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Declarations
Funding: No funds, grants, or other forms of support were received.
Conflicts of interest/competing interests: The authors have no financial or proprietary interests in any material discussed in this paper.
Availability of data and material: The data that support the findings of this study are available from Bundesamt für Statistik (the Swiss Federal Statistical Office), but restrictions apply to the availability of these data, which were used under license for the current study and so are not publicly available.
Code availability: The code, which can be used to replicate the study findings, can be obtained on request from the authors.
Ethics approval: For this type of study, formal consent is not required.

Less student dropout, more frequent change of study subjects: Evidence from Swiss administrative data, 1975–2018

This paper aims to illustrate the extent to which structural changes and institutional modifications within the higher education landscape influenced the rates of completion, dropout, and changes in the subject of study of Swiss university students between 1975 and 2018. Using administrative data, our results indicate that the completion rate and the subject of study change rate increased during that period. Furthermore, student dropout rates fell significantly over the observation period.

1 Introduction

Three out of every ten students in Organization for Economic Co-operation and Development (OECD) countries who entered tertiary education in 2011 did not obtain a tertiary degree (OECD 2019). Dropping out of the higher education system can have negative impacts for students (Behr et al. 2020). For example, access to the skilled labor market is more difficult for higher education dropouts, and they experience a higher risk of unemployment (Schnepf 2017). Furthermore, high dropout rates also result in negative economic consequences for universities (high costs and poor reputation) and for societies overall (lack of skilled labor and unprofitable educational investments) (Barefoot 2004; Schneider 2010; Aubyn et al. 2009; Quinn 2013; Diem and Wolter 2019). Because of the high prevalence of non-completion and the negative consequences that accompany it, this topic has been heavily investigated (Tinto 1975, 1987; Bound and Turner 2011; Aina 2013; Stinebrickner and Stinebrickner 2014; Kehm et al. 2019; Behr et al. 2020; Tieben 2020; Hadjar et al. 2022).

Since the end of World War II, the educational landscape worldwide has undergone major changes (Meyer et al. 1992). First, a massive educational expansion has significantly raised levels of educational attainment and, as a result, more and more

students are entering university (Wolter et al. 2014). The second notable change is the sharp increase in the participation of women in tertiary education (Buchmann et al. 2008). In Europe, in addition to these structural changes, institutional changes were introduced to the higher education system in the early 2000s through the Bologna reform, which aimed to promote student mobility in the European higher education system and to standardize degrees across Europe (Tauch 2004; Powell et al. 2012; Zahavi and Friedman 2019). This reform introduced a two-tier Bachelors and Masters system and replaced diploma degrees, which often had a five-year study period (Glauser et al. 2019; Nennstiel and Becker 2020). In addition, in many European countries, universities of applied sciences (UAS) and universities of teacher education (UTE) have been introduced to facilitate access to tertiary education (Müller and Wolbers 2003). Numerous international studies of student dropout and university completion rates distinguish between individual entry cohorts or universities (e.g., Johnes and Taylor 1989; Chen 2012; Aina 2013; Stinebrickner and Stinebrickner 2014). However, considerably fewer studies take longer time periods into account (e.g., Bound et al. 2010; Wolter et al. 2014; Crisp et al. 2018; Diem and Wolter 2019). Most of these studies do not analyze study subject change separately. The present study does so because a change of study subject change (within or between universities) is often regarded as a dropout or non-completion from the perspective of the universities (e.g., Johnes and Taylor 1989). Yet a change in the subject of study is characterized by students remaining in higher education, which is clearly to be distinguished from leaving the tertiary system (Tinto 1975; Kehm et al. 2019). Changing a study program is likely to be associated with higher direct and indirect costs of studying because of the longer total enrollment duration before graduating (Berlingieri et al. 2022). Recent studies from different European countries report varying rates of study subject changes

of newly enrolled university students, amounting to between 15 and 25 percent (Berlingieri et al. 2022; Diem and Wolter 2019; Bodin and Millet 2011).

Considering the abovementioned developments in the higher education system (increasing participation; the higher participation of women; the Bologna reform; the introduction of additional types of higher education institution), analyses with a long-term perspective can help produce insights into the profound changes that have taken place in the higher education system, as well as in study behavior. Furthermore, little is known about the influence on university dropout and subject change rates of structural factors, such as cohort size (Bound and Turner 2007; Diem and Wolter 2019) or the proportion of women (Severiens and ten Dam 2012). A particular focus of our research is on the extent to which structural changes (the higher number of students and the higher proportion of women) and the Bologna reform have changed the aggregated behavioral patterns in this multi-step process. In doing so, we hope to help reduce research gaps regarding long-term study patterns and their association with structural and institutional factors.

We aim to contribute to the research literature by following Tinto (1975)'s division between institutional and system dropout, and by considering both completing higher education and dropping out as multi-stage processes (Mare 1980; Tieben 2020). This division also makes it more feasible to examine, not only the extent to which total dropout and completion rates have changed over time, but also the extent to which changes in the intermediate steps (change in subject of study and initial completion) can be revealed.

In this descriptive paper, we aim to answer the following two questions in regard to the Swiss educational system: first, how did rates of completion, dropout, and study subject change evolve over time between 1975 and 2018? Second, what impact do structural

changes such as increased student numbers and higher female enrollment, as well as the introduction of the Bologna reform, have on completion, dropout, and change of study rates? To answer these research questions, we use administrative data from Switzerland – the 'Longitudinal Analyses in the Field of Education' (LABB).[1] These data contain information on the course of studies and degrees of all people enrolled at Swiss tertiary educational institutions between 1973 and 2018 (N = 1,341,170).

In the next section, we briefly introduce the Swiss higher education system. We then explain our theoretical considerations and outline the state of research in this area. Next, we describe the data and our statistical procedures. This is followed by the presentation of our results. Finally, we discuss our results and contextualize them with respect to the state of research.

2 The Swiss context

The Swiss tertiary education system is composed of universities (10 cantonal and two federal), as well as UAS and UTE.

UAS and UTE were introduced in Switzerland in the 1990s following an educational reform that sought to promote and simplify access to tertiary education, with UAS opening in 1996 and UTE opening in 1999. However, UAS and UTE in Switzerland were introduced later compared to other European countries such as Germany, Belgium, and the Netherlands, where such institutions had already been introduced in the 1970s (Lepori and Kyvik 2010). During the course of the 1994 reform of Switzerland's UAS, a

[1] *Längsschnittanalysen im Bildungsbereich.* For further information, see www.labb.bfs.admin.ch.

vocational baccalaureate was introduced, qualifying students to study at tertiary level. In addition, a specialized baccalaureate was introduced in 2004. These baccalaureate degrees nevertheless only entitled students to study at a UAS or at a UTE. In 2005, an additional examination (*Passerelle*) was introduced, which allowed people with a vocational baccalaureate to study at universities. In 2017, this possibility was also extended to people with a professional baccalaureate. However, among the new Bachelors students enrolled at universities since 2005, only 3 percent entered universities through this pathway (Eberle 2022). Students who obtained an academic baccalaureate first had to acquire practical experience in the field of study to attend a UAS (OECD 2003). In the academic year 2015/16, over one-third of all students were enrolled at a UAS or a UTE (BfS 2019, 11).

Since we are interested in long-term trends, the analyses presented in this paper focus on newly enrolled students entering cantonal or federal universities.[2] Figure 1 shows the number of new first-time entrants to these universities, and the share of women among them, between 1975 and 2018. Two global trends described in the introduction can be detected: increasing student enrollment and increasing female participation. The absolute number of new first-time entrant students increased from 11,000 to 22,500 during the period, and the proportion of women among them also increased steadily, from 41 to 52 percent. To put these figures into perspective, the permanent resident population aged 18–23 numbered about 550,000 in 1975 and had increased to about

[2] As mentioned above, since UAS and UTE were only founded in the 1990s, it is not possible to analyze long-term trends for these universities. However, as the introduction of these institutions also created new study opportunities for university students, students who studied first at a university and then at a UAS or UTE are included in our analyses.

620,000 by 1985. After this, it dropped, with some volatility, to about 560,000 in 2018 (BfS 2022). The increase in the number of first-year students was therefore not due to a significant increase in the student-age population. Nor can the increase be attributed solely to a rise in the number of foreign students (see Figure A1 in the appendix).

— Figure 1 about here —

In terms of an international comparison, two particularities of the Swiss higher education landscape stand out. First, there are no access regulations for most university study programs.[3] This means anyone who obtains a baccalaureate (a university entrance degree) can study the subjects he or she wants to study, regardless of the grade point average obtained. Second, access to this baccalaureate is very limited and is socially selective (Combet 2019). This social selectivity is reflected in the proportion of people in a given cohort with a baccalaureate degree, which stands at 20 percent (Diem and Wolter 2019).

The Bologna reform divided the five-year study period into two study phases: a three-year Bachelors degree and a subsequent two-year Masters degree. Thus, a first academic degree could now be obtained faster (Tauch 2004; Powell et al. 2012). The Bologna reform was implemented considerably faster in Switzerland than in other European countries (Glauser et al. 2019), with the first Bachelors degree programs being offered

[3] Courses of study in medicine are an exception. Access regulations (*numerus clausus)* were introduced for human medicine in 1998, for veterinary medicine in 1999, and for dentistry in 2004.

as early as 2001. The Bologna reform had been completely implemented in all Swiss universities by 2007.[4]

3 Theoretical considerations and the state of research

In his seminal work on student dropout, Tinto (1975) distinguishes between institutional and system dropout. System dropout is defined as complete withdrawal from the higher education system, whereas institutional dropout is understood as students leaving a subject of study or a university, but not directly leaving the higher education system. For example, after institutional dropout, a student may study another subject or may study at another university. This distinction illustrates that completion, graduation, and dropout rates can all be considered outcomes of multi-stage processes (Mare 1980; Tieben 2020). We have schematically mapped this multi-stage process leading to an individual's first tertiary degree in Figure 2.

