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Department of Economics  
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# Impact of a tertiary eligibility threshold on tertiary education and earnings: A discontinuity approach

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## Abstract

This study evaluates the impact of achieving tertiary eligibility in upper-secondary education on tertiary education and earnings in Sweden. Using a regression discontinuity design, we estimate the impact of tertiary eligibility and show that it has a substantial impact on the probability of enrolling in tertiary education. For students who achieve tertiary eligibility, the probability of enrolling in tertiary education increases by around 15 and 7 percentage points for an academic and vocational track, respectively. This implies (before age 30) around 8 percent higher earnings (at the intensive margin) for men on an academic track, while for women on an academic track it increases the probability of having positive incomes (the extensive margin) by around 3 percent. Thus, we conclude that (academic) students at the margin of eligibility for enrolling in tertiary education receive a substantial tertiary education payoff.

**Keywords:** Tertiary education, upper-secondary education, earnings, eligibility, regression discontinuity design

**JEL-codes:** I21, I26, I28

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## 1 Introduction

Tertiary education is a key determinant of future labour market outcomes. To be eligible for tertiary education in Sweden, students are required to achieve tertiary eligibility. In 1997-2010, this meant that students had to achieve pass grades in 90 percent of the course credits in upper-secondary education. Having such a clear cutoff, where passing or failing one marginal course determines tertiary eligibility, may have a decisive influence on the probability of enrolling in tertiary education.<sup>1</sup> However, the system provides a second chance where non-pass grades can be improved in adult education (Komvux). Yet, the transition to tertiary education is likely to be smoother for those reaching tertiary eligibility in upper-secondary education. Supplementing grades in adult education comes with time and financial costs, decreasing the probability of pursuing tertiary education. Stenberg (2007) also shows that supplementing grades in adult education is not associated with higher earnings.

Thus, not reaching the tertiary eligibility requirement in upper-secondary education is likely to have a negative effect on educational attainment and future labour market outcomes. Our data show that individuals who fail to achieve tertiary eligibility have almost 70 percent lower probability of enrolling in tertiary education and around 18 percent lower earnings eight to ten years after finishing upper-secondary education compared with individuals who achieve tertiary eligibility. However, educational failure is not random and a substantial part of the observed difference is likely to be caused by both scholastic skills and non-cognitive traits. For a similar marginal group in the US and Canada, Heckman et al. (2010) report that the General Educational Development (GED)

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<sup>1</sup>In a schooling system such as the Swedish one, where higher education is tuition-free, the eligibility criterion is definitely a barrier, whereas in a schooling system with high tuition fees, the marginal group is less likely to invest in higher education anyway.

test – which gives high school dropouts high school equivalency credentials – has a minimal impact on labour market outcomes and post-secondary educational attainment.<sup>2</sup> They conclude that “The same traits that lead them to drop out of school also lead them to leave jobs early, to divorce more frequently, and to fail in the military”.

Hence, estimating a causal tertiary eligibility effect is difficult because the effect is likely to be biased by unobserved individual characteristics. The question is whether the education and earnings differences reported above are partly caused by lower tertiary investment because of non-eligibility for tertiary education, or by other factors. This study uses the discontinuity in the Swedish tertiary eligibility requirement to estimate the probability of enrolling in tertiary education and earnings for students at the margin of tertiary education. Thus, we estimate the marginal effect of reaching the 90-percent threshold in a regression discontinuity design (RDD). The RDD requires that individuals have imprecise control over the assignment variable (Lee and Lemieux, 2010), in this setting the share of passed courses. In the last term of their third year, students take around seven or eight courses and for each of these courses the grade is uncertain, particularly for marginal students. To precisely manipulate the threshold it requires that students know in advance the number of courses they need to pass and which courses they need to focus on. This seems unlikely. For teachers to manipulate the threshold they have to collude with other teachers to raise the student over the threshold. However, since tertiary eligibility is not raised as an important educational outcome and students are not explicitly encouraged to pass the cut-off, teacher manipulation around this particular threshold is, also, not likely.

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<sup>2</sup>Moreover, exit exams in the US and Germany do not seem to have a major impact on higher education and labour market outcomes (Backes-Gellner and Veen, 2008; Baker and Lang, 2013).

As tertiary eligibility is primarily assumed to affect enrolment in tertiary education,<sup>3</sup> this study has much in common with recent studies using discontinuities in admission systems. These analyze the marginal impact of different amounts of tertiary education (Öckert, 2010; Zimmerman, 2014), quality differences in tertiary education (Hoekstra, 2009), or different fields of tertiary education (Hastings et al., 2013; Kirkeboen et al., forthcoming). The fundamental difference is, however, that our study uses a discontinuity in the eligibility to apply for tertiary education, and not a discontinuity in the admissions per se.

Thus, a significant contribution of this study is that we examine the tertiary payoff of students at the margin of tertiary eligibility enrolling in tertiary education. The marginal group is from a relatively low socioeconomic background. Compared with the average individual enrolling in tertiary education, their father's income is almost 30 percent lower. Additionally, investments in tertiary education have increased substantially in Sweden and most other developed countries, and in an expanding tertiary education system it is particularly important to explore the tertiary payoff of the marginal student because the payoff may be low, possibly lower than the individual's cost of education. A large body of research has established that the payoff of tertiary education is substantial for the average tertiary student (see e.g. Card, 1999). In contrast, few studies have investigated the tertiary payoff of marginal students enrolling in tertiary education. A review of the research on the returns to tertiary education for students at different margins can be found in Öckert (2012). He shows that there seem to be variations and

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<sup>3</sup>Because the signaling value of tertiary eligibility is small (given the upper-secondary grades) – and not reported in the school leaving certificate – employers are unlikely to act on tertiary eligibility.

that e.g., proximity to college (probably affecting the costs of education) is associated with differences in the returns.

This paper is organized as follows. Section 2 reviews the recent literature on marginal effects of education on earnings and Section 3 presents the data. Section 4 describes the RDD model and the grading system, and graphically analyzes the relationship between tertiary eligibility and tertiary education. Section 5 presents the results of the analysis and Section 6 presents some conclusions.

## **2 Literature review**

To the best of our knowledge, a similar tertiary eligibility rule is not applied in other countries and the only Swedish study to examine tertiary eligibility is that by Hall (2012). It evaluates an educational reform in 1991 that increased the academic content and length of vocational upper-secondary education and gave vocational students tertiary eligibility. Hall considers a pilot scheme that preceded the reform and demonstrates that it did not affect enrollment in tertiary education or earnings, but it increased the dropout rate from vocational education.

The discontinuity in the Swedish tertiary eligibility requirement provides random variation in tertiary enrollment, which discontinuities in admission systems also do. Using admissions data, Zimmerman (2014) studies the returns to college for marginal students attending Florida International University. In a discontinuity design (where the counterfactual is community college attendance), he compares students at the (grade point) threshold of admission, and finds that students just above the admission threshold receive 22 percent higher earnings 8-14 years after completing high school, with the gain being largest for males. Since admitted students invest in almost two more years of

education than non-admitted students, this corresponds to a return to schooling of 11 percent. In a similar design, Hoekstra (2009) studies the (test score) cut-off effect of being admitted to a US flagship state university and shows that for white men aged 28 to 33, attending a flagship university increases earnings by 20 percent. This is a large effect considering that the rejected individuals are likely to attend less selective universities<sup>4</sup>. Hence, the estimate is the marginal effect of attending a high-quality university<sup>5</sup> and not the effect of enrolling in higher education. This is a shortcoming of using admission discontinuities: rejected individuals generally attend some other education and the final education level could end up being similar. This probably explains the small impact in the study by Öckert (2010), which uses a discontinuity in the Swedish admissions system to tertiary education. With admissions data, he examines the threshold where almost equivalent applicants are randomly admitted to tertiary education. The admissions data are for 1982 and 14 years later (1996) the admitted applicants have 0.2 more years of schooling than the rejected applicants, but the earnings difference between the groups is insignificant.

Field of education is another qualitative aspect of education that determines the payoff of marginal students. Recent studies analyze discontinuous admissions rules that randomize individuals to different fields of education and show that field of education is of major importance. Kirkeboen et al. (2016) study the returns on different fields of education for Norway and find that the variation in payoff between different fields of study is as large as the payoff from enrolling in tertiary education. They also show that

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<sup>4</sup>Hoekstra lacks information about the counterfactual study choice if rejected at the flagship university.

<sup>5</sup>Other studies investing the impact of college quality on labour market outcomes find that quality matters (see e.g. Black and Smith, 2006) and the variation in quality between colleges seem to increase in the US (Hoxby, 2009). A Swedish study shows that attending an old university (of plausibly higher quality) is more rewarding than attending a new university (Lindahl and Regnér, 2005).



individuals choose a field where they have a comparative advantage. In a similar study, Hastings et al. (2013) show that for Chile, payoffs vary largely by field of education, with degrees in health, social science and science/technology in particular being highly rewarded. They conclude that there seem to be frictions in the supply and/or demand for degrees with high payoffs.

Thus, field of education and school quality seem to have a large impact on the payoff of tertiary education and students at the margin of tertiary education, who are lower ranked in the competition for tertiary education places, may have to settle for a low-paying field of education or a low-quality university. Marginal students may also have to settle for a field of education that is poorly matched with their abilities, which could affect their payoff.

On the other hand, in a study on a one-off lowering of the examination threshold in France that enabled students to invest in more education than would otherwise have been possible, Maurin and McNally (2008) provide evidence of high returns to tertiary education for a particular marginal group. The student riots in 1968 sparked a strike that meant that normal examination procedures were abandoned at higher education institutions. For students at the margin of passing their examinations, the exogenous increase to a higher education level resulted in a return to schooling estimate of 14 percent. An additional year of schooling also increased the probability of reaching an upper-white-collar occupation by 10 percent.

### **3 Data and sample**

The data used in this study is a population sample of students receiving a final grade from upper-secondary education between the years 2003 and 2005<sup>6</sup>. With matched education data and labour market data from Statistics Sweden (SCB), we follow these cohorts up until 2013. The register of final grades from compulsory school, the register of grades from upper-secondary school, and the register of higher education describe the educational attainment of these individuals, while the Longitudinal Integration Database for Health Insurance and Labour Market Studies (LISA) describes their labour market outcomes. The Multigenerational Register links the individuals to their parents, and the population and housing censuses provide data on parental education and income during childhood.

