probability of dropping out of university education is in line with expectations, since affected students had one less year to discover their tastes and talents. However, weak significance and the short observation period suggest that this result should be interpreted with caution.

March and June). The results from these regressions support the findings discussed so far.

Regarding the field of study, the *performance effect* can explain the findings. No reform effect is found for humanities, which might be due to the fact that for them verbal and writing skills, which were not affected by the reform (Büttner and Thomsen, 2010), are much more important than mathematical abilities. The same may hold for social sciences. In contrast, STEM subjects are presumably most sensitive to the reform. Although this subject group as a whole is not affected, a significant negative causal effect on the probability of males studying mathematics or natural science is identified. Moreover, this effect remains stable in the robustness checks. It seems likely that the negative treatment effect on final examination grades in mathematics (Büttner and Thomsen, 2010) has further influenced the decision to study these subjects. Male students from the treatment group may have switched from the more sophisticated natural sciences to the more application-oriented engineering subjects. Hence, a performance effect driving the reform effect may be the most plausible explanation.

8 Conclusion

The important role of secondary schooling for further education choice is based on its contribution to the formation of human capital and to the discovery and development of aptitudes and concepts of life. Therefore, time spent in school is, besides family background, perhaps the most relevant factor in predicting post-school education and occupational outcomes, which is confirmed by the literature. We have empirically investigated the effects of a large school reform that took place in the German state of Saxony-Anhalt between 2003 and 2007, which reduced the duration of upper secondary schooling by one year but left the curriculum unchanged. The implementation of the reform provides a clean natural experimental setting, which allows us to analyze the effects of reduced school duration and increased learning intensity by comparing the outcomes of affected and non-affected students in terms of several post-school education decisions.

Our findings show that some but not all decisions are affected by the reform. Affected female students significantly delay university enrollment by one year and also show a lower participation in university education overall. Furthermore, there is an increase in the probability of females being enrolled in vocational education. This greater likelihood remains constant over the two years following *Abitur* graduation. In addition, the probability of dropping out of university education is slightly increased by the reform. Further heterogeneity in the effects of the reform is revealed with respect to the field of study. Females are more likely to choose social and economic sciences. The area of technical and scientific subjects (STEM) is not significantly affected as a whole, but the probability of studying mathematics or natural sciences is significantly reduced for male students affected by the reform.

By and large, the results presented in this study indicate that shortening the duration of secondary school education has some adverse effects on post-school education decisions, at least in the short-term. This emphasizes the fact that instructional time and learning intensity are relevant for subsequent choices of education. With respect to the reform in Germany,

policymakers as well as decision-makers in schools are well advised to focus on the contents of secondary education in order to ensure that future G12-graduates will have the same capabilities and are equally prepared for vocational and academic education as the former G13-graduates. Furthermore, care should be taken to ensure that the shortened school duration sufficiently includes academic and occupational orientation, since insecurity regarding future decisions as well as skill deficits at school graduation have adverse effects on further education outcomes.

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Tables and Figures

Table 1: Means of Selected Characteristics by Year and Gender

	Female			Male		
	Year 12	Year 13	p-value[a]	Year 12	Year 13	p-value[a]
Schooling achievements						
Schooling achievements until reform						
Age at school enrollment	6.12	6.19	0.06	6.22	6.23	0.89
Average grade in year 7[b]	2.15	2.20	0.35	2.25	2.35	0.14
Mathematics grade in year 7[b]	2.33	2.29	0.57	2.12	2.19	0.48
Schooling achievements at graduation						
Average grade at graduation[b]	2.43	2.33	0.06	2.55	2.51	0.53
Mathematics grade at graduation[b]	3.30	3.11	0.04	3.35	3.08	0.02
Mathematics or science as advanced course[c]	0.40	0.47	0.14	0.71	0.77	0.25
Family background						
Occupational degree of father (categorial)						
No occupational training	0.01	0.00		0.00	0.00	
Apprenticeship training	0.60	0.60		0.58	0.53	
University / university of applied sciences	0.35	0.34		0.36	0.41	
PhD	0.05	0.06	0.89	0.06	0.07	0.71
Occupational degree of mother (categorial)						
No occupational training	0.01	0.02		0.00	0.01	
Apprenticeship training	0.55	0.53		0.63	0.49	
University / university of applied sciences	0.40	0.42		0.34	0.45	
PhD	0.05	0.03	0.56	0.04	0.05	0.13
Further occupational characteristics of family[c]						
Academic degree of at least one sibling	0.19	0.23	0.34	0.18	0.14	0.35
Unemployment of at least one parent[d]	0.41	0.50	0.05	0.45	0.46	0.87
Number of books of parents (categorial)						
0 to 100	0.26	0.27		0.32	0.30	
101 to 500	0.51	0.54		0.37	0.39	
More than 500	0.23	0.19	0.52	0.31	0.32	0.93
N	221	233		142	128	

[a] p-value from t-test on equality of means; for categorial variables: p-value from Pearson χ^2-test of independence.
[b] Grades range from 1 (excellent) to 6 (failed), i.e. lower grades indicate higher achievement.
[c] Dummy variables: 0 (no), 1 (yes).
[d] Occurence of unemployment during years until reform.