— Figure 2 about here —

After entering the initial program, students are expected to achieve one of two outcomes: completion of the chosen field of study, or non-completion of it. In the case of completion, we speak of initial completion. In the case of non-completion of the first subject of study (institutional dropout), there are two possibilities: complete withdrawal from the higher education system (system dropout), or transferring to an alternative program. We refer to this transfer as a change of study program or a change in the subject of study. In this alternative program, there are again the same two options:

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[4] However, the introduction of the Bachelors system was not simultaneous across all Swiss universities (see Figure A2 in the appendix for the introduction rate for selected universities).

completion and non-completion. In the case of another non-completion, there is again the choice between a change of study program or system dropout. This process can, in theory, be repeated indefinitely until the student achieves a first degree. For the sake of clarity, Figure 3 depicts the first two cycles. Accordingly, the total graduation rate consists of the initial completion and the completion of study programs after a change in the subject of study. The total dropout rate consists of the first-time system dropout and subsequent dropouts.

This stepwise approach shows that potential changes in total graduation or dropout rates can be caused by different processes within the higher education system. For example, higher total graduation rates could be the result of more students successfully completing their initial study program, or of more students re-entering and successfully completing their studies after non-completion of that program.

3.1 State of research for the international context

Dropout, completion, and subject change rates vary considerably from country to country. For example, dropout rates of 40 percent and six-year graduation rates of just under 50 percent were found for the US (Chen 2012; Crisp et al. 2018). Bound et al. (2010) showed that the eight-year university completion rates of the 1972 and 1992 entry cohorts in the US declined from 50.5 to 45.9 percent, with men being the main drivers of this effect, while the completion rates for women remained constant. For Italy, Aina (2013) found initial dropout rates below 20 percent after the introduction of the Bologna reform. For Spain, eight-year initial dropout rates of 46 percent were found by Lassibille and Navarro Gómez (2008). For Germany, Heublein et al. (2017) reported an initial dropout rate of 29 percent for Bachelors degree programs.

Berlingieri et al. (2022) found that 15 percent of newly enrolled university students in Germany changed their field of study within the first four years after enrollment. Bodin and Millet (2011) investigated the study trajectories of the 2006/07 entry cohort at the French University of Poitiers and found that almost a quarter of the students changed their study subject.

3.2 State of research for the Swiss context

For Switzerland, Wolter et al. (2014) found a mean dropout rate of 30 percent for entry cohorts between 1975 and 2001. They were able to show that the dropout rate fell from 40 percent in 1975 to 30 percent in 2001. The dropout rate for men remained roughly constant, while it fell significantly for women. In Switzerland, the mean rate of change of study field for entry cohorts between 1980 and 2001 was 19.5 percent (Diem and Wolter 2019).

3.3 How changes over time could affect study outcomes

After briefly outlining the state of international and Swiss research on dropout and subject change rates, we now move on to discuss how structural (increasing participation and higher participation of women) and institutional changes (introduction of the Bologna reform) might influence study outcomes over time.

Bound and Turner (2007) showed for the US that a 10 percent increase in the college-age population led to a 4 percent decrease in the proportion of Bachelors degree completions. It can be assumed that an increase in the number of students led to a decrease in the amount of resources per student, which in turn led to more dropouts (Bound et al. 2010). For Switzerland, Diem and Wolter (2019) found a positive

relationship between student cohort growth and dropout. They argued that this relationship could not be explained by the staff–student ratio. Rather, they argued that universities increased academic demands when faced with strong growth in student numbers, which resulted in higher dropout rates. With regard to the influence of the number of fellow students on subject changes, it could be assumed that students with an increasing number of fellow students might be attracted to less crowded study programs, and thus the change rates should increase over time (Diem and Wolter 2019). However, Diem and Wolter (2019) found that cohort growth had no effect on the propensity to change majors for the 1980–2001 entry cohorts in Switzerland. Furthermore, it could be argued that an increasing number of students could reduce the social integration of students by increasing anonymity, lowering the sense of belonging, and reducing the number of interactions between students and faculty members. It is nevertheless questionable how strong the influence of social integration on student outcomes is in Switzerland, as students do not usually live on campus – unlike, for example, in the US (Diem and Wolter 2019).

As previously noted, another factor that has changed considerably in recent decades is the proportion of women at universities. By analyzing Dutch university leaving cohorts between 2000 and 2006, Severiens and ten Dam (2012) were able to show that dropout was related to the proportion of women or men in the study program. In particular, the dropout rate was high for men in female-dominated programs. They pointed out that this could be because the proportion of men and women in the study program might be related to satisfaction and involvement. They also showed that men in female-dominated programs exhibited a higher propensity to drop out as a result of securing employment elsewhere, perceiving the occupational status to which their studies led as rather low. Furthermore, these men reported experiencing a deficit of parental support

and encountering a negative culture within their study programs. This finding implies that men in female-dominated fields may perceive a lack of social integration, potentially contributing to their increased dropout rates. In Switzerland, the pronounced gender-based horizontal segregation in the labor market and the accompanying wage disparities might lead women in female-dominated programs to perceive lower labor market returns compared to those in male-dominated fields, subsequently influencing their study decisions.

A major institutional change in the Swiss higher education system was the introduction of the Bologna system from 2001. Since this reform reduced the minimum period of study for a university degree from five to three years, one might expect to lead to a reduction in dropout rates, as it reduced the cost and duration of a university degree (Aina 2013). However, Wolter et al. (2014) found the Bologna reform had no effect on student dropout rates in Switzerland for student entry cohorts between 1970 and 2001. Regarding the influence of the Bologna reform on changes in study subjects, it should have had a positive influence. On the one hand, this was due to shortening of the period of study; on the other, it was due to the introduction of credit points, which should have simplified the transfer and the comparability of study achievements across study programs.

4 Data, operationalization, and statistical method

4.1 Data

Our statistical analyses are based on the LABB dataset. These data are created by linking different datasets, mainly collected from education statistics (statistics on enrolled persons from primary to tertiary level and obtained degrees). To create this

dataset, data from various surveys (the Structural Survey of the Swiss Population and Households, and the Database of Students and Degrees of the Swiss Higher Education System) were synthesized by the Swiss Federal Statistical Office. The LABB allows tracking of individual educational trajectories based on a personal identification number, which is used to collect longitudinal data concerning an individual's educational pathway. Thus, we have a dataset for study entry cohorts between 1973 and 2018 that includes all study episodes of all people enrolled in Swiss higher education institutions. A study episode is defined as any year in which a student was enrolled at a Swiss higher education institution or received a degree. For example, if a student was enrolled from 2008 to 2010 and graduated in 2010, this student will have four study episodes in the dataset.[5] These administrative data contain 7,022,021 study episodes for 1,341,170 students for the entire Swiss higher education sector.

4.2 Sample selection

As mentioned above, this study focuses on students enrolled at Swiss universities. We only consider students who first enrolled at a Swiss university between 1975 and 2010 and who spent their first study episode at a university (N = 517,330 students). We have chosen this time period in order to accurately determine the study entry for the oldest cohort (data plausibility problems exist for cohorts before 1975) and to have information available on the study trajectory for the youngest cohort (2010 plus eight years).

To ensure comparability over time, we only consider the time elapsed before receiving the first degree. This means that we only investigate study episodes for Bachelors

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[5] The cumulative distribution function of the number of study episodes per person is shown in Figure A3 in the appendix.

degree or diploma programs; we do not examine episodes at higher tertiary levels, such as for Masters or doctoral programs.

We only consider students who attained Swiss university admission. Furthermore, we exclude students who directly obtained a degree during the first observed episode, students younger than 17 years or older than 40 years, and students whose study program could not be assigned an International Standard Classification of Education (ISCED) code. Since the Università della Svizzera italiana and the University of Lucerne were only established in the late 1990s, we have excluded students from these universities from our analyses. For the bivariate analyses, our sample comprises 407,383 students (224,659 male students and 182,724 female students). Furthermore, for the multilevel models, we have excluded students in study programs with fewer than 100 students and students with missing values in any of the model variables described below. Hence, our analytic sample includes 407,008 students (224,476 male students and 182,532 female students).

4.3 Operationalization

Our analyses consider four different outcome variables: total completion; initial completion; change of subject of study; and initial dropout.

Total completion (0/1) indicates whether a student earned a tertiary degree within an 8-year or 10-year period after first entering the higher education system. We chose this time restriction for two reasons. First, it is common in this field of research to add a period of time of several years to the standard length of study (diploma: five plus five years; Bachelors degree: three plus five years). Second, we looked at the empirical distribution of time elapsed before achieving a first degree for diploma and Bachelors degree students: at least 90 percent of students who graduated did so within the selected

time periods. Aggregated at the population level, total completion indicates the total completion rate. Its complement is the total dropout rate.

Initial completion (0/1) indicates whether a student has graduated within a period of 8 or 10 years in the field of study they were studying when they first entered university. The field of study is operationalized using the ISCED two-digit classification (21 different fields of study).

Change of subject (0/1) indicates whether a student has changed their first subject of study within a period of 8 or 10 years. Here, we assign a change in the subject of study to a student if that student has study episodes in different ISCED-2 subject areas.

Initial dropout (0/1) indicates that a student has not completed their initial field of study and has not started another field of study at a Swiss tertiary education institution within a period of 8 or 10 years after first enrollment.

At the student level, we have included the following control variables available in the dataset: Swiss citizen (yes/no) and age (in years). Previous research has shown that citizens have higher completion rates than foreign students, and that older students drop out more often and change their field of study less often than younger students (Reisel and Brekke 2010; Larsen et al. 2013; Müller and Schneider 2013).[6]

At the study program level, we include the following variables in the models: proportion of women in the study program, Bachelors degree system introduced (yes/no), and the number of students in the study program. All these variables are calculated separately for each ISCED group in each university for each year between 1975 and 2010. The variable relating to the introduction of the Bachelors degree system indicates whether

[6] The proportion of citizens among the students (Figure A4) is shown in the appendix, as well as boxplots for the age distribution of the students (Figure A5) over time.

the share of diploma students in a program is above 20 percent (0) or below 20 percent (1). Since the number of students is highly skewed, we include the logarithmized number of students in the models.

