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DELAYS AND DROPOUTS: IDENTIFYING RISKS OF SUBOPTIMAL POST-COMPULSORY EDUCATIONAL PATHWAYS IN SWEDEN

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ABSTRACT

Successful completion of upper secondary education is increasingly vital for participation in the labor market. Rates of school dropout in Sweden are below the EU average but remain a concern for policymakers. This quantitative study used the Swedish register covering 22 birth cohorts to establish the pathways available for students following compulsory school graduation and to identify the socio-demographic risks of taking a suboptimal pathway. The results showed that immigrant students arriving after the beginning of compulsory schooling and students from low-education households had the most elevated risks of engaging with upper secondary school in a suboptimal way, indicating sustained inequalities in the Swedish school system.

KEYWORDS

compulsory school; upper secondary school; dropout; multinomial logistic regression

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Introduction

The point at which a student exits formal education matters, with completion of upper secondary education considered an essential prerequisite for entering the workforce (OECD, 2020). The strong relationship between an individual's realized level of education and income potential has long been acknowledged (e.g., Houthakker, 1959), with inequality in earnings increasing with increased inequalities in education (Chiswick, 1971; Gregorio & Lee, 2002). In addition to the ramifications of an individual's education level on their own economic future, the effects of education level are intergenerational, with effects of parental education observed in a range of child outcomes including education, health, income, and cognitive skills (e.g., Black et al., 2005). Given the well-established relationship between education level and life outcomes, this study aims to investigate possible risk factors predicting low education level in the Swedish context.

The research literature on high school non-completion is predominantly situated in the U.S. context. A number of factors, such as socioeconomic status, gender, low parental education, and ethnic minority background, have been established as predictors of high school non-completion by longitudinal studies conducted in the United States (e.g., Jimerson et al., 2000; Rumberger, 1987). Methods for establishing dropout rates vary and can be based on the percentage of students who prematurely leave education in a given year or the proportion in a range of years who left school prematurely (Christle et al., 2007). A further complication of counting how many students drop out of school is the frequent failure to capture data on students who leave at a very young age (i.e., before high school, see Hayes et al., 2002), or who are offered education through prison facilities (Smink & Schargel, 2004). The question of how to account for students who achieve an alternative terminal high school qualification after dropping out from mainstream school (such as the general educational development test [GED] in the United States), is also a challenge for establishing dropout rates (compare Greene & Winters, 2002; Kaufman & Bradbury, 1992).

The earliest point at which an individual can leave education within local statutory frameworks is commonly at the end of lower secondary education. Sweden, like its Nordic neighbors, has a low level of school dropout, with less than 15% of students failing to complete upper secondary school (Andrei et al., 2011), which is below the EU average. School dropout among Swedish youth is lower in girls than boys (World Bank, 2020). However, the historically low levels of school dropout conceal the risk of students engaging with the educational system in suboptimal ways.

1 The Swedish school system 1994–2021

In Sweden, all students must attend compulsory school through the end of the ninth grade (ages 6–16). At the post-16 level, Swedish upper secondary school is legally optional for young people but is a de facto requirement for successful entry into the workforce. In Sweden, upper secondary education, also known as gymnasium, is provided free of charge and is open for enrollment to all students under 20 years of age who have completed compulsory schooling (Bäckman et al., 2011). Municipal adult education is available in Sweden to those over 18 (SFS 2011:1108, 2011) and can be used to obtain high school qualifications where none exist, make up for missing or incomplete grades, or add additional courses to enable a student to change career track.[1]

The current structure of upper secondary education includes 18 national upper secondary programs (six academic and twelve vocational).[2] Additionally, there are six nationally recruiting high school programs in highly specialized disciplines (e.g., professional dance training, aeronautical engineering, marine engineering, Sami [indigenous] industries) and four introductory programs[3] for students who do not qualify for the national programs (Skolverket, 2021b, 2021c). The upper secondary programs are similar in that all are school-based, and within each program students complete a number of courses totaling 2,500 points, split across four categories: high school common courses, program common courses, program specialization courses, and optional specialization (see for example Skolverket 2021a, 2021d). However, admittance to the academic programs, which facilitate university entry, has traditionally been strongly predicted by students' social background, gender, and ethnicity (e.g., Svensson, 2006).

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1 For example, an individual who studied in the humanities program, while having sufficient high school credit to enter university, might need to take additional courses in mathematics and natural science through municipal adult education to apply for a nursing degree.

2 The academic programs are arts, economics, humanities, natural science, social sciences, and technology. The vocational programs are: children and leisure, building and construction, electricity and energy, vehicle and transport, trade and administration, craft, hotel and tourism, industrial engineering, nature management, restaurant and food, plumbing and real estate, and treatment and care. The nationally recruiting programs are in aeronautical engineering, marine engineering, maritime education, train engineering, Sami [indigenous] industries, professional dancer, high school engineer (further education in the form of a fourth technical year) (Skolverket, 2021b).

3 Program-oriented choice, vocational introduction, individual alternative, language introduction (Skolverket, 2021c).

The Swedish school system has become increasingly marketized since the introduction of a package of school reforms in the early 1990s. These reforms included the decentralization of education to the municipal level, opening the operation of schools to private actors operating on a for-profit basis (Lundahl, 2002; Lundahl et al., 2013), and the introduction of school choice, particularly in compulsory schools. School choice in Sweden has led to a shift away from students automatically attending their local school, with funding now following individual students within and between municipalities to the school of their choice. Nevertheless, independent schools in Sweden must still follow nationally imposed rules regarding student recruitment. All schools are required to be open to all and transparent in their application process (SFS 2010:800, 2010). Compulsory schools are comprehensive and may only use approved criteria for student selection when they are over-subscribed (Skolverket, 2016), which precludes academic selection or 'cream-skimming' (Põder et al., 2017). Further, student opportunity to exercise school choice is constrained by the geographic availability of schools across the country and can often be "conditional on slots being available after those residing closest to the school had made their choices" (Böhlmark & Lindahl, 2007, p. 6). The exercise of school choice has had mixed effects on student outcomes, with the benefit in terms of increased performance only experienced by children from immigrant families in deprived areas selecting out of attending the local school (Trumberg & Urban, 2021).

Admittance to upper secondary school is competitive, with students recruited to programs on the basis of their final compulsory school grades. Upper secondary schools operate within Sweden's marketized school framework, and students as consumers have the choice to apply to providers outside their localities, although student mobility is influenced by socioeconomic background and prior achievement (Fjellman, 2019).

Swedish schools follow a national curriculum, set by Skolverket. The curriculum has undergone periodic reforms, the most pertinent of which for this study are those which were introduced in 1994 and 2011. The implementation of curricula reforms is rarely without obstacles (e.g., Schwarz & Cavener, 1994), and they should be regarded as needing to be settled in time. One of the changes Sweden saw concurrent to the implementation of the 1994 curriculum was the shift from norm-referenced to criterion-referenced grades (Wikström, 2006), fundamentally altering the way of working with assessment in Swedish schools. The curriculum in Sweden introduces expectations for a school's mission and values, statements of which apply to all actors and subjects within the school. The curriculum also outlines subject-specific syllabi guiding teachers' planning and assessment (Skolverket, 1994, 2018b).

The current[4] (2011) curriculum has a results-oriented focus, compared to the preceding (1994) curriculum's open competence-oriented focus (Wahlström & Sundberg, 2015).

For much of the 20th century, post-compulsory education was fragmented between provider and program types. The contemporary model of upper secondary education in Sweden was codified through the integration of academic and vocational programs into a single school form under the 1971 upper secondary school reform (Mellén, 2021). Students who completed upper secondary education under the 1994 curriculum met the general education requirements for university entry, regardless of whether they studied in the academic or vocational programs. However, the introduction of the 1994 curriculum, which provided all graduates with the possibility to enroll in university, is paradoxically associated with an increase in the proportion of students who had been characterized as low achievers at the end of compulsory school enrolling in upper secondary school (Holmlund et al., 2019). The introduction of the 1994 curriculum also saw a decline in the proportion of students who successfully completed upper secondary school (Holmlund et al., 2019; Svensson, 2006), and an increase in the number of students taking longer than expected to graduate; both trends are concentrated among low achievers (Holmlund et al., 2019).