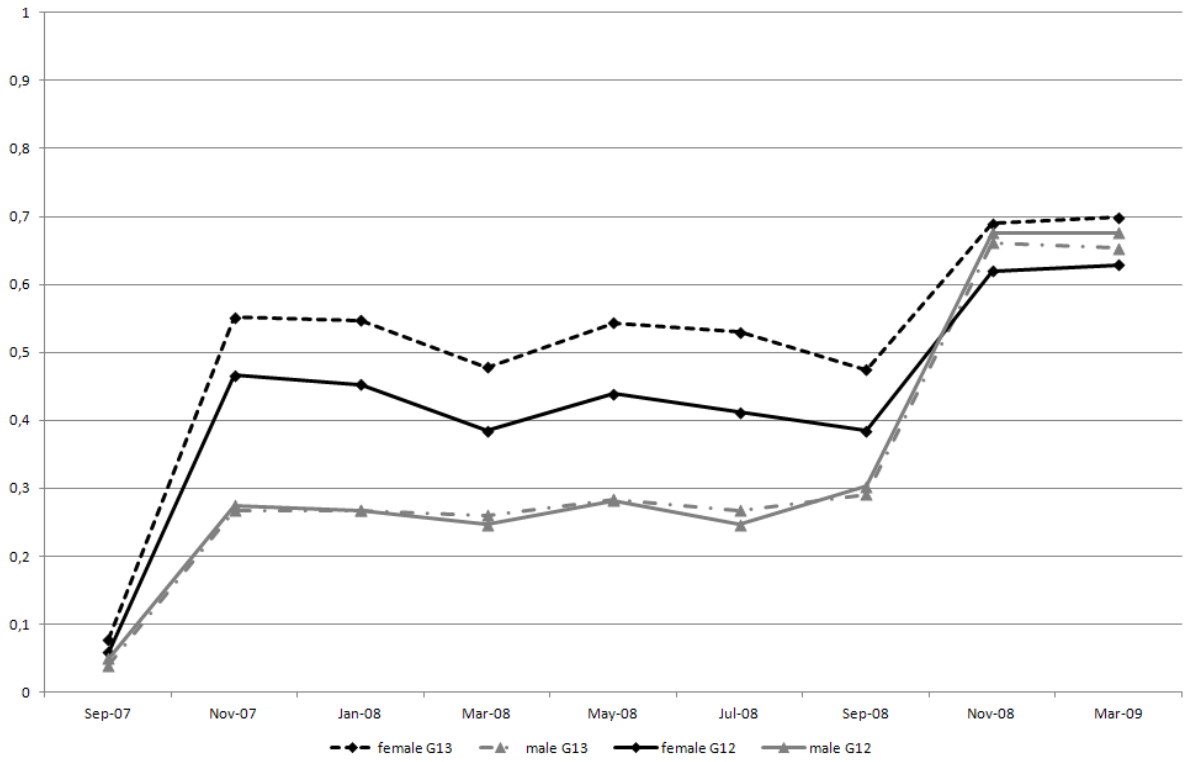

Figure 1: Share of Students in University Education, September 2007 - March 2009

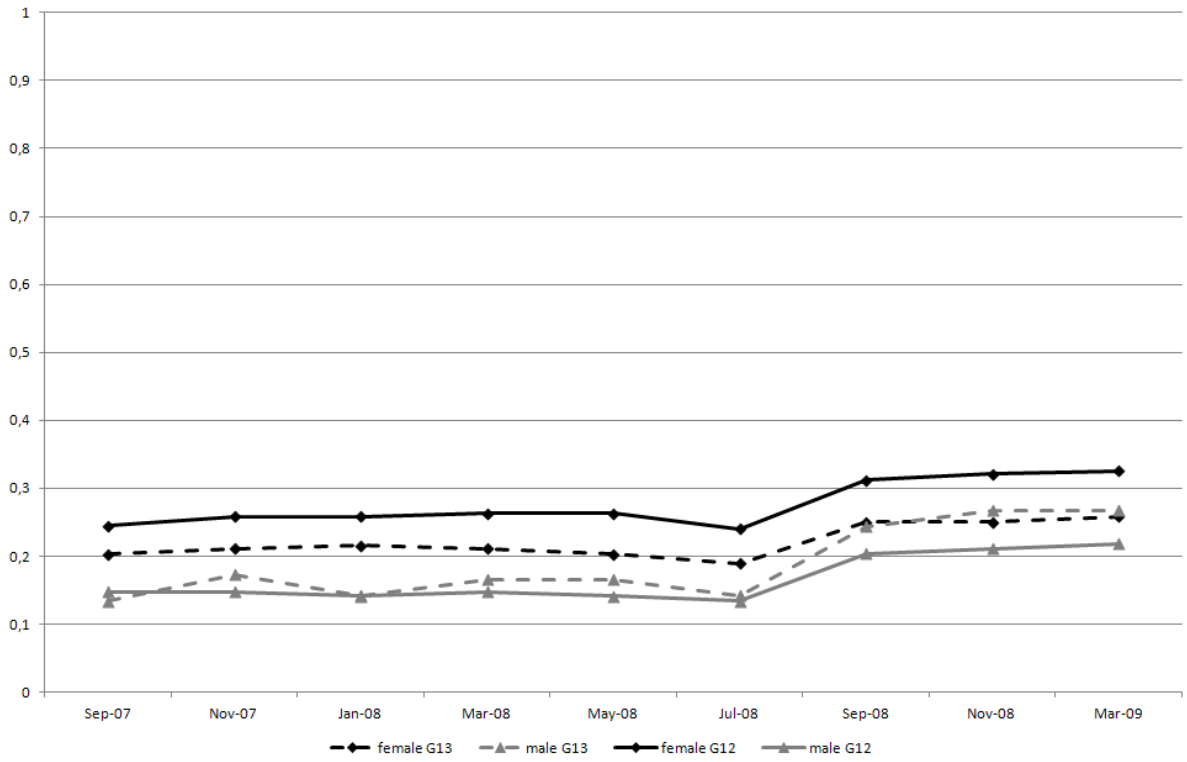

Figure 2: Share of Students in Vocational Education, September 2007 - March 2009

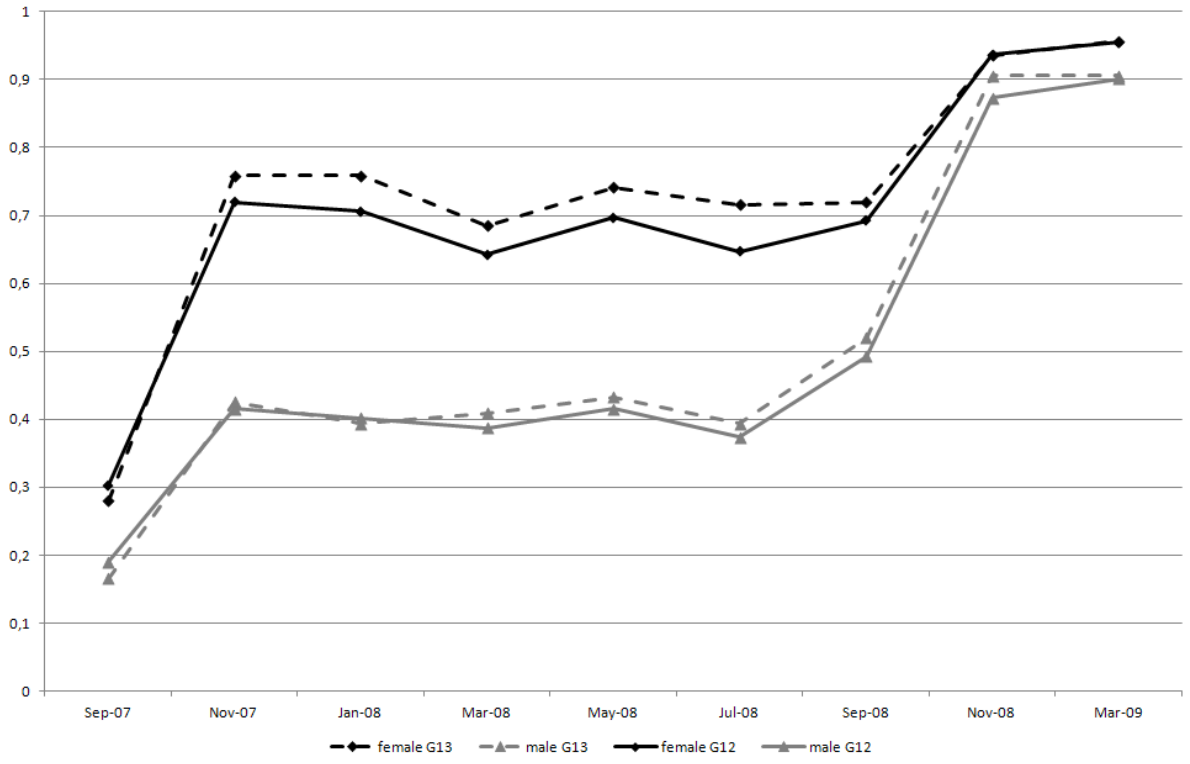

Figure 3: Share of Students generally enrolled in Post-school Education, September 2007 - March 2009

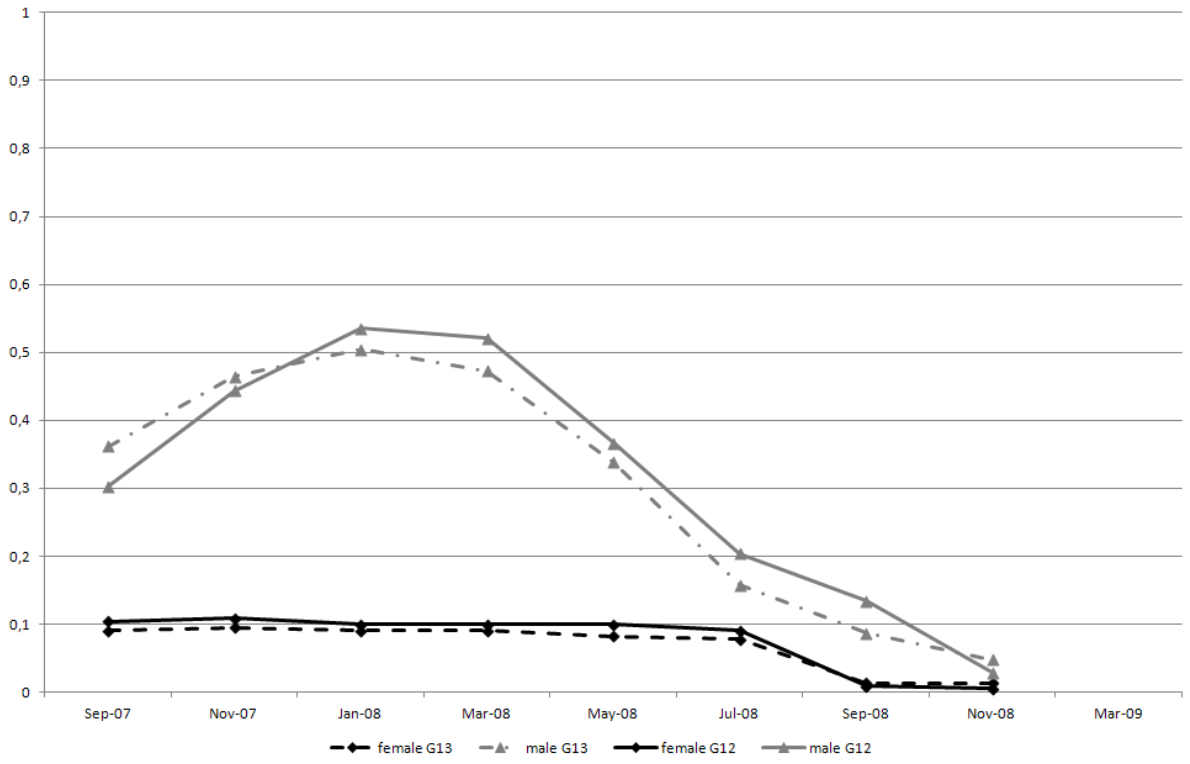

Figure 4: Share of Students carring out Military, Civilian or Voluntary Service, September 2007 - December 2008

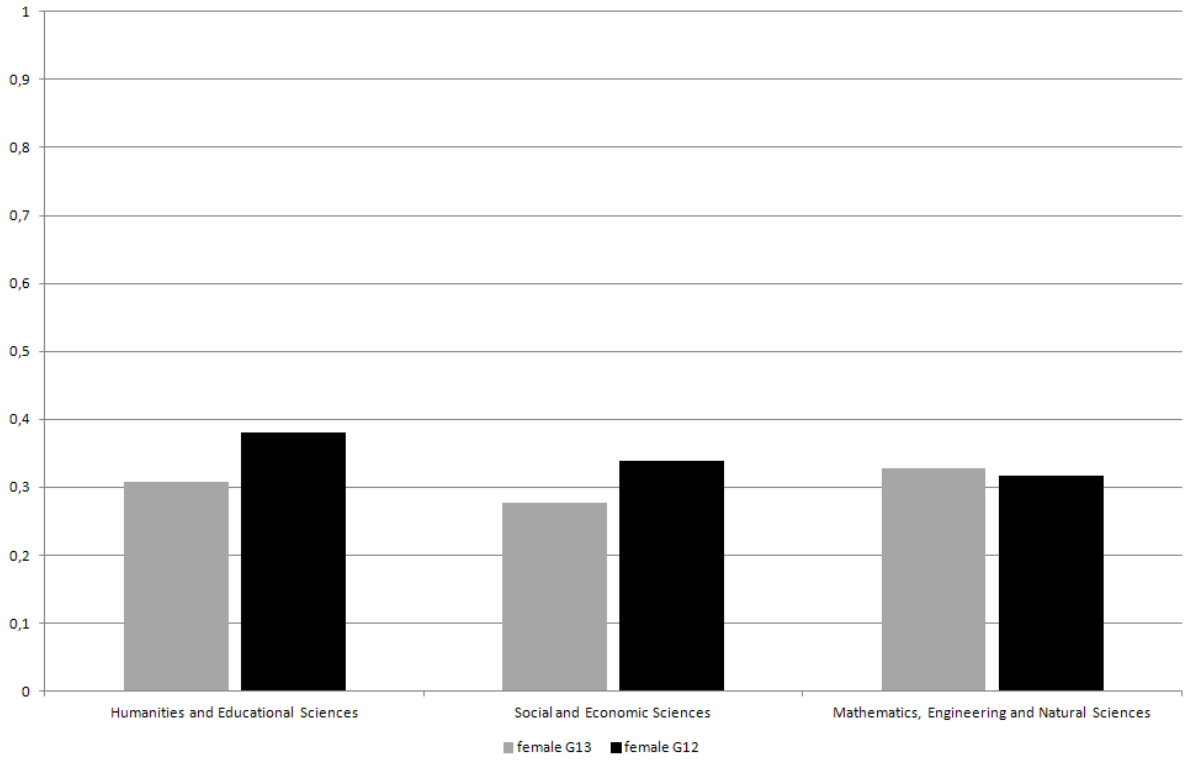

Figure 5: Share of University Subjects of Female Students (March 2009)