We restrict the sample to individuals who have attended Swedish compulsory education. For each cohort, around 23 percent are not in the register of grades from upper-secondary school (but they are in the LISA database), because they fail to achieve a final grade from upper-secondary education. The main proportion is drop-offs from upper-secondary education and only a minor share leave school after compulsory education.<sup>7</sup>

Before 2003 it is common that individuals do retake exams at their upper-secondary school (typically during the summer after graduating in June), providing them tertiary eligibility. Since the register of grades from upper-secondary school is not updated after the graduation date we lack this information. From 2003 this is less common and only 0.2% attend tertiary education without achieving tertiary eligibility. These students who achieve tertiary eligibility without supplementing their grades in adult education (but

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<sup>6</sup>Since the aim is to analyse earnings in 2013, we exclude younger cohorts (so at least eight years have passed since finishing upper-secondary education).

<sup>7</sup>Every student has a right to begin upper-secondary school. When lacking upper-secondary eligibility the student begins a certain program named the 'individual program'. Almost every student begins either the national or the individual program (98.3 percent). For each cohort, around 0.5 percent of graduates are from the individual program and, since they cannot achieve tertiary eligibility, they are removed from the sample.

where correct information about the running variable, passed courses, is missing) are removed from the sample.

It is common for Swedish students (12.0 percent) to finish upper-secondary education at an older age than the typical graduation age of 19. A small share (2.8 percent) finish at a younger age. Typical reasons for a delayed finishing age are: retake years, breaks, changing programs, or studies abroad. Students who graduate in advance typically also start compulsory schooling before the mandatory starting age. We remove pupils who finish more than one year later (2 percent) or more than one year in advance (less than 1 per thousand). Keeping students who finish at age 18 or 20 has no impact on the results in this study. Thus, the studied cohorts are, principally, born between 1984 and 1986 (about 2 percent are born in either 1983 or 1987), and the sample consists of 229,971 individuals. However, it is only in the graphical analysis below (section 4) that the full sample is used; additional restrictions largely reduce the study sample in the econometric analysis.

## **4 The empirical strategy and tertiary eligibility in Sweden**

### *4.1 Regression Discontinuity Design (RDD)*

This section presents a RDD to estimate the tertiary eligibility effect on tertiary education and earnings. Formally, in our analysis the achieved course credits,  $C$  (the *running variable*), determines tertiary eligibility,  $T$  (the *treatment variable*). If  $C \geq 0.9$ , tertiary eligibility ( $T = 1$ ) is achieved. The standard RDD model is:

$$Y = \beta T + f(C) + \gamma X + \epsilon$$

where  $f(C)$  are low-order polynomials of  $C$  included separately on either side of the threshold and  $X$  is a set of observable characteristics affecting the outcome and  $C$ . The

RDD assumes that students have, conditional on  $X$ , imprecise control over  $C$ . If there is a discontinuity around the threshold of tertiary eligibility in the histogram of  $C$  or the baseline covariates,  $X$ , this indicates sorting, i.e., that students can precisely manipulate  $C$ . Before visually inspecting the discontinuity around the threshold, the covariates, and the histogram of the course credits, we present the Swedish grading system and discuss whether sorting around the threshold is likely.

#### *4.2 The grading system and tertiary eligibility in Sweden*

A full upper-secondary program<sup>8</sup> consists of 2,500 course credits. Courses give either: 50, 100, 150, 200, or 250 course credits (with some exceptions of even larger courses) and the programs contain a larger share of compulsory courses. The discrete nature of the running variable has some impact on the analysis (we return to this later).

The system contains four grade levels: no-pass, pass, pass with distinction, and pass with special distinction. Pass grades are not a requirement for getting a final grade – to achieve a final grade it is only necessary to complete three years of upper-secondary education.

To receive a diploma of eligibility for tertiary education, a student needs pass grades in 90 percent of the course credits, which corresponds to 2,250 course credits.<sup>9</sup> For male students just above the threshold of 2,250 course credits on an academic or vocational track, their compulsory grades place them in the 46th and 15th percentile of the male

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<sup>8</sup>Students can take a reduced program, but to achieve tertiary eligibility they must still reach 90 percent of a full program.

<sup>9</sup>Before 1997, the eligibility for tertiary education requirement was lower: pupils needed to participate in two years of Swedish and English courses at upper-secondary level and more than 95 percent of pupils received tertiary eligibility before 1997. To be admitted to some tertiary programs the individual is still required to take certain courses during upper-secondary education.

compulsory grade distribution (who finish upper-secondary education), respectively. The corresponding numbers for female students are 42 and 13.

Generally, the seven or eight courses taken by students in the last term of their third year are each assessed by different teachers (who teach the different subjects). From the student's perspective, there is always some uncertainty about whether they will pass a course (particularly for marginal students), and having precise control over seven or eight courses is unlikely. The student have to know in advance which, and the number of, courses they need to focus on. Precise manipulation of the threshold is therefore unlikely. Even if the students makes the extra effort to pass the threshold, he or she may still fail, or end up far above the threshold. Thus, having abilities (cognitive or non-cognitive) that is potitively related to the probability of passing the threshold does not imply precise manipulation. These abilities are also continuously distributed and will affect the running variable continuously.

In addition, teachers may manipulate the grades of students with certain characteristics but, as long as teachers do not coordinate their behavior, their control is also imprecise. Moreover, becuase, tertiary eligibility does not seem to be raised as an important educational outcome during this period teacher collusion seems unlikely. We did not find a single document (either school action plans or official inquiries) focusing on the importance of tertiary eligibility and students do not seem to be encouraged to pass the cut-off.<sup>10</sup>

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<sup>10</sup>We have talked to several students who graduated upper-secondary education during this period and they did not recollect that tertiary eligibility was raised as an important outcome. A large share of these students did not even seem to recollect how tertiary eligibility was calculated. Because tertiary eligibility is now (again) based on passing certain non-mandatory core courses, this has changed. We contacted a large number of school representatives and they pointed out the importance of passing core courses.

Next, we provide a visual inspection of the relationship between the course credits and tertiary education, and then assess whether the variation in tertiary enrolment around the threshold of tertiary eligibility is random. It is difficult to rule out sorting, but our evidence below indicates that the variation around the threshold is as-good-as random.

#### *4.3 Visual inspection of the relationship between course credits and tertiary education*

To motivate the empirical strategy, we show the impact of barely passing the cut-off point on the probability of enrolling in tertiary education up until 2013. The x-axis shows the sum of courses credits reached during upper-secondary education for students who finish upper-secondary education,<sup>11</sup> and the y-axis shows the share going to tertiary education. The vertical lines show the sum of course credits providing tertiary eligibility ( $2,250=2,500\times 0.9$ ) and the sum of course credits for having passing grades in all courses (2,500). In the RDD estimation, we exclude individuals close to the upper threshold ( $\leq 2,450$ ), because modelling another jump (see Figures 1 and 2) complicates the RDD. The selection around a full program is also very different from the selection around the tertiary eligibility threshold (discussed below).<sup>12</sup>

Figure 1 shows the findings for men and women studying on an academic track. The main finding is that reaching the tertiary eligibility threshold has a major impact on the probability of enrolling in tertiary education. For both men and women, the share enrolling in tertiary education is almost 15 percentage points higher for students passing

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<sup>11</sup>For illustrative reasons, we exclude the highest and lowest achievers who constitute about 3 percent of the total sample.

<sup>12</sup>The figures also show that it is common to take more courses than a full program. There are several reasons for this and the main motive is probably a strategic motive (and academic interest is another one): the final grade is based on grades up to a full program, and by taking an additional course students can replace a low passing grade with a higher grade. However, according to the figures, this strategic behavior does not seem to increase the probability of enrolling in tertiary education. More importantly, around the margin of tertiary eligibility the probability of taking more courses than a full program is equal for individuals just above and below the threshold.

the marginal course. Moreover, the share enrolling in tertiary education increases with the sum of course credits. Hence, since more passed courses increases the final grade – on which admission to higher education is based – the probability of enrolling in tertiary education is related to the sum of course credits.

**Figure 1 about here**

Figure 2 shows the same descriptive for students studying on a vocational track. First, the share enrolling in tertiary education is much lower for this group of students, 21 and 40 percent for men and women, respectively. Second, achieving tertiary eligibility has a smaller impact on the probability of enrolling in tertiary education: at the 2,250 threshold, the probability increases by around 8 percentage points for both genders.

**Figure 2 about here**

*4.4 Inspection of the covariates*

As mentioned earlier, the assumption in RDD is that the individual has imprecise control over the running variable, here the passed course credits. To examine if this condition is fulfilled, we analyze whether the distribution of baseline covariates is continuous at the threshold.

Tables 1 and 2 show descriptive statistics for students with course credits barely under (2,150-2,200) and over (2,250-2,300) the tertiary eligibility threshold, and for students with less (or more) course credits than 2,150 (or 2,300). Students barely under the threshold differ from students barely over the threshold: their parents' education level and income are lower and their compulsory grades are higher.

**Tables 1 and 2 about here**

Figures A1 to A5 provide a visual illustration of the covariates, to see whether they are locally balanced on either side of the threshold. The figures model the relationship between the sum of course credits,  $C$ , and: compulsory grades, parental education, and income. The fitted intervals (here  $C$  and  $C^2$  model the relationships separately for the bandwidths 1,850-2,250 and 2,250-2,450, respectively) indicate whether there are jumps at the 2,250 threshold. For women, a tendency of a jump around the threshold can be seen for compulsory grades. As shown in Table 3, which reports estimates of the relationship between tertiary eligibility and the covariates for our preferred models (see section 6.2), the jumps for women's compulsory grades are significant in one of the models. We also conduct a F-test to see whether the covariates jointly affect the probability of reaching tertiary eligibility (results not reported). In this test, we include the full set of covariates (i.e., also region of origin variables). For female students on a vocational track, the test is significant at the 5% level, but only one covariate is significantly positive: having one native and one foreign-born parent. Hence, the overall conclusion is that the pre-determined covariates are as good-as-random around the threshold of tertiary eligibility.

**Table 3 about here**

In Figure 3 we also investigate upper-secondary grades – an endogenous outcome likely to be affected by potential selection around the threshold, i.e., if the selection affects the probability of achieving tertiary eligibility, it is reasonable to assume that students who reach the tertiary eligibility threshold have higher grades in general. For example, if the individual is motivated or risk-averse and wants to avoid ending up below the threshold, an extra effort is likely to result in a higher grade (than just a pass) in at least one course.