A key aspect of the 2011 reforms at the upper secondary level occurred in the vocational programs. These programs became less theoretical than their earlier iterations, with a reduction in the general academics required to graduate. The goal of this revision of the vocational curriculum was to retain student interest and increase completion rates, although the need to de-academize these programs to increase completion has been questioned (e.g., Nylund, 2013). Consequently, students completing vocational programs under the 2011 curriculum are no longer eligible for university studies, unlike their earlier counterparts. As previously mentioned, the provision of municipal adult education can compensate for choosing a vocational program and being ineligible for tertiary education despite graduating from upper secondary school (SFS 2011:1108, 2011) but availing oneself of this opportunity delays entry to university and is often undertaken alongside employment.

[4] The 2022 curriculum was introduced in September 2022.

2 Socio-demographic determinants of educational outcomes

Several contextual factors associated with school dropout have been established in the literature (see, e.g., Jimerson et al., 2000; Rumberger, 1987). The present study is located in the Swedish context; as a consequence, the socio-demographic characteristics investigated herein are socioeconomic status and migration background.

Socioeconomic status has long been understood as one of the strongest predictors of student achievement (e.g., Coleman et al., 1966; Sirin, 2005). The predicative capability of socioeconomic status holds across national contexts, and studies using data from international educational assessments such as PISA and TIMSS have evidenced persistent relationships between student socioeconomic background and achievement in Sweden (e.g., Rolfe et al., 2021). While multiple approaches to measuring socioeconomic status exist in large-scale quantitative educational research (see Rolfe, 2021), one measure that has frequently been used as a proxy for the construct is the level of parental education (e.g., Schiller et al., 2002; Schlicht et al., 2010). In a meta-analysis of the relationship between measures of cultural capital and student achievement, Tan (2017) found that parental education, an example of cultural capital that is institutionalized and valued by the community, was the strongest predictor of student achievement, supporting earlier findings (e.g., Sirin, 2005; Yang, 2003) regarding the predictive importance of this measure. Across developed nations including Sweden, the long-term trend has been for education levels to increase, with an ever-growing proportion of adults attending tertiary education (OECD, 2016; Skolverket, 2009). However, despite the increases in parental education levels and the transition to a highly educated knowledge economy, the correlation between parental education and student outcomes in Sweden has held over time (Skolverket, 2012).

Sweden has a long tradition of welcoming immigrants and refugees. Between 1990 and 2020, the foreign-born population in Sweden grew from 9.2% to 19.7% of the population, representing an increase of 1,256,286 people (SCB, 2021). This trend has been mirrored in the growth of students with an immigration background in Swedish schools (Skolverket, 2009) and an increase in the proportion of students eligible for mother-tongue instruction (Skolverket, 2018a, 2018c). These students have diverse educational needs and a one-size-fits-all solution to integrating them is not applicable across all local contexts (e.g., Taguma et al., 2010).

The size of the contribution of various nations to the growth in Sweden's foreign-born population has changed over time. In the 1970s, the first and fifth most common countries of origin were Finland and Denmark.

The Balkan conflicts of the 1990s led to an increase in the population from this region. By the 2010s, the growth of the foreign-born population in Sweden reflected sustained humanitarian crises (e.g., Syria, Afghanistan, and Eritrea) (SCB, 2021). Research both in Sweden (Böhlmark, 2008; Elmeroth, 2006) and internationally (Cahan et al., 2001), has demonstrated that students who immigrate to Sweden at a young age (before they are 9 years old) adjust well to Swedish school. While Swedish students outperform students with a migration background when considered as a whole in the ninth grade, when we separate the foreign-born population by age at arrival, the achievement gap between Swedish student's performance and students who moved to Sweden in their teenage years is particularly pronounced (Skolverket, 2009). Further, high levels of school dropout have been noted among immigrant students in Sweden (Taguma et al., 2010).

In addition to the changing overall demographics of the Swedish population in terms of educational and migration backgrounds, Swedish schools have witnessed an increase in segregation by both socioeconomic and immigration background. Socioeconomic segregation in housing has been widely observed since the 1970s, while residential segregation between immigrant and native-born Swedes has been evident since the 1990s (Skolverket, 2009). Social segregation as a consequence of housing segregation in Sweden has resulted in within- and between-school differences in student achievement (SCB, 2007; Yang, 2003). Despite the expectation that the introduction of school choice in the educational reforms of the early 1990s might mitigate the historic effects of housing segregation on student achievement (Skolverket, 2003), between-school differences in achievement increased throughout the 1990s and 2000s (Björklund, 2005). The segregated Swedish school market (Fjellman, 2019) can perhaps be understood as a consequence of both the reforms of the 1990s and the importance of peer effects, which have long been recognized as an important indicator of student performance, surpassing the influence of teacher resources and quality (e.g., Coleman et al., 1966).

A further demographic source of unequal outcomes is student gender. In Sweden, girls outperform boys in compulsory schools, with these performance inequalities persisting over time and appearing larger for course grades than national test scores. Girls continue to outperform boys in terms of grades in upper secondary school (Holmlund et al., 2019). These gender differences in grades are in line with international trends, particularly in the case of mathematics (see, e.g., Dwyer & Johnson, 1997; Kenney-Benson et al., 2006). In addition to outperforming boys academically, previous research has also suggested that girls are less likely to drop out than boys (e.g., World Bank, 2020).

3 Research questions

From our review of the literature, various factors need to be included in the investigation of school dropout and delayed graduation in the Swedish context. Previous research suggested that boys are more likely to drop out than girls (e.g., World Bank, 2020), that immigrant students, particularly those who migrate at older ages, have poorer outcomes overall and are more likely to leave school prior to graduation (e.g., Taguma et al., 2010), and that parental education correlates with student outcomes (e.g., Gustafsson & Yang Hansen, 2018). Given the persistent importance of these factors in explaining student outcomes, this study aims to answer the following research questions:

1. Which suboptimal educational pathways do students follow after graduating compulsory school?
2. Which socio-demographic characteristics predict post-compulsory educational pathways for Swedish teenagers?
3. Does the risk of suboptimal post-secondary school engagement vary between Sweden's 1994 and 2011 curricula?

4 Methods

4.1 Data source

This analysis used data from the Gothenburg Educational Longitudinal Database (GOLD). GOLD combines data from Statistics Sweden and multiple sources including the National Agency for Education, the National Archives, and the National Agency for Higher Education Services (University of Gothenburg, 2020). The data was compiled by Statistics Sweden and provided anonymized to the researchers. The analysis used data pertaining to students from the birth cohorts 1979–2000, who completed compulsory school between 1994 and 2015. To be eligible for inclusion in the GOLD dataset, students must be entered into the Swedish Population Register maintained by the Tax Authority before their 16th birthday. Children born in Sweden are registered at birth, and those moving to Sweden are registered upon arrival. Children who arrive in Sweden as unaccompanied minors or after age 16 are not included in the dataset.

4.2 Educational pathways and grouping

The dataset was split into two groups. The first group (LP94) was comprised of 16 cohorts totaling 1,747,656 students who were born between 1979 and 1994. This group was eligible for upper secondary education under the 1994 curriculum. The second group (LP11) was comprised of six cohorts containing a total of 593,659 students who were born between 1995 and 2000 and who

attended upper secondary school under the 2011 curriculum. Due to the aforementioned challenges of defining school dropouts (see Christle et al., 2007; Greene & Winters, 2002; Hayes et al., 2002; Kaufman & Bradbury, 1992) and the age restrictions on attending upper secondary school despite the possibilities for lifelong community-based learning in Sweden (Bäckman et al., 2011; SFS 2011:1108, 2011), this study conceives upper secondary school dropouts to be those individuals who do not complete an upper secondary program within four years of starting upper secondary school.