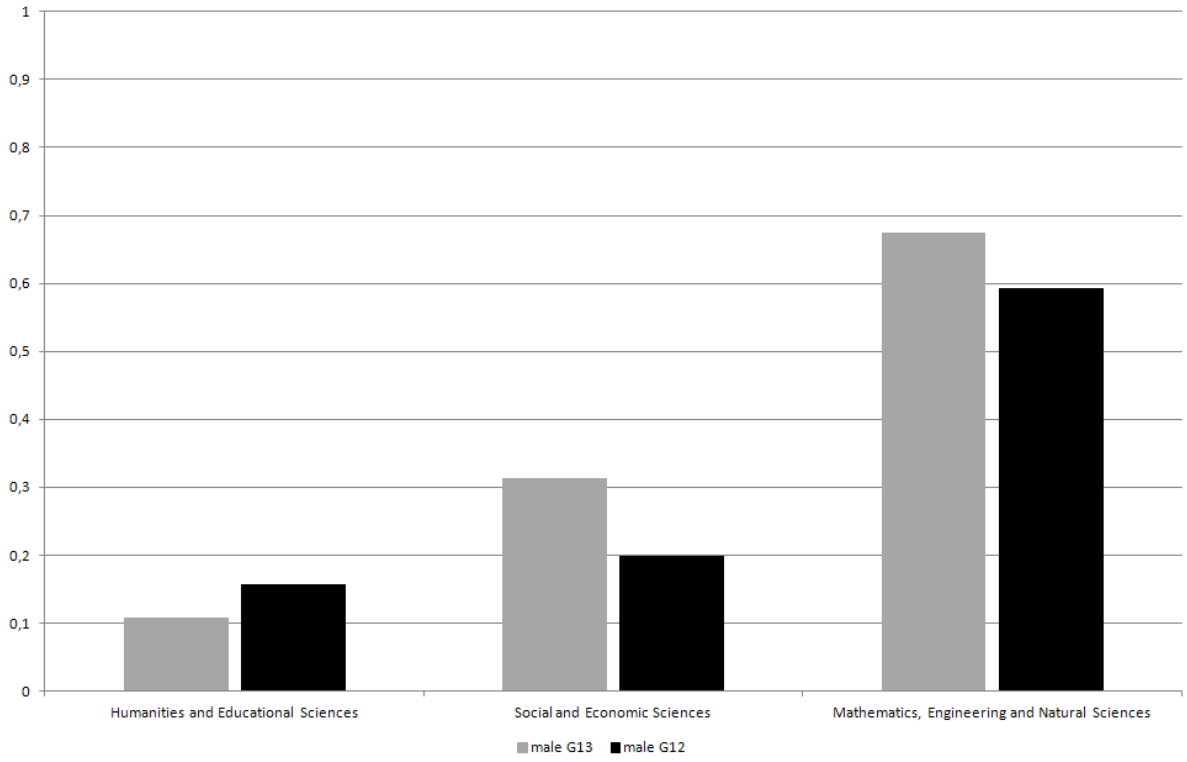

Figure 6: Share of University Subjects of Male Students (March 2009)

Table 2: Probability of University Education (Probit Estimates, Marginal Effects)[a]

Independent Variables	Pooled Sample Marginal effect	Female Sample Marginal effect	Male Sample Marginal effect
D	-0.025	-0.068*	0.062
	(0.032)	(0.036)	(0.052)
Average grade in year 7 (reference: good)			
Very good	-0.042	-0.045	-0.016
	(0.062)	(0.072)	(0.108)
Satisfactory (and below)	-0.055	-0.084	-0.031
	(0.044)	(0.056)	(0.071)
Grade in mathematics in year 7 (reference: good)			
Very good	0.088*	0.202***	-0.044
	(0.050)	(0.057)	(0.083)
Satisfactory (and below)	-0.088**	-0.058	-0.091
	(0.044)	(0.052)	(0.072)
Academic degree of at least one parent or sibling (reference: no academic degree)			
Academic parents	0.119***	0.081*	0.221***
	(0.035)	(0.048)	(0.050)
Academic siblings	0.063	0.056	0.067
	(0.039)	(0.046)	(0.069)
Unemployment of at least one parent during years until reform (reference: no unemployment)			
Unemployment (parents)	0.010	0.067*	-0.089
	(0.033)	(0.040)	(0.057)
Number of books of parents (reference: 0 to 100 books)			
101 to 500	0.053	0.025	0.073
	(0.037)	(0.045)	(0.061)
More than 500	0.134***	0.125**	0.102
	(0.041)	(0.056)	(0.066)
Sociodemographic variables			
Age (enrollment at school)	0.031	0.029	-0.033
	(0.039)	(0.060)	(0.055)
Gender (male)	0.002	–	–
	(0.036)		
School Fixed Effects	yes	yes	yes
Statistics			
McFadden'S R^2	0.080	0.131	0.141
N	699	439	260
Number of clusters	93	87	82
Estimation without control variables			
D	-0.039	-0.077*	0.025
	(0.037)	(0.046)	(0.064)
Gender (male)	0.021	–	–
	(0.036)		
School Fixed Effects	yes	yes	yes
McFadden's R^2	0.002	0.006	0.001
N	722	453	269
Number of clusters	93	87	84

[a] Dependent variable: dummy indicating university enrollment at least once between October 2007 and March 2009. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Variables not included in specification are indicated by –.

Table 3: Probability of University Education, by Semester (Probit Estimates, Marginal Effects)[a]

	Pooled Sample				Female Sample				Male Sample			
	11/2007	05/2008	11/2008	03/2009	11/2007	05/2008	11/2008	03/2009	11/2007	05/2008	11/2008	03/2009
Independent Variables	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.
D	-0.039	-0.059*	-0.026	-0.022	-0.082**	-0.104***	-0.060	-0.063*	0.037	0.028	0.064	0.061
	(0.033)	(0.032)	(0.033)	(0.032)	(0.040)	(0.037)	(0.038)	(0.035)	(0.053)	(0.056)	(0.050)	(0.053)
Average grade in year 7 (reference: good)												
Very good	0.069	0.020	-0.032	-0.014	0.059	-0.018	-0.045	-0.014	0.146	0.149	-0.004	-0.009
	(0.064)	(0.060)	(0.063)	(0.060)	(0.070)	(0.070)	(0.072)	(0.070)	(0.134)	(0.136)	(0.112)	(0.115)
Satisfactory (and below)	-0.006	-0.038	-0.065	-0.047	0.001	-0.036	-0.120*	-0.087	-0.038	-0.066	-0.016	-0.004
	(0.048)	(0.050)	(0.045)	(0.045)	(0.064)	(0.066)	(0.064)	(0.057)	(0.068)	(0.070)	(0.071)	(0.076)
Grade in mathematics in year 7 (reference: good)												
Very good	0.079	0.093	0.091*	0.105**	0.145	0.182**	0.188***	0.185**	-0.018	-0.024	-0.020	0.019
	(0.066)	(0.061)	(0.052)	(0.053)	(0.092)	(0.088)	(0.065)	(0.076)	(0.088)	(0.087)	(0.086)	(0.082)
Satisfactory (and below)	-0.123***	-0.086*	-0.086*	-0.085*	-0.138***	-0.115**	-0.049	-0.054	-0.065	0.001	-0.081	-0.090
	(0.046)	(0.052)	(0.047)	(0.047)	(0.050)	(0.055)	(0.055)	(0.050)	(0.071)	(0.080)	(0.079)	(0.084)
Academic degree of at least one parent or sibling (reference: no academic degree)												
Academic parents	0.047	0.060	0.108***	0.119***	0.028	0.032	0.070	0.096**	0.097	0.129*	0.214***	0.186***
	(0.039)	(0.040)	(0.037)	(0.036)	(0.052)	(0.054)	(0.051)	(0.047)	(0.063)	(0.066)	(0.053)	(0.053)
Academic siblings	0.048	0.027	0.067	0.050	-0.019	-0.041	0.079*	0.024	0.198**	0.183*	0.039	0.088
	(0.053)	(0.054)	(0.041)	(0.040)	(0.056)	(0.056)	(0.047)	(0.047)	(0.095)	(0.097)	(0.075)	(0.074)
Unemployment of at least one parent during years until reform (reference: no unemployment)												
Unemployment (parents)	0.037	0.049	0.004	0.021	0.040	0.046	0.053	0.057	0.021	0.036	-0.087	-0.040
	(0.032)	(0.032)	(0.035)	(0.034)	(0.040)	(0.042)	(0.044)	(0.043)	(0.049)	(0.052)	(0.058)	(0.060)
Number of books of parents (reference: 0 to 100 books)												
101 to 500	0.045	0.018	0.069*	0.077**	0.054	0.034	0.020	0.028	0.019	-0.026	0.120**	0.126**
	(0.045)	(0.042)	(0.037)	(0.036)	(0.059)	(0.058)	(0.047)	(0.043)	(0.066)	(0.062)	(0.052)	(0.059)
More than 500	0.086	0.077	0.178***	0.135***	0.136*	0.126*	0.168***	0.100*	-0.030	-0.051	0.151**	0.136**
	(0.056)	(0.053)	(0.038)	(0.041)	(0.077)	(0.075)	(0.053)	(0.056)	(0.066)	(0.066)	(0.063)	(0.068)
Sociodemographic variables												
Age (enrollment at school)	0.030	0.007	0.020	0.045	0.031	0.008	0.053	0.031	-0.007	-0.041	-0.086	0.003
	(0.041)	(0.043)	(0.040)	(0.040)	(0.053)	(0.058)	(0.059)	(0.060)	(0.061)	(0.057)	(0.060)	(0.069)
Gender (male)	-0.232***	-0.213***	-0.000	-0.019	–	–	–	–	–	–	–	–
	(0.032)	(0.037)	(0.036)	(0.039)								
School Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Statistics												
McFadden's R^2	0.095	0.084	0.084	0.079	0.083	0.088	0.133	0.127	0.097	0.094	0.127	0.107
N	699	699	699	699	439	439	439	439	260	260	260	260
Number of clusters	93	93	93	93	87	87	87	87	82	82	82	82

[a] Dependent variable: dummy indicating university enrollment at several points of time. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects. Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Variables not included in specification are indicated by –.