**Figure 3 about here**



As Figure 3 shows, at the threshold of tertiary eligibility there is no jump in upper-secondary grades.<sup>13</sup> In contrast, at the threshold of having completed a full program, there is a clear jump in upper-secondary grades: at the 2,500 threshold the grades jump by 17 percent. Thus, as acknowledged above, we have to restrict the upper bandwidth to  $\leq 2,450$  course credits, since otherwise we have to model the upper jump (and the selection at the jump), an unnecessary complication in modeling.

#### *4.5 Inspection of the histogram of the running variable*

Finally, a visual inspection of the histogram of the running variable,  $C$ , is recommended (Lee and Lemieux, 2010). Thus, for men and women, Figure 4 shows the histogram of the course credits. We cannot detect a jump in the distribution at the threshold, which indicates that students have imprecise control over the running variable,  $C$ . A formal test is also recommended. McCrary (2008) propose that frequencies be computed for bins around the threshold. In a second step the frequency counts are analysed with local linear regression. However, around the threshold of tertiary eligibility the number of bins is too few to perform this test. This is because our data are discrete (the bins cannot be smaller than the smallest course size of 50).

**Figure 4 about here**

## **5 Regression discontinuity results**

### *5.1 Specifying the RDD model further*

The validity of the RDD is conditional on adequate modelling of  $E[Y | \Sigma C]$ . To avoid estimating a treatment effect caused by nonlinearities in  $C$ , a small interval (bandwidth)

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<sup>13</sup>According to Table 1, the difference in upper-secondary grades between the groups barely over and under the threshold is around 0.7, which roughly corresponds to the achieved course credit difference: the difference in course credits is about 100, and 100 course credits increases the final grade by 0.4 to 0.8 (depending on the grade achieved).<sup>13</sup> That is, besides passing the marginal course, students above the threshold do not seem to achieve higher grades than students below the threshold.

around the cut-off point is recommended (Hahn, Todd, and van der Klaauw, 2001; Lee and Lemieux, 2010). The non-parametric approach used in this study – with different polynomials on both sides of the discontinuity – is often called local linear regression. We use two different bandwidths: 2,050-2,400 (0.82-0.96% passed courses), and 1,850-2400 (0.74-0.96%) passed courses. The first bandwidth is symmetrical, with the same number of course credits, 200, on both sides of the cut-off. As discussed above, we want to avoid modeling the upper threshold (completing a full program) and therefore we increase only the lower bandwidth to 400 course credits.<sup>14</sup> We also estimate the tertiary eligibility effect when including C linearly and when including C quadratically.<sup>15</sup> Use of clustered standard errors is recommended (Lee and Card, 2008) and we therefore cluster the standard errors on the smallest bin size: 50 course credits.

### *5.2 RDD results for tertiary eligibility*

The unconditional impact (without covariates included) of tertiary eligibility on tertiary education is shown in Table 4, columns (1)–(4) and (5)–(8), for men and women, respectively. The four different models correspond to the different specifications described above. The upper panel of Table 4 shows the results for students on an academic track and the lower panel shows the results for students on a vocational track. For students on an academic track, tertiary eligibility increases the probability of investing in tertiary education by around 10 to 15 percentage points for men, and 12 to 18 percentage points for women (i.e., increasing the probability of enrolling in tertiary education by at least 30 percent). For students on a vocational track, tertiary eligibility increases the probability of investing in tertiary education by around 7 percentage points for men and around 4 to

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<sup>14</sup>Because our data are discrete, formal analysis of the optimal bandwidth is of little value; decreasing the lower bound further has no impact on the results.

<sup>15</sup>Higher-order polynomials do not increase the fit of the model.

10 percentage points for women (i.e., increasing the probability of enrolling in tertiary education by around 100 and 60 percent for men and women on a vocational track, respectively).

#### **Table 4 about here**

Although the different models give somewhat different estimates, a clearly superior (or inferior) model is difficult to detect. However, Figures 1-2 suggest that a linear model is sufficient for the smaller bandwidth, but a linear and quadratic model is preferred for the wider bandwidth (particularly for women). These are our preferred models. We also tried weighting with the inverse of the (course credit) distance from the threshold, and found that it has no significant impact on the results.

Next we add a battery of background covariates (region of origin for first-generation immigrants, parents' country of origin for second-generation immigrants, and parental education and income), and compulsory grades to the models. As Table 5 shows, the tertiary eligibility effects on tertiary education decrease some with covariates included, but the overall conclusion is that they have no major impact on the results.<sup>16</sup> To sum up, tertiary eligibility has a significant impact on investment in tertiary education.

#### **Table 5 about here**

### *5.3 RDD results for other educational outcomes*

Next we examine the impact on other educational (related) outcomes: (i) years between upper-secondary education and tertiary education (for those who go to tertiary education), (ii) years of schooling, and (iii) the probability of taking 15 years of schooling or more. Taking 15 years of schooling implies that the student reaches the number of tertiary

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<sup>16</sup>School fixed effects have also been included, but these have no impact on the estimates.

course credits required for a Bachelor's degree<sup>17</sup>. Table 6 shows the results for the model with the broader bandwidth and the second-order polynomials (and covariates included), but note that the results are similar for the other models. In the upper panel, we find that individuals with tertiary eligibility enroll in tertiary education around one year earlier than those who fail to achieve tertiary eligibility in upper-secondary education. The effect is almost the same for men and women, but somewhat larger for a vocational track. The middle panel shows that the group reaching tertiary eligibility have about 0.2-0.3 and 0.1 years of schooling more than the group without tertiary eligibility for an academic and a vocational track, respectively. Calculating the impact on years of schooling for those who actually pursue higher education (i.e., taking the ratio between these estimates and the estimates in Table 5) shows that it corresponds to about 1.5 years of schooling for men on an academic track and for men and women on a vocational track. For women on an academic track, it corresponds to about 2 years of schooling.

In the lower panel we find the tertiary eligibility effect of taking 15 years of schooling or more. These effects are considerably smaller than the tertiary eligibility effects on tertiary education enrolment (see Table 5). This is an expected finding, since a relatively large share of students at the margin of tertiary eligibility decide to end their tertiary studies at an early stage: for those with 2150-2300 and  $\geq 2301$  course credits, 55 and 30 percent take less than 15 years of schooling, respectively.

### **Table 6 about here**

Next we examine the tertiary eligibility effect on tertiary attendance longitudinally, i.e., we estimate the model (same model as above) for each year after finishing upper-secondary education. The plot begins with zero years, which indicate the autumn after

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<sup>17</sup>However, without fulfilling the program-specific requirements (including a Bachelor's project or thesis) a Bachelor's degree is not necessarily achieved. The student also has to apply for the degree and not everyone does.

finishing upper-secondary education in June. For students on an academic track, Figure 5 shows that the tertiary eligibility effect decreases with years since finishing upper-secondary education, but after seven years the effect for women increases again. This is around the time when the recent financial crisis increased unemployment in Sweden, potentially leading to increased investment in tertiary education. Another explanation could be a change in the admissions system in 2010.<sup>18</sup> For students in vocational streams, the tertiary eligibility effect first increases up to around four to five years after finishing upper-secondary education, and then decreases.

**Figure 5 about here**

We also examine whether eligible students choose better universities. Thus, we estimate the tertiary eligibility effect on attending a high-quality university (for individuals who pursue tertiary education). Quality is measured as either: the probability of attending an old university (where the earnings premium seems to be higher (Lindahl and Regnér, 2005)), or the students' mean upper-secondary grades at the universities. For men on an academic track, as Table 7 shows, there is a negative impact on the probability of attending a high-quality university. For women on a vocational track there is a positive impact on the probability of attending an old university. A possible explanation for these results is differences in the selection into tertiary education within the groups. That is, since the non-eligible individuals, de facto, have to supplement their grades in adult education, those who actually pursue tertiary education are likely to be more selective than eligible individuals who pursue tertiary education, i.e., since the cost of investing in

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<sup>18</sup>From 2010, individuals who supplemented (in adult education) grades in already passed courses were placed in a separate ranking group (called the "supplement group") with relatively few study places, but those who passed courses were placed in the main ranking group (called the "direct group") with a relative increase in study places. So for our individuals (who have incentives to mainly supplement failed courses), the new admission system probably increases the chance of getting accepted for tertiary education.

education is higher for the non-eligible individuals, it may affect the selection. However, it is uncertain why only men are negatively affected, and why there is a positive impact for women on a vocational track.

#### **Table 7 about here**

We also analyze the probability of attending different fields of education. For academic students we find that tertiary eligibility has a negative impact on the probability of attending a field of education with higher mean upper-secondary grades among its students. The impact remains when including the university quality indicators in the model. As for university quality, the cost of education is also likely to affect the field of education. For the probability of choosing *certain* fields of education, we find no general pattern in the results (not reported). On the other hand, in comparison with students who finish a full program, students around the margin of tertiary eligibility are much more likely to enter low-paying fields of education (humanities, teaching, nursing) and less likely to enter a high-paying field (technology, science).

#### *6.5 RDD results for earnings*

Finally, we estimate the tertiary eligibility effect on earnings, where the earnings measure is the individual's annual sum of gross wage earnings (in SEK). However, for our young cohorts, it is problematic to analyze the (long-term) payoff of tertiary education. First, they enroll in tertiary education at a late age: for individuals around the margin of tertiary eligibility, the mean period between upper-secondary education and tertiary education is about three years (in the total sample, the mean period is two years). A delayed tertiary school start implies that almost 10 percent of the individuals are still in school in 2013.

Second, investment in tertiary education implies a late labour market entry and less labour market experience. As Figure 6<sup>19</sup> shows, the non-eligible group consistently accumulates more labour market experience than the eligible group.

**Figure 6 about here**

Thus, when estimating the tertiary eligibility effect in a reduced effect model, the long-term effect on earnings is probably underestimated. We try to handle this by controlling for labour market experience (up until 2012, to avoid endogeneity between the earnings outcome and experience), but at the expense of losing the causal interpretation. We analyze the extensive margin (probability of having earnings $>0$ ) and the intensive margin (earnings, if earnings $>0$ ). As suggested in section 6.1, two different models are preferred: i) the smaller bandwidth (2050-2400) with a linear course credit control, and ii) the wider bandwidth (1850-2400) with a linear and a quadratic course credit control.