Data from several variables was examined to create a hierarchy of educational pathways. The students were grouped according to the pathway they took after completing compulsory school. Two items in the dataset were used to establish whether students graduated from compulsory school and upper secondary school. Completion of compulsory school on time was established by comparing graduation year with birth year, and students graduating after the age of 15 were deemed late graduates. The taking of a "gap year" before starting upper secondary school was observed by comparing the year of compulsory school graduation to the semester in which students were first registered as attending upper secondary school. Yearly registrations were evaluated to establish whether students attended any upper secondary school, whether they attended for three sequential years, and whether students changed programs at any time point. The following four pathways were subsequently identified:

Early dropouts. These students completed compulsory school but never attended upper secondary school. Students who dropped out of the education system after graduating from compulsory school were the smallest group in our study, accounting for 0.7% of students in the LP94 cohorts and 0.5% of students in the LP11 cohorts.

Upper secondary school dropouts. These students completed compulsory school and attended at least one year of upper secondary school, but never graduated from upper secondary school. In our study, 15% of students included in the LP94 cohorts and 12% of students in the LP11 were identified as upper secondary school dropouts.

Delayed upper secondary school graduates. These students graduated compulsory school and upper secondary school, but completed their schooling after age 20. They may have repeated a year in compulsory school in the correct year for their birth cohort, proceeded directly to upper secondary school, and graduated from their program of study after more than 3 years. This group represented 18% of students under LP94 and 16% under LP11.

Perfect participants. These students graduated compulsory school in the correct year for their birth cohort, proceeded directly to upper secondary school, and graduated from their program of study after 3 years. The majority of included students fell into this group: 66% of students across the LP94 cohorts and 71% across the LP11 cohorts. Descriptive statistics by educational

pathway and cohort group are presented in Appendix A, and the proportion of students in each pathway is shown in Figures 1 and 2.

The very small number of students who were missing compulsory school data were excluded from the analysis, as we could not discern whether they were system-missing cases for which data had not been gathered or entered into GOLD, or whether they dropped out of school early (i.e., individuals were missing achievement and compulsory school data for modelling). When the educational pathways of students in Sweden are examined by student immigration background, the proportion of students within each educational pathway has remained relatively stable over time (see Appendix B), although there are a few noticeable years where there are fluctuations and increased proportions of students in suboptimal pathways.

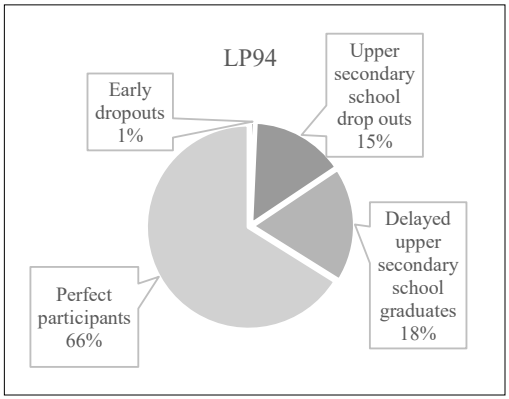

Figure 1
Proportion of students in each educational pathway, LP94 (N=1,747,656)

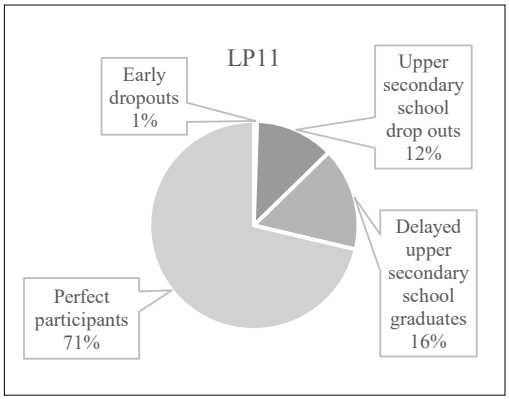

Figure 2
Proportion of students in each educational pathway, LP11 (N=593,659)

4.3 Independent variables

To conduct our analysis, we utilized variables from the GOLD dataset representing individual student background, compulsory school achievement, and school characteristics.

4.3.1 Student background

Three components of student background were considered in this analysis: student gender, parental education level, and student immigration background. To indicate gender, student sex at age 16 was coded 0=girl and 1=boy. Parental education was indicated at the student level, with dummy variables created to represent the response options to the six-category parental education variable (PE6) provided in the dataset. Immigration background was derived from a categorical variable indicating the age of arrival for foreign-born students, with dummy variables representing each of the response options. The dummy variables denoting student background are summarized in Table 1.

Table 1
Dummy variables at the individual level, where 1 indicates group membership

Boy	Boy
PED_1	Not stated/unspecified education shorter than 7 years
PED_2	Pre-secondary education
PED_3	Upper secondary vocational education, 2–3 years and 2-year theoretical education
PED_4	High school preparatory education, 3 years or postsecondary education <2 years
PED_5	Higher education 2–3 years
PED_6	Higher education ≥4 years
CSPS	Child Swedish, parent Swedish
CSPI	Child Swedish, parent immigrant
CIPS	Child immigrant, parent Swedish
CIPI 0–6 years	Child immigrant, parent immigrant arrived age 0–6
CIPI 7–12 years	Child immigrant, parent immigrant arrived age 7–12
CIPI 13–16 years	Child immigrant, parent immigrant arrived age 13–16

4.3.2 Compulsory school achievement

Student achievement at the end of compulsory school was identified through individual merit scores. The merit score is the sum of a student's 16 highest subject grades attained in ninth grade. Each subject is graded out of 20, so

the maximum merit rating possible is 320. Grades are determined by teachers; since 1994, these grades have been determined using criterion referencing (Wikström, 2006).

4.3.3 School characteristics

To identify the socioeconomic profiles of schools, a new ID variable was created to distinguish between schools and the multiple time points. The 6-category parental education variable PE6 was aggregated to school level by calculating the arithmetic mean of student responses. The immigration makeup of each school was operationalized by calculating the arithmetic mean of a dichotomous variable indicating whether a student was born in Sweden or not (0=born in Sweden, 1=born abroad). Student merit ratings were aggregated to school level to give an attainment profile at the compulsory school level. Descriptive statistics are presented in Appendix A.

4.3.4 Analysis Plan

Data handling was conducted using SPSS v 27, while modelling was conducted using Mplus v8 (Muthén & Muthén, 1998−2017). Educational pathways after compulsory school are coded "early dropouts"=0, "upper secondary school dropouts"=1, "delayed upper secondary school graduates "=2, and "perfect participants"=3. The order in which these outcomes are presented appears to be hierarchically ordered in as far as students are required to meet an increasing number of conditions to qualify for group membership, but this is an artifice of convenience to the research process rather than an inherent quality of the data. The existence of such a nominal outcome requires that multinomial logistic regression be adopted as a modelling strategy.

In multinomial logistic regression, the log odds of the available outcomes are modelled as a linear combination of the predictor variables, enabling researchers to identify which indicators increase or decrease the risk of individuals deviating from a reference outcome. The model is expressed mathematically thus:

$$logit(p) = \log\left(\frac{p}{1-p}\right) = a + b_1 * x_1 + \cdots + b_k * x_k \quad (1)$$

Or

$$p = \frac{\exp(a+b_1*x_1+\cdots+b_k*x_k)}{1+\exp(a+b_1*x_1+\cdots+b_k*x_k)} \quad (2)$$

In this equation, *p* is the probability that a case is in a particular category, *exp* is the exponential, *a* is the constant of the equation, and *b* is the coefficient of the predictor or independent variables. Mplus by default uses the outcome with the highest value, in this case perfect participation, as the reference category in the model. The solution computed allows us to see the probability

of a student being in one of the three suboptimal education pathways (early dropouts, upper secondary school dropouts, or delayed upper secondary school graduates) rather than being a perfect participant. The estimator used in the analysis was MLR (maximum likelihood with robust standard errors) to account for the non-normality in the distribution of individuals to the categorical outcomes in the model.

A two-level model (Model 1) was specified separately for the two curricula. At the student level, gender, immigration background, parental education, and achievement in compulsory school (merit score), while at the school level, the proportion of immigrant students, the average parental education level, and the average merit score were all regressed on group membership to examine which individual factors predict pathway and indicate risk for suboptimal educational trajectories. The coding of individual level parental education and immigration background as dummy variables allows the parental education level "higher education ≥ 4 years" and the immigration status "child Swedish, parent Swedish" to be used as the baseline categories in the model. Thus, the ratio of the probability of a student not being in these categories provides us with the relative risk for their inclusion in the various educational pathways. In a second stage, Model 2 extended Model 1, integrating interactions between sex and parental education and sex and immigration background at the individual level to Model 2.

