Educational pathways and dropout from higher education in Germany

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Abstract

Extending access to higher education has led to a growing heterogeneity in the social origins and previous educational biographies of first-year students. They differ in their socialization, their preparedness for tertiary studies, and the salience of alternative options. How do these differences relate to social inequality in dropout from higher education? Drawing on theories and concepts of rational choice, differential learning environments, and selection, we argue that social origins and pre-tertiary educational pathways have at least an initial impact on dropout risks. We draw on retrospective life course data from the "Adult Education and Life-Long Learning" stage of the German National Educational Panel Study (NEPS) to use pre-tertiary pathways to reconstruct educational careers and perform an event history analysis on dropping out of higher education. Results suggest that these pathways substantially influence dropout rates in Germany. Students taking the direct pathway via the Gymnasium (i.e. the school type representing the highest school track) have significantly lower dropout rates than students with an upwardly mobile educational biography or students who obtained a vocational qualification before starting higher education. Whereas students from a higher social background are less prone to drop out than students from a lower social background at universities, social origins do not have any significant direct influence on dropout rates at universities of applied sciences and influence only the likelihood of entering these institutions.

Introduction

Sociological studies exploring the mechanisms of dropout from tertiary education are rather scarce in Europe in general and Germany in particular. However, research in this field is important, because dropping out relates to issues of social inequality and influences how far graduation rates will increase in the population.

In times of accelerated technological change, modern societies respond to economic competition by increasing the proportion of higher education graduates. They pursue this goal by opening up access to higher education to a larger proportion of the population, and by fostering permeability from secondary and post-secondary education into tertiary education. However, due to their different qualifications and prerequisites, these newly-entitled groups might face higher obstacles to obtaining a higher education degree.

In this context, Germany is a particularly interesting case. Graduation rates at tertiary level

are far below the OECD average (OECD, 2012, p. 68) and have increased more slowly than in other countries due to institutional barriers (Powell & Solga, 2011). In addition, Germany has very high social inequality in access to tertiary education (Hillmert & Jacob, 2010). Therefore, providing new paths to obtain a higher education entrance certificate is an important step in raising tertiary completion rates. Some attempts have been made to provide new educational options which afford eligibility to higher education. However, the persistently high segregation of the German education system, particularly the "schism in education" (Baethge, 2010, p. 281) between vocational and general education, might render it particularly difficult for those who entered higher education via nonstandard pathways to complete it successfully.

In this article, we want to gain insights into the mechanisms of dropout from a life-course perspective using recent longitudinal nationwide data from Germany. The main research questions are: Do previous secondary or post-secondary educational pathways and social origins influence dropping out of higher education? Do these influences differ by type of higher education institution? And do these features become less important as the length of study time increases?

The German education system

The German education system is characterized by early tracking, high differentiation, and high stratification (Allmendinger, 1989). The lower secondary level differentiates between three tracks. In most federal states, each of these three tracks has been represented for many years by one specific school type: the lower track by the *Hauptschule*, the intermediate track by the *Realschule*, and the upper, academic track by the *Gymnasium*. The *Hauptschule* provides basic general education and usually covers Grades 5 to 9 (sometimes also including Grade 10). At the *Realschule*, students receive more extensive general education. This school type usually covers Grades 5 to 10. The *Gymnasium* aims to teach intensified general education and comprises Grades 5 to 12 or 13. The *Gymnasium* is the only one of the three school types offering students a final examination, known as *Abitur*, entitling them to enter higher education. Some federal states provide the lower and intermediate track within one school type; others also offer comprehensive schools containing

all three tracks. However, comprehensive schools have not replaced the traditional *Gymnasium* in any single federal state.

High-achieving students from the *Haupt-* or *Realschule* who want to gain eligibility to higher education can transfer to a *Gymnasium* or to other schools offering senior classes (*gymnasiale Oberstufe*) at the upper secondary level. Some of these schools allow for part-time schooling, offer (either exclusively or additionally) restricted forms of the higher education entrance certificate, or also award vocational qualifications. A further possibility is to enter higher education without a higher education entrance certificate via a special examination (*Begabtenprüfung*), for talented or vocationally qualified persons. However, between 1995 and 2010, only about 1 per cent of students accessed higher education on this path (Autorengruppe Bildungsberichterstattung, 2012, p. 118, Tab. F1-4A).