Tables 8 and 9 show the earning results for an academic and vocational track, respectively. Columns (1)-(2) are for men and columns (3)-(4) are for women. For the extensive margin, we find a positive tertiary eligibility effect, around 2-3%, for women (although insignificant in the second model for a vocational track). Figure A7 graphically presents the extensive threshold effect for women. For women on an academic track, the figure supports the results, but for women on a vocational track the jump is less clear. Note, the coefficient intervals in the figure are based on the mean values for each bin, and are therefore broader than the corresponding RDD coefficient intervals.

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<sup>19</sup>Figure 6 shows descriptive differences for individuals close to the threshold of tertiary eligibility (here 2,100-2,350 course credits). Since we have yearly labour market data, we can construct true labour market experience and not settle for potential labour market experience (age-years of schooling -7). If an individual is employed (in November) and receives  $\geq 4$  months of median salary for individuals below 30 years of age (a total salary of SEK 100,000), we assume that the individual has one year of experience; 2 to 4 months of median salary gives 0.5 years of experience, 1 to 2 months of median salary gives 0.25 years of experience, and less than 1 month of salary gives 0.1 years of experience.

### **Tables 8 and 9 about here**

For men, tertiary eligibility has no impact on the extensive margin. The negative impact in one of the models for men on a vocational track is not supported by the graphical results (see Figure A6).

For the intensive margin, without experience controlled for, the tertiary eligibility effect is around 6% and 2-3% for men on an academic and vocational track, respectively. When including experience in the model the effect increases to 8-9% for men on an academic track and around 3% for men on a vocational track. More importantly, the effect becomes significant in all models for men. The graphical results shown in Figure A7 support the finding for men on an academic track, while for men on a vocational track the jump is less clear.

For women on an academic track the tertiary eligibility effect on the intensive model is insignificant in all models, while for women on a vocational track the effect is largely negative. However, the negative effect does not show up graphically in Figure A8, and is probably caused by misspecification.

To conclude, for students on an academic track, tertiary eligibility has a significant impact on labour market outcomes, but for students on a vocational track the impact is more uncertain. However, identifying a reduced form effect from a relatively small impact on tertiary education for vocational students can be expected to be difficult. Hence, in this study we estimate reduced form models where the impact of tertiary eligibility on earnings is not necessarily channeled through higher education. An alternative is to estimate an IV model where tertiary eligibility functions as the instrument. However, since tertiary eligibility may have some signaling value on the labour market – and therefore a direct impact on earnings – we prefer the reduced form model.



## **6 Conclusion**

It is generally known that there is a substantial penalty of dropping out from upper-secondary education (see e.g., Oreopoulos (2007), who uses compulsory schooling laws to evaluate high school drop-out). The present study shows that not reaching an arbitrary tertiary eligibility requirement in upper-secondary education is also crucial. From a theoretical perspective, the non-passing of a marginal course – which can be supplemented later – should have a small impact on the educational investment decision, but the findings in this study show that it has long-term consequences.

The first main finding of this study is that having a tertiary eligibility threshold in upper-secondary education has a substantial impact on tertiary education. For students on an academic track, exceeding the tertiary eligibility threshold increases the probability of enrolling in tertiary education by around 15 percentage points. For marginal students on a vocational track, who are farther down in the scholastic skill distribution, achieving tertiary eligibility increases the probability of enrolling in tertiary education by around 7 percentage points. As second finding, from estimating the payoff of tertiary eligibility, is that it increases earnings (the intensive margin) by around 8% for men on an academic track. For women on an academic track, it increases the probability of having positive earnings (the extensive margin) by about 3%. For students on a vocational track, the labour market impact is uncertain. However, with earnings measured before age 30, the long-term payoff of tertiary eligibility is likely to be understated, while for vocational students a positive impact may show up in the long run.

Thus, the Swedish tertiary eligibility requirement prevents a large group of individuals from investing in tertiary education, and for these marginal students on an

academic track a significant labour market impact of tertiary education is found (even though our margin seems to be differentiated into low-quality universities and low-paying fields of education). Because 23 percent of students on an academic track in upper-secondary school do not pursue tertiary education, further expansion of tertiary education in Sweden is suggested.

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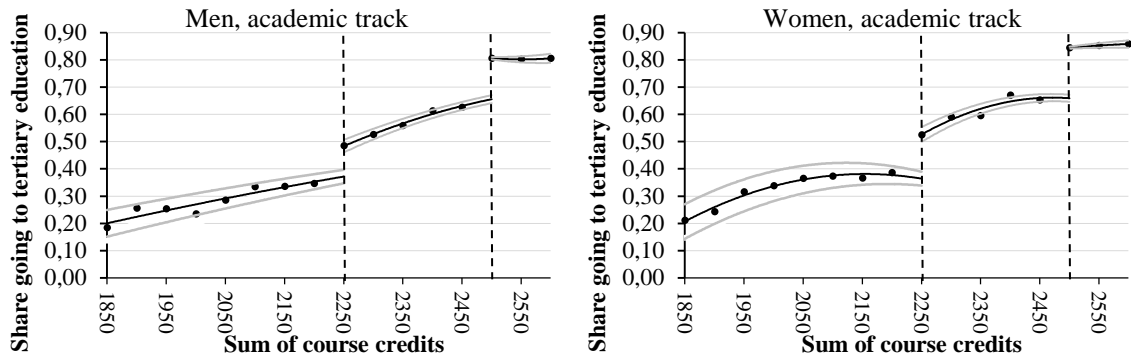
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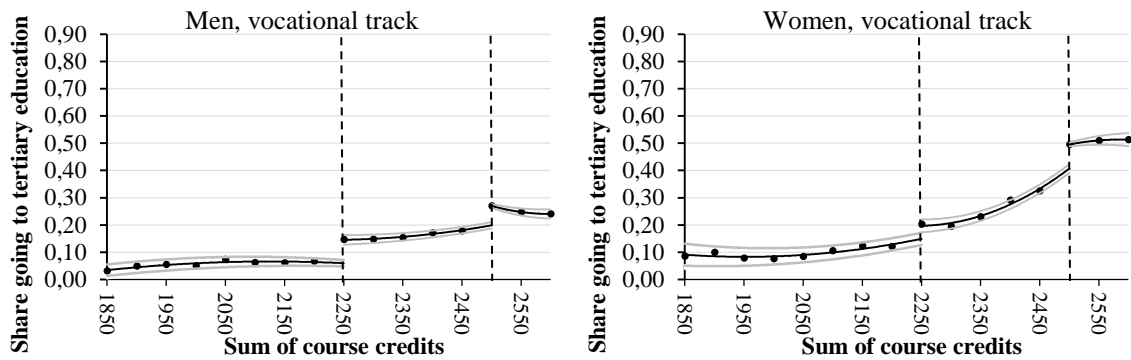
## **Appendix**

Parental education in 1990 is measured as years of schooling. For 7.9 percent of the fathers and 6.6 percent of the mothers, education level is missing; for these individuals dummy variables are used. Parental earning is an average of (positive) earnings in 1985 and 1990. The first-generation immigrant dummy is child's region of origin: Nordic countries, EU28, non-EU28 countries and Russia, North America and Oceania, Africa, Asia and South America. Second-generation immigrants are born in Sweden, but their parents are both born abroad. We use the same region of origin as for first-generation immigrants, but we include a dummy for having a parent of mixed origin.

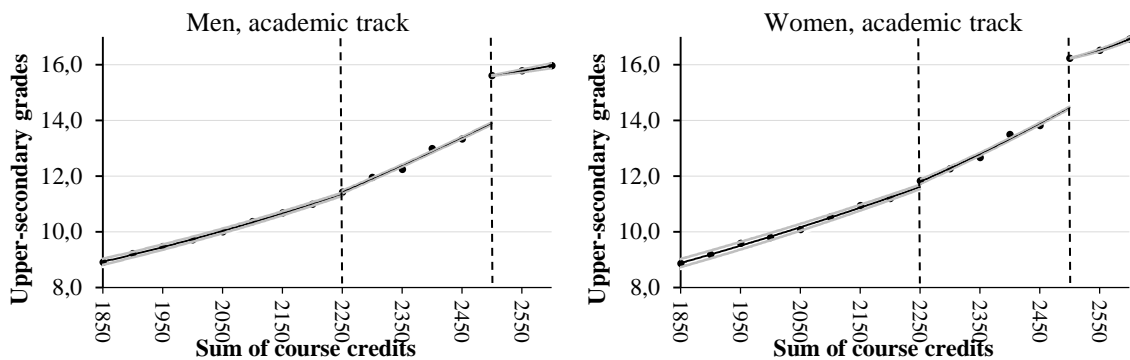
## Tables and Figures



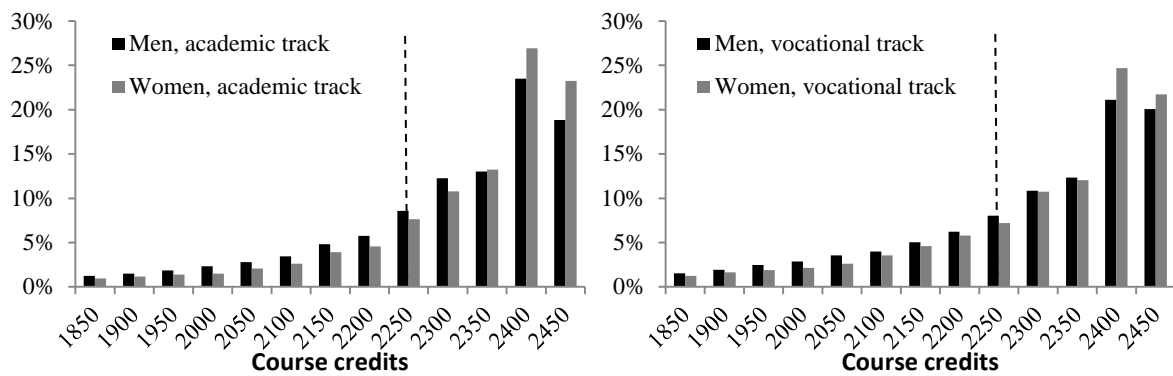
**Figure 1.** Relationship between tertiary education and the sum of course credits achieved in upper-secondary education. Students attending an academic track, 2003-2005.



**Figure 2.** Relationship between tertiary education and the sum of course credits achieved in upper-secondary education. Students attending a vocational track, 2003-2009.



**Figure 3.** Relationship between upper-secondary grades and the sum of course credits achieved in upper-secondary education. Students attending an academic track, 2003-2006.



**Figure 4.** Histogram of course credits for men and women on (left) an academic track and (right) a vocational track, 2003-2005.