4.4 Statistical procedures

As our dependent variables are binary variables, we estimate linear probability models (Breen et al. 2018; see Equation 1). Since we are particularly interested in the time trend, the year of university entry is our central independent variable. Because we are working with large-scale administrative data, we opt for a conservative significance level of $p < 0.005$ (Benjamin et al. 2018):

$$D = \gamma_0 + \gamma_t * Y_t + \gamma_{X*} \mathrm{X} + \gamma z * \mathrm{Z} + r \quad (1)$$

where

D is one of the four dependent variables;

γ are the regression coefficients;

Y_t is the university entry year;

X is a vector for all the individual-level model variables;

Z is a vector for all the subject-level model variables; and

r is the error term.

Because our data structure can be thought of as repeated measurement time points of study programs over time, we estimate these linear probability models in a multilevel framework (students within university-specific study programs). Since there are only 10 universities in the dataset, we include a fixed effect for them in the models. For the study programs, we have created a categorical variable to distinguish between study

programs at different universities (114 different combinations of study programs at ISCED-2 level and universities).[7] We assume that our output variables vary across university-specific study programs as they differ in teaching quality, learning environment, and level of requirement (Johnes and Taylor 1989; Larsen et al. 2013; Tieben 2020). Furthermore, previous research has shown that dropout rates are unevenly distributed across the different subjects (Behr et al. 2020; Tieben 2020). The dropout rate is higher in science, technology, engineering, and mathematics subjects than in other subjects (Larsen et al. 2013). Therefore, we include random intercept at the study program level u_{0jk} (see Equation 2):

$$D_{jk} = \gamma_{000} + u_{0jk} + \gamma_{t0} * Y_{tjk} + \gamma_{X0} * X_{jk} + \gamma_{Z0} * Z_{jk} + r_{jk} \quad (2)$$

Men and women differ in their dropout rate and subject change behavior. Therefore, we calculate our analyses separately for men and for women.

5 Results

5.1 Bivariate results

Figure 3 depicts the total completion rates for men and women in the university entry cohorts for the years 1975–2010. In 1975, men started with a total completion rate of 64 percent and women with a total completion rate of 50 percent. The completion rate increased steadily for both men and women up to 80 percent in 2001. Thereafter, it

[7] The maximum number of combinations would be 210 (21 different study subjects at ISCED-2 level times 10 different universities). The reduced number in the data results from the fact that not all universities offer all study subjects.

slightly increased for men (84 percent) and increased a little further for women (87 percent). Two trends emerge: first, a general positive trend toward a higher total completion rate; and second, women caught up with men – and then surpassed them in recent years.

— Figure 3 about here —

Figure 4 depicts the initial completion rate for the first study program started. Again, it can be seen that women caught up with men: 40 percent of female students in the 1975 entry cohort completed their initial studies, while 65 percent of the 2010 entry cohort did so. For men, the initial completion rate remained much more stable between 1975 and 1990, rising from 53 to 60 percent, and thereafter it fluctuated around the 60 percent mark, with a slightly positive trend. The initial completion rates of the entry cohorts after 2000 differed very little by gender.

— Figure 4 about here —

The initial non-completion rates, the rates for changing one's subject of study, and the initial dropout rates are shown in Figure 5. The initial non-completion rate for both men and women decreased between the mid-1970s and the mid-2000s – for men from 45 to 35 percent, and for women from 60 to 35 percent. Over the decades, a convergence could be observed. After 2006, the trend changed for both genders. The initial non-completion rate rose again slightly to around 36 percent. The trend in initial non-completion consists of the two underlying rates: the rate of students changing their subject of study, and the initial dropout rate. The initial dropout rates for both genders fell relatively consistently over time to below 10 percent in the 2010 cohort. While

women had a dropout rate about 10 percentage points higher than men in 1975, their dropout rate no longer differed from that of men in 2010. The rate of students changing their subject of study was quite similar for men and women for the years between 1975 and 2010. For the years between 1975 and 1993, the rate for changing subject of study fluctuated around 20 percent. Thereafter, this rate increased, from 20 percentage points in 1993 to 28 percentage points in 2010.

— Figure 5 about here —

The increase in the rate of students changing their subject of study and the steep decrease in initial dropout rates coincided with the introduction of UAS and UTE, as well as with the implementation of the Bologna reform. If the rate of students changing their subject of study is subdivided according to whether the subject alone was changed or whether the study degree also changed (Figure 6), as well as taking into account the type of university to which the student changed (Figure 7), interesting patterns emerge. During the transitional period at the beginning of the Bologna reform, students could choose between different degree types (diploma or Bachelors/Masters). The bell-shaped curve with the peak in 2004 for subject and degree changes shows that many of those who changed their subject used the moment at which the Bologna degree programs were introduced to change their degree at the same time (see Figure 6). With the introduction of UAS and UTE, students at universities were given the opportunity to transfer to other higher education institutions. Over time, more and more students who changed their subject also changed the type of university they attended (see Figure 7). Even though there was a continuous increase in these rates, many students who changed their subject still remained at university. These results suggest that the increase in the rate of students changing their subject of study since the mid-1990s may have been due to the

introduction of UAS and UTE. Looking only at the change rate within universities, it fluctuated quite consistently – by 20 percentage points – over time.

— Figure 6 about here —

— Figure 7 about here —

5.2 Multilevel results

After examining the study outcomes bivariate over time, we use multilevel models to examine the extent to which structural factors influenced the outcomes and explain the observed time trends. Tables A1–A4 in the appendix show stepwise models of the various outcomes. Since the coefficients of the time trend are almost identical across all models, we only show the full model results (Table 1) , which we discuss below.

Regarding the total completion rate, a positive time trend could be observed for men and women. However, the annual increases for women (1.1 percentage points) were higher than those for men (0.5 percentage points). This result supports the bivariate finding that women caught up in regard to the total completion rate. It can be noted that the Bologna reform – regardless of the positive time trend – was not accompanied by a substantial increase in the total completion rate for both genders. For men, a significant positive effect of this indicator could be observed, but it was rather small, at 1.3 percentage points. The following patterns emerge concerning the field of study factors. A higher proportion of women in a given study program reduced the probability of an individual completing a degree program for both genders, and the number of fellow students in a degree program had no effect on the total completion rate for women, but had a negative effect for men.

A positive time trend could be observed for the initial completion rate, which was again stronger for women than for men (0.7 percentage points versus 0.2 percentage points).

The indicator regarding the introduction of Bachelors degree programs was only significant for men. However, this effect was relatively small in magnitude (1.2 percentage points). In addition, statistically significant negative effects of the proportion of women and the number of co-students on the initial completion rate were found for male and female students.

A positive time trend was found in the rate of students changing subject of study for men and women, of 0.3 and 0.2 percentage points per year respectively. For the period after the Bologna reform was introduced, no significant effect was detected beyond the general time trend. Furthermore, the higher the number of students in the initial field of study, the higher a student's probability of changing their field of study.

The initial dropout rates decreased over time by 0.5 percentage points for men and by 0.9 percentage points for women per year. The introduction of Bologna degree programs did not result in a significant change in initial dropout rates. The higher the share of women in a given study program, the more likely an initial dropout became for both men and women. For men, a positive significant effect of the number of fellow students on the initial dropout rate was observed.

— Table 1 about here —

6 Discussion and conclusion

The aim of this paper was to present rates for university completion, dropout, and students changing their subject of study over a period of 43 years between 1975 and 2018 in Switzerland. A particular focus was to determine whether there were trends over time, and to what extent changes in the higher education landscape (an increasing number of students; an increasing proportion of female students; and the introduction of

UAS and UTE) influenced these developments. Furthermore, we were interested in how the Bologna reform and the introduction of a new study level with a shorter duration (a three-year Bachelors degree, as opposed to a five-year diploma) influenced these rates. Using administrative data on all students in the Swiss higher education system, we were able to examine the patterns for completion, dropout, and change in the subject of study of first-entry university cohorts between 1975 and 2010. Utilizing these data enabled us to expand upon the timeframe of prior Swiss studies, and by examining students who transition to UAS or UTE we were able to uncover intriguing study patterns (e.g., Wolter et al. 2014; Diem and Wolter 2019).

Through our analyses, we obtained the following results. First, we found that the total completion rates for men and women increased over time during the observation period. Thus, 8.4 out of every 10 male students and 8.7 out of every 10 female students in the 2010 first-entry cohort obtained a tertiary degree (within eight or ten years after first enrollment), compared with 6.6 out of 10 male students and 5 out of 10 female students in the 1975 cohort. It is worth noting that women were able to catch up and were graduating slightly more often than men by the end of the period. Due to our inability to account for various factors in our models, such as the academic abilities of the student body, we cannot provide an explanation for this observed increase (e.g., Wolter et al. 2014). However, it is conceivable that the tertiarization of the labor market, marked by an increased demand for individuals with tertiary education, could provide a potential explanation for the escalating rates observed at the societal level.

Second, over time, a higher proportion of students also graduated from the program (ICSED-2 classification) on which they first enrolled at a university. By the end of the observation period, this proportion had risen to two-thirds. Over time, it was apparent that both male and female students increased their initial completion rate, but the

increase was much greater for female students (from 40 percent to 66 percent) than for male students (from 55 percent to 65 percent).

Third, we were also able to show that the number of students leaving the higher education system without a degree continuously decreased over the observation period. The dropout rate fell from about 25 percent to 9 percent for male students, and from 35 percent to 9 percent for female students, during the period investigated. Again, there was an evident effect of equalization in study patterns between the sexes over time. This result is in line with previous research from Switzerland (Wolter et al. 2014; Diem and Wolter 2019). For an international comparison, dropout rates in Switzerland are lower than in Italy (20 percent; Aina 2013), Germany (29 percent; Heublein et al. 2017), and Spain (46 percent; Lassibille and Navarro Gómez 2008).