Table 4: Probability of Vocational Education (Probit Estimates, Marginal Effects)[a]

Independent Variables	Pooled Sample Marginal effect	Female Sample Marginal effect	Male Sample Marginal effect
D	0.022	0.060	-0.055
	(0.033)	(0.041)	(0.049)
Average grade in year 7 (reference: good)			
Very good	-0.042	0.005	-0.153*
	(0.061)	(0.068)	(0.087)
Satisfactory (and below)	0.094**	0.100*	0.092
	(0.042)	(0.057)	(0.066)
Grade in mathematics in year 7 (reference: good)			
Very good	-0.007	-0.100	0.110
	(0.059)	(0.086)	(0.089)
Satisfactory (and below)	0.047	0.054	0.008
	(0.040)	(0.052)	(0.066)
Academic degree of at least one parent or sibling (reference: no academic degree)			
Academic parents	-0.085**	-0.062	-0.152***
	(0.035)	(0.048)	(0.053)
Academic siblings	-0.070*	-0.084*	-0.003
	(0.037)	(0.044)	(0.074)
Unemployment of at least one parent during years until reform (reference: no unemployment)			
Unemployment (parents)	0.004	-0.032	0.059
	(0.034)	(0.045)	(0.058)
Number of books of parents (reference: 0 to 100 books)			
101 to 500	-0.081**	-0.030	-0.141***
	(0.033)	(0.047)	(0.050)
More than 500	-0.181***	-0.140***	-0.198***
	(0.037)	(0.053)	(0.053)
Sociodemographic variables			
Age (enrollment at school)	-0.044	0.042	0.009
	(0.040)	(0.057)	(0.055)
Gender (male)	-0.047	–	–
	(0.032)		
School Fixed Effects	yes	yes	yes
Statistics			
McFadden'S R^2	0.091	0.129	0.132
N	699	439	260
Number of clusters	93	87	82
Estimation without control variables			
D	0.029	0.060	-0.023
	(0.038)	(0.051)	(0.059)
Gender (male)	-0.052	–	–
	(0.032)		
School Fixed Effects	yes	yes	yes
McFadden's R^2	0.003	0.003	0.001
N	722	453	269
Number of clusters	93	87	84

[a] Dependent variable: dummy indicating enrollment in vocational education at least once between October 2007 and March 2009. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Variables not included in specification are indicated by –.

Table 5: Probability of Vocational Education, by Semester (Probit Estimates, Marginal Effects)[a]

	Pooled Sample				Female Sample				Male Sample			
	11/2007	05/2008	11/2008	03/2009	11/2007	05/2008	11/2008	03/2009	11/2007	05/2008	11/2008	03/2009
Independent Variables	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.	Marg.eff.
D	0.010	0.017	0.016	0.015	0.051	0.061*	0.071*	0.066*	-0.048	-0.043	-0.081*	-0.081*
	(0.025)	(0.025)	(0.030)	(0.030)	(0.035)	(0.035)	(0.039)	(0.037)	(0.036)	(0.037)	(0.044)	(0.047)
Average grade in year 7 (reference: good)												
Very good	-0.073	-0.069	-0.044	-0.036	-0.066	-0.057	-0.004	-0.003	-0.098	-0.091	-0.132	-0.105
	(0.050)	(0.049)	(0.056)	(0.057)	(0.060)	(0.059)	(0.066)	(0.065)	(0.064)	(0.063)	(0.086)	(0.089)
Satisfactory (and below)	0.052	0.045	0.062	0.062	0.034	0.033	0.095*	0.101*	0.067	0.055	0.032	0.021
	(0.039)	(0.038)	(0.041)	(0.042)	(0.055)	(0.054)	(0.057)	(0.058)	(0.059)	(0.060)	(0.069)	(0.068)
Grade in mathematics in year 7 (reference: good)												
Very good	0.021	0.005	-0.052	-0.037	-0.058	-0.096	-0.113*	-0.124	0.121	0.116	0.018	0.056
	(0.057)	(0.054)	(0.052)	(0.054)	(0.067)	(0.059)	(0.068)	(0.077)	(0.090)	(0.091)	(0.085)	(0.087)
Satisfactory (and below)	0.037	0.034	0.062	0.075*	0.062	0.058	0.049	0.048	-0.014	-0.004	0.048	0.082
	(0.042)	(0.042)	(0.042)	(0.041)	(0.064)	(0.062)	(0.053)	(0.051)	(0.052)	(0.054)	(0.067)	(0.068)
Academic degree of at least one parent or sibling (reference: no academic degree)												
Academic parents	-0.066**	-0.059*	-0.081**	-0.093***	-0.051	-0.056	-0.065	-0.073	-0.115***	-0.083**	-0.137***	-0.158***
	(0.032)	(0.031)	(0.033)	(0.033)	(0.048)	(0.047)	(0.045)	(0.046)	(0.037)	(0.037)	(0.049)	(0.049)
Academic siblings	-0.088***	-0.084***	-0.091**	-0.058	-0.056	-0.052	-0.093**	-0.060	-0.141***	-0.131***	-0.047	-0.021
	(0.032)	(0.032)	(0.036)	(0.036)	(0.040)	(0.040)	(0.041)	(0.043)	(0.037)	(0.037)	(0.069)	(0.071)
Unemployment of at least one parent during years until reform (reference: no unemployment)												
Unemployment (parents)	-0.027	-0.031	-0.028	-0.002	-0.031	-0.037	-0.056	-0.036	-0.017	-0.020	0.028	0.067
	(0.029)	(0.028)	(0.031)	(0.033)	(0.036)	(0.035)	(0.039)	(0.040)	(0.041)	(0.041)	(0.052)	(0.055)
Number of books of parents (reference: 0 to 100 books)												
101 to 500	-0.047	-0.045	-0.072**	-0.085***	-0.052	-0.038	-0.019	-0.040	-0.029	-0.044	-0.134***	-0.123***
	(0.030)	(0.029)	(0.033)	(0.032)	(0.045)	(0.045)	(0.045)	(0.042)	(0.043)	(0.040)	(0.042)	(0.047)
More than 500	-0.153***	-0.148***	-0.184***	-0.183***	-0.165***	-0.142***	-0.143***	-0.156***	-0.105**	-0.129***	-0.213***	-0.190***
	(0.030)	(0.029)	(0.032)	(0.034)	(0.044)	(0.047)	(0.048)	(0.047)	(0.044)	(0.036)	(0.041)	(0.046)
Sociodemographic variables												
Age (enrollment at school)	-0.025	-0.034	-0.048	-0.041	-0.022	-0.032	-0.038	-0.041	0.023	0.011	-0.014	0.013
	(0.035)	(0.034)	(0.039)	(0.038)	(0.051)	(0.051)	(0.055)	(0.056)	(0.045)	(0.045)	(0.056)	(0.053)
Gender (male)	-0.071***	-0.074***	-0.038	-0.037	–	–	–	–	–	–	–	–
	(0.027)	(0.026)	(0.031)	(0.039)								
School Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Statistics												
McFadden's R^2	0.096	0.093	0.089	0.093	0.122	0.117	0.114	0.125	0.155	0.140	0.141	0.139
N	699	699	699	699	439	439	439	439	251	251	260	260
Number of clusters	93	93	93	93	87	87	87	87	78	78	82	82

[a] Dependent variable: dummy indicating vocational enrollment at several points of time. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects. Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Variables not included in specification are indicated by –.

Table 6: Probability of Dropping out of University Education (Probit Estimates, Marginal Effects)[a]

Independent Variables	Pooled Sample Marginal effect	Female Sample Marginal effect	Male Sample Marginal effect
D	0.043*	0.048	0.166
	(0.025)	(0.038)	(0.109)
Average grade in year 7 (reference: good)			
Very good	0.116**	0.163**	–
	(0.058)	(0.078)	
Satisfactory (and below)	0.051	0.111	-0.053
	(0.038)	(0.069)	(0.070)
Grade in mathematics in year 7 (reference: good)			
Very good	-0.045**	-0.024	–
	(0.019)	(0.048)	
Satisfactory (and below)	-0.033*	-0.069***	-0.075
	(0.019)	(0.025)	(0.083)
Academic degree of at least one parent or sibling (reference: no academic degree)			
Academic parents	-0.032*	-0.018	-0.205***
	(0.017)	(0.027)	(0.056)
Academic siblings	0.018	0.006	0.168
	(0.032)	(0.044)	(0.175)
Unemployment of at least one parent during years until reform (reference: no unemployment)			
Unemployment (parents)	-0.002	0.001	-0.021
	(0.018)	(0.026)	(0.097)
Number of books of parents (reference: 0 to 100 books)			
101 to 500	-0.011	0.004	-0.045
	(0.022)	(0.038)	(0.087)
More than 500	-0.041**	-0.043	-0.080
	(0.020)	(0.036)	(0.111)
Sociodemographic variables			
Age (enrollment at school)	-0.003	-0.009	-0.051
	(0.026)	(0.042)	(0.081)
Gender (male)	-0.015	–	–
	(0.024)		
School Fixed Effects	yes	yes	yes
Statistics			
McFadden'S R^2	0.101	0.135	0.206
N	436	246	56
Number of clusters	77	63	29
Estimation without control variables			
D	0.028	0.022	0.036
	(0.024)	(0.034)	(0.038)
Gender (male)	-0.018	–	–
	(0.019)		
School Fixed Effects	yes	yes	yes
McFadden's R^2	0.013	0.028	0.051
N	501	311	190
Number of clusters	89	82	77

[a] Dependent variable: dummy indicating a drop-out of university education at least once between October 2007 and March 2009. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Variables not included in specification are indicated by –.