**Table 1.** Descriptive statistics for students with course credits barely under (2150-2200) and over (2250-2300) the tertiary eligibility threshold, and for students with more ( $2301 \leq$ ) or fewer course credits ( $\leq 2149$ ). Students finishing academic track upper-secondary education, 2003-2005

Course credits:	Men				Women			
	$\leq 2149$	2150-2200	2250-2300	$2301 \leq$	$\leq 2149$	2150-2200	2250-2300	$2301 \leq$
Tertiary education	23.4% (0.007)	34.2% (0.011)	50.9% (0.008)	75.6% (0.002)	29.4% (0.009)	37.7% (0.013)	56.3% (0.009)	81.1% (0.002)
Years of schooling	12.522 (0.016)	12.802 (0.026)	13.162 (0.020)	14.254 (0.007)	12.678 (0.023)	12.896 (0.033)	13.359 (0.024)	14.477 (0.006)
Ln Earnings	6.755 (0.040)	6.852 (0.055)	6.968 (0.036)	7.173 (0.010)	6.232 (0.054)	6.310 (0.070)	6.495 (0.043)	6.936 (0.009)
Positive earnings	89.2% (0.005)	90.2% (0.007)	91.1% (0.004)	92.5% (0.001)	87.1% (0.007)	87.4% (0.009)	89.5% (0.005)	93.0% (0.001)
Labour market experience	5.393 (0.044)	5.461 (0.061)	5.219 (0.041)	4.676 (0.011)	4.947 (0.055)	5.057 (0.071)	4.931 (0.044)	4.638 (0.009)
Age in 2013	28.204 (0.015)	28.131 (0.021)	28.1 (0.013)	28.083 (0.004)	28.122 (0.019)	28.144 (0.026)	28.073 (0.015)	28.049 (0.004)
Comp. grades (stand.)	-0.701 (0.010)	-0.508 (0.015)	-0.369 (0.011)	0.304 (0.003)	-0.582 (0.016)	-0.391 (0.020)	-0.208 (0.013)	0.585 (0.003)
Upper-secondary grades	9.020 (0.025)	10.838 (0.025)	11.735 (0.021)	15.064 (0.011)	9.172 (0.037)	11.073 (0.036)	12.078 (0.029)	15.841 (0.009)
First-gen. imm.	14.6% (0.006)	10.8% (0.007)	8.8% (0.004)	6.6% (0.001)	18.5% (0.008)	12.6% (0.009)	11.6% (0.006)	7.0% (0.001)
Second-gen. imm.	9.2% (0.005)	7.0% (0.006)	6.2% (0.004)	4.2% (0.001)	11.4% (0.006)	8.5% (0.007)	6.5% (0.004)	4.6% (0.001)
Father's income	6.446 (0.034)	6.688 (0.041)	6.776 (0.027)	6.97 (0.007)	6.204 (0.048)	6.541 (0.053)	6.613 (0.034)	6.917 (0.006)
Mother's income	5.952 (0.031)	6.207 (0.038)	6.292 (0.024)	6.429 (0.006)	5.787 (0.043)	6.069 (0.048)	6.116 (0.031)	6.386 (0.006)
Father's years of schooling	11.487 (0.044)	11.797 (0.061)	11.895 (0.043)	12.565 (0.013)	11.078 (0.056)	11.207 (0.073)	11.389 (0.049)	12.216 (0.012)
Mother's years of schooling	11.416 (0.038)	11.718 (0.055)	11.857 (0.037)	12.518 (0.011)	10.984 (0.050)	11.3 (0.065)	11.505 (0.043)	12.297 (0.010)

Note: Standard error in parenthesis.



**Table 2.** Descriptive statistics for students with course credits barely under (2150-2200) and over (2250-2300) the tertiary eligibility threshold, and for students with more (2301≤) or fewer course credits (≤2149). Students finishing vocational track upper-secondary education, 2003-2005

Course credits:	Men				Women			
	≤2149	2150-2200	2250-2300	2301≤	≤2149	2150-2200	2250-2300	2301≤
Tertiary education	4.9% (0.003)	6.4% (0.005)	14.7% (0.006)	24.0% (0.002)	7.6% (0.005)	12.2% (0.008)	19.8% (0.008)	45.3% (0.003)
Years of schooling	12.117 (0.007)	12.167 (0.013)	12.31 (0.013)	12.639 (0.006)	12.185 (0.011)	12.296 (0.020)	12.446 (0.018)	13.235 (0.008)
Ln Earnings	6.874 (0.036)	7.050 (0.051)	7.099 (0.039)	7.302 (0.011)	6.264 (0.046)	6.359 (0.063)	6.447 (0.046)	6.738 (0.012)
Positive earnings	89.4% (0.004)	91.2% (0.006)	91.6% (0.005)	93.1% (0.001)	88.6% (0.006)	88.8% (0.008)	9(0.1% (0.006)	92.4% (0.001)
Labour market experience	6.115 (0.038)	6.473 (0.056)	6.454 (0.042)	6.607 (0.013)	5.264 (0.047)	5.554 (0.068)	5.556 (0.048)	5.623 (0.013)
Age in 2013	28.212 (0.014)	28.174 (0.021)	28.113 (0.015)	28.013 (0.005)	28.149 (0.017)	28.141 (0.024)	28.068 (0.017)	27.97 (0.005)
Comp. grades (stand.)	-1.384 (0.012)	-1.227 (0.016)	-1.099 (0.013)	-0.605 (0.004)	-1.259 (0.015)	-1.097 (0.019)	-0.948 (0.016)	-(0.212 (0.005)
Upper-secondary grades	8.345 (0.023)	10.153 (0.023)	10.869 (0.022)	13.258 (0.011)	8.531 (0.031)	10.414 (0.030)	11.292 (0.028)	14.553 (0.013)
First-gen. imm.	1(0.8% (0.004)	8.3% (0.006)	8.3% (0.005)	5.2% (0.001)	11.6% (0.006)	1(0.8% (0.008)	9.3% (0.006)	5.9% (0.001)
Second-gen. imm.	6.3% (0.004)	5.5% (0.005)	4.9% (0.004)	3.7% (0.001)	6.6% (0.005)	5.8% (0.006)	5.5% (0.004)	3.9% (0.001)
Father's income	6.562 (0.027)	6.695 (0.037)	6.735 (0.028)	6.9 (0.007)	6.461 (0.037)	6.522 (0.050)	6.651 (0.034)	6.886 (0.008)
Mother's income	6.081 (0.025)	6.181 (0.034)	6.233 (0.025)	6.367 (0.006)	6.028 (0.033)	6.042 (0.045)	6.153 (0.031)	6.341 (0.007)
Father's years of schooling	10.457 (0.035)	10.614 (0.052)	10.71 (0.040)	10.956 (0.013)	10.386 (0.042)	10.315 (0.057)	10.471 (0.045)	10.97 (0.014)
Mother's years of schooling	10.731 (0.030)	10.889 (0.045)	10.927 (0.034)	11.261 (0.011)	10.512 (0.035)	10.512 (0.050)	10.655 (0.038)	11.203 (0.012)

Note: Standard error in parenthesis.

**Table 3.** Estimated relationship between the covariates and tertiary eligibility in a regression discontinuity design (RDD)

	Academic track				Vocational track			
	Men		Women		Men		Women	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Compulsory grade	0.035	(0.029)	0.0439	(0.039)	0.031	(0.032)	0.0238	(0.040)
Father's education	-0.028	(0.121)	-0.004	(0.067)	-0.027	(0.104)	0.189	(0.116)
Mother's education	-0.044	(0.108)	-0.077	(0.129)	-0.021	(0.089)	0.171*	(0.099)
Father's income	-0.125	(0.081)	-0.134	(0.108)	-0.008	(0.072)	0.0396	(0.095)
Mother's income	-0.135*	(0.075)	-0.134	(0.095)	0.003	(0.066)	0.0488	(0.086)
Bandwidth	2050-2400							
Polynomials	1							
	Academic track				Vocational track			
	Men		Women		Men		Women	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Compulsory grades	0.036	(0.035)	0.102**	(0.0472)	0.055	(0.09)	0.085*	(0.049)
Father's education	0.049	(0.149)	0.099	(0.174)	-0.219*	(0.127)	0.256*	(0.143)
Mother's education	-0.011	(0.132)	-0.134	(0.157)	-0.140	(0.108)	0.197	(0.121)
Father's income	-0.127	(0.100)	-0.096	(0.129)	-0.032	(0.089)	-0.011	(0.117)
Mother's income	-0.117	(0.092)	-0.127	(0.116)	-0.004	(0.080)	0.051	(0.107)
Bandwidth	1850-2400							
Polynomials	2							

Notes: Each tertiary eligibility effect on the covariates is from a separate model. Compulsory grade is a standardized grade. The course credit polynomials are included separately above and under the tertiary eligibility threshold. \*\*\*Significant at 1% level. \*\*Significant at 5% level. \*Significant at 10% level. Clustered (on bin size) standard error in parenthesis.

**Table 4.** Estimated relationship between tertiary education and tertiary eligibility in a regression discontinuity design (RDD) (without covariates included)

	Men				Women			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<u>Academic track</u>							
Tertiary eligibility	0.113***	0.153***	0.106***	0.119***	0.144***	0.137***	0.116***	0.178***
	(0.008)	(0.016)	(0.009)	(0.014)	(0.013)	(0.019)	(0.015)	(0.022)
R-squared	0.044	0.044	0.064	0.064	0.044	0.045	0.062	0.062
Observations	15,445		16,872		12,544		13,397	
	<u>Vocational track</u>							
Tertiary eligibility	0.079***	0.065***	0.068***	0.085***	0.040*	0.097***	0.051***	0.058***
	(0.006)	(0.002)	(0.005)	(0.006)	(0.020)	(0.005)	(0.019)	(0.010)
R-squared	0.015	0.015	0.021	0.021	0.026	0.027	0.033	0.034
Observations	13,527		15,191		10,678		11,712	
Bandwidth	2050-2400		1850-2400		2050-2400		1850-2400	
Polynomials	1	2	1	2	1	2	1	2

Notes: Samples include students finishing upper-secondary education. The course credit polynomials are included separately above and under the tertiary eligibility threshold. \*\*\*Significant at 1% level. \*\*Significant at 5% level. \*Significant at 10% level. Clustered (on bin size) standard error in parenthesis.