Mplus generates logistic regression odds ratio (OR) results for each nominal group in the model, which includes an estimate, standard error, and lower and upper limits for a 95% confidence interval (CI) for the estimate. To establish the odds risk ratio of students entering one of the suboptimal tracks rather than being a perfect participant when accounting for each covariate of the model, the exponential of the estimate and the upper and lower CI values were calculated. These are presented in Table 3, in the columns labelled 'OR' and 'CI'. By examining these values, we are able to determine which student socio-demographic characteristics carry the biggest risks for entering a suboptimal educational pathway following graduation from compulsory school.

The odds ratio expresses the odds of an individual being in the specified suboptimal education pathway divided by the odds of that individual being a perfect participant. Where OR=1, this suggests that there is no risk of suboptimal educational pathway associated with the risk factor. When OR≠1, the risk factor is associated with the specified educational pathway. Instances where the confidence interval crosses 1 should be considered non-significant. Additionally, in cases where the confidence interval is excessively broad, the OR can be regarded as unreliable as it indicates a low level of precision in the OR (Szumilas, 2010). A method for evaluating the size of odds ratios proposed by Chen et al. (2010) maps odds ratios to Cohen's *d*. Chen et al.

(2010) suggested that odds ratios of 1.68, 3.47, and 6.71 are equivalent to Cohen's *d* effect sizes of 0.2 (small), 0.5 (medium), and 0.8 (large).

Model fit was assessed by examining the log-likelihood of the models using a G-test (Hosmer Jr et al., 2013). We calculated minus twice the change of the log-likelihood relative to the previous model to find G, and then right-tailed the probability of the chi-squared distribution of G with the difference in degrees of freedom between the models. This enabled us to establish whether the introduction of the interactions in Model 2 had significantly improved Model 1 (see Appendix C).

5 Results

As outlined in the analysis plan, we ran a series of pairs of multinomial logistic regressions, introducing covariates in a stepwise order. When deciding which of these models to present in detail, we first compared the goodness of fit between subsequent models (see Appendix C). Given the significant improvements made by the addition of covariates, it was deemed pertinent to limit the scope of the presentation and discussion of the results to Model 2.

The model presented in this section, Model 2, integrated 12 individual-level predictors and three school-level predictors. At the individual level, we included sex and compulsory school achievement, while student immigration background and parental education were dichotomized into five variables each. We used the immigration status "child born in Sweden, parents born in Sweden" and the parental education level "higher education ≥ 4 years" as reference groups, and thus those are excluded from the model. At the school level, we considered the proportion of students born outside Sweden, the average parental education, and average achievement (see Appendix D for unstandardized regression coefficients). Positive estimates indicate increased odds of entering a pathway, while negative estimates indicate decreased odds. Interactions between sex and parental education and sex and immigration background at the individual level were also specified.

Among the early dropouts in the LP94 cohorts, students with an immigration background who came to Sweden between the ages of 7 and 12 had a 1.30 increase in the relative log odds of being in this group compared to the Swedish children of Swedish parents. Students with the least educated parents, who had less than 7 years of formal education, had a 0.84 increase in the relative log odds of being early dropouts compared to their peers from highly educated families. For both the upper secondary school dropout and delayed upper secondary school graduate groups, students who migrated to Sweden as teenagers (ages 13–16) had large increased log odds of falling into these pathways (0.79 and 1.80 respectively). Students with poorly educated

parents had increased log odds of being in these suboptimal pathways, as with the early dropouts.

The patterns of indicators that significantly increase the log odds of students following the different suboptimal pathways are not so clear cut among the students who attended school under LP11. Interestingly, while very low parental education levels universally increase the log odds of being an upper secondary school dropout, it is a non-significant predictor of early dropout of delayed graduation. Increased levels of parental education were associated with decreased log odds of suboptimal outcomes in the majority of scenarios for the LP11 group; however, the decrease in the log odds was particularly marked for early dropouts.

A striking communality across all outcomes and both curriculum groups was the ameliorating effect of the covariate PED_3 on group membership, which saw the largest decrease in the log odds of group membership when compared to the other parental education levels. This variable indicates that the highest level of parental education is upper secondary school vocational education, 2–3 years, and 2-year theoretical education. Of particular interest when reading the unstandardized regression coefficients was the counter-intuitive inverse relationship between an individual being a boy and entering a suboptimal educational pathway. When the interactions between being a boy and parental education level and being a boy and migration background are examined, the expected increased log odds of falling into a suboptimal educational pathway appears, with the exception of teen and pre-teen migrant boys in the LP94 group.

Attending a school with a high proportion of foreign-born classmates is associated with increased log odds of entering a suboptimal educational pathway for all pathways under both the 1994 and 2011 curricula. However, these relative log odds were notably higher for students classed as early dropouts or upper secondary school dropouts in the LP11 group. Interestingly, while the influence of this variable on the log odds of group membership diminishes as the pathway is more "successful" in students under LP11, this is not the case in the LP94 schools. For the earlier curriculum group, an increase in the proportion of immigrant students in a school increases the log odds of being in the group upper secondary school dropouts more than the other two groups.

The results of fitting the logistic regression model for Model 2 are presented in Table 2. We have selected examples from this section of the results to elucidate based on their correspondence to those highlighted from the unstandardized model output and the size of these odds ratios as discussed in the analysis plan (i.e., 1.68 (small), 3.47 (medium), and 6.71 (large), see Chen et al. (2010).

Table 2
Results of fitting the logistic regression model – Model 2

		1994					2011				
		Estimate	S.E.	Odds ratio	95% C.I.		Estimate	S.E.	Odds ratio	95% C.I.	
					Lower 2.5%	Upper 2.5%				Lower 2.5%	Upper 2.5%
Early dropouts	Boy	0.78	0.08	2.18	1.89	2.60	0.44	0.06	1.56	1.41	1.77
	CSPI	1.49	0.10	4.46	3.70	5.50	1.08	0.10	2.95	2.46	3.67
	CIPS	1.94	0.27	6.95	4.38	12.76	1.33	0.38	3.77	2.13	1.27
	CIPI 0–6 years	2.02	0.17	7.54	5.57	1.77	1.38	0.23	3.99	2.73	6.71
	CIPI 7–12 years	3.41	0.28	3.18	18.25	54.44	1.99	0.25	7.28	4.74	12.58
	CIPI 13–16 years	2.44	0.28	11.43	7.04	2.91	1.47	0.21	4.36	3.06	6.97
	PED_1	2.31	0.34	1.12	5.67	21.91	0.87	0.23	2.39	1.68	4.27
	PED_2	0.89	0.08	2.44	2.12	2.88	0.55	0.06	1.73	1.55	1.97
	PED_3	0.58	0.05	1.79	1.64	1.99	0.28	0.03	1.32	1.26	1.42
	PED_4	0.59	0.06	1.80	1.62	2.03	0.36	0.04	1.43	1.33	1.57
	PED_5	0.60	0.06	1.82	1.64	2.05	0.35	0.04	1.43	1.32	1.56
	Compulsory school achievement	0.97	0.00	2.64	2.64	2.64	0.97	0.00	2.63	2.62	2.63
	Boy*PED_1	0.98	0.20	2.65	1.91	4.34	2.80	1.00	16.36	4.02	275.61
	Boy*PED_2	1.67	0.19	5.33	3.81	8.12	2.21	0.34	9.15	5.13	2.05
	Boy*PED_3	1.57	0.17	4.79	3.54	6.99	2.21	0.33	9.14	5.25	19.20
	Boy*PED_4	1.21	0.15	3.36	2.58	4.71	1.89	0.31	6.63	3.96	13.49
	Boy*PED_5	1.27	0.16	3.57	2.71	5.06	1.67	0.28	5.33	3.34	1.20
	Boy*CSPI	0.88	0.07	2.40	2.11	2.79	0.95	0.12	2.59	2.12	3.34
	Boy*CIPS	0.91	0.18	2.49	1.87	3.79	0.43	0.19	1.53	1.19	2.82
	Boy*CIPI 0–6 years	0.57	0.07	1.77	1.57	2.04	1.03	0.22	2.81	1.97	4.80
	Boy*CIPI 7–12 years	0.68	0.07	1.98	1.74	2.32	0.92	0.15	2.51	1.97	3.50
	Boy*CIPI 13–16 years	0.76	0.12	2.14	1.76	2.79	0.64	0.13	1.89	1.54	2.57
	Constant	0.23	0.22				0.93	0.30			