There has been a considerable expansion of tertiary education in Germany in recent decades. For example, the proportion of 18- to 21-year-old students entering tertiary education increased from 17 per cent in 1980 to 44 per cent in 2009 (Statistisches Bundesamt, 2012). However, expansion in tertiary education has not been as extensive as that in secondary education (Lörz & Schindler, 2009, p. 98). Moreover, Germany has lower proportions of participation and graduation in tertiary education, and has experienced a smaller increase in tertiary enrolment and completion since the 1980s, than a number of other European countries (Arum, Gamoran, & Shavit, 2007; Powell & Solga, 2011; OECD, 2012, p. 68). Although inequality in completing secondary education decreased during the period of educational expansion, social inequality in post-secondary decisions increased (Mayer, Müller, & Pollak, 2007). Given the same level of achievement, students with *Abitur* from a higher social background more often access university directly, whereas students from the middle and lower classes more often opt for the less risky strategy of vocational training first and studies afterwards, or they even decide against higher education studies despite their eligibility (Becker & Hecken, 2009; Hillmert & Jacob, 2003; Mayer et al., 2007; Müller & Pollak, 2004; Reimer & Pollak, 2010). Those who have decided to take up higher education studies differ in their educational biography depending on their social origins. Higher

social classes follow the standard sequence from primary school to *Gymnasium* to university significantly more often (Jacob & Weiss, 2010).

The decision to enter higher education involves options in itself. The higher education system in Germany is binary (Mayer et al., 2007). On the one hand, there are the more practically oriented universities of applied sciences (*Fachhochschulen*) offering shorter and more structured study programmes of about 3.5 years. On the other hand, there are the more theory-oriented universities with longer study programmes of 5 to 6 years. Whereas students from a higher social background are more likely to enrol at a university, students from a lower social background are more likely to opt for a university of applied sciences. The degrees awarded by the different institutions are also connected to unequal chances. Graduates from the universities of applied sciences face more

restrictions in accessing postgraduate studies, and their labour market outcomes are also less favourable (Müller, Brauns & Steinmann, 2002)[1].

To provide information on the prevalence and social selectivity of different educational pathways, we developed a basic classification of these pathways, which is also used later in our main analysis. This classification was based on first, whether students attended *Gymnasium* from the lower secondary level; second, whether they completed vocational education and training and third, whether they took up tertiary studies and, if so, whether they attended university (U) or university of applied sciences (UAS; see Table 1). If individuals completed vocational training and started tertiary studies, only vocational qualifications before tertiary studies are taken into account, while vocational qualifications acquired after tertiary studies are discounted.

Table 1. Types of educational pathways

Pathway	Gymnasium at lower secondary level	Completed vocational and educational training	Tertiary education at U = university, UAS = university of applied sciences
1a	x		U
1b	x		UAS
1c	x		-
2a	x	x	U
2b	x	x	UAS
2c	x	x	-
3a			U
3b			UAS
3c			-
4a		x	U
4b		x	UAS
4c		x	-

Table 2 gives an overview of the frequency of these pathways, both in total and by parental education, based on the weighted percentages. We distinguished four parental education groups according to the parents' highest educational qualification: (1) no qualification or lower school diploma with or without non-tertiary vocational qualification (CASMIN 1a, 1b, 1c), (2) intermediate school diploma with or without non-tertiary vocational qualification (CASMIN 2a, 2b), (3) tertiary

education entrance diploma with or without vocational qualification (CASMIN 2c_voc, 2c_gen), and (4) degrees from universities or universities of applied sciences (CASMIN 3a, 3b). Pathway 1 comprises students who attend the *Gymnasium* at the lower secondary level (before Grade 10). Most of them enter university (10.2 per cent of all pathways); others enter a university of applied science (2.3 per cent) or do not enrol in tertiary education (2.0 per cent). Persons classified in

Pathway 2 also attend the *Gymnasium* at lower secondary level but additionally gain a vocational qualification. Some enter university afterwards (1.6 per cent); others, a university of applied sciences (1.4 per cent). However, the majority do not continue into tertiary education (9.0 per cent). Individuals classified in Pathway 3 do not attend the *Gymnasium* before Grade 10, but a lower or intermediate school. A minority switch to an upper secondary school offering a higher education entrance certificate and continue to university

(1.9 per cent) or a university of applied sciences (1.1 per cent). The majority do not enter tertiary education (11.6 per cent). Pathway 4 comprises students who attend lower or intermediate schools at lower secondary level and obtain a vocational qualification. Some of them attain eligibility before, during, or after completing vocational education and training and enter university (1.0 per cent) or a university of applied sciences (2.9 per cent). Most of them do not enter tertiary studies, which is the most common of all pathways (55.1 per cent).