**Table 5.** Estimated relationship between tertiary education and tertiary eligibility in a regression discontinuity design (RDD) (with covariates included)

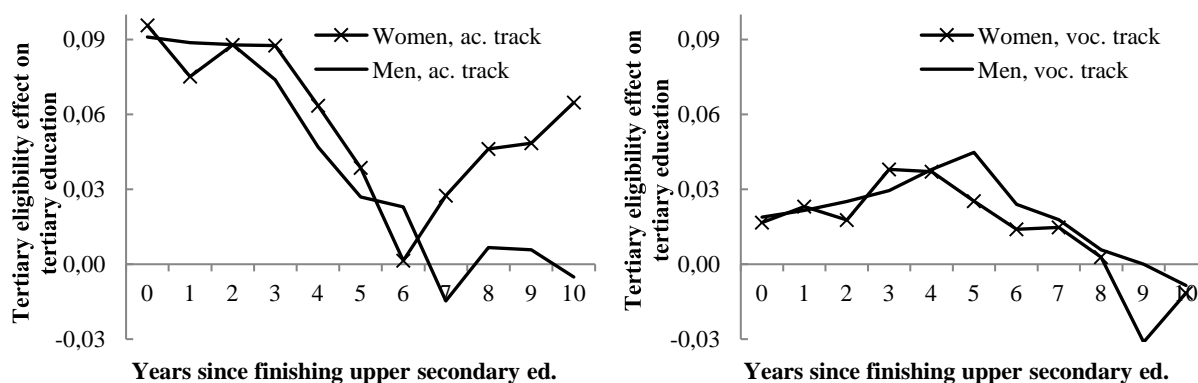
	Men				Women			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<u>Academic track</u>							
Tertiary eligibility	0.107*** (0.010)	0.153*** (0.017)	0.102*** (0.009)	0.112*** (0.016)	0.135*** (0.013)	0.120*** (0.019)	0.100*** (0.015)	0.167*** (0.020)
R-squared	0.116	0.116	0.134	0.134	0.115	0.115	0.131	0.132
Observations	15,445		16,872		12,544		13,397	
	<u>Vocational track</u>							
Tertiary eligibility	0.074*** (0.004)	0.077*** (0.004)	0.060*** (0.007)	0.084*** (0.005)	0.031* (0.016)	0.079*** (0.005)	0.044*** (0.016)	0.044*** (0.009)
R-squared	0.105	0.105	0.106	0.106	0.108	0.109	0.111	0.111
Observations	13,527		15,191		10,678		11,712	
Bandwidth	2050-2400		1850-2400		2050-2400		1850-2400	
Polynomials	1	2	1	2	1	2	1	2

Notes: Samples include students finishing upper-secondary education. The course credit polynomials are included separately above and under the tertiary eligibility threshold. All models include: dummies for year when finishing upper-secondary education, mother's and father's education level and logarithmic income, world region of origin and parents' world region of origin (for second-generation immigrants), and compulsory grades. \*\*\*Significant at 1% level. \*\*Significant at 5% level. \*Significant at 10% level. Clustered (on bin size) standard error in parenthesis.

**Table 6.** Estimated tertiary eligibility effect on years between upper-secondary education and tertiary education, years of schooling, and the probability of taking 15 years of schooling or more in a regression discontinuity design (RDD)

	Academic track		Vocational track	
	Men (1)	Women (2)	Men (3)	Women (4)
	<u>Years between upper-secondary education and tertiary education</u>			
Tertiary eligibility	-0.759*** (0.143)	-0.698*** (0.116)	-1.254*** (0.163)	-0.996*** (0.123)
Observations	8,264	7,477	1,899	2,397
	<u>Years of schooling</u>			
Tertiary eligibility	0.177*** (0.0514)	0.345*** (0.0748)	0.133*** (0.0175)	0.0745*** (0.0104)
	<u>Probability of taking 15 years of schooling or more</u>			
Tertiary eligibility	0.0374** (0.0153)	0.100*** (0.0245)	0.0333*** (0.00495)	0.0220*** (0.00348)
Observations	16,872	13,397	15,191	11,712

Notes: Samples include students finishing upper-secondary education with 1850-2400 course credits. The course credit polynomials (linear and quadratic) are included separately above and under the tertiary eligibility threshold. All models include: dummies for year when finishing upper-secondary education, mother's and father's education level and logarithmic income, world region of origin and parents' world region of origin (for second-generation immigrants), and compulsory grades. \*\*\*Significant at 1% level. \*\*Significant at 5% level. \*Significant at 10% level. Clustered (on bin size) standard error in parenthesis.

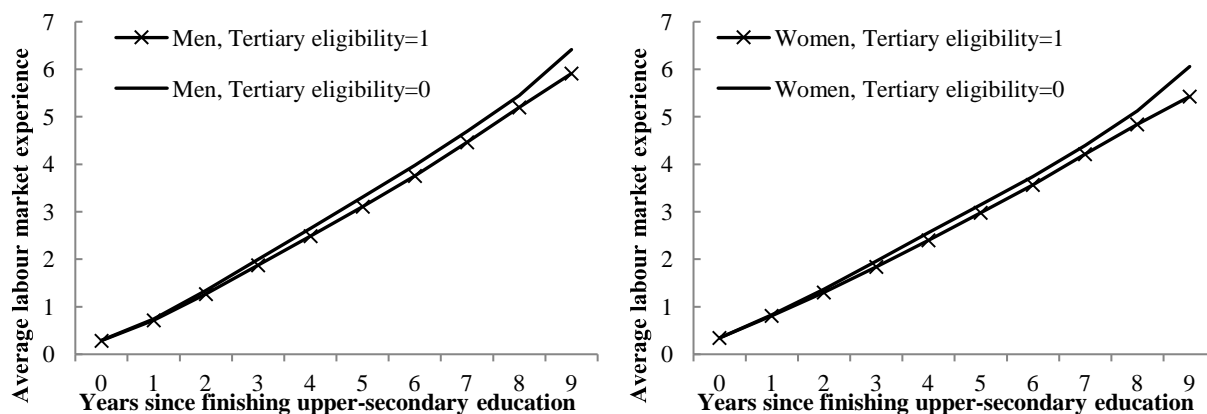


**Figure 5.** The tertiary eligibility effect on tertiary education for each year after upper-secondary education. Bandwidth 1850-2050 course credits, and two polynomials included.

**Table 7.** Estimated impact of tertiary eligibility on the probability of attending an old university and the mean grades at the university and in fields of education.

	Old university		Mean grades at university		Mean grades at field of ed.	
	Men	Women	Men	Women	Men	Women
	<u>Academic track</u>					
Tertiary eligibility	-0.106*** (0.0241)	-0.0212 (0.0261)	-0.281*** (0.0418)	-0.0177 (0.0694)	-0.192* (0.101)	-0.228*** (0.0412)
Observations	8,264	7,477	8,264	7,477	8,264	7,477
	<u>Vocational track</u>					
Tertiary eligibility	-0.0306 (0.0586)	0.0605*** (0.0204)	0.0361 (0.135)	-0.0988 (0.0616)	0.0881 (0.0960)	-0.0156 (0.0818)
Observations	1,899	2,397	1,899	2,397	1,899	2,397

Notes: Samples include students finishing upper-secondary education with 1850-2400 course credits. The course credits polynomials (linear and quadratic) are included separately above and under the tertiary eligibility threshold. All models include: dummies for year when finishing upper-secondary education, mother's and father's education level and logarithmic income, world region of origin and parents' world region of origin (for second-generation immigrants), and compulsory grades. \*\*\*Significant at 1% level. \*\*Significant at 5% level. \*Significant at 10% level. Clustered (on bin size) standard error in parenthesis.



**Figure 6.** Relationship between labour market experience and years since finishing upper-secondary education for individuals with course credits between 2,100-2,350. Academic track.

**Table 8.** Estimated impact of tertiary eligibility on the extensive and intensive earnings margin in a regression discontinuity design (RDD). Students on an academic track

	Men		Women	
	(1)	(2)	(3)	(4)
	Earnings>0			
Tertiary eligibility	-0.00252 (0.0122)	0.00974 (0.0110)	0.0204*** (0.00672)	0.0297*** (0.00965)
Observations	15,445	16,872	12,544	13,397
	Earnings (if >0)			
Tertiary eligibility	0.0532 (0.0331)	0.0683* (0.0359)	-0.0251 (0.0238)	-0.0478 (0.0291)
	Earnings (if >0), when controlling for experience in 2012			
Tertiary eligibility	0.0808** (0.0311)	0.0889*** (0.0308)	0.000549 (0.0295)	-0.0183 (0.0340)
Observations	14,001	15,277	11,292	12,025
Bandwidth	2050-2400	1850-2400	2050-2400	1850-2400
Polynomials	1	2	1	2

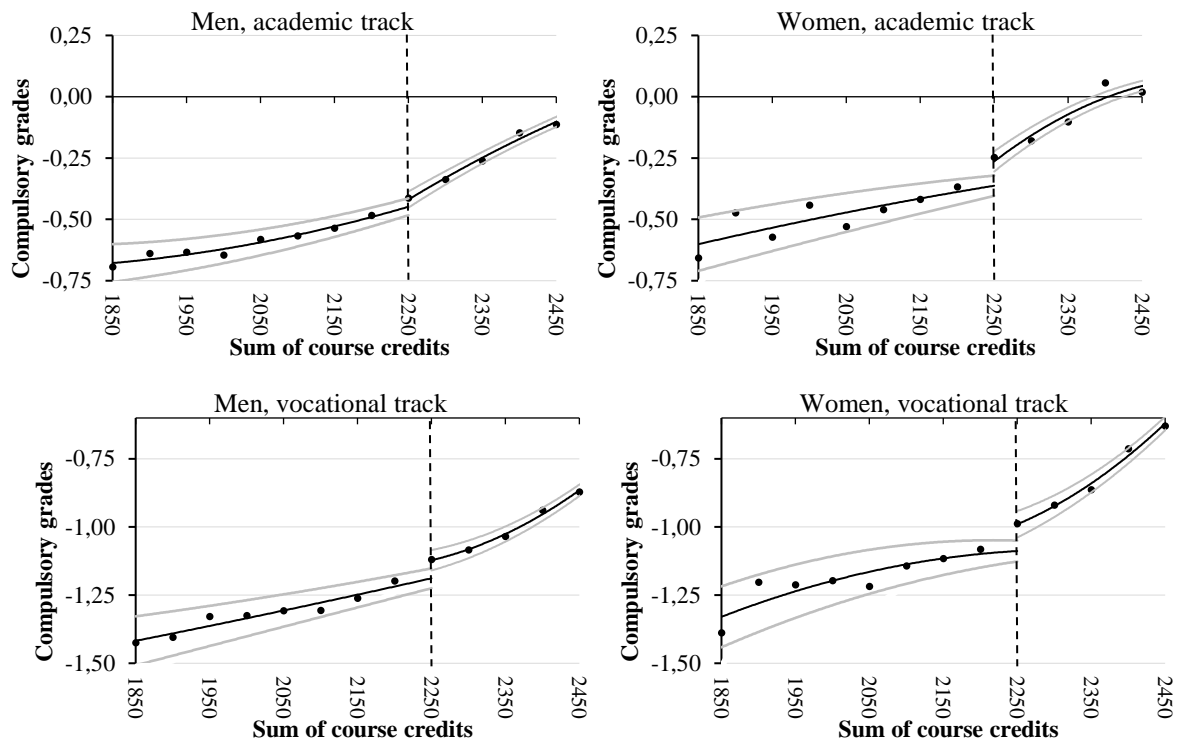
Notes: Dependent variable is logarithmic earnings in 2013. The course credit polynomials are included separately above and under the tertiary eligibility threshold. All models include: dummies for year when finishing upper-secondary education, mother's and father's education level and logarithmic income, world region of origin and parents' world region of origin (for second-generation immigrants), and compulsory grades. \*\*\*Significant at 1% level. \*\*Significant at 5% level. \*Significant at 10% level. Clustered (on bin size) standard error in parenthesis.