Fourth, the rate of students changing their subject of study was relatively constant, at 20 percent for male and female students between cohorts from the mid-1970s and cohorts from the early 1990s, before continuously rising to nearly 30 percent in the 2010 cohort. This increase in the rate of students changing their subject of study coincided with the introduction of UAS and UTE, as well as with the introduction of the Bologna degree programs. Thus, it can be seen that, after the entry cohorts of the early 1990s, the proportion of students who changed university type when changing programs grew for both male and female students. Looking only at program changes within universities, we observe at most a small increase in the rate of change of the subject of study for male students over time. This suggests that the introduction of these universities may have resulted in more university students being retained in the tertiary education system, as they were given other transfer options in addition to traditional universities. This interpretation is supported by the fact that the initial dropout rate fell sharply after the cohorts of the mid-1990s. By the end of the observation period, just under a quarter of

male students and just under a third of female students who first enrolled at a university and then changed their course of study transferred to a UAS or a UTE.

Fifth, in our multilevel models, we found only limited evidence that the introduction of Bachelors degree programs at the university-specific study program level had a substantial impact on rates of completion, dropout, or changing study subject beyond the general time trend. Our findings revealed no significant effects for women, but for men, both total completion rates and initial completion rates exhibited a modest increase of just over one percentage point. These null effects and minimal effects corroborate the results of prior Swiss research (e.g., Wolter et al. 2014). Furthermore, the bivariate analyses showed that, especially in the entry cohorts shortly before and shortly after the introduction of Bachelors programs (between 1997 and 2004), many students who changed programs also changed their degree type.

Sixth, in line with previous studies, we were able to demonstrate that the presence of a higher number of fellow students increased the dropout risk (Bound and Turner 2007), and that a higher proportion of women students also increased the dropout risk for both men and women (Severiens and ten Dam 2012). Furthermore, our research demonstrates that a larger number of peers in a study program heightened the likelihood of students changing their field of study (Diem and Wolter 2019). These effects, while statistically significant, were not very large in magnitude.

A limitation of our study is that we have not been able to consider individual factors motivating student dropout (e.g., Tinto 1975; Larsen et al. 2013; Behr et al. 2020). However, since we are primarily interested in long-term time trends, we consider the use of administrative data to be appropriate because these data do not suffer from the biases common in surveys (e.g., selective participation, selective dropout, and selective response behavior: Suchman 1962). Nonetheless, we must point out that we cannot

close many causal pathways that influence study patterns because we cannot control for individual characteristics. Therefore, we are reluctant to interpret the results of our multilevel models causally and see our contribution to the state of the research in showing descriptive relationships.

In summary, we have shown that the total and initial completion rates in Switzerland increased over time. At the same time, dropout rates decreased significantly and the rate of students changing their subject of study increased moderately. Furthermore, it is apparent that study behavior patterns became more equal between male and female students. It is worth noting that both the increase in completion rates and the increase in the rate of students changing their subject of study, as well as the sharp fall in dropout rates, were observed starting with the university entry cohorts of the mid-1990s, the period when the UAS, UTE, and Bologna degree programs were introduced in Switzerland.

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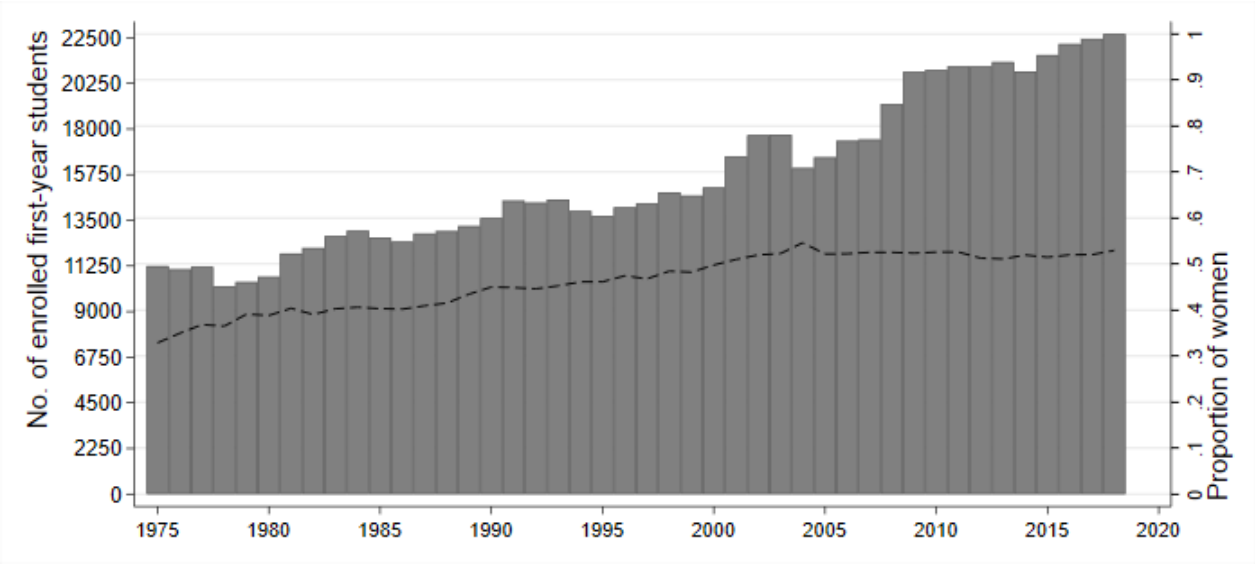

Fig. 1 Number of first-year university students at Swiss universities and the proportion of women among them between 1975 and 2018. *Source:* LABB data; authors' calculations; N = 690,666.

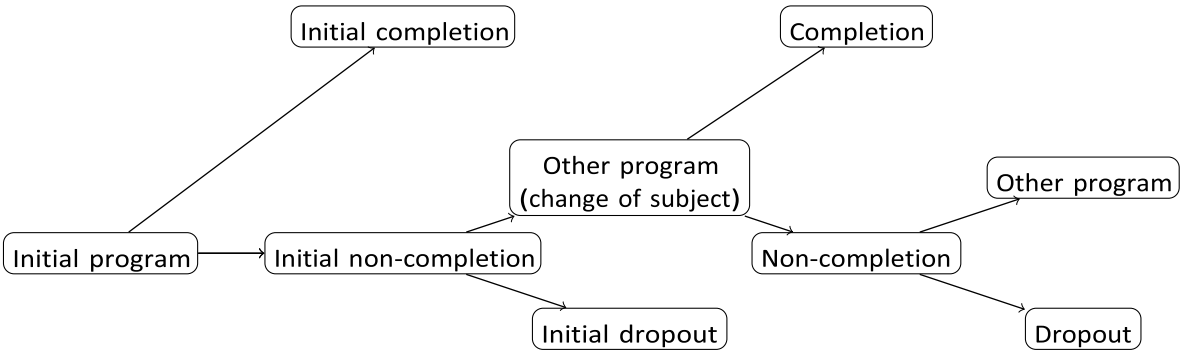

Fig. 2 Schematic representation of the multi-stage processes of university completion, change of study subject, and student dropout. *Note*: authors' depiction.

Fig. 3 Total completion rates of university entry cohorts, by gender. *Source*: LABB data; authors' calculations. N = 407,383.

Fig. 4 Initial completion rates of university entry cohorts, by gender. *Source*: LABB data; authors' calculations. N = 407,383.

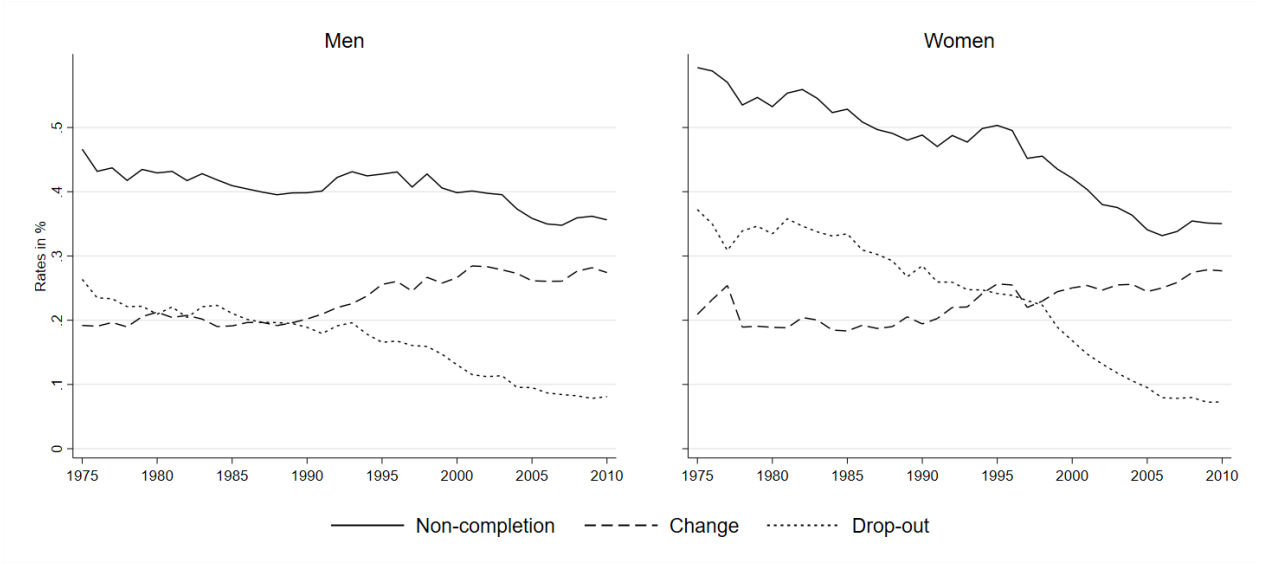

Fig. 5 Initial non-completion, change of the subject of study, and dropout rates of university entry cohorts, by gender. *Source*: LABB data; authors' calculations. N = 407,383.