Table 2. Prevalence of educational pathways by education of parents

Pathway	No.[1]	%[1]	Total %[2]	CASMIN 1a, 1b, 1c %[2]	CASMIN 2a, 2b %[2]	CASMIN 2c_voc, 2c_gen %[2]	CASMIN 3a, 3b %[2]
1a	1,191	15.5	10.2	3.5	11.1	18.3	35.5
1b	284	3.7	2.3	1.2	2.6	3.4	6.6
1c	133	1.7	2	1.4	2.4	3.1	3.3
2a	180	2.3	1.6	0.6	2	2.3	4.9
2b	155	2	1.4	0.7	1.7	2.1	3.6
2c	783	10.2	9	7	12.5	12.4	11.6
3a	190	2.5	1.9	1.2	2.8	3	3.4
3b	115	1.5	1.1	0.9	1.3	1.2	1.6
3c	554	7.2	11.6	14.4	9.1	9.9	3.1
4a	126	1.6	1	0.9	1.1	1.8	1.1
4b	301	3.9	2.9	2.6	3	4.5	2.9
4c	3,657	47.7	55.1	65.6	50.3	38	22.3
Total (No.)	7,669	7,669	7,669	4,664	1,451	549	1,005
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes. Source: NEPS: SC6: 1.0.0; own calculations.
[1]Unweighted.
[2]Standardized weights based on Mikrozensus 2009.

The distribution over pathways depends strongly on the parents' education: the higher the latter, the more likely are pathways in which students attend the *Gymnasium* at lower secondary level (1a–2c). The strongest differences by parental education prevail in Pathway 1a. Whereas 35.5 per cent of students whose parents have tertiary degrees attend the *Gymnasium* before Grade 10 and enrol in tertiary studies later without completing any vocational training before (Pathway 1a), only 3.5 per cent of those whose parents have no more

than basic vocational training above and beyond compulsory schooling do so. By contrast, the share of students entering tertiary education without having attended the *Gymnasium* at lower secondary level (Pathways 3a, 3b, 4a, 4b) is distributed more equally with regard to parental education. The percentage of students not attending the *Gymnasium* and not entering tertiary education (Pathways 3c and 4c), however, is much higher if parents are less educated.

Theoretical considerations and hypotheses

This section considers explanations for why and when students drop out. First, we discuss mechanisms linking pre-tertiary pathways and dropout from higher education. Then, we explain how social origin might relate to both (pre-tertiary pathways and dropout). Finally, we reflect on the role of time.

Mechanisms linking pre-tertiary pathways and dropout from higher education

Previous research has shown that students at the same level of initial competencies develop differently according to which track they are assigned to (Hanushek & Wössmann, 2006; Maaz, Trautwein, Lüdtke, & Baumert, 2008; Trautwein, Lüdtke, Marsh, Köller, & Baumert, 2006). Due to institutional (e.g. curricula, timetables, education of teachers) and compositional differences (distribution of achievement and social background), progress in competencies is higher at the *Gymnasium* (Maaz et al., 2008). Although the majority of tertiary students, including those who have previously attended a lower or intermediate track, attained eligibility in senior classes of the highest track (*Gymnasiale Oberstufe*), there might be negative long-term effects. First, it is unlikely that three years of senior classes overwrite the effects of about five years of tracking at lower secondary level. Second, tertiary students who have attended lower or intermediate tracks at lower secondary level are more likely to join senior classes that are more heterogeneous in terms of achievement and social background (see Maaz, Chang, & Köller, 2004). Beyond effects on competencies, tracking also gives the opportunity to meet students with certain characteristics, and this may shape aspirations (Hallinan & Williams, 1990). Students on upwardly mobile paths are more likely to become acquainted with persons not entering tertiary education. Values shared in these friendships might be opposed to higher educational aspirations and might render integration into tertiary education more difficult (Tinto, 1975). The example given by friends might make educational or occupational alternatives appear more desirable than continuing tertiary education.

Tracking was found to have an effect on students' self-concepts. On the one hand, students in schools with lower average achievement develop higher academic self-concepts (big-fish-little-pond effect (BFLP), Marsh & Parker, 1984; for evidence on the German education system, see e.g. Trautwein et al., 2006). On the other hand, students in selective schools might develop higher academic self-concepts because they attribute the positive collective identity to themselves (basking-in-the-reflected-glory effect (BIRG), Cialdini et al., 1976; for evidence on the German education system, see e.g. Knigge & Hannover, 2011). However, the latter seems to be much weaker than the BFLP effect (Marsh, Kong, & Hau, 2000; Trautwein et al., 2006). Having formed a high level of academic self-concept at school, students who enter tertiary education via upwardly mobile pathways might experience substantial losses of academic self-concept when they arrive at an institution in which the average performance level is higher.

Drawing on differential learning environments and their effects on competencies, social relations, and self-concepts, we therefore expect that students who reach higher education from outside the standard academic track of the *Gymnasium,* will have higher dropout risks (Hypothesis 1).

In Germany, vocational education and tertiary education are particularly strongly divided within the general education system and have developed along separate paths for the last 200 years (Baethge, 2010, p. 281). Vocational and general education, therefore, differ in institutional characteristics. For example, the main goal in vocational education is to impart competencies related to an occupational field, whereas in general education, it is to develop the personality and to promote autonomy. Moreover, whereas vocational education is organized as a combination of practical work on the job and learning that is related to practical tasks at school, general education is mainly theoretical (Baethge, 2010, pp. 278–280).