		1994					2011				
		Esti-mate	S.E.	Odds ratio	95% C.I.		Esti-mate	S.E.	Odds ratio	95% C.I.	
					Lower 2.5%	Upper 2.5%				Lower 2.5%	Upper 2.5%
Upper secondary school dropouts	Boy	0.76	0.02	2.13	2.06	2.21	0.61	0.02	1.85	1.78	1.93
	CSPI	0.94	0.02	2.57	2.48	2.66	0.77	0.02	2.17	2.08	2.26
	CIPS	1.19	0.05	3.29	3.01	3.62	1.49	0.10	4.42	3.66	5.50
	CIPI 0–6 years	1.11	0.03	3.03	2.87	3.21	0.97	0.05	2.64	2.41	2.90
	CIPI 7–12 years	2.02	0.05	7.54	6.82	8.37	1.68	0.06	5.37	4.79	6.06
	CIPI 13–16 years	2.20	0.11	8.99	7.35	11.20	2.37	0.13	1.66	8.41	13.89
	PED_1	1.53	0.10	4.61	3.87	5.62	1.38	0.16	3.96	3.02	5.56
	PED_2	1.08	0.02	2.96	2.83	3.09	0.97	0.03	2.64	2.49	2.82
	PED_3	0.85	0.02	2.33	2.26	2.41	0.68	0.02	1.98	1.91	2.06
	PED_4	0.83	0.02	2.29	2.22	2.37	0.70	0.02	2.00	1.93	2.09
	PED_5	0.86	0.02	2.37	2.30	2.46	0.75	0.02	2.11	2.02	2.21
	Compulsory school achievement	0.97	0.00	2.65	2.65	2.65	0.97	0.00	2.64	2.64	2.64
	Boy*PED_1	1.11	0.09	3.02	2.55	3.70	1.62	0.24	5.04	3.34	8.73
	Boy*PED_2	1.16	0.03	3.20	3.01	3.41	1.23	0.05	3.40	3.08	3.80
	Boy*PED_3	1.09	0.03	2.97	2.82	3.13	1.17	0.04	3.23	2.97	3.53
	Boy*PED_4	1.07	0.03	2.90	2.75	3.07	1.14	0.05	3.12	2.86	3.43
	Boy*PED_5	1.06	0.03	2.88	2.73	3.05	1.14	0.05	3.12	2.86	3.43
	Boy*CSPI	1.25	0.03	3.48	3.29	3.68	1.44	0.05	4.22	3.85	4.65
	Boy*CIPS	1.42	0.07	4.12	3.59	4.79	1.11	0.10	3.03	2.52	3.79
	Boy*CIPI 0–6 years	1.25	0.04	3.50	3.24	3.81	1.33	0.09	3.78	3.23	4.51
	Boy*CIPI 7–12 years	1.26	0.04	3.54	3.26	3.85	1.29	0.06	3.64	3.25	4.11
	Boy*CIPI 13–16 years	1.26	0.08	3.53	3.04	4.19	1.35	0.09	3.85	3.24	4.68
	Constant	2.20	0.08				2.60	0.09			

		1994					2011				
		Esti-mate	S.E.	Odds ratio	95% C.I.		Esti-mate	S.E.	Odds ratio	95% C.I.	
					Lower 2.5%	Upper 2.5%				Lower 2.5%	Upper 2.5%
Delayed upper secondary school graduates	Boy	0.78	0.01	2.17	2.13	2.22	0.66	0.01	1.93	1.88	1.99
	CSPI	1.22	0.02	3.40	3.30	3.52	1.05	0.02	2.84	2.74	2.96
	CIPS	1.28	0.04	3.59	3.34	3.88	1.58	0.08	4.87	4.17	5.77
	CIPI 0–6 years	1.32	0.03	3.73	3.55	3.92	1.40	0.05	4.07	3.72	4.49
	CIPI 7–12 years	3.20	0.07	24.51	21.61	27.94	3.11	0.09	22.35	18.90	26.68
	CIPI 13–16 years	6.09	0.24	44.54	279.78	72.54	6.04	0.29	419.89	246.16	753.70
	PED_1	1.11	0.06	3.05	2.73	3.44	1.12	0.11	3.08	2.51	3.94
	PED_2	0.77	0.01	2.17	2.12	2.21	0.90	0.02	2.46	2.36	2.57
	PED_3	0.68	0.01	1.97	1.94	2.00	0.68	0.01	1.97	1.92	2.02
	PED_4	0.73	0.01	2.07	2.03	2.11	0.69	0.01	2.00	1.95	2.06
	PED_5	0.81	0.01	2.25	2.21	2.30	0.81	0.02	2.24	2.17	2.31
	Compulsory school achievement	0.99	0.00	2.68	2.68	2.68	0.98	0.00	2.68	2.68	2.68
	Boy*PED_1	1.18	0.09	3.24	2.77	3.88	1.73	0.24	5.64	3.76	9.55
	Boy*PED_2	1.26	0.02	3.53	3.37	3.70	1.30	0.04	3.67	3.39	4.00
	Boy*PED_3	1.21	0.02	3.34	3.22	3.47	1.29	0.03	3.65	3.42	3.90
	Boy*PED_4	1.12	0.02	3.07	2.95	3.19	1.21	0.03	3.36	3.15	3.59
	Boy*PED_5	1.08	0.02	2.94	2.84	3.04	1.13	0.03	3.08	2.91	3.26
	Boy*CSPI	1.12	0.02	3.08	2.97	3.20	1.27	0.03	3.55	3.34	3.78
	Boy*CIPS	1.29	0.05	3.62	3.27	4.02	1.23	0.09	3.40	2.89	4.12
	Boy*CIPI 0–6 years	1.19	0.03	3.28	3.10	3.48	1.28	0.06	3.60	3.23	4.07
	Boy*CIPI 7–12 years	1.15	0.03	3.15	2.97	3.35	1.22	0.04	3.37	3.10	3.69
	Boy*CIPI 13–16 years	1.18	0.07	3.25	2.88	3.71	1.20	0.07	3.30	2.89	3.85
	Constant	0.53	0.06				0.92	0.07			

The strongest relative risks of being an early dropout from education under LP94 related to migratory background, with migrating to Sweden as a teen, a small child, and being the foreign-born child of Swedish parents all having much stronger odds of being an early dropout. Of the interaction effects included in the LP94 model, boys with parents educated to pre-secondary or vocational upper secondary level had moderate risks of being early dropouts. When examining the relative risks for the LP11 model, the strongest risks were associated with being a boy with parents educated to pre-secondary or vocational upper secondary level, followed by migrating to Sweden as a pre-teen. Interestingly, while being a boy with parents educated to pre-secondary or vocational upper secondary level had stronger relative risks of having this least optimal outcome for both curricula, the risk was medium for the earlier cohorts and large for the more recent cohorts.

For upper secondary school dropouts, the risk of dropping out amongst the LP94 cohorts was strongest for teenage and pre-teen migrants to Sweden in both groups, with a moderate risk associated with having low-educated parents. For the younger cohorts who attended upper secondary school under LP11, there was a moderate risk for pre-teen migrants and a moderate risk for boys with very low-educated parents to follow this pathway.