Table 7: Probability of Dropping out of Vocational Education (Probit Estimates, Marginal Effects)[a]

Independent Variables	Pooled Sample Marginal effect	Female Sample Marginal effect	Male Sample Marginal effect
D	0.029	-0.050	0.098
	(0.038)	(0.046)	(0.145)
Average grade in year 7 (reference: good)			
Very good	0.091	0.215	–
	(0.123)	(0.213)	
Satisfactory (and below)	0.086	0.018	0.178
	(0.074)	(0.098)	(0.110)
Grade in mathematics in year 7 (reference: good)			
Very good	0.151	0.022	0.481***
	(0.139)	(0.191)	(0.147)
Satisfactory (and below)	-0.066**	0.065	-0.126*
	(0.032)	(0.090)	(0.068)
Academic degree of at least one parent or sibling (reference: no academic degree)			
Academic parents	0.020	-0.011	0.119
	(0.046)	(0.054)	(0.097)
Academic siblings	-0.095***	–	0.073
	(0.021)		(0.283)
Unemployment of at least one parent during years until reform (reference: no unemployment)			
Unemployment (parents)	0.072	0.166*	0.123
	(0.049)	(0.099)	(0.090)
Number of books of parents (reference: 0 to 100 books)			
101 to 500	0.021	0.022	-0.017
	(0.045)	(0.064)	(0.120)
More than 500	0.171*	0.191	0.588***
	(0.102)	(0.161)	(0.184)
Sociodemographic variables			
Age (enrollment at school)	0.052	0.086	0.106
	(0.047)	(0.085)	(0.113)
Gender (male)	-0.011	–	–
	(0.041)		
School Fixed Effects	yes	yes	yes
Statistics			
McFadden'S R^2	0.184	0.194	0.483
N	199	90	48
Number of clusters	70	44	31
Estimation without control variables			
D	0.027	-0.011	0.107
	(0.036)	(0.035)	(0.100)
Gender (male)	0.027	–	–
	(0.048)		
School Fixed Effects	yes	yes	yes
McFadden's R^2	0.007	0.001	0.044
N	219	146	73
Number of clusters	81	68	48

[a] Dependent variable: dummy indicating a drop-out of vocational education at least once between October 2007 and March 2009. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Variables not included in specification are indicated by –.

Table 8: Probability of Studying Humanities or Educational Sciences (Probit Estimates, Marginal Effects)[a]

Independent Variables	Pooled Sample Marginal effect	Female Sample Marginal effect	Male Sample Marginal effect
D	0.044	0.052	-0.032
	(0.040)	(0.050)	(0.049)
Average grade in year 7 (reference: good)			
Very good	0.120	0.049	0.635***
	(0.075)	(0.101)	(0.034)
Satisfactory (and below)	-0.017	0.044	-0.030
	(0.060)	(0.095)	(0.062)
Grade in mathematics in year 7 (reference: good)			
Very good	-0.126***	-0.023	-0.241***
	(0.044)	(0.087)	(0.025)
Satisfactory (and below)	0.106	0.080	0.020
	(0.072)	(0.104)	(0.077)
Mathematics or natural science as an advanced course during upper secondary school (reference: no advanced course in mathematics or science)			
Advanced course (math.)	-0.135***	-0.148***	-0.243***
	(0.036)	(0.049)	(0.063)
Academic degree of at least one parent or sibling (reference: no academic degree)			
Academic parents	0.056	0.055	0.105*
	(0.043)	(0.061)	(0.063)
Academic siblings	-0.014	-0.023	0.018
	(0.048)	(0.065)	(0.074)
Unemployment of at least one parent during years until reform (reference: no unemployment)			
Unemployment (parents)	0.068	0.045	0.077
	(0.045)	(0.064)	(0.066)
Number of books of parents (reference: 0 to 100 books)			
101 to 500	-0.001	0.013	-0.054
	(0.050)	(0.070)	(0.057)
More than 500	0.028	0.032	-0.055
	(0.051)	(0.080)	(0.057)
Sociodemographic variables			
Age (enrollment at school)	-0.019	-0.041	0.012
	(0.048)	(0.066)	(0.054)
Gender (male)	-0.156***	–	–
	(0.034)		
School Fixed Effects	yes	yes	yes
Statistics			
McFadden'S R^2	0.140	0.093	0.325
N	463	291	143
Number of clusters	88	81	61
Estimation without control variables			
D	0.064	0.073	0.048
	(0.042)	(0.053)	(0.061)
Gender (male)	-0.212***	–	–
	(0.028)		
School Fixed Effects	yes	yes	yes
McFadden's R^2	0.053	0.005	0.006
N	480	301	179
Number of clusters	88	82	76

[a] Dependent variable: dummy indicating university enrollment in a subject from humanities or educational sciences in March 2009. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Variables not included in specification are indicated by –.

Table 9: Probability of Studying Social or Economic Sciences (Probit Estimates, Marginal Effects)[a]

Independent Variables	Pooled Sample Marginal effect	Female Sample Marginal effect	Male Sample Marginal effect
D	0.006	0.087*	-0.056
	(0.042)	(0.047)	(0.055)
Average grade in year 7 (reference: good)			
Very good	-0.021	0.042	-0.155*
	(0.075)	(0.096)	(0.085)
Satisfactory (and below)	-0.029	0.054	-0.156**
	(0.059)	(0.092)	(0.061)
Grade in mathematics in year 7 (reference: good)			
Very good	-0.056	-0.014	-0.108
	(0.064)	(0.083)	(0.076)
Satisfactory (and below)	0.047	-0.000	0.145
	(0.070)	(0.092)	(0.097)
Mathematics or natural science as an advanced course during upper secondary school (reference: no advanced course in mathematics or science)			
Advanced course (math.)	0.007	0.023	0.003
	(0.047)	(0.052)	(0.086)
Academic degree of at least one parent or sibling (reference: no academic degree)			
Academic parents	-0.030	-0.087	0.107
	(0.046)	(0.059)	(0.076)
Academic siblings	-0.010	-0.038	0.012
	(0.056)	(0.077)	(0.071)
Unemployment of at least one parent during years until reform (reference: no unemployment)			
Unemployment (parents)	-0.027	-0.003	0.057
	(0.041)	(0.050)	(0.057)
Number of books of parents (reference: 0 to 100 books)			
101 to 500	0.035	0.022	0.072
	(0.049)	(0.067)	(0.100)
More than 500	0.003	-0.098	0.099
	(0.059)	(0.070)	(0.103)
Sociodemographic variables			
Age (enrollment at school)	0.095*	0.094	0.073
	(0.052)	(0.071)	(0.063)
Gender (male)	-0.053	–	–
	(0.042)		
School Fixed Effects	yes	yes	yes
Statistics			
McFadden'S R^2	0.035	0.073	0.147
N	463	291	172
Number of clusters	88	81	75
Estimation without control variables			
D	-0.006	0.060	-0.115**
	(0.039)	(0.050)	(0.054)
Gender (male)	-0.054	–	–
	(0.036)		
School Fixed Effects	yes	yes	yes
McFadden's R^2	0.003	0.003	0.016
N	480	301	179
Number of clusters	88	82	76

[a] Dependent variable: dummy indicating university enrollment in a subject from social or economic sciences in March 2009. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Variables not included in specification are indicated by –.

Table 10: Probability of Studying Natural Science, Technology, Engineering or Mathematics (STEM) (Probit Estimates, Marginal Effects)[a]

Independent Variables	Pooled Sample Marginal effect	Female Sample Marginal effect	Male Sample Marginal effect
D	-0.035	-0.012	-0.106
	(0.044)	(0.048)	(0.078)
Average grade in year 7 (reference: good)			
Very good	-0.040	-0.018	-0.140
	(0.081)	(0.090)	(0.167)
Satisfactory (and below)	0.049	0.023	0.117
	(0.059)	(0.084)	(0.085)
Grade in mathematics in year 7 (reference: good)			
Very good	0.127*	0.075	0.228**
	(0.066)	(0.093)	(0.092)
Satisfactory (and below)	-0.083	-0.045	-0.071
	(0.064)	(0.079)	(0.101)
Mathematics or natural science as an advanced course during upper secondary school (reference: no advanced course in mathematics or science)			
Advanced course (math.)	0.200***	0.184***	0.191**
	(0.058)	(0.067)	(0.097)
Academic degree of at least one parent or sibling (reference: no academic degree)			
Academic parents	-0.013	0.016	-0.080
	(0.053)	(0.064)	(0.086)
Academic siblings	-0.004	-0.021	0.041
	(0.051)	(0.076)	(0.087)
Unemployment of at least one parent during years until reform (reference: no unemployment)			
Unemployment (parents)	-0.024	0.006	-0.056
	(0.047)	(0.055)	(0.082)
Number of books of parents (reference: 0 to 100 books)			
101 to 500	0.030	0.029	-0.009
	(0.049)	(0.075)	(0.090)
More than 500	0.069	0.097	0.029
	(0.055)	(0.089)	(0.088)
Sociodemographic variables			
Age (enrollment at school)	-0.081	-0.103	-0.051
	(0.054)	(0.065)	(0.081)
Gender (male)	0.198***	–	–
	(0.048)		
School Fixed Effects	yes	yes	yes
Statistics			
McFadden'S R^2	0.138	0.114	0.141
N	463	287	172
Number of clusters	88	78	75
Estimation without control variables			
D	-0.037	-0.011	-0.081
	(0.049)	(0.057)	(0.084)
Gender (male)	-0.312***	–	–
	(0.048)		
School Fixed Effects	yes	yes	yes
McFadden's R^2	0.068	0.000	0.005
N	480	301	179
Number of clusters	88	82	76

[a] Dependent variable: dummy indicating university enrollment in a subject from natural science, technology, engineering or mathematics in March 2009. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Variables not included in specification are indicated by –.