This strong division between non-tertiary vocational education plus training (VET) and tertiary education in the German education system, renders the transition from VET to tertiary education particularly difficult (Powell & Solga, 2011, p. 54). Students with vocational qualifications who enrol in tertiary education might be frustrated due to the lack of recognition of prior qualifications, and they might find it difficult to adapt to the stronger theoretical orientation.

Following a reformulation of the rational-choice model on educational decisions, the key

determinants of the decision between tertiary and vocational education and the labour market can be considered to be the subjective probability of success, the expected income, and the time horizon (i.e. the time span taken into account for calculating the returns; see Hillmert & Jacob, 2003). If these determinants explain the decision to enter tertiary education after obtaining a vocational qualification, any changes occurring in them might lead to a revision of this decision and to a dropout from tertiary studies. Empirical evidence shows that students adjust their perceptions of the probability that they will succeed in tertiary education after receiving feedback through, for example, grades (Stinebrickner & Stinebrickner, 2012). Because students with vocational qualifications who drop out can anticipate the income of a skilled rather than an unskilled employee, their expected income gains through tertiary education will be lower. As a result, they might be more sensitive to reductions in their perceived probability of success. Due to the difficult transition from non-tertiary vocational education to tertiary education and the lower additional benefits of graduation, we therefore expect higher dropout risks for vocationally qualified students than for students without prior vocational qualification (Hypothesis 2).

Being the most direct pathway to tertiary education, the standard academic pathway via the Gymnasium is usually also the shortest in duration. Students who additionally obtain a vocational qualification before or after acquiring eligibility for tertiary studies, are therefore older when they enter tertiary studies. Older students might be under stronger time constraints because they are more likely to have children or to work longer hours in a job (DesJardins, Ahlburg, & McCall, 1999, p. 385; Smith & Naylor, 2000). We therefore expect older students to be more prone to drop out, and that age at enrolment will explain part of the higher dropout rates of pathways other than the *Gymnasium,* especially those including vocational qualifications (Hypothesis 3).

Universities have always been the central institutions of the German tertiary education system. Universities of applied sciences emerged from the non-tertiary vocational system and only later became recognised as tertiary institutions. In line with their origins, they are more practically oriented than academic universities (Mayer et al., 2007, p. 244). Thus, the transfer from more

vocationally oriented schools or vocational training to a university of applied sciences, might be smoother than that to a university. Moreover, the prior pathways leading to universities of applied sciences are more heterogeneous (see Scheller, Isleib, & Sommer, 2013 and the descriptive section in this paper, esp. Table 3). Thus, students who arrive at a university of applied sciences via nonstandard pathways meet peers who share their school experience. This might ease integration. Consequently, we expect the effects of pre-tertiary pathways to be less pronounced at a university of applied sciences than at an academic university (Hypothesis 4).

The role of social origins

As mentioned above, educational pathways before higher education are class-specific (Table 2; see also Becker & Hecken, 2009; Jacob & Weiss, 2010; Reimer & Pollak, 2010): students from higher social classes have taken the standard path more often than students from lower classes. If pathways outside the academic track produce higher dropout rates, this should result in a social inequality of dropout (Hypothesis 5).

According to Tinto (1975), successful integration into the tertiary social and academic environment helps prevent students from dropout. Thus, students who engage more strongly in extracurricular activities and manage to establish a social network or those who find it easier to comply with the academic requirements based on the values and norms of the university system, are considered to be at less risk of quitting tertiary studies before graduation. Similar arguments can be found in studies following the tradition of Bourdieu (Reay, Davies, David & Ball, 2001; Thomas & Quinn, 2006) that highlight the rifts between the habitus of origin and the institutional habitus, and show how difficult they are to overcome for students from a lower social background. Hansen and Mastekaasa (2006), for example, found that after controlling for the secondary school grade-point average, students at Norwegian universities gain higher grades when they have higher levels of cultural capital.

According to the principle of relative risk aversion (Breen & Goldthorpe, 1997), students assign priority to the goal of avoiding downward social class mobility when taking educational decisions. Students whose parents have a higher education degree, risk a status loss by dropping out

of higher education. Hence, dropout involves higher costs for them compared to students whose parents have no tertiary degrees. Because students with more highly educated parents have access to a higher level of resources, find it easier to integrate into the college environment, and have higher costs of status demotion in case of dropping out, we expect them to have lower dropout rates than students with less well educated parents (Hypothesis 6a).

On the other hand, due to the highly socially selective German education system, a much smaller proportion of students from lower social origins than from higher social origins reach higher education. As a result, tertiary students from lower social origins might be a positive selection in terms of the qualities that help them to succeed in the educational system (Mare, 1980). These qualities might compensate for disadvantages and cancel out the effect of social origin (Hypothesis 6b).