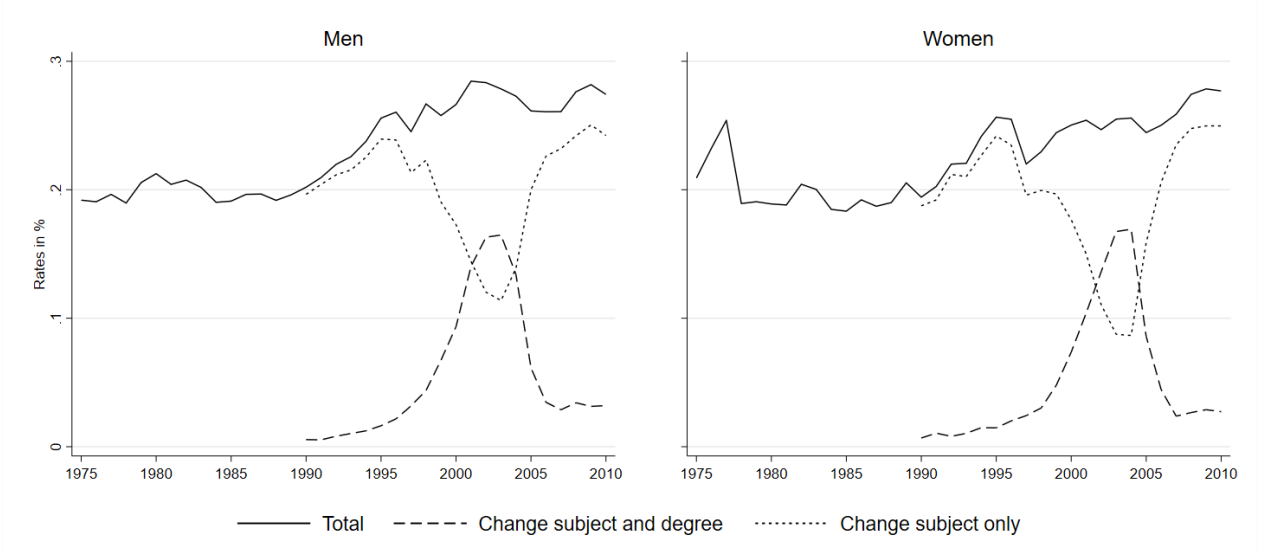

Fig. 6 Rate of changing study subject (total), rate of changing subject and type of degree (change subject and degree), and rate of changing subject only (change subject only) of university entry cohorts, by gender. *Source*: LABB data; authors' calculations. N = 407,383.

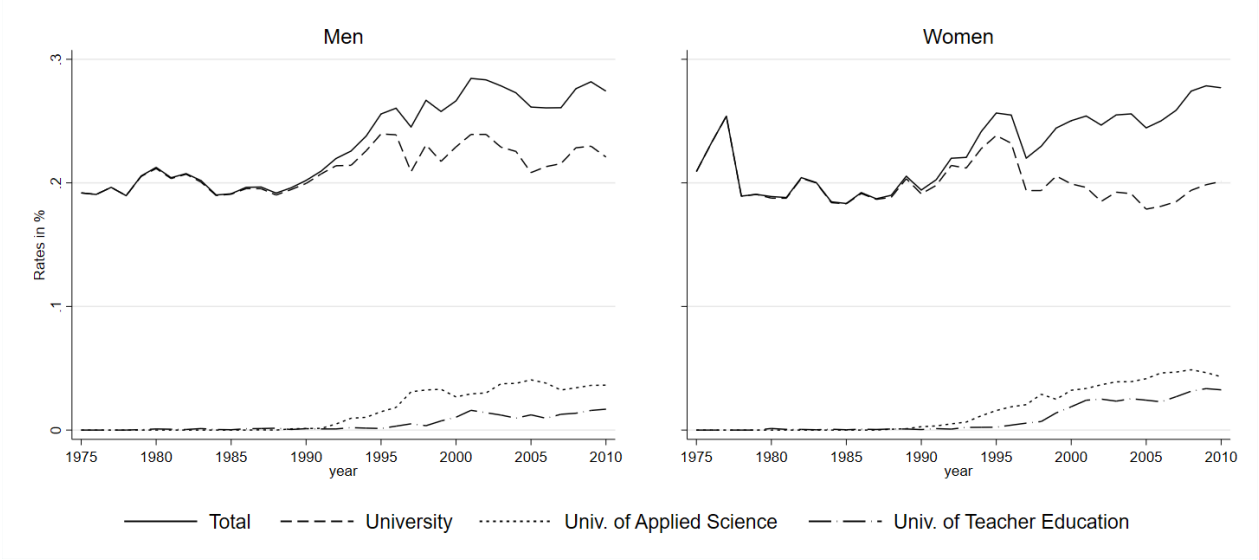

Fig. 7 Rate of changing study subject (total), disaggregated by institution (university, university of applied sciences, and university of teacher education) of university entry cohorts, by gender. *Source*: LABB data; authors' calculations. N = 407,383.

Table 1 Multilevel linear probability models predicting total completion rates (TCR), initial completion rates (ICR), subject change rates (C), and initial dropout rate (ID), by gender

	Men				Women			
	TCR	ICR	C	ID	TCR	ICR	C	ID
Year	0.005*	0.002*	0.003*	-0.005*	0.011*	0.007*	0.002*	-0.009*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Individual factors								
Citizen (0/1)	0.109*	0.099*	-0.026*	-0.074*	0.098*	0.081*	-0.009	-0.074*
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)
Age	-0.029*	-0.022*	-0.005*	0.027*	-0.021*	-0.015*	-0.005*	0.019*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Field of study factors								
Share of women	-0.001*	-0.001*	-0.000	0.001*	-0.002*	-0.001*	-0.000	0.002*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of students	-0.013*	-0.040*	0.024*	0.010*	-0.007	-0.032*	0.029*	0.004
	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
BA introduced (0/1)	0.013*	0.012*	-0.006	-0.006	0.001	0.003	0.001	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Intercept	0.366*	0.404*	0.145*	0.469*	0.325*	0.398*	0.092*	0.507*
	(0.030)	(0.041)	(0.027)	(0.027)	(0.026)	(0.036)	(0.029)	(0.024)
sd(field of study in university)	0.099*	0.139*	0.087*	0.090*	0.074*	0.111*	0.087*	0.070*
	(0.007)	(0.010)	(0.006)	(0.006)	(0.005)	(0.008)	(0.007)	(0.005)
sd(residual)	0.412*	0.468*	0.416*	0.348*	0.419*	0.474*	0.415*	0.374*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	224,476	224,476	224,476	224,476	182,532	182,532	182,532	182,532

Note: * $p < 0.005$. Fixed effects for universities included. (0/1) indicates dummy variables. *Source*: LABB data, our own calculations.

Appendix

Nennstiel, R. and Z. Brosy. Less student dropout, more frequent change of study subjects: Evidence from Swiss administrative data, 1975–2018

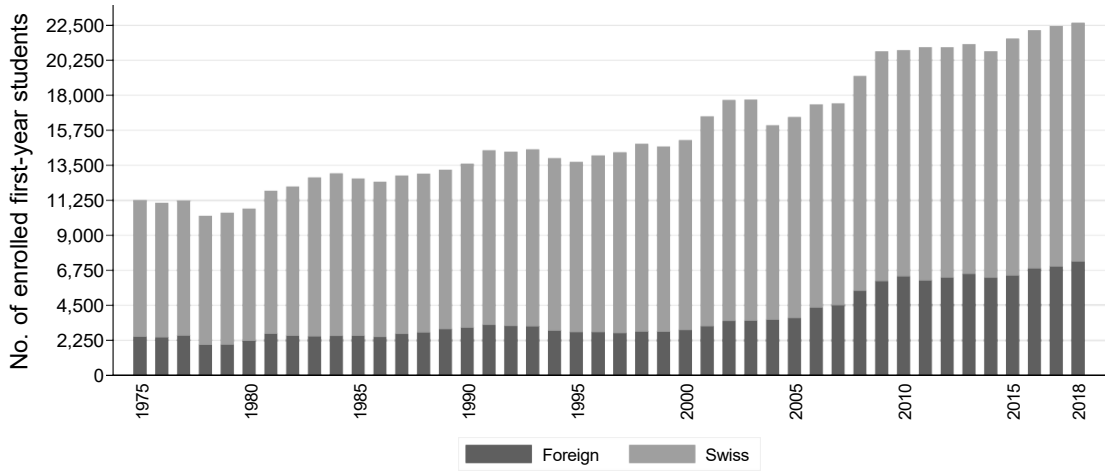

Fig. A1 Number of native and foreign first-year university students at Swiss universities between 1975 and 2018. *Source*: LABB data; authors' calculations.

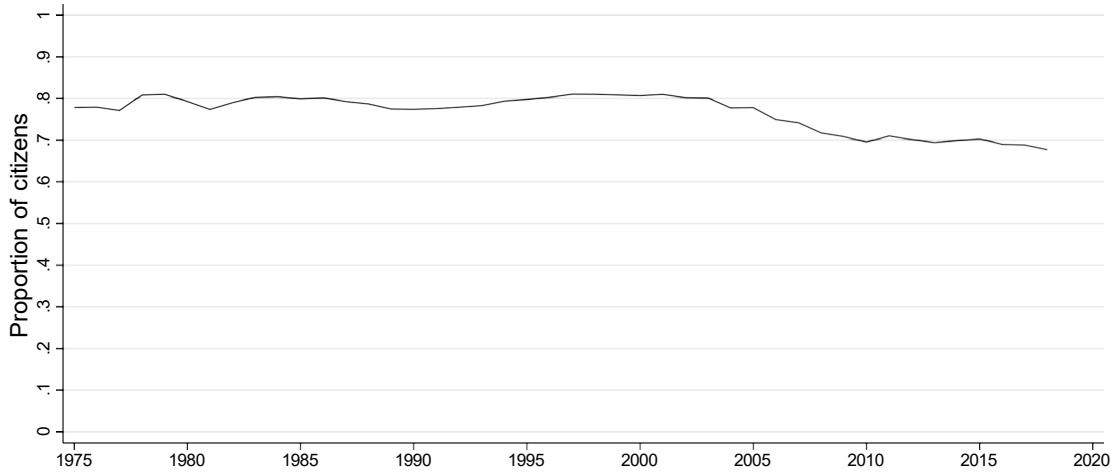

Fig. A2 Proportion of diploma students under new enrolled first-year university students for selected Swiss universities. *Source*: LABB data; authors' calculations.