**Table 9.** Estimated impact of tertiary eligibility on the extensive and intensive earnings margin in a regression discontinuity design (RDD). Students on a vocational track

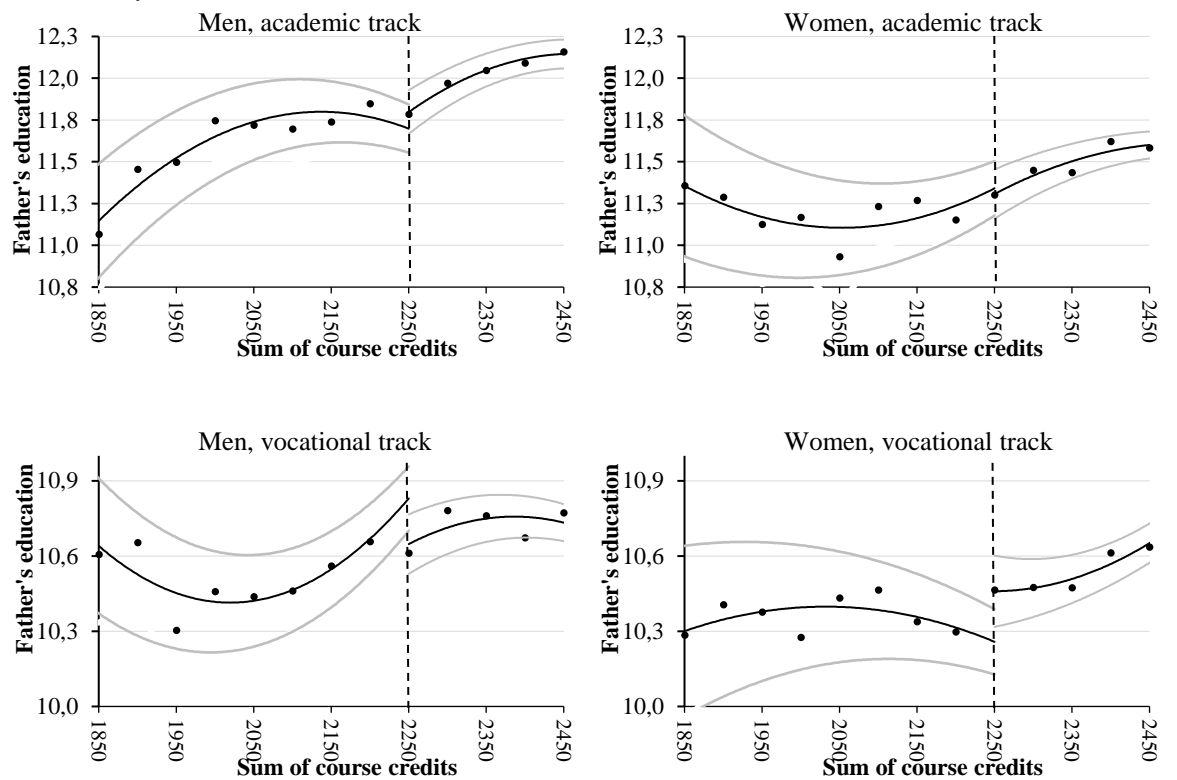
	Men		Women	
	(1)	(2)	(3)	(4)
	Earnings>0			
Tertiary eligibility	-0.0102 (0.00615)	-0.0150** (0.00697)	0.00908 (0.00898)	0.0217** (0.00985)
Observations	13,527	15,191	10,678	11,712
	Earnings (if >0)			
Tertiary eligibility	0.0181* (0.00946)	0.0380*** (0.0130)	-0.0893*** (0.0294)	-0.113** (0.0478)
	Earnings (if >0), when controlling for experience in 2012			
Tertiary eligibility	0.0258** (0.0115)	0.0362** (0.0160)	-0.0672** (0.0329)	-0.0892** (0.0443)
Observations	12,386	13,887	9,69	10,617
Bandwidth	2050-2400	1850-2400	2050-2400	1850-2400
Polynomials	1	2	1	2

Notes: Dependent variable is logarithmic earnings in 2013. The course credit polynomials are included separately above and under the tertiary eligibility threshold. All models include: dummies for year when finishing upper-secondary education, mother's and father's education level and logarithmic income, world region of origin and parents' world region of origin (for second-generation immigrants), and compulsory grades. \*\*\*Significant at 1% level. \*\*Significant at 5% level. \*Significant at 10% level. Clustered (on bin size) standard error in parenthesis.

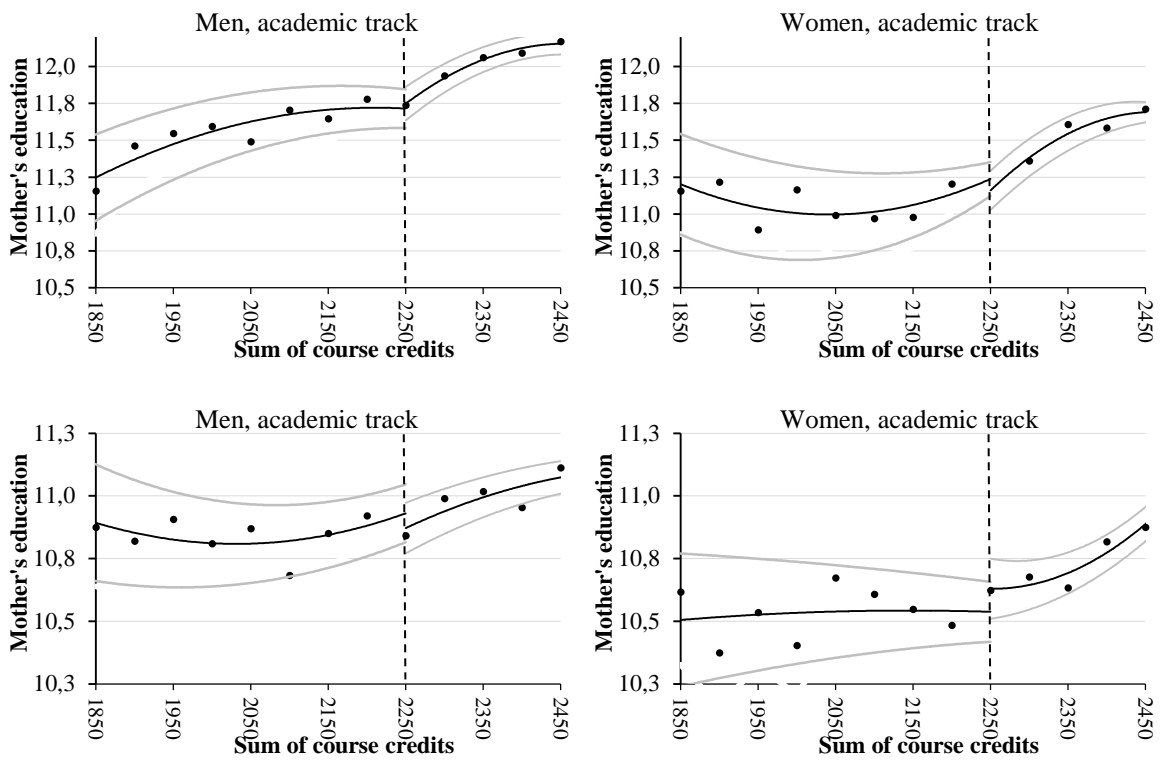
**Appendix**



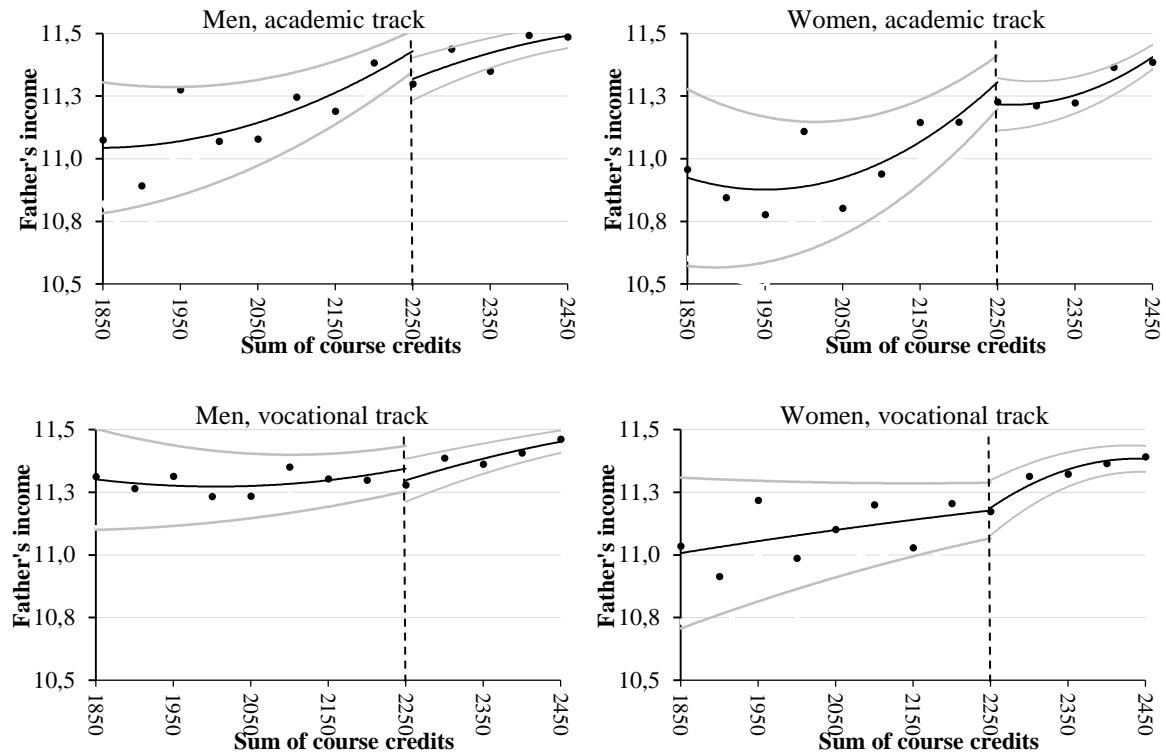
**Figure A1.** Relationship between compulsory grades and the sum of course credits achieved in upper-secondary education.