Table 11: Probability of Studying Natural Science, Technology, Engineering or Mathematics (STEM, in Detail) (Probit Estimates, Marginal Effects)[a]

	Pooled Sample		Female Sample		Male Sample	
	Science & Maths	Engi-neering	Science & Maths	Engi-neering	Science & Maths	Engi-neering
Independent Variables	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.
D	-0.070**	0.020	-0.034	-0.029	-0.147***	0.091
	(0.029)	(0.037)	(0.035)	(0.033)	(0.046)	(0.074)
Average grade in year 7 (reference: good)						
Very good	0.011	-0.132***	-0.051	-0.036	-0.001	-0.257*
	(0.074)	(0.046)	(0.057)	(0.048)	(0.142)	(0.131)
Satisfactory (and below)	0.043	0.054	0.013	0.042	0.134	-0.005
	(0.047)	(0.051)	(0.062)	(0.062)	(0.083)	(0.096)
Grade in mathematics in year 7 (reference: good)						
Very good	0.038	0.095	0.122	0.008	0.038	0.143
	(0.060)	(0.066)	(0.087)	(0.063)	(0.097)	(0.118)
Satisfactory (and below)	-0.072*	-0.032	-0.073	-0.000	-0.094	0.012
	(0.041)	(0.045)	(0.051)	(0.058)	(0.058)	(0.093)
Mathematics or natural science as an advanced course during upper secondary school (reference: no advanced course in mathematics or science)						
Advanced course (math.)	0.071	0.142***	0.097*	0.109**	-0.086	0.240**
	(0.044)	(0.048)	(0.051)	(0.050)	(0.067)	(0.113)
Academic degree of at least one parent or sibling (reference: no academic degree)						
Academic parents	-0.041	0.005	-0.027	-0.004	-0.074	0.025
	(0.034)	(0.034)	(0.039)	(0.038)	(0.065)	(0.084)
Academic siblings	-0.011	0.010	-0.009	0.031	-0.039	0.047
	(0.043)	(0.038)	(0.055)	(0.057)	(0.060)	(0.086)
Unemployment of at least one parent during years until reform (reference: no unemployment)						
Unemployment (parents)	-0.017	-0.014	-0.015	-0.005	-0.008	-0.064
	(0.034)	(0.034)	(0.041)	(0.036)	(0.063)	(0.075)
Number of books of parents (reference: 0 to 100 books)						
101 to 500	-0.023	0.036	-0.047	0.028	0.032	0.050
	(0.036)	(0.044)	(0.042)	(0.065)	(0.086)	(0.082)
More than 500	-0.009	0.051	-0.079*	0.199*	0.114	-0.079
	(0.041)	(0.052)	(0.043)	(0.103)	(0.106)	(0.093)
Sociodemographic variables						
Age (enrollment at school)	-0.098**	0.021	-0.123**	0.061	-0.051	-0.004
	(0.039)	(0.038)	(0.051)	(0.047)	(0.065)	(0.080)
Gender (male)	0.011	0.253***	–	–	–	–
	(0.041)	(0.052)				
School Fixed Effects	yes	yes	yes	yes	yes	yes
Statistics						
McFadden'S R^2	0.073	0.204	0.146	0.130	0.105	0.142
N	463	463	287	248	163	172
Number of clusters	88	88	78	63	69	75
Estimation without control variables						
D	-0.054*	0.003	-0.023	-0.023	-0.107**	0.056
	(0.031)	(0.037)	(0.039)	(0.033)	(0.049)	(0.081)
Gender (male)	0.043	0.350***	–	–	–	–
	(0.044)	(0.053)				
School Fixed Effects	yes	yes	yes	yes	yes	yes
McFadden's R^2	0.008	0.157	0.001	0.047	0.018	0.070
N	480	461	301	281	179	172
Number of clusters	88	87	82	75	76	76

[a] Dependent variable: dummy indicating university enrollment in engineering as well as in mathematics or natural sciences in March 2009. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Variables not included in specification are indicated by –.

A Appendix

In order to provide an overview of the available information provided by the survey, the 101 questions can be divided into the following ten categories:

1. *Personal information:* The first set of questions covers certain personal characteristics of the student, such as date of birth, gender, legal address, place of residence during schooling, number of relocations, nationality, number of close friends, etc.

2. *Family background:* This category provides details concerning the family of the student, including information about the parents, the siblings, and the household in general. Information about the father and the mother are separate and cover such items as: age, the time of cohabitation with each parent, divorce, death, change of partners by the parent, education, occupational degree, unemployment and personal involvements, e.g., cultural, political, religious, or sport. The family background includes household details, including the number of books owned by the parents and other relevant equipment in the household. For these items, the use by the student is important, e.g. internet access, dictionaries, newspapers, reference books, etc. Information about the siblings of the student includes: number, gender, age, education, etc.

3. *Schooling, general information:* General information includes: the duration of pre-school, primary, secondary schooling, changes of residence during that time, grade repetition, etc.

4. *Schooling, detailed information:* This contains details of the curriculum of the student. Examples include the sequence of enrollment, the grades when courses where started, the duration and the number of foreign languages learned at school. Moreover, information on natural sciences (biology, chemistry, physics) is provided in this category and there are questions covering details of additional in-school education which the students attained. Furthermore, a number of questions are devoted to assessing the stress and burden of schooling on the students, an assessment of the skills learned at school and the evaluation of teaching these skills at school.

5. *Education outside school:* Classes at school provide a relevant part of individual's education but many students participate in a number of educational activities outside school. These activities comprise, for example, musical classes, sports, journalistic activities such as student newspapers, political activities, etc. Information on different activities and the number of years of these activities is provided in this category.

6. *Last year of school and graduation:* Questions describing the last year of school and graduation cover the class size, the types of the main courses (basic courses and intensified courses taught with more hours per week), the achievement score in each of these courses, the overall achievement score, activities outside school (working, homework, etc.), the

state of health during the last year of school, spending of leisure time and leisure activities (dating friends, reading, chatting, etc.), and consumption of alcoholic beverages and smoking behavior.

7. *Support from parents, teachers and other persons:* This category comprises the incidence and amount of support with schooling tasks and homework from close relatives, particularly the parents, teachers, and other persons such as friends, siblings and peers.

8. *Education after graduation:* Since students in the survey graduated in 2007, about 18 months passed between graduation and the date of interview. The activities that took place during that time are reported in a retrospective monthly calendar covering various states of employment, civil and military service, education, and time spent abroad. In addition, information is provided on the financing of living today, the type of education (apprenticeship, university or university of applied sciences studies), the subject, the degree aspired to (e.g., bachelor, master, PhD), and reasons for the choice of education program.

9. *Assessment of school:* In this category the students were asked to assess the value of schooling for different skills: logical thinking, independence, ability to accept criticism, cooperation in teamwork, practical skills, technical skills, etc. In addition, several items evaluating the relationship between teachers and students were collected.

10. *Attitudes and non-cognitive skills:* In the final set of questions, information concerning various items was collected in order to identify certain aspects of the student's personality. The set of items could be used to derive measures of non-cognitive skill levels.

Table A.1: Means of Post-School Educational Decisions by Year and Gender

	Female			Male		
	Year 12	Year 13	p-value[a]	Year 12	Year 13	p-value[a]
University education[b]						
University education in November 2007	0.47	0.55	0.07	0.27	0.27	0.90
University education in Mai 2008	0.44	0.54	0.03	0.28	0.28	0.97
University education in November 2008	0.62	0.69	0.12	0.68	0.66	0.80
University education in March 2009	0.63	0.70	0.12	0.68	0.65	0.70
University drop-out[d]	0.07	0.05	0.40	0.06	0.02	0.22
Vocational education[c]						
Vocational education in November 2007	0.26	0.21	0.24	0.15	0.17	0.57
Vocational education in Mai 2008	0.26	0.20	0.13	0.14	0.17	0.58
Vocational education in November 2008	0.32	0.25	0.09	0.21	0.27	0.28
Vocational education in March 2009	0.33	0.26	0.12	0.22	0.27	0.35
Vocational drop-out[d]	0.08	0.09	0.81	0.16	0.06	0.15
General postschool education[e]						
Postschool education in November 2007	0.72	0.76	0.34	0.42	0.43	0.87
Postschool education in Mai 2008	0.70	0.74	0.29	0.42	0.43	0.77
Postschool education in November 2008	0.94	0.94	0.95	0.87	0.91	0.40
Postschool education in March 2009	0.95	0.96	0.91	0.90	0.91	0.91
Military, civilian or voluntary service [f]						
Military or civilian service	0.00	0.01	0.17	0.51	0.47	0.57
Voluntary year of social/ecological service	0.12	0.10	0.63	0.06	0.07	0.61
University subjects[g]						
Humanities and educational sciences	0.38	0.31	0.19	0.16	0.11	0.35
Social and economic sciences	0.34	0.28	0.26	0.20	0.31	0.07
Mathematics, engineering and natural sciences	0.32	0.33	0.84	0.59	0.67	0.27
N	221	232		142	127	

[a] p-value from t-test on equality of means.
[b] Share of students enrolled in university or university of applied sciences.
[c] Share of students enrolled in an apprenticeship or a professional school.
[d] Share of students dropping out at least once up to March 2009.
[e] Share of students generally enrolled in post-school education.
[f] Share of students carrying out military, civilian or voluntary service up to March 2009.
[g] Share of university subjects (as percentage of total university students) in March 2009.
(Note that students could study more than one subject, which explains differences in the sum of all subjects.)

Table A.2: Probability of University Education, Separately for High and Low Ability Students (Probit Estimates, Marginal Effects)[a]

	High Ability Students			Low Ability Students		
	Pooled Sample	Female Sample	Male Sample	Pooled Sample	Female Sample	Male Sample
Independent Variables	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.
D	-0.053	-0.095*	-0.017	-0.012	-0.055	0.072
	(0.042)	(0.050)	(0.062)	(0.048)	(0.059)	(0.065)
Grade in mathematics in year 7 (reference: good)						
Very good	0.092**	0.162***	-0.027	-0.297*	–	-0.413***
	(0.040)	(0.044)	(0.077)	(0.179)		(0.152)
Satisfactory (and below)	-0.044	-0.174	–	-0.109**	0.040*	-0.174**
	(0.133)	(0.146)		(0.052)	(0.058)	(0.084)
Academic degree of at least one parent or sibling (reference: no academic degree)						
Academic parents	0.124***	0.081	0.185***	0.106*	0.053	0.231***
	(0.046)	(0.051)	(0.083)	(0.058)	(0.079)	(0.068)
Academic siblings	0.085*	0.104**	0.079	0.022	-0.015	0.067
	(0.049)	(0.052)	(0.114)	(0.063)	(0.084)	(0.100)
Unemployment of at least one parent during years until reform (reference: no unemployment)						
Unemployment (parents)	0.019	0.041	-0.070	0.019	0.099	-0.076*
	(0.040)	(0.042)	(0.091)	(0.053)	(0.068)	(0.068)
Number of books of parents (reference: 0 to 100 books)						
101 to 500	0.033	-0.028	0.102	0.068	0.091	0.018
	(0.046)	(0.065)	(0.076)	(0.055)	(0.071)	(0.089)
More than 500	0.115**	0.058	0.088	0.151**	0.201**	0.140
	(0.049)	(0.072)	(0.092)	(0.068)	(0.087)	(0.104)
Sociodemographic variables						
Age (enrollment at school)	0.004	-0.020	-0.086	0.030	0.033	0.009
	(0.050)	(0.068)	(0.094)	(0.057)	(0.085)	(0.070)
Gender (male)	-0.032	–	–	0.050	–	–
	(0.051)			(0.048)		
School Fixed Effects	yes	yes	yes	yes	yes	yes
Statistics						
McFadden's R^2	0.103	0.173	0.210	0.061	0.083	0.172
N	349	225	115	351	211	140
Number of clusters	84	71	62	87	77	68

[a] Dependent variable: dummy indicating university enrollment at least once between October 2007 and March 2009. High ability students are characterized by an average grade in year 7 of good or very good, low ability students by an average grade in year 7 of satisfactory or below. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Variables not included in specification are indicated by –.