The role of time

The literature on dropout emphasizes that it should be seen as a process in time (e.g. Chen, 2012; DesJardins, 2003; Tinto, 1988). The transition into tertiary studies can be considered as a succession of different stages (Tinto, 1988) that each have their own specific vulnerability to dropout. In addition, the determinants influencing dropout change over time and vary in the strength of their effects (DesJardins et al., 1999).

Differences in the starting conditions based on different educational histories should converge with the duration of a common history of studies under equal conditions. Students from upwardly mobile pathways who may well be less prepared for higher education might still catch up. Furthermore, newly acquired knowledge should become more important than that acquired before higher education. Consequently, the advantage of students who have taken the standard direct path should decrease over time. Finally, the lack of familiarity with the higher education culture might be overcome by making contact and exchanging ideas and information with other students. Indeed, Pascarella, Pierson, Wolniak, and Terenzini (2004) found that students with lower levels of social and cultural capital improve more strongly in educational outcomes through social interactions and academic activities, than students with higher levels of social and cultural capital. Thus, interactions with other students and academic

effort seem to have compensatory potential. Regarding the timing of dropout among students who have already gained vocational qualifications, the driving force might well be cost–benefit calculations. According to human capital theory (e.g. Becker, 1964), the decision to invest in education depends not only on expected returns but also on opportunity costs. The latter are higher for students with vocational qualifications, because their qualification raises the costs of foregone earnings. This should result in an early dropout of students with prior vocational qualifications.

In summary, we expect educational pathways before higher education to lose their impact on dropout rates over the duration of higher education, because socialization and newly gained knowledge in the tertiary environment become more important than knowledge learned at school (Hypothesis 7). We also expect that the effect of a vocational qualification will diminish over study duration because the value of the prior qualification declines over time (Hypothesis 8).

Data and methods

We tested our hypotheses on data from the National Educational Panel Study (NEPS): Starting Cohort 6 – Adults (Adult Education and Lifelong Learning), doi:10.5157/NEPS:SC6:1.0.0. The NEPS data collection is part of the Framework Programme for the Promotion of Empirical Educational Research, funded by the German Federal Ministry of Education and Research and supported by the Federal States. The study population consists of 11,649 individuals born between 1944 and 1986 who were surveyed for either the first or second time in 2009/2010. Because the entire education and labour market history is surveyed on the basis of spells, i.e. the time spent in a specific state, we can identify starting points, durations, and successful completions of tertiary studies.

We doubt that our arguments apply to study episodes in East Germany before reunification, because access to higher education, study programmes, and the labour market situation differed strongly from conditions in West Germany (see Solga, 1997). Therefore, we dropped school and study episodes in the NEPS sample that were found to have taken place in the German Democratic Republic (GDR). This information is not available for those interviewed for the second time

in 2009/2010. Thus, respondents of this subsample were disregarded if they were born in East Germany and started secondary or tertiary education before the restructuring of the educational system in 1990.

Because our study is restricted to the German education system, we did not consider individuals who had migrated to Germany after the age of 7 years, had spent more than a year abroad during their school career, or had studied in a tertiary institution abroad.

As only 43 respondents (1.6 per cent of the analysed sample) had missing values on at least one variable of interest, we decided to exclude them listwise from the analysis. Additionally, we excluded 19 cases with extreme values (greater than 40) in the variable age at enrolment. For reasons of comparability over time, we did not take into account student entry cohorts before 1970. Although the institutional setting of higher education did not change dramatically afterwards, the recognition of universities of applied sciences as higher education institutions was a major change in the late 1960s.

We restricted our analyses to study episodes at universities and universities of applied sciences (both ISCED-level 5A). We excluded ISCED-level 5B institutions such as universities of cooperative education (*Berufsakademien*), business academies (*Wirtschaftsakademien*), or academies of public administration (*Verwaltungsakademien*) that are not yet recognized comprehensively as university-level institutions by federal law.

We analysed dropout from first tertiary studies as the dependent variable, defined as leaving first tertiary studies without a degree and not attending higher education again within the following 12 months. This definition ensures that we avoid considering changes in the field of studies as dropouts.

For the purpose of the present analysis, we distinguished four types of educational pathway after primary school and before tertiary entrance (see Pathways 1a, 1b, 2a, 2b, 3a, 3b, 4a, and 4b in Table 1, and the respective description in the text). We were not interested in Pathways 1c, 2c, 3c, and 4c, because students in these pathways do not enter tertiary education. Social origin was measured by the parents' highest educational qualification. As mentioned above, we distinguished four parental education groups: (1) no qualification or lower school diploma with or without non-tertiary vocational qualification (CASMIN 1a, 1b, 1c), (2) intermediate school diploma

with or without non-tertiary vocational qualification (CASMIN 2a, 2b), (3) tertiary education entrance diploma with or without vocational qualification (CASMIN 2c_voc, 2c_gen), and (4) degrees from universities or universities of applied sciences (CASMIN 3a, 3b). Here again, we did not consider degrees from universities of cooperative education (*Berufsakademien*), business academies (*Wirtschaftsakademien*), or academies of public administration (*Verwaltungsakademien*) as higher education degrees.