The relative risk of following the delayed upper secondary school graduate showed the most congruence between the two curricula. The variable with the strongest relative risk for indicating group membership under both LP94 and LP11, migrating to Sweden between 13 and 16 years old, must be disregarded due to the extremely broad confidence intervals, per Szumilas (2010), $279.78<OR<720.54$ and $246.16<OR<753.70$ respectively. For both LP94 and LP11, there was a very large risk of delayed graduation for pre-teen migrants to Sweden, with moderate risks for those who migrated at a young age or who were born outside of Sweden to Swedish parents. Boys with parents educated to pre-secondary level had a similar moderate relative risk of delayed graduation for both cohorts.

6 Discussion and conclusions

In line with previous European research (e.g., Andrei et al., 2011), we observed that overall dropout from school in Sweden was low, with approximately 15% of students failing to graduate upper secondary school across our cohorts. The study aimed to explore three related questions. The first objective was to classify the suboptimal pathways students can follow after graduating from compulsory school in Sweden. Second, we sought to identify which socio-demographic characteristics predict post-compulsory educational

pathways for Swedish teenagers. Third, we asked whether the risk of not completing upper secondary school varied between the iterations of Sweden's school curricula.

Sweden's high overall participation rate in upper secondary education and its diverse catalogue of formalized programs (Skolverket, 2021b) at this level obscures the small but concerning segment of this age group who either drop out of education or experience delays in navigating the system. Examining the available population data concerning registration within schools and programs across 22 years enabled us to identify four distinct educational pathways amongst Swedish youth post-16. These groups – *early dropouts, upper secondary school dropouts, delayed upper secondary school graduates,* and *perfect participants* – were defined on the basis of individual student histories of engagement with the upper secondary school system following graduation from compulsory school. While the majority of students, 67% of our overall population, graduated from upper secondary school on time and without changing programs and are thus classified as perfect participants, the 15% of students who dropped out either at the end of compulsory school or during their upper secondary tenure represent a cause for concern. With educational level strongly linked to an individual's future earning power (e.g., Houthakker, 1959) and having intergenerational effects that echo across diverse outcomes (e.g., Black et al., 2005), dropping out of school prior to completing upper secondary school is highly likely to negatively impact both the future of these students and that of their own future children.

A child's immigration background is a strong predictor of them following a suboptimal pathway. Interestingly, late arrival to Sweden (between ages 13 and 16) is the strongest predictor of dropping out of or delaying graduation from upper secondary school, but early dropout from education (i.e. immediately after compulsory school) is predicted most strongly by arriving in Sweden between the ages of 7 and 12. These findings are in line with earlier research indicating lower outcomes for immigrant students generally, and higher levels of dropout in these subpopulations (Böhlmark, 2008; Elmeroth, 2006; Taguma et al., 2010). However, the increased risk of entering a pathway in which a student begins upper secondary school and then is either delayed in graduating or drops out for students arriving in Sweden between the ages of 7 and 12 is troubling. This suggests that these students, who are in school before starting the final phase of compulsory schooling, are being overlooked and could be viewed as a manifestation of "a dilemma, where [school districts] would prefer to have earlier, shorter, more intensive programming for newcomers, particularly young children" (Taguma et al., 2010, p. 55) which would serve as an early inoculation against later difficulties but are also faced with the needs of older newcomers.

Additional predictors of entering a suboptimal pathway include attending a school with a high proportion of students born outside of Sweden and low levels of parental education. The increased relative log odds of being in a suboptimal group that are predicted by an increased proportion of foreign-born students in a student's compulsory school point to the persistent existence of peer effects on student outcomes. The increased levels of residential segregation by ethnic background that have been observed across Sweden since the 1990s (Skolverket, 2009) are thus linked by the results of the present study to long-term educational outcomes and engagement with the school system.

The risk of following a suboptimal educational pathway after compulsory school associated with student gender diverged from the outcomes suggested by previous research. While prior research has suggested that girls are less likely to drop out than boys (e.g., World Bank, 2020), for each pathway in both the 1994 and 2011 curricula, male students had decreased log odds of entering the pathway for being a perfect participant than female students did. However, when the interaction terms that combined being a boy with parental education and being a boy with migration background, the log odds of being an upper secondary school dropout or a delayed graduate increased. While academic achievement, a measure that favors girls at all stages of education in Sweden (see, i.e., Holmlund et al., 2019) ameliorates the odds of entering a suboptimal pathway, the log odds of this covariate were generally smaller than those associated with the interaction terms including gender. It might be speculated that the confluence of gender, achievement, and social background makes the discernment of the risks associated with these indicators individually difficult to parse, and perhaps points to the necessity of further studies in this field.

The intergenerational consequence of education level (e.g., Black et al., 2005) manifests in how low parental education significantly predicts entry to all suboptimal educational pathways and the sustained importance of this background variable on predicting outcomes in Sweden (Skolverket, 2012); completion of upper secondary education (either vocational or academic) can ameliorate the younger generation's risk of taking a suboptimal educational pathway. The common alleviating effect size of parental graduation from vocational or academic upper secondary education on a student being an upper secondary school dropout or a delayed upper secondary school graduate in the LP11 group may relate to the trend towards increased levels of parental education in Sweden (Skolverket, 2009); however, further research is needed to fully explore and explain this observation.

The risk of suboptimal post-secondary school engagement, established by examining odds ratios, shows some variation between the iterations of Sweden's school curricula. The odds ratios of students being early dropouts

were higher for students under LP94 than LP11, but this is reversed for students dropping out of or delaying graduation from upper school – the students attending under LP11 had a stronger relative risk of being in a suboptimal pathway.

A finding of this study that we cannot as yet offer an empirical explanation for relates to the risks associated with the immigrant children of Swedish parents in the LP94 cohorts. It is not possible from our data to establish who these children, who have a moderately elevated risk of being a delayed upper secondary school graduate, are. The designation could include both international adoptees and the children of returning Swedish emigrants, and the data available to us does not indicate the age at which they arrived in Sweden. Adoptees may have faced integration problems similar to their immigrant peers, while the children of former Swedish expatriates may arrive in Sweden to find themselves "out of step" with the cycle of Swedish schools and thus repeating a year or needing language development.

The results of this study have contributed to the state of knowledge around delayed graduation and dropout from upper secondary school in Sweden in three key ways. First, a framework for identifying differing suboptimal pathways through the post-compulsory stage of education for students completing compulsory school between 1994 and 2015 has been formulated based on data collected as part of the wider GOLD study. Second, the odds of entering a suboptimal pathway associated with common socio-demographic characteristics have been estimated and compared between curricula. Third, the findings highlight the hard-to-disaggregate effects of the demographic changes in Sweden that have occurred concurrent to changes in the curriculum.

7 Limitations and future directions

A limitation of this research is that the number of cohorts available under the two curricula, LP94 and LP11, is unequal. LP94 was implemented for a 16-year period in Sweden, while LP11 will have run for only 11 years by the time it is replaced in autumn 2022, and only six birth cohorts were available to us. Given the settling-in problems that can be faced during the initial implementation of a new curriculum (see Schwarz & Cavener, 1994), it is not unreasonable to assume that the data available for this analysis cannot fully illustrate differences between LP94 and LP11. The scope of this study was identifying risks for entering suboptimal education pathways and establishing differences in these risks between curricula. A natural line of further enquiry stemming from the research presented in this article concerns the students who attend upper secondary school but engaged with it in suboptimal ways,

as our findings indicate that approximately a third of Swedish teenagers either drop out from or have delayed processing through upper secondary school. In future research, we intend to examine the educational decisions made by the upper secondary school dropouts and delayed upper secondary school graduates throughout their upper secondary school careers and how these actions might predict outcomes.