Table A.3: Probability of Vocational Education, Separately for High and Low Ability Students (Probit Estimates, Marginal Effects)[a]

	High Ability Students			Low Ability Students		
	Pooled Sample	Female Sample	Male Sample	Pooled Sample	Female Sample	Male Sample
Independent Variables	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.
D	-0.012	0.026	-0.093	0.076	0.123*	0.004
	(0.039)	(0.049)	(0.060)	(0.049)	(0.065)	(0.073)
Grade in mathematics in year 7 (reference: good)						
Very good	-0.062	-0.110*	-0.002	0.477***	–	0.568***
	(0.045)	(0.064)	(0.076)	(0.144)		(0.155)
Satisfactory (and below)	-0.012	0.070		0.069	0.040	0.063
	(0.120)	(0.132)		(0.046)	(0.057)	(0.080)
Academic degree of at least one parent or sibling (reference: no academic degree)						
Academic parents	-0.099**	-0.081	-0.082	-0.060	-0.024	-0.167**
	(0.050)	(0.055)	(0.076)	(0.056)	(0.076)	(0.084)
Academic siblings	-0.101**	-0.134**	-0.038	-0.018	-0.007	-0.012
	(0.048)	(0.052)	(0.125)	(0.059)	(0.081)	(0.107)
Unemployment of at least one parent during years until reform (reference: no unemployment)						
Unemployment (parents)	-0.012	-0.017	0.022	-0.003	-0.048	0.056
	(0.040)	(0.046)	(0.082)	(0.056)	(0.074)	(0.074)
Number of books of parents (reference: 0 to 100 books)						
101 to 500	-0.056	0.029	-0.149**	-0.098**	-0.075	-0.138*
	(0.044)	(0.067)	(0.058)	(0.049)	(0.070)	(0.078)
More than 500	-0.183***	-0.055	-0.292***	-0.164***	-0.213***	-0.163*
	(0.037)	(0.072)	(0.044)	(0.059)	(0.080)	(0.098)
Sociodemographic variables						
Age (enrollment at school)	-0.028	-0.019	0.061	-0.029	-0.012	-0.048
	(0.049)	(0.065)	(0.084)	(0.058)	(0.084)	(0.075)
Gender (male)	0.002	–	–	-0.103**	–	–
	(0.046)			(0.068)		
School Fixed Effects	yes	yes	yes	yes	yes	yes
Statistics						
McFadden's R^2	0.115	0.172	0.217	0.079	0.099	0.123
N	349	229	115	351	211	140
Number of clusters	84	74	62	87	77	68

[a] Dependent variable: dummy indicating enrollment in vocational enrollment at least once between October 2007 and March 2009. High ability students are characterized by an average grade in year 7 of good or very good, low ability students by an average grade in year 7 of satisfactory or below. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Variables not included in specification are indicated by –.

Table A.4: Probability of a Voluntary Year of Social or Ecological Service, Separately for High and Low Ability Students (Probit Estimates, Marginal Effects)[a]

	High Ability Students			Low Ability Students		
	Pooled Sample	Female Sample	Male Sample	Pooled Sample	Female Sample	Male Sample
Independent Variables	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.
D	0.076**	0.103**	0.005	-0.047*	-0.084**	0.031
	(0.039)	(0.050)	(0.069)	(0.025)	(0.035)	(0.075)
Grade in mathematics in year 7 (reference: good)						
Very good	-0.006	-0.003	-0.006	–	–	–
	(0.036)	(0.055)	(0.069)			
Satisfactory (and below)	-0.044	-0.002	–	-0.000	-0.015	0.041
	(0.051)	(0.092)		(0.033)	(0.053)	(0.050)
Academic degree of at least one parent or sibling (reference: no academic degree)						
Academic parents	-0.011	-0.070	0.144	0.031	0.012	-0.143***
	(0.040)	(0.044)	(0.154)	(0.023)	(0.040)	(0.034)
Academic siblings	0.038	0.044	-0.032	0.091**	0.128**	0.134
	(0.051)	(0.063)	(0.074)	(0.046)	(0.063)	(0.127)
Unemployment of at least one parent during years until reform (reference: no unemployment)						
Unemployment (parents)	-0.017	-0.002	-0.064	-0.002	-0.042	0.076*
	(0.030)	(0.037)	(0.051)	(0.030)	(0.041)	(0.102)
Number of books of parents (reference: 0 to 100 books)						
101 to 500	0.006	-0.037	0.118	0.069	0.096	0.083
	(0.043)	(0.042)	(0.121)	(0.048)	(0.065)	(0.104)
More than 500	0.022	-0.024	0.133	0.085	0.173*	-0.084
	(0.052)	(0.054)	(0.162)	(0.068)	(0.105)	(0.065)
Sociodemographic variables						
Age (enrollment at school)	-0.008	-0.002	-0.004	0.008	-0.096*	0.206***
	(0.343)	(0.046)	(0.061)	(0.035)	(0.058)	(0.077)
Gender (male)	-0.047*	–	–	-0.045*	–	–
	(0.029)			(0.027)		
School Fixed Effects	yes	yes	yes	yes	yes	yes
Statistics						
McFadden's R^2	0.070	0.102	0.186	0.116	0.185	0.297
N	337	222	65	334	186	68
Number of clusters	77	69	35	82	63	30

[a] Dependent variable: dummy indicating voluntary social or ecological service at least once between October 2007 and March 2009. High ability students are characterized by an average grade in year 7 of good or very good, low ability students by an average grade in year 7 of satisfactory or below. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Variables not included in specification are indicated by –.

Table A.5: Final Examination Grades (Regression Estimates, Marginal Effects)[a]

	Pooled Sample		Female Sample		Male Sample	
	Average	Maths	Average	Maths	Average	Maths
Independent Variables	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.	Marg. eff.
D	-0.143**	-0.221***	-0.178**	-0.183**	-0.062	-0.312***
	(0.068)	(0.060)	(0.087)	(0.081)	(0.110)	(0.116)
Average grade in year 7 (reference: good)						
Very good	0.427***	0.062	0.378**	0.037	0.460**	0.001
	(0.150)	(0.143)	(0.184)	(0.165)	(0.217)	(0.317)
Satisfactory (and below)	-0.579***	-0.132	-0.557***	-0.171	-0.624***	-0.137
	(0.083)	(0.105)	(0.115)	(0.117)	(0.138)	(0.165)
Grade in mathematics in year 7 (reference: good)						
Very good	0.339***	0.511***	0.369**	0.517***	0.322*	0.558***
	(0.123)	(0.116)	(0.157)	(0.159)	(0.179)	(0.194)
Satisfactory (and below)	-0.239***	-0.552***	-0.338***	-0.633***	-0.073	-0.396***
	(0.089)	(0.095)	(0.111)	(0.110)	(0.159)	(0.146)
Academic degree of at least one parent or sibling (reference: no academic degree)						
Academic parents	0.278***	0.163*	0.331***	0.239**	0.199*	0.053
	(0.079)	(0.084)	(0.094)	(0.099)	(0.116)	(0.135)
Academic siblings	-0.055	0.077	-0.011	0.027	-0.174	0.180
	(0.088)	(0.092)	(0.121)	(0.130)	(0.146)	(0.157)
Unemployment of at least one parent during years until reform (reference: no unemployment)						
Unemployment (parents)	0.089	0.090	0.110	0.098	0.074	0.117
	(0.072)	(0.075)	(0.097)	(0.095)	(0.111)	(0.104)
Number of books of parents (reference: 0 to 100 books)						
101 to 500	0.243***	0.231***	0.193*	0.115	0.293**	0.416***
	(0.079)	(0.079)	(0.109)	(0.100)	(0.135)	(0.149)
More than 500	0.262***	0.302***	0.180	0.205	0.337**	0.417***
	(0.092)	(0.098)	(0.133)	(0.141)	(0.162)	(0.151)
Sociodemographic variables						
Age (enrollment at school)	-0.040	-0.176**	0.044	-0.161	-0.162	-0.177
	(0.074)	(0.081)	(0.107)	(0.115)	(0.130)	(0.137)
Gender (male)	-0.216***	-0.061	–	–	–	–
	(0.068)	(0.072)				
School Fixed Effects	yes	yes	yes	yes	yes	yes
Statistics						
R^2	0.317	0.260	0.318	0.272	0.329	0.285
N	693	681	433	425	260	256
Number of clusters	93	93	87	87	82	82
Estimation without control variables						
D	-0.128**	-0.219***	-0.173**	-0.198**	-0.035	-0.260**
	(0.064)	(0.065)	(0.080)	(0.091)	(0.118)	(0.116)
Gender (male)	-0.242***	0.018	–	–	–	–
	(0.082)	(0.078)				
School Fixed Effects	yes	yes	yes	yes	yes	yes
R^2	0.073	0.077	0.065	0.068	0.093	0.105
N	715	702	446	438	269	264
Number of clusters	93	93	87	87	84	84

[a] Dependent variables: standardized average score and standardized score in mathematics in final examination *(Abitur)*. A higher score indicates higher achievement. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Variables not included in specification are indicated by –.