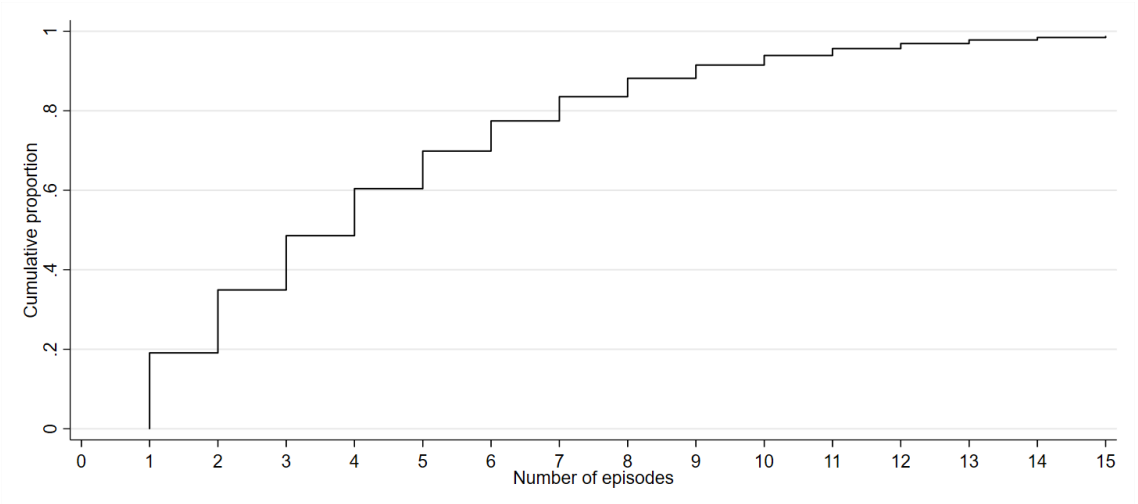

Fig. A3 Cumulative distribution of study episodes (up to 15 episodes depicted) for students in the Swiss higher education sector. *Source*: LABB data; authors' calculations. N = 1,341,170.

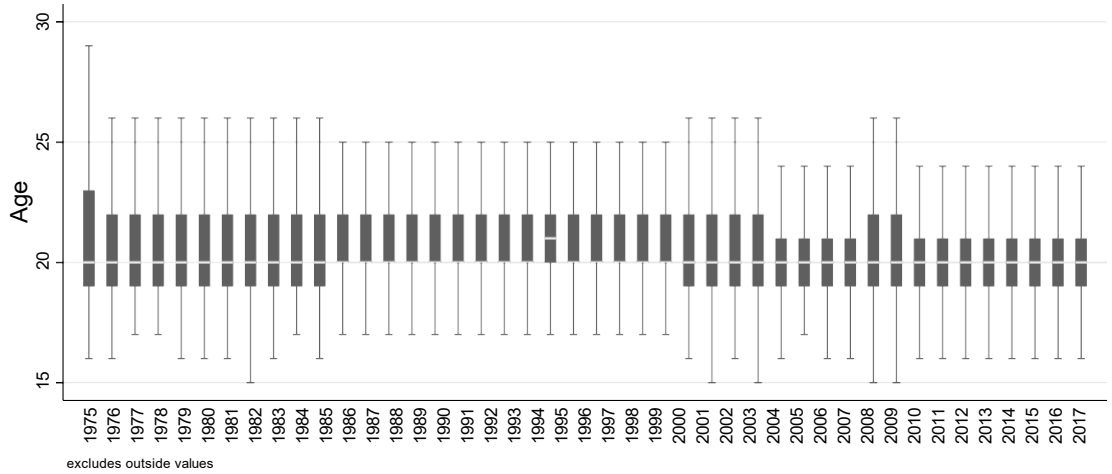

Fig. A4 Share of citizens among newly enrolled first-year university students at Swiss universities between 1975 and 2018. *Source*: LABB data; authors' calculations. N = 690,531.

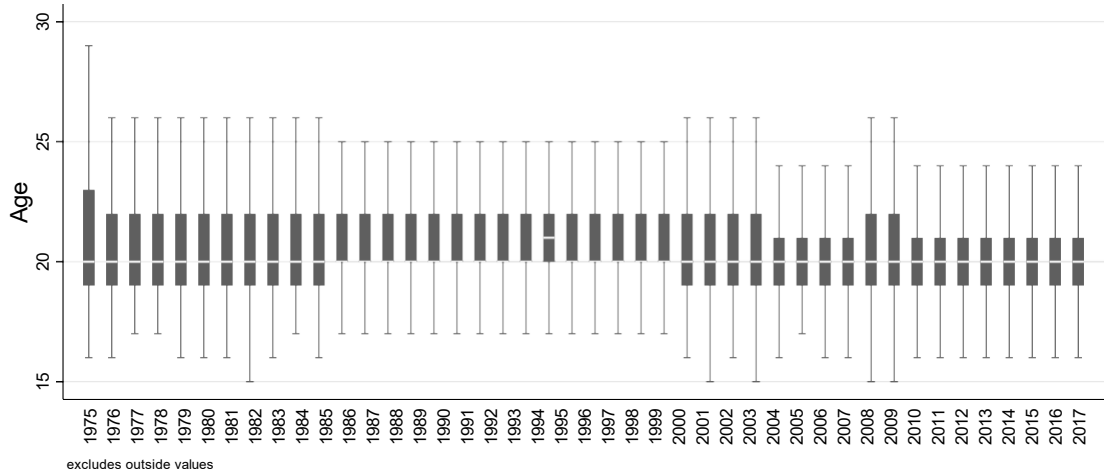

Fig. A5 Boxplots of the age distribution of newly enrolled first-year university students at Swiss universities between 1975 and 2018. *Source*: LABB data; authors' calculations. N = 690,666.

Table A1 Multilevel linear probability models predicting total completion rates, stepwise models, by gender

	Men				Women			
	1	2	3	4	1	2	3	4
Year	0.005*	0.005*	0.006*	0.005*	0.011*	0.010*	0.011*	0.011*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Individual factors								
Citizen (0/1)		0.110*	0.109*	0.109*		0.099*	0.098*	0.098*
		(0.003)	(0.003)	(0.003)		(0.004)	(0.004)	(0.004)
Age		-0.030*	-0.029*	-0.029*		-0.021*	-0.021*	-0.021*
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Field of study factors								
Share of women			-0.001*	-0.001*			-0.002*	-0.002*
			(0.000)	(0.000)			(0.000)	(0.000)
Number of students			-0.013*	-0.013*			-0.007	-0.007
			(0.003)	(0.003)			(0.003)	(0.003)
BA introduced (0/1)				0.013*				0.001
				(0.003)				(0.003)
Intercept	0.611*	0.279*	0.363*	0.366*	0.484*	0.233*	0.325*	0.325*
	(0.032)	(0.028)	(0.030)	(0.030)	(0.024)	(0.023)	(0.026)	(0.026)
sd(field of study in university)	0.116*	0.102*	0.099*	0.099*	0.086*	0.078*	0.074*	0.074*
	(0.008)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.005)	(0.005)
sd(residual)	0.420*	0.412*	0.412*	0.412*	0.425*	0.419*	0.419*	0.419*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	224,476	224,476	224,476	224,476	182,532	182,532	182,532	182,532

Note: * $p < 0.005$. Fixed effects for universities included. (0/1) indicates dummy variables. *Source*: LABB data; authors' calculations.

Table A2 Multilevel linear probability models predicting initial completion rates, stepwise models, by gender

	Men				Women			
	1	2	3	4	1	2	3	4
Year	0.002*	0.002*	0.003*	0.002*	0.007*	0.006*	0.007*	0.007*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Individual factors								
Citizen (0/1)		0.100*	0.100*	0.099*		0.082*	0.081*	0.081*
		(0.004)	(0.004)	(0.004)		(0.004)	(0.004)	(0.004)
Age		-0.022*	-0.022*	-0.022*		-0.015*	-0.015*	-0.015*
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Field of study factors								
Share of women			-0.001*	-0.001*			-0.001*	-0.001*
			(0.000)	(0.000)			(0.000)	(0.000)
Number of students			-0.039*	-0.040*			-0.032*	-0.032*
			(0.003)	(0.003)			(0.003)	(0.003)
BA introduced (0/1)				0.012*				0.003
				(0.003)				(0.004)
Intercept	0.491*	0.228*	0.401*	0.404*	0.400*	0.215*	0.397*	0.398*
	(0.038)	(0.036)	(0.040)	(0.041)	(0.030)	(0.030)	(0.036)	(0.036)
sd(field of study in university)	0.139*	0.131*	0.139*	0.139*	0.108*	0.104*	0.111*	0.111*
	(0.009)	(0.009)	(0.010)	(0.010)	(0.008)	(0.007)	(0.008)	(0.008)
sd(residual)	0.472*	0.468*	0.468*	0.468*	0.477*	0.474*	0.474*	0.474*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	224,476	224,476	224,476	224,476	182,532	182,532	182,532	182,532

Note: * $p < 0.005$. Fixed effects for universities included. (0/1) indicates dummy variables. *Source*: LABB data; authors' calculations.