We also took into account the respondent's age at entry into higher education derived from the respondent's birth year and the spell data on education.

Finally, all multivariate models include control variables. These are gender, first-year student cohorts, the type of higher education entrance certificate, changing between the two higher education institutions as a time-dependent variable, and the grade-point average of the highest school certificate. The latter variable was used in an attempt to control for primary effects, the relationship between socio-economic background and performance, as well as the relationship between school performance and educational pathway. In order to achieve better comparability over time, we standardized the grade-point average by the year of graduation. Additionally, we reversed the standardized values so that higher values indicate better grades. Although the type of higher education entrance certificate is related to the pathway, there is some variation within the pathways with regard to the type of the certificate. We also did not consider collinearity to be a problem. However, we were concerned that grading might differ between school types or, more precisely, that at the same level of competencies, students at other schools than the *Gymnasium* might obtain better grade-point averages. In this case, the predictive power of the grade-point average on dropout should be stronger for students who obtain their higher education entrance certificate at the *Gymnasium* than for students who obtain it at a vocational or other school. However, interaction effects between the school type awarding the entrance diploma and the grade-point average were not significant. This convinced us that the quality of the grade-point average as a proxy for primary effects does not differ strongly between school types. For a distribution of all covariates in both samples at different points in time, see Tables A1 and A2 in the Appendix.

We tested our hypotheses with event history analysis in order to take the time dependency of dropout into account. In a first step, we estimated the following functions indicating the proportion of students who have dropped out (H^a) or completed (H^b) tertiary education until a certain point in time (see Rohwer, 2006):

(1) $H^a(t) := \sum_{k=0}^{t-1} r^a(k)G(k)$

(2) $H^b(t) := \sum_{k=0}^{t-1} r^b(k)G(k)$

in which $r^a(k)$ represents the transition rate of dropout, $r^b(k)$ the transition rate of completion, and $G(k)$ the global survivor function of dropout and completion – that is, the probability of still persisting in tertiary studies at a certain point in time. We computed the survivor function with the Kaplan–Meier method.

For the multivariate analyses, we estimated transition rate models. The underlying dependent process is the monthly duration in first tertiary studies ending with an event for dropouts. The transition rate is the intensity of experiencing an event under the condition of not having experienced the event before (Blossfeld, Golsch & Rohwer, 2007). This is given in the following Equation 3:

(3) $r(t) = \lim_{t'-t} \frac{P(t \leq T < t' | T \geq t)}{t'-t}$

in which *T* is defined as a continuous random variable indicating the duration in tertiary education. Possible destination states are dropout, receiving a degree, or still being in tertiary education at the time of the interview. Whereas the last case is inherently right-censored, we also treated graduating as right-censored. We modelled the duration dependence with a piecewise constant exponential model that assumes the baseline hazard rate to be constant within time periods but allows it to vary between them (Blossfeld et al., 2007). A hazard rate for each predefined interval (l) was computed with the following equation, based on the coefficient for the baseline hazard of the interval (β_{0l}) and the regression coefficients of the covariates ($\beta_1 \dots \beta_k$). Thus, it is assumed that covariates shift the rate proportionally up or down.

(4) $r(t_l) = \exp\{\beta_{0l} + \beta_1 x_1 + \dots + \beta_k x_k\}$

In order to test whether the effects of covariates vary over time, we also estimated period-specific effects that can vary between the time intervals ($\beta_{1l} \dots \beta_{kl}$):

(5) $r(t_l) = \exp\{\beta_{0l} + \beta_{1l} x_1 + \dots + \beta_{kl} x_k\}$

At the time when large proportions of students have already graduated, the remaining population at risk might be highly selective, and this selectiveness might not be independent of studying successfully. We introduced right censoring into the multivariate analysis for cases that have no event during the first 8 years after starting tertiary studies. At this point in time, the risk set comprises 10 per cent of the original risk set at university and 2 per cent of the original risk set at universities of applied sciences. We ran the models separately for academic universities and universities of applied sciences because these two types of higher education institutions differ in important aspects: the composition of students regarding social origins, the composition of students regarding previously taken pathways, the length of study programmes, and the proportion of vocational versus academic orientation.

Results

In this section, we first present some descriptive results on the prevalence of pre-tertiary educational pathways and on the distribution of dropout and graduation over time, before moving on to the multivariate analyses of dropout.