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Appendix A

Descriptive statistics by educational pathway and cohort group

	LP94[a]							
	Early dropouts		Upper secondary school dropouts		Delayed upper secondary school graduates		Perfect participants	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Individual level variables								
Boy	0.61	0.49	0.57	0.50	0.53	0.50	0.49	0.50
CSPS	0.70	0.46	0.78	0.42	0.78	0.42	0.89	0.32
CSPS	0.13	0.34	0.09	0.29	0.09	0.28	0.06	0.24
CIPS	0.02	0.12	0.01	0.12	0.01	0.12	0.01	0.10
CIPI 0−6 years	0.05	0.21	0.04	0.19	0.04	0.19	0.02	0.15
CIPI 7−12 years	0.07	0.25	0.05	0.22	0.06	0.23	0.01	0.12
CIPI 13−16 years	0.04	0.19	0.03	0.17	0.03	0.17	0.00	0.05
PE6_1	0.03	0.17	0.01	0.12	0.01	0.10	0.00	0.04
PE6_2	0.30	0.46	0.22	0.42	0.14	0.35	0.09	0.29
PE6_3	0.39	0.49	0.41	0.49	0.33	0.47	0.32	0.47
PE6_4	0.11	0.31	0.14	0.35	0.17	0.37	0.18	0.39
PE6_5	0.12	0.32	0.16	0.37	0.23	0.42	0.26	0.44
PE6_6	0.05	0.22	0.06	0.24	0.12	0.33	0.14	0.35
Compulsory school achievement	112.98	77.73	139.62	67.37	189.97	62.96	224.27	46.92
School level variables								
Proportion of immigrant students	0.12	0.14	0.10	0.12	0.09	0.11	0.07	0.08
Parental education	2.72	0.47	2.79	0.44	2.90	0.46	2.91	0.44
Compulsory school achievement	195.72	29.72	199.88	22.44	205.12	2.32	207.83	17.44
NB [a] N=1747656 [b] N=593659								

	LP11[b]							
	Early dropouts		Upper secondary school dropouts		Delayed upper secondary school graduates		Perfect participants	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Individual level variables								
Boy	0.58	0.49	0.57	0.50	0.53	0.50	0.50	0.50
CSPS	0.61	0.49	0.64	0.48	0.65	0.48	0.84	0.37
CSPS	0.16	0.37	0.13	0.33	0.13	0.34	0.11	0.31
CIPS	0.01	0.09	0.01	0.11	0.01	0.11	0.01	0.09
CIPI 0−6 years	0.05	0.21	0.03	0.17	0.04	0.19	0.02	0.14
CIPI 7−12 years	0.10	0.30	0.08	0.28	0.10	0.30	0.02	0.15
CIPI 13−16 years	0.08	0.27	0.11	0.31	0.07	0.25	0.01	0.07
PE6_1	0.03	0.16	0.03	0.17	0.02	0.12	0.00	0.03
PE6_2	0.30	0.46	0.23	0.42	0.16	0.37	0.06	0.23
PE6_3	0.29	0.45	0.32	0.47	0.26	0.44	0.25	0.44
PE6_4	0.16	0.36	0.17	0.37	0.18	0.39	0.22	0.41
PE6_5	0.14	0.34	0.17	0.38	0.23	0.42	0.28	0.45
PE6_6	0.10	0.30	0.09	0.28	0.15	0.35	0.19	0.39
Compulsory school achievement	101.15	92.19	129.29	76.37	192.03	63.33	233.97	44.56
School level variables								
Proportion of immigrant students	0.19	0.19	0.17	0.18	0.15	0.16	0.11	0.10
Parental education	2.87	0.59	2.90	0.52	3.02	0.52	3.13	0.48
Compulsory school achievement	194.96	42.15	201.92	31.49	209.74	26.13	216.54	21.62
NB [a] N=1747656 [b] N=593659								

Appendix B

Proportion of students in each year following each educational pathway by student immigration status

	CSPS				CSPI				CIPS			
Year of birth	Early dropouts	Upper secondary school dropouts	Delayed upper secondary school graduates	Perfect partici-pants	Early dropouts	Upper secondary school dropouts	Delayed upper secondary school graduates	Perfect partici-pants	Early dropouts	Upper secondary school dropouts	Delayed upper secondary school graduates	Perfect partici-pants
LP94												
1979	0.6%	19.2%	11.4%	68.8%	1.7%	31.9%	13.9%	52.6%	1.0%	24.2%	18.0%	56.8%
1980	0.5%	21.8%	11.4%	66.3%	1.5%	31.8%	13.6%	53.1%	0.8%	25.5%	16.0%	57.7%
1981	0.6%	19.9%	11.4%	68.0%	1.9%	30.6%	13.0%	54.5%	0.9%	25.7%	15.8%	57.6%
1982	0.6%	22.7%	14.0%	62.7%	1.9%	33.6%	15.8%	48.7%	0.9%	29.0%	17.3%	52.8%
1983	0.6%	22.3%	13.6%	63.4%	1.9%	32.2%	16.3%	49.6%	0.9%	26.1%	20.6%	52.5%
1984	0.8%	20.2%	14.4%	64.5%	1.7%	30.5%	17.3%	50.5%	1.6%	25.4%	21.4%	51.6%
1985	0.7%	15.6%	23.1%	60.6%	1.6%	22.2%	28.7%	47.5%	1.1%	18.7%	28.7%	51.6%
1986	0.7%	8.1%	24.7%	66.6%	1.7%	12.8%	32.2%	53.3%	0.9%	10.4%	32.2%	56.5%
1987	0.6%	8.0%	17.7%	73.6%	1.5%	12.3%	23.8%	62.4%	1.3%	8.4%	23.5%	66.7%
1988	0.5%	9.2%	17.0%	73.2%	1.4%	14.2%	21.8%	62.6%	0.5%	11.5%	27.4%	60.5%
1989	0.6%	10.2%	16.2%	73.0%	1.3%	14.6%	21.9%	62.2%	1.0%	13.1%	27.9%	58.0%
1990	0.6%	10.1%	17.5%	71.8%	1.0%	14.6%	22.8%	61.5%	0.9%	14.3%	26.2%	58.6%
1991	0.4%	9.8%	19.3%	70.5%	0.8%	14.7%	24.8%	59.6%	1.2%	13.5%	31.3%	53.9%
1992	0.4%	9.3%	18.5%	71.8%	0.7%	12.3%	25.4%	61.5%	0.7%	11.3%	29.2%	58.8%
1993	0.3%	9.3%	18.1%	72.4%	0.6%	12.6%	24.4%	62.5%	0.4%	16.1%	28.8%	54.7%
1994	0.3%	9.2%	17.0%	73.5%	0.6%	12.0%	21.6%	65.8%	0.5%	14.5%	28.9%	56.1%
LP11												
1995	0.4%	10.3%	15.0%	74.4%	0.6%	14.2%	19.7%	65.5%	0.3%	17.2%	28.6%	54.0%
1996	0.3%	9.8%	14.2%	75.7%	0.5%	13.7%	18.3%	67.5%	0.3%	16.9%	24.1%	58.7%
1997	0.4%	9.5%	13.3%	76.8%	0.8%	12.8%	17.6%	68.8%	0.3%	17.8%	21.6%	60.2%
1998	0.4%	9.5%	13.4%	76.7%	0.8%	12.6%	17.9%	68.7%	0.5%	13.3%	21.5%	64.6%
1999	0.4%	9.9%	13.4%	76.2%	0.8%	13.3%	19.0%	66.9%	0.7%	16.5%	20.3%	62.6%
2000	0.5%	10.8%	10.6%	78.1%	0.7%	14.1%	14.8%	70.5%	0.5%	20.9%	16.3%	62.2%