Table A3 Multilevel linear probability models predicting subject change rates, stepwise models, by gender

	Men				Women			
	1	2	3	4	1	2	3	4
Year	0.003*	0.003*	0.002*	0.003*	0.002*	0.002*	0.002*	0.002*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Individual factors								
Citizen (0/1)		-0.026*	-0.026*	-0.026*		-0.009	-0.009	-0.009
		(0.003)	(0.003)	(0.003)		(0.004)	(0.004)	(0.004)
Age		-0.005*	-0.005*	-0.005*		-0.005*	-0.005*	-0.005*
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Field of study factors								
Share of women			-0.000	-0.000			-0.000	-0.000
			(0.000)	(0.000)			(0.000)	(0.000)
Number of students			0.024*	0.024*			0.029*	0.029*
			(0.003)	(0.003)			(0.003)	(0.003)
BA introduced (0/1)				-0.006				0.001
				(0.003)				(0.003)
Intercept	0.251*	0.234*	0.146*	0.145*	0.221*	0.193*	0.092*	0.092*
	(0.021)	(0.021)	(0.027)	(0.027)	(0.021)	(0.022)	(0.029)	(0.029)
sd(field of study in university)	0.076*	0.076*	0.086*	0.087*	0.074*	0.074*	0.087*	0.087*
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.005)	(0.007)	(0.007)
sd(residual)	0.416*	0.416*	0.416*	0.416*	0.416*	0.415*	0.415*	0.415*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	224,476	224,476	224,476	224,476	182,532	182,532	182,532	182,532

Note: * $p < 0.005$. Fixed effects for universities included. (0/1) indicates dummy variables. *Source*: LABB data; authors' calculations.

Table A4 Multilevel linear probability models predicting initial dropout rates, stepwise models, by gender

	Men				Women			
	1	2	3	4	1	2	3	4
Year	-0.005*	-0.004*	-0.005*	-0.005*	-0.009*	-0.008*	-0.009*	-0.009*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Individual factors								
Citizen (0/1)		-0.074*	-0.074*	-0.074*		-0.074*	-0.074*	-0.074*
		(0.003)	(0.003)	(0.003)		(0.003)	(0.003)	(0.003)
Age		0.027*	0.027*	0.027*		0.020*	0.019*	0.019*
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Field of study factors								
Share of women			0.001*	0.001*			0.002*	0.002*
			(0.000)	(0.000)			(0.000)	(0.000)
Number of students			0.009*	0.010*			0.004	0.004
			(0.002)	(0.002)			(0.003)	(0.003)
BA introduced (0/1)				-0.006				-0.004
				(0.003)				(0.003)
Intercept	0.248*	0.531*	0.471*	0.469*	0.370*	0.585*	0.509*	0.507*
	(0.029)	(0.025)	(0.027)	(0.027)	(0.024)	(0.022)	(0.024)	(0.024)
sd(field of study in university)	0.106*	0.092*	0.089*	0.090*	0.083*	0.076*	0.070*	0.070*
	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
sd(residual)	0.355*	0.348*	0.348*	0.348*	0.379*	0.374*	0.374*	0.374*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	224,476	224,476	224,476	224,476	182,532	182,532	182,532	182,532

Note: * $p < 0.005$. Fixed effects for universities included. (0/1) indicates dummy variables. *Source*: LABB data; authors' calculations.

Supplementary Appendix

Nennstiel, R. and Z. Brosy. Less student dropout, more frequent change of study subjects: Evidence from Swiss administrative data, 1975–2018

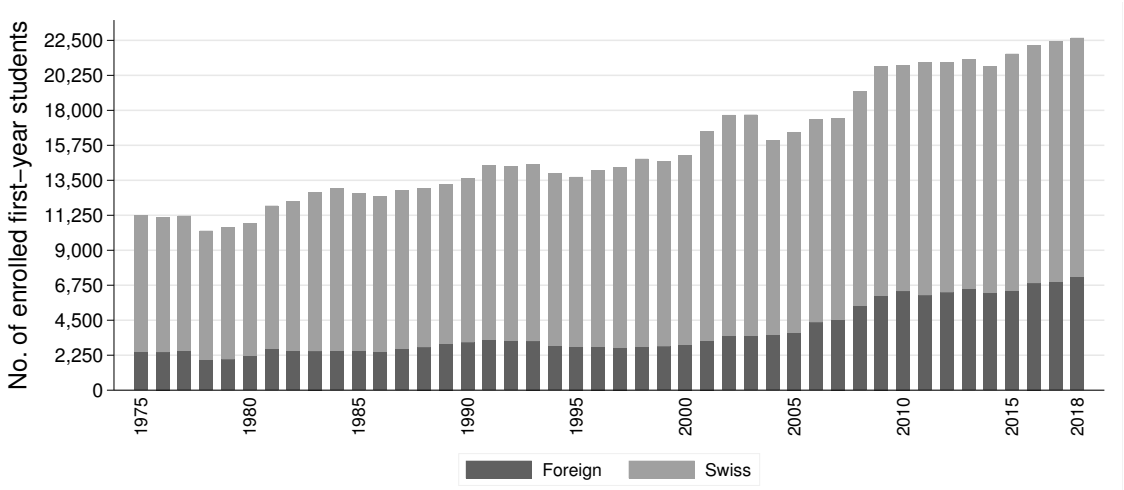

Figure A1: Number of native and foreign first-year university students at Swiss universities between 1975 and 2018. *Source*: LABB data; authors' calculations.

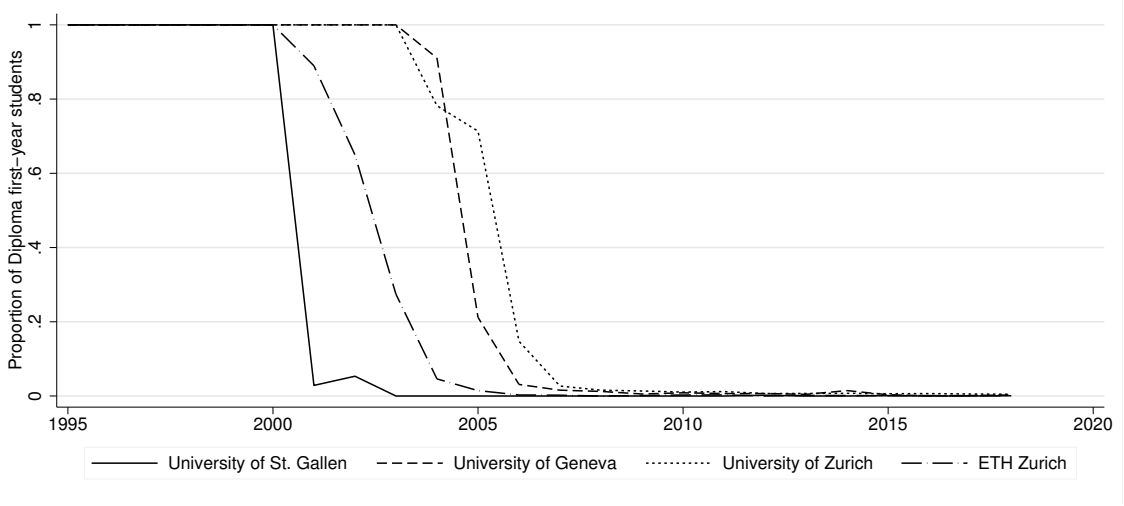

Figure A2: Proportion of diploma students under new enrolled first-year university students for selected Swiss universities. *Source*: LABB data; authors' calculations.

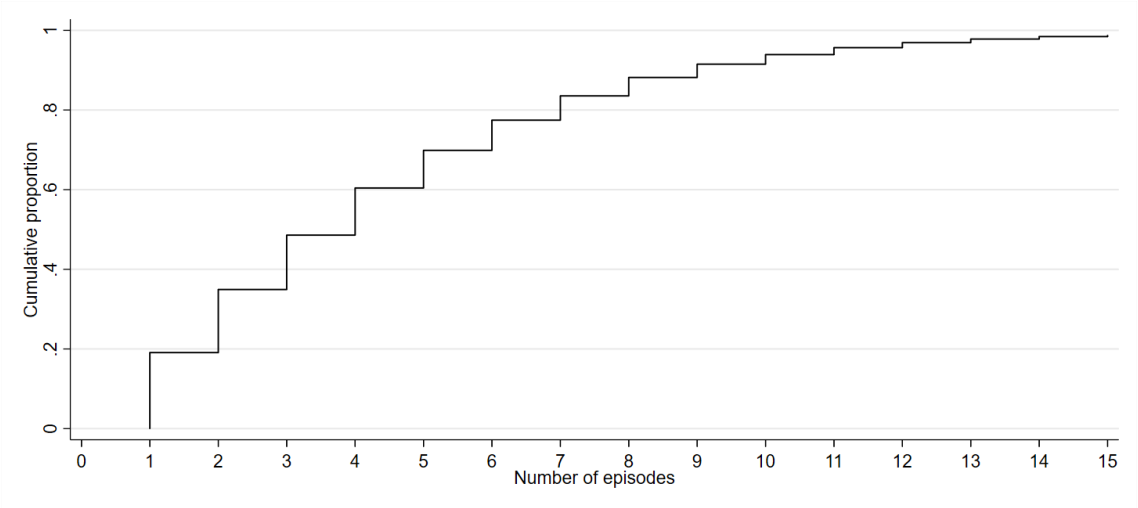

Figure A3: Cumulative distribution of study episodes (up to 15 episodes depicted) for students in the Swiss higher education sector. *Source*: LABB data; authors' calculations. N = 1,341,170.