Descriptive results

Table 3 shows the distribution of students at university and university of applied sciences over the four types of educational pathway. The weighted percentages give an impression of the prevalence of each pathway in the population. The distribution differs largely between the two types of higher education institution. The majority of first-year students (about 70 per cent) reach university via the standard pathway. At universities of applied sciences, however, the picture is different: here, less than every third student has taken the standard pathway. In comparison to academic university students, more students at the universities of applied sciences have obtained a vocational qualification before entering higher education. The largest group of these students reaches a university of applied sciences via an upwardly mobile pathway combined with non-tertiary vocational training (about 38 per cent). Also, the combination of the standard path-way with a vocational qualification is more frequent at universities of applied sciences (18 per cent) than at academic universities (about 11 per cent).

Table 3. Prevalence of pre-tertiary educational pathways among students at universities and universities of applied sciences

Types of pre-tertiary pathways	Universities			Universities of applied sciences		
	Freq.[1]	%[1]	%[2]	Freq.[1]	%[1]	%[2]
(1) Standard pathway	1,203	70.6	69.2	287	33.3	30.3
(2) Standard pathway + voc. qual.	183	10.7	10.8	156	18.1	18.0
(3) Upwardly mobile pathway	190	11.2	12.9	116	13.4	14.0
(4) Upw. mobile pathway + voc. qual.	128	7.5	7.1	304	35.2	37.7
Total	1,704	100	100	863	100	100

Notes. Source: NEPS: SC6: 1.0.0; own calculations.
[1]Unweighted.
[2]Standardized weights based on Mikrozensus 2009.

The functions in Figure 1 and 2 indicate the proportions of students who leave their university or university of applied sciences within 10 years after starting tertiary studies, because they either drop out (solid line) or graduate (dashed line).

Because study programmes take longer at academic universities, students there graduate later than those at universities of applied sciences. In the first 3 years, graduations are extremely rare, but more than half of the dropouts have already taken place.

Figure 1. Proportion functions of dropout and graduation from higher education at universities, based on survivor functions (Kaplan–Meier method)
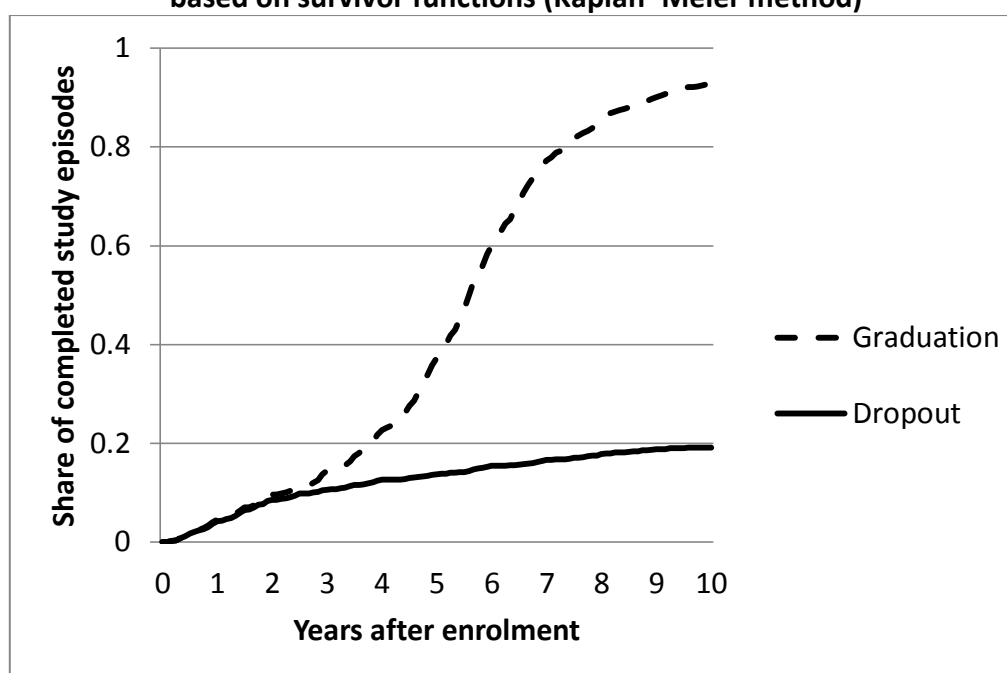
Notes. Source: NEPS SC6; own calculations.
Number of events: 320 dropouts; 1,204 graduations.