	CIPI 0–6 YEARS				CIPI 7–12 YEARS				CIPI 13–16 YEARS			
Year of birth	Early dropouts	Upper secondary school dropouts	Delayed upper secondary school graduates	Perfect partici-pants	Early dropouts	Upper secondary school dropouts	Delayed upper secondary school graduates	Perfect partici-pants	Early dropouts	Upper secondary school dropouts	Delayed upper secondary school graduates	Perfect partici-pants
LP94												
1979	1.5%	33.7%	16.7%	48.1%	2.0%	38.5%	26.9%	32.6%	1.7%	41.8%	40.0%	16.5%
1980	1.4%	35.7%	16.9%	45.9%	1.7%	38.0%	27.7%	32.6%	1.4%	40.6%	33.0%	25.0%
1981	1.7%	34.2%	16.2%	47.9%	1.0%	38.5%	24.8%	35.7%	2.7%	50.3%	26.5%	20.5%
1982	1.1%	37.6%	20.1%	41.2%	1.5%	38.7%	28.3%	31.5%	4.1%	51.3%	32.2%	12.4%
1983	1.4%	35.4%	19.4%	43.8%	1.7%	36.1%	27.7%	34.5%	3.8%	49.6%	35.7%	11.0%
1984	1.6%	34.5%	20.3%	43.5%	2.0%	32.4%	31.0%	34.6%	3.0%	41.2%	42.3%	13.4%
1985	1.3%	23.2%	31.0%	44.5%	1.2%	22.7%	43.1%	33.0%	2.8%	35.5%	52.2%	9.5%
1986	1.0%	13.4%	34.7%	50.9%	1.8%	15.3%	42.2%	40.7%	2.2%	32.3%	52.3%	13.2%
1987	1.2%	12.4%	27.6%	58.9%	2.0%	18.2%	40.1%	39.7%	2.0%	30.9%	49.7%	17.5%
1988	1.0%	13.9%	24.2%	60.9%	1.9%	18.7%	44.2%	35.2%	2.5%	33.9%	48.8%	14.9%
1989	1.2%	13.1%	21.8%	63.9%	1.9%	18.7%	43.8%	35.6%	2.2%	34.0%	50.6%	13.2%
1990	1.1%	13.9%	22.4%	62.6%	1.5%	19.7%	45.9%	32.9%	2.2%	32.4%	51.6%	13.7%
1991	0.8%	13.2%	24.7%	61.4%	1.4%	19.2%	48.1%	31.3%	1.4%	35.4%	48.3%	14.9%
1992	1.2%	12.0%	26.7%	60.1%	1.5%	19.1%	44.5%	34.9%	1.6%	35.1%	49.0%	14.4%
1993	0.9%	13.4%	28.8%	56.9%	1.3%	17.9%	45.6%	35.2%	1.7%	38.5%	48.5%	11.3%
1994	0.9%	15.7%	28.7%	54.6%	1.1%	20.9%	43.0%	35.0%	1.9%	42.0%	44.9%	11.3%
LP11												
1995	1.1%	16.1%	27.5%	55.3%	1.0%	25.0%	38.7%	35.2%	1.7%	40.7%	45.5%	12.1%
1996	1.1%	16.2%	25.6%	57.1%	1.1%	23.1%	41.4%	34.4%	1.8%	38.8%	47.6%	11.8%
1997	1.1%	14.6%	22.6%	61.6%	1.4%	22.1%	39.4%	37.1%	1.9%	41.3%	46.4%	10.4%
1998	0.9%	14.0%	23.5%	61.6%	1.3%	21.1%	37.5%	40.1%	1.2%	42.8%	44.5%	11.5%
1999	0.8%	14.8%	24.9%	59.4%	1.3%	21.6%	40.5%	36.6%	1.1%	47.7%	39.9%	11.3%
2000	0.7%	15.6%	19.1%	64.6%	1.3%	30.9%	29.2%	38.6%	1.3%	61.9%	23.7%	13.0%

Appendix C

Assessment of model fit between successive models

	G	Δdf	*P*
model 2 v 1			
1994	711.26	30	<.000
2011	480.35	30	<.000

Appendix D

Unstandardized model outputs – Model 1 and Model 2

	Model 1					
	1994			2011		
	Early dropouts	USS dropouts	Delayed USS graduates	Early dropouts	USS dropouts	Delayed USS graduates
Student level						
Boy	0.01	−0.17*	−0.10*	−0.28*	−0.28*	−0.20*
CSPI	0.31*	0.06*	0.26*	0.05	−0.06***	0.17*
CIPS	0.59*	0.35*	0.37*	−0.14	0.45*	0.56*
CIPI 0−6 years	0.38*	.023*	0.36*	0.34***	0.12*	0.45*
CIPI 7−12 years	1.00*	0.83*	1.23*	0.64*	0.66*	1.23*
CIPI 13−16 years	0.72*	0.91*	1.89*	0.17	1.03*	1.90*
PED_1	0.88*	0.48*	0.19*	0.36***	0.62*	0.44*
PED_2	0.18**	0.16*	−0.14*	−0.18***	0.08*	0.03
PED_3	−0.27*	−0.12*	−0.29*	−0.83*	−0.29*	−0.26*
PED_4	−0.43*	−0.15*	−0.26*	−0.68*	−0.29*	−0.26*
PED_5	−0.38*	−0.12*	−0.17*	−0.77*	−0.22*	−0.16*
Compulsory school achievement	−0.03*	−0.03*	−0.01*	−0.04*	−0.03*	−0.02*
Boy*PED_1						
Boy*PED_2						
Boy*PED_3						
Boy*PED_4						
Boy*PED_5						
Boy*CSPI						
Boy*CIPS						
Boy*CIPI 0−6 years						
Boy*CIPI 7−12 years						
Boy*CIPI 13−16 years						
School level						
Proportion of immigrant students	1.14*	1.49*	1.19*	2.61*	2.38*	1.57*
Parental education	−0.23*	−0.12*	0.11*	0.22***	−0.01	0.04***
Compulsory school achievement	0.01*	0.01*	0.00*	0.00***	0.01*	0.00*
Intercepts						
Education pathway	0.09	2.14*	0.45*	0.67***	2.48*	0.80*
Number of free parameters	48			48		
Loglikelihood	−1067529.01			−35484.36		
NB: * *P*=.000, ***P*<.001, ****P*<.05						

	Model 2					
	1994			2011		
	Early dropouts	USS dropouts	Delayed USS graduates	Early dropouts	USS dropouts	Delayed USS graduates
Student level						
Boy	−0.23***	−0.28*	−0.26*	−0.81*	−0.49*	−0.42*
CSPI	0.40*	−0.06***	0.20*	0.08	−0.26*	0.04***
CIPS	0.66*	0.17*	0.25*	0.28	0.40*	0.46*
CIPI 0−6 years	0.70*	0.10*	0.27*	0.32***	−0.03	0.34*
CIPI 7−12 years	1.23*	0.70*	1.16*	0.69*	0.52*	1.13*
CIPI 13−16 years	0.89*	0.79*	1.81*	0.39***	0.86*	1.80*
PED_1	0.84*	0.43*	0.11***	−0.14	0.32***	0.12
PED_2	−0.12	0.08*	−0.26*	−0.60*	−0.03	−0.11*
PED_3	−0.54*	−0.17*	−0.39*	−1.27*	−0.38*	−0.39*
PED_4	−0.53*	−0.19*	−0.32*	−1.02*	−0.36*	−0.37*
PED_5	−0.52*	−0.15*	−0.21*	−1.04*	−0.29*	−0.22*
Compulsory school achievement	−0.03*	−0.03*	−0.01*	−0.04*	−0.03*	−0.02*
Boy*PED_1	−0.02	0.10	0.16***	1.03***	0.48**	0.55*
Boy*PED_2	0.52*	0.15*	0.23*	0.80*	0.20*	0.26*
Boy*PED_3	0.45*	0.08**	0.19*	0.80*	0.16*	0.26*
Boy*PED_4	0.19	0.06***	0.11*	0.64*	0.13**	0.19*
Boy*PED_5	0.24	0.06***	0.07*	0.52***	0.13**	0.12*
Boy*CSPI	−0.13	0.22*	0.12*	−0.05	0.36*	0.24*
Boy*CIPS	−0.09	0.35*	0.25*	−0.86	0.10	0.20***
Boy*CIPI 0−6 years	−0.57*	0.23*	0.17*	0.03	0.28*	0.25*
Boy*CIPI 7−12 years	−0.38*	0.23*	0.14*	−0.08	0.26*	0.20*
Boy*CIPI 13−16 years	−0.27	0.23*	0.16***	−0.45***	0.30*	0.18***
School level						
Proportion of immigrant students	1.15*	1.49*	1.19*	2.63*	2.40*	1.58*
Parental education	−0.22*	−0.12*	0.11*	0.22***	−0.01	0.04***
Compulsory school achievement	0.01*	0.01*	0.00*	0.00***	0.01*	0.00*
Intercepts						
Education pathway	0.23	2.20*	0.53*	0.93***	2.60*	0.92*
Number of free parameters	78			78		
Loglikelihood	−1067173.38			−354600.19		
NB: * P=.000, **P<.001, ***P<.05						