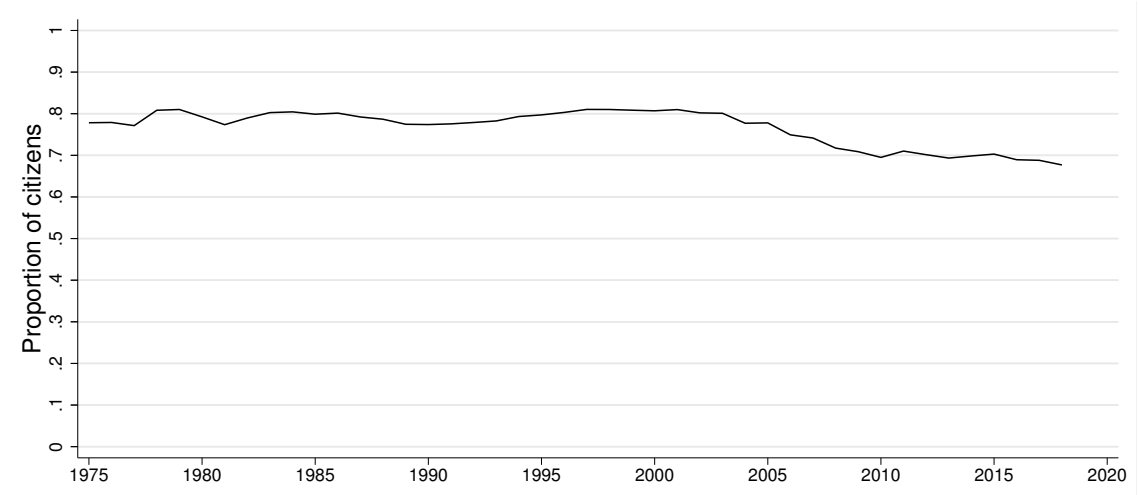

Figure A4: Proportion of citizens among newly enrolled first-year university students at Swiss universities between 1975 and 2018. *Source*: LABB data; authors' calculations. N = 690,531.

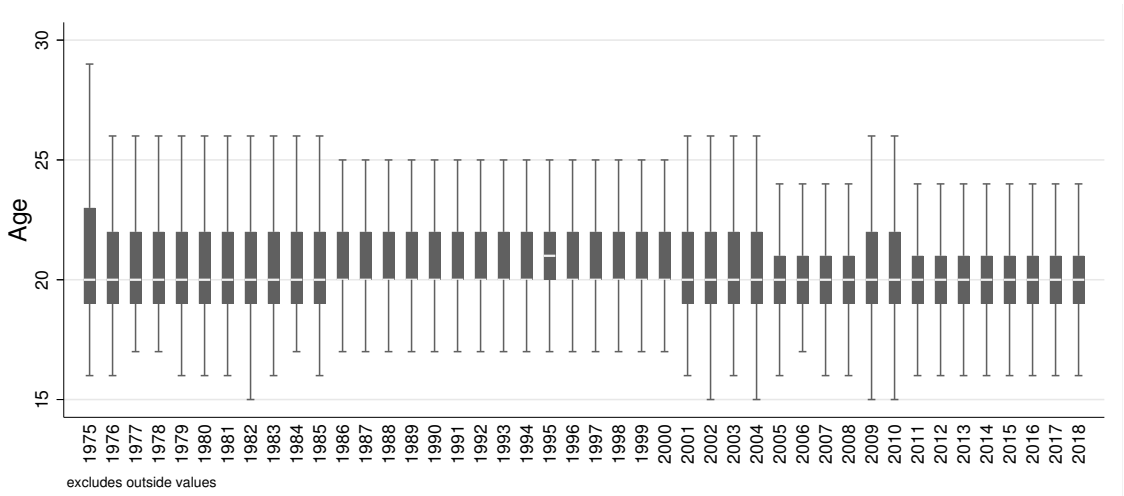

Figure A5: Boxplots of the age distribution of newly enrolled first-year university students at Swiss universities between 1975 and 2018. *Source*: LABB data; authors' calculations. N = 690,666.

Table A1: Multilevel linear probability models predicting total completion rates, stepwise models, by gender

	Men				Women			
	1	2	3	4	1	2	3	4
Year	0.005*	0.005*	0.006*	0.005*	0.011*	0.010*	0.011*	0.011*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Individual factors								
Citizen (0/1)		0.110*	0.109*	0.109*		0.099*	0.098*	0.098*
		(0.003)	(0.003)	(0.003)		(0.004)	(0.004)	(0.004)
Age		-0.030*	-0.029*	-0.029*		-0.021*	-0.021*	-0.021*
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Field of study factors								
Share of women			-0.001*	-0.001*			-0.002*	-0.002*
			(0.000)	(0.000)			(0.000)	(0.000)
Number of students			-0.013*	-0.013*			-0.007	-0.007
			(0.003)	(0.003)			(0.003)	(0.003)
BA introduced (0/1)				0.013*				0.001
				(0.003)				(0.003)
Intercept	0.611*	0.279*	0.363*	0.366*	0.484*	0.233*	0.325*	0.325*
	(0.032)	(0.028)	(0.030)	(0.030)	(0.024)	(0.023)	(0.026)	(0.026)
sd(field of study in University)	0.116*	0.102*	0.099*	0.099*	0.086*	0.078*	0.074*	0.074*
	(0.008)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.005)	(0.005)
sd(residual)	0.420*	0.412*	0.412*	0.412*	0.425*	0.419*	0.419*	0.419*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	224,476	224,476	224,476	224,476	182,532	182,532	182,532	182,532

Note: * $p < 0.005$. Fixed effects for universities included. (0/1) indicates dummy variables. *Source:* LABB data; authors' calculations.

Table A2: Multilevel linear probability models predicting initial completion rates, stepwise models, by gender

	Men				Women			
	1	2	3	4	1	2	3	4
Year	0.002*	0.002*	0.003*	0.002*	0.007*	0.006*	0.007*	0.007*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Individual factors								
Citizen (0/1)		0.100*	0.100*	0.099*		0.082*	0.081*	0.081*
		(0.004)	(0.004)	(0.004)		(0.004)	(0.004)	(0.004)
Age		-0.022*	-0.022*	-0.022*		-0.015*	-0.015*	-0.015*
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Field of study factors								
Share of women			-0.001*	-0.001*			-0.001*	-0.001*
			(0.000)	(0.000)			(0.000)	(0.000)
Number of students			-0.039*	-0.040*			-0.032*	-0.032*
			(0.003)	(0.003)			(0.003)	(0.003)
BA introduced (0/1)				0.012*				0.003
				(0.003)				(0.004)
Intercept	0.491*	0.228*	0.401*	0.404*	0.400*	0.215*	0.397*	0.398*
	(0.038)	(0.036)	(0.040)	(0.041)	(0.030)	(0.030)	(0.036)	(0.036)
sd(field of study in University)	0.139*	0.131*	0.139*	0.139*	0.108*	0.104*	0.111*	0.111*
	(0.009)	(0.009)	(0.010)	(0.010)	(0.008)	(0.007)	(0.008)	(0.008)
sd(residual)	0.472*	0.468*	0.468*	0.468*	0.477*	0.474*	0.474*	0.474*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	224,476	224,476	224,476	224,476	182,532	182,532	182,532	182,532

Note: * $p < 0.005$. Fixed effects for universities included. (0/1) indicates dummy variables. *Source:* LABB data; authors' calculations.

Table A3: Multilevel linear probability models predicting subject change rates, stepwise models, by gender

	Men				Women			
	1	2	3	4	1	2	3	4
Year	0.003*	0.003*	0.002*	0.003*	0.002*	0.002*	0.002*	0.002*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Individual factors								
Citizen (0/1)		-0.026*	-0.026*	-0.026*		-0.009	-0.009	-0.009
		(0.003)	(0.003)	(0.003)		(0.004)	(0.004)	(0.004)
Age		-0.005*	-0.005*	-0.005*		-0.005*	-0.005*	-0.005*
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Field of study factors								
Share of women			-0.000	-0.000			-0.000	-0.000
			(0.000)	(0.000)			(0.000)	(0.000)
Number of students			0.024*	0.024*			0.029*	0.029*
			(0.003)	(0.003)			(0.003)	(0.003)
BA introduced (0/1)				-0.006				0.001
				(0.003)				(0.003)
Intercept	0.251*	0.234*	0.146*	0.145*	0.221*	0.193*	0.092*	0.092*
	(0.021)	(0.021)	(0.027)	(0.027)	(0.021)	(0.022)	(0.029)	(0.029)
sd(field of study in University)	0.076*	0.076*	0.086*	0.087*	0.074*	0.074*	0.087*	0.087*
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.005)	(0.007)	(0.007)
sd(residual)	0.416*	0.416*	0.416*	0.416*	0.416*	0.415*	0.415*	0.415*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	224,476	224,476	224,476	224,476	182,532	182,532	182,532	182,532

Note: * $p < 0.005$. Fixed effects for universities included. (0/1) indicates dummy variables. *Source:* LABB data; authors' calculations.

Table A4: Multilevel linear probability models predicting initial dropout rates, stepwise models, by gender

	Men				Women			
	1	2	3	4	1	2	3	4
Year	-0.005*	-0.004*	-0.005*	-0.005*	-0.009*	-0.008*	-0.009*	-0.009*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Individual factors								
Citizen (0/1)		-0.074*	-0.074*	-0.074*		-0.074*	-0.074*	-0.074*
		(0.003)	(0.003)	(0.003)		(0.003)	(0.003)	(0.003)
Age		0.027*	0.027*	0.027*		0.020*	0.019*	0.019*
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Field of study factors								
Share of women			0.001*	0.001*			0.002*	0.002*
			(0.000)	(0.000)			(0.000)	(0.000)
Number of students			0.009*	0.010*			0.004	0.004
			(0.002)	(0.002)			(0.003)	(0.003)
BA introduced (0/1)				-0.006				-0.004
				(0.003)				(0.003)
Intercept	0.248*	0.531*	0.471*	0.469*	0.370*	0.585*	0.509*	0.507*
	(0.029)	(0.025)	(0.027)	(0.027)	(0.024)	(0.022)	(0.024)	(0.024)
sd(field of study in University)	0.106*	0.092*	0.089*	0.090*	0.083*	0.076*	0.070*	0.070*
	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
sd(residual)	0.355*	0.348*	0.348*	0.348*	0.379*	0.374*	0.374*	0.374*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	224,476	224,476	224,476	224,476	182,532	182,532	182,532	182,532

Note: * $p < 0.005$. Fixed effects for universities included. (0/1) indicates dummy variables. *Source:* LABB data; authors' calculations.