Table A.6: Means of Selected Characteristics from Own Sample Compared to Means from GSOEP Data

	Student Survey	GSOEP Data Germany	p-value[a]	GSOEP Data East Germ.	p-value[a]
Sociodemographic variables	N=722	N=2994		N=1069	
Gender[b]	0.37	0.43	0.00	0.40	0.25
Age	20.70	22.07	0.00	21.94	0.00
Country of birth[c]	0.98	0.97	0.02	0.99	0.00
Number of siblings[d]	0.94	1.13	0.00	0.99	0.42
School-leaving degree of father (categorial)	N=685	N=2691		N=945	
No school-leaving degree	0.00	0.00		0.00	
Secondary school degree	0.58	0.60		0.68	
Upper secondary school degree	0.42	0.39	0.24	0.32	0.00
School-leaving degree of mother (categorial)	N=713	N=2715		N=963	
No school-leaving degree	0.00	0.00		0.00	
Secondary school degree	0.62	0.69		0.70	
Upper secondary school degree	0.38	0.30	0.00	0.30	0.00
Occupational degree of father (categorial)	N=693	N=2874		N=1028	
No occupational training	0.00	0.02		0.01	
Apprenticeship training	0.58	0.55		0.54	
University / university of applied sciences	0.41	0.42	0.01	0.45	0.08
Occupational degree of mother (categorial)	N=716	N=2885		N=1042	
No occupational training	0.01	0.06		0.02	
Apprenticeship training	0.55	0.61		0.50	
University / university of applied sciences	0.44	0.33	0.00	0.48	0.04
Occupational position of father (categorial)	N=682	N=2858		N=1019	
Not employed	0.07	0.07		0.07	
Blue-/white-collar worker, civil servant	0.77	0.77		0.80	
Self-employed	0.15	0.16	0.69	0.14	0.52
Occupational position of mother (categorial)	N=709	N=1744		N=525	
Not employed	0.08	0.15		0.08	
Blue-/white-collar worker, civil servant	0.84	0.74		0.84	
Self-employed	0.08	0.11	0.00	0.08	0.99
Leading occupational position of parents[e]	N=695	N=2999		N=1070	
Leading position of father	0.34	0.33	0.54	0.33	0.72
Leading position of mother	0.23	0.13	0.00	0.11	0.00
Number of books of parents (categorial)	N=719	N=690		N=249	
0 to 100	0.28	0.34		0.34	
101 to 500	0.47	0.48		0.51	
More than 500	0.25	0.18	0.00	0.14	0.00
Leisure activities during childhood[e]	N=723	N=1030		N=279	
Sport	0.76	0.73	0.24	0.60	0.00
Music	0.51	0.54	0.17	0.48	0.54

[a] p-value from t-test on equality of means; for categorial variables: p-value from Pearson χ^2-test of independence.
[b] Dummy variable: 0 (female), 1 (male)
[c] Dummy variable: 0 (foreign countries), 1 (Germany)
[d] Number of observations: 1019 (Germany), 368 (East Germany)
[e] Dummy variable: 0 (no), 1 (yes)

Table A.7: Comparison of Student Survey with GSOEP-Data (Regression Estimates)[a]

	(1)		(2)		(3)	
	Germany	East Germ.	Germany	East Germ.	Germany	East Germ.
Independent Variables	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Education and occupation of parents (categorial; reference: no degree / not employed)						
School-leaving degree of father	-0.063*	-0.202***	-0.122**	-0.265***	-0.099*	-0.039
	(0.036)	(0.067)	(0.053)	(0.064)	(0.055)	(0.068)
School-leaving degree of mother	0.038	-0.014	0.040	-0.041	0.050	0.039
	(0.033)	(0.065)	(0.051)	(0.069)	(0.048)	(0.061)
Occupational degree of father	0.075**	0.063	0.087	0.105	0.127**	0.006
	(0.036)	(0.067)	(0.054)	(0.070)	(0.059)	(0.071)
Occupational degree of mother	-0.169***	-0.019	-0.157***	0.070	-0.242***	-0.119**
	(0.025)	(0.058)	(0.045)	(0.061)	(0.035)	(0.054)
Occupational position of father	0.034	0.047	0.019	0.022	0.073*	0.018
	(0.030)	(0.054)	(0.046)	(0.057)	(0.044)	(0.064)
Occupational position of mother	-0.046	-0.080	-0.073	-0.102**	-0.063	-0.023
	(0.031)	(0.060)	(0.053)	(0.051)	(0.044)	(0.071)
Leading occ. position of father	-0.013	-0.046	0.004	-0.063	-0.069	-0.015
	(0.033)	(0.055)	(0.043)	(0.050)	(0.045)	(0.059)
Leading occ. position of mother	0.012	-0.081	0.029	-0.064	0.005	-0.039
	(0.038)	(0.059)	(0.050)	(0.053)	(0.051)	(0.056)
Leisure activities - current frequency (categorial; reference: daily)						
Watching TV	–	–	-0.039	0.000	–	–
			(0.032)	(0.036)		
Sport	–	–	-0.059***	-0.027	–	–
			(0.016)	(0.018)		
Reading	–	–	-0.115***	-0.081***	–	–
			(0.016)	(0.021)		
Honorary activity	–	–	-0.027	0.018	–	–
			(0.019)	(0.022)		
Leisure activities during childhood (dummy; reference: no activity)						
Sport	–	–	–	–	-0.029	-0.144**
					(0.043)	(0.058)
Music	–	–	–	–	0.030	-0.044
					(0.039)	(0.046)
Gender	0.043	0.032	0.065	0.122**	0.058	-0.050
	(0.026)	(0.047)	(0.040)	(0.048)	(0.039)	(0.049)
Constant	0.836***	0.662***	1.344***	0.695***	0.738***	0.531***
	(0.057)	(0.111)	(0.135)	(0.154)	(0.090)	(0.139)
R^2	0.042	0.051	0.139	0.143	0.075	0.062
N	2095	1029	1255	798	1393	805
Number of clusters	1177	787	834	670	916	697

[a] Dependent variable: Dummy variable, indicating whether an observation belongs to student survey (=0) or GSOEP data (=1). All standard errors are clustering-robust based on personal number (GSOEP panel data from 2000 to 2008). Standard errors of coefficient estimates are reported below coefficients.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Variables not included in specification are indicated by –.

Table A.8: Reform Effects, Estimation with Weighted Data[a] (Probit Estimates, Marginal Effects)[b]

Independent Variables	Pooled Sample Marginal effect	Female Sample Marginal effect	Male Sample Marginal effect
Enrollment decisions			
D: University education	-0.052	-0.093*	0.066
	(0.041)	(0.047)	(0.072)
D: Vocational education	0.056	0.092*	-0.028
	(0.043)	(0.051)	(0.062)
Drop-out from education			
D: Drop-out from university education	0.043**	0.032	0.018**
	(0.023)	(0.027)	(0.093)
D: Drop-out from vocational education	0.013	-0.005	0.060
	(0.012)	(0.008)	(0.044)
University subjects			
D: Humanities or Educational Sciences	0.127**	0.105*	0.022
	(0.051)	(0.062)	(0.031)
D: Social or Economic Sciences	-0.025	0.065	-0.082
	(0.051)	(0.051)	(0.069)
D: Natural Science, Technology (STEM)	-0.066	-0.011	-0.191*
	(0.063)	(0.062)	(0.101)
University subjects: STEM subjects in detail			
D: Natural Science or Maths	-0.078**	-0.058	-0.146**
	(0.037)	(0.040)	(0.072)
D: Engineering	-0.011	-0.034	0.080
	(0.043)	(0.027)	(0.103)
Other explaining variables X_i	yes	yes	yes
School Fixed Effects	yes	yes	yes
Statistics			
N	619	394	225
Number of clusters	92	85	80

[a] Data weighted according to GSOEP: weights indicate the probability that an observation is included in the GSOEP data.

[b] Dependent variable: dummy indicating probability of outcome (university or vocational enrollment at least once between October 2007 and March 2009; drop-out from university or vocational enrollment at least once between October 2007 and March 2009; university enrollment in a specific subject in March 2009). Marginal effects are evaluated at the means of the independent variables. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.9: Robustness Check for Age Effects (Probit Estimates, Marginal Effects)[a]

Independent Variables	Pooled Sample Marginal effect	Female Sample Marginal effect	Male Sample Marginal effect
Enrollment in University Education			
D_{1988}: University Education	-0.056	-0.043	-0.091
	(0.052)	(0.061)	(0.073)
D_{1988}: University Education in November 2007	-0.038	-0.110*	0.028
	(0.052)	(0.065)	(0.080)
D_{1988}: University Education in November 2008	-0.044	-0.022	-0.067
	(0.057)	(0.061)	(0.075)
Enrollment in Vocational Education			
D_{1988}: Vocational Education	0.021	-0.012	0.167*
	(0.050)	(0.058)	(0.093)
D_{1988}: Vocational Education in November 2007	-0.019	-0.021	0.057
	(0.040)	(0.047)	(0.093)
D_{1988}: Vocational Education in November 2008	0.023	0.007	0.097
	(0.048)	(0.056)	(0.085)
University Subjects			
D_{1988}: Humanities or Educational Sciences	0.051	-0.008	-0.211
	(0.054)	(0.079)	(0.000)
D_{1988}: Social or Economic Sciences	0.069	0.109	-0.011
	(0.068)	(0.075)	(0.091)
D_{1988}: Natural Science, Technology (STEM)	-0.034	0.036	-0.088
	(0.065)	(0.074)	(0.112)
University Subjects: STEM in Detail			
D_{1988}: Natural Science or Maths	-0.091**	-0.068	-0.196**
	(0.041)	(0.054)	(0.099)
D_{1988}: Engineering	0.044	-0.034	0.127
	(0.050)	(0.060)	(0.117)
Other explaining variables X_i	yes	yes	yes
School Fixed Effects	yes	yes	yes

[a] Dependent variable: dummy indicating probability of outcome (university or vocational enrollment at least once between October 2007 and March 2009 as well as in October 2007 and 2008; university enrollment in a specific subject in March 2009). The sample only contains individuals born in 1988. Marginal effects are average marginal effects. All standard errors are clustering-robust based on class as the sampling unit. Standard errors of coefficient estimates below marginal effects.
Stars denote significance of the estimates as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.