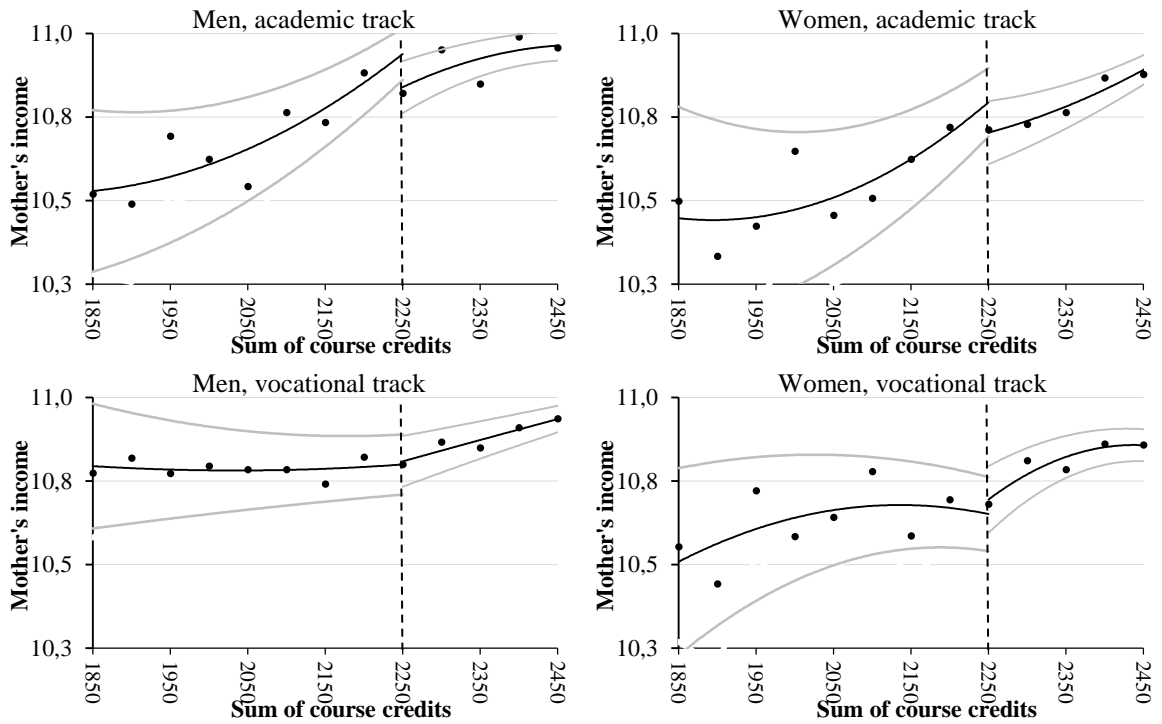
**Figure A2.** Relationship between father's education level and the sum of course credits achieved in upper-secondary education.



**Figure A3.** Relationship between mother's education level and the sum of course credits achieved in upper-secondary education.

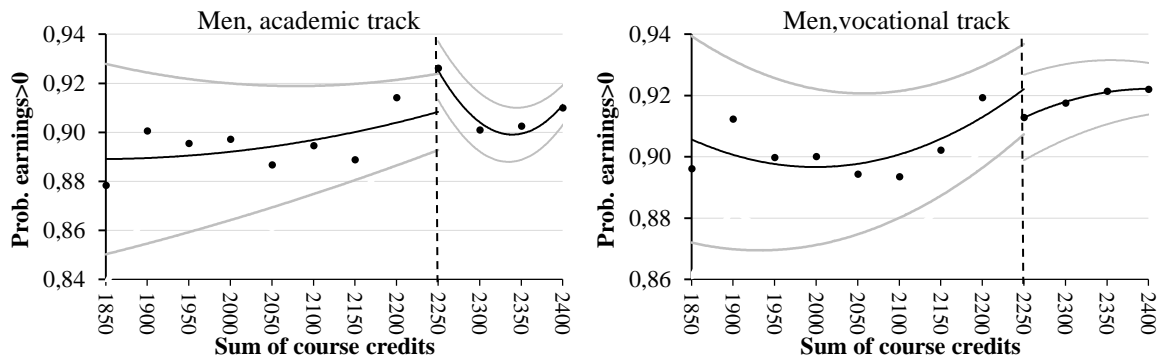


**Figure A4.** Relationship between father's (logarithmic) earnings and the sum of course credits achieved in upper-secondary education.

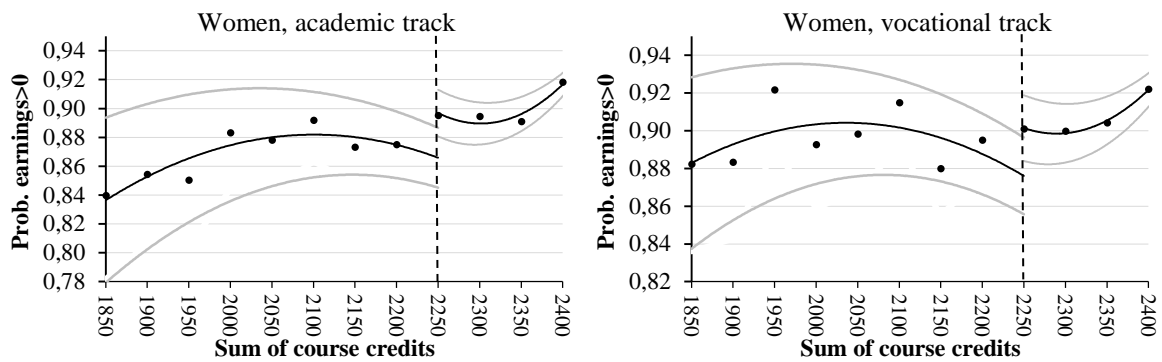


**Figure A5.** Relationship between mother's (logarithmic) earnings and the sum of course credits achieved in upper-secondary education.

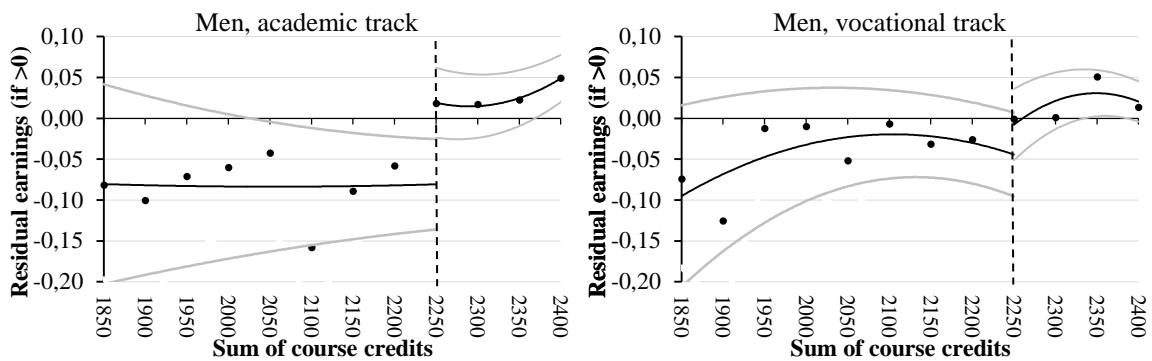




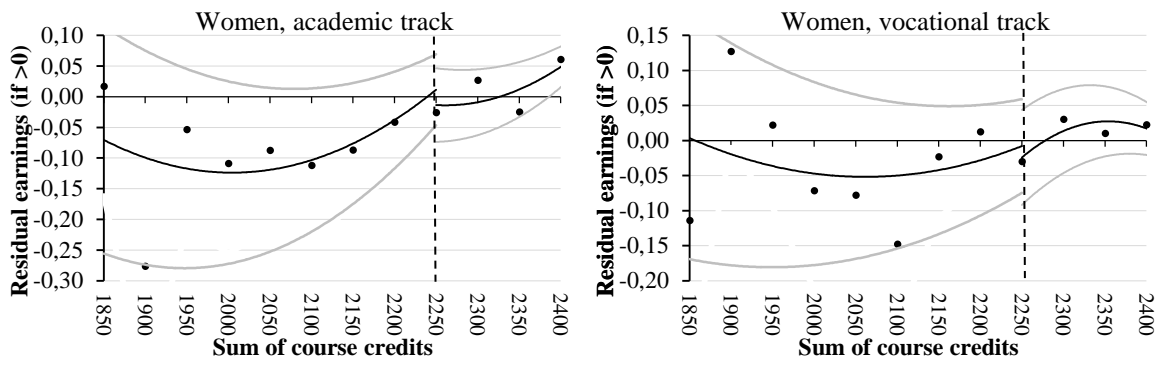
**Figure A6.** Relationship between the probability of having positive earnings and the sum of course credits achieved in upper-secondary education. Male students, 2003-2005.



**Figure A7.** Relationship between the probability of having positive earnings and the sum of course credits achieved in upper-secondary education. Female students, 2003-2005.



**Figure A8.** Relationship between residual (given experience) earnings (if earnings > 0) and the sum of course credits achieved in upper-secondary education. Male students, 2003-2005.



**Figure A9.** Relationship between residual (given experience) earnings (if earnings>0) and the sum of course credits achieved in upper-secondary education. Female students, 2003-2005.