Figure 2. Proportion functions of dropout and graduation from higher education at universities of applied sciences, based on survivor functions (Kaplan–Meier method)
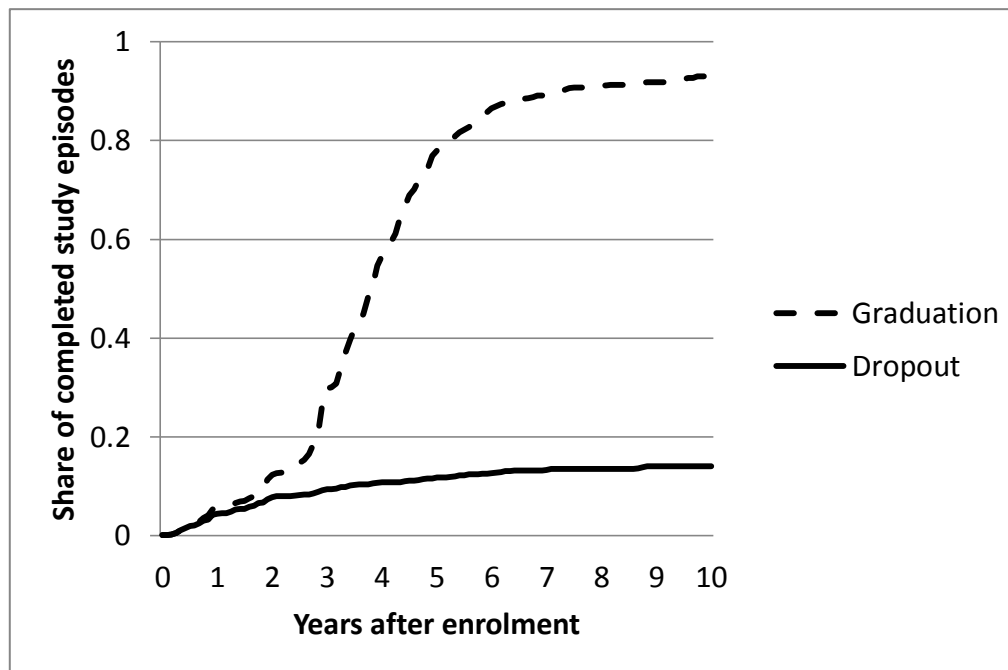
Notes. Source: NEPS SC6; own calculations.
Number of events: 116 dropouts; 705 graduations.

Multivariate results

We shall start with the findings from the multivariate analysis of university students. We estimated a piece-wise-constant exponential model. The hazard of dropping out does not change over time (see Table 4, Model 1). The risk seems to be time-constant. Regarding social origin, results suggest that students with at least one parent holding a tertiary degree drop out less often from university (see Table 4, Model 1). However, to some extent, this seems to be due to higher academic performance: if the grade-point average of the highest school certificate is controlled (as in Model 2), the effect of social origin decreases, although it is still statistically significant on a 10 per cent level.

If, additionally, pre-tertiary pathways are taken into account (see Model 3), the effect of parents with tertiary education declines even more and ceases to be significant[2]. This is in line with the hypothesis that educational pathways explain social inequality in dropout rates to a notable degree (Hypothesis 5). As the remaining effects of parental education are not significant, Hypothesis 6a has to be rejected, whereas findings favour the conflicting Hypothesis 6b: students from a higher social background do not seem to be prevented from dropping out because they can rely on the resources of their parents, they integrate more easily at university, or they have higher dropout costs in terms of status demotion.

Table 4. Piecewise constant exponential models on dropout from universities within 8 years of starting tertiary studies

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year 1	-10.53*	-13.56**	-11.46*	-11.64*	-11.55*	-11.72*
	[4.89]	[4.88]	[4.89]	[4.87]	[4.89]	[4.87]
Year 2	-10.23*	-13.25**	-11.15*	-11.33*	-11.18*	-11.36*
	[4.89]	[4.88]	[4.89]	[4.87]	[4.89]	[4.87]
Year 3–4	-10.99*	-13.99**	-11.88*	-12.06*	-11.94*	-12.10*
	[4.89]	[4.89]	[4.90]	[4.88]	[4.89]	[4.88]
Year 5–8	-10.76*	-13.77**	-11.65*	-11.82*	-11.67*	-11.83*
	[4.90]	[4.90]	[4.91]	[4.89]	[4.91]	[4.89]
Parents: CASMIN 1a/1b/1c	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Parents: CASMIN 2a/2b	-0.22	-0.16	-0.09	-0.07	-0.09	-0.07
	[0.17]	[0.17]	[0.17]	[0.17]	[0.17]	[0.17]
Parents: CASMIN 2c	0.07	0.16	0.24	0.23	0.24	0.23
	[0.19]	[0.19]	[0.19]	[0.19]	[0.19]	[0.19]
Parents: CASMIN 3a/3b	-0.42**	-0.26[+]	-0.14	-0.12	-0.13	-0.12
	[0.15]	[0.15]	[0.16]	[0.15]	[0.16]	[0.15]
GPA of highest school certificate		-0.67**	-0.66**	-0.64**		
		[0.08]	[0.08]	[0.08]		
in year 1					-0.70**	-0.68**
					[0.18]	[0.18]
in year 2					-0.49**	-0.47**
					[0.16]	[0.16]
in year 3–4					-0.81**	-0.78**
					[0.17]	[0.17]
in year 5–8					-0.70**	-0.66**
					[0.16]	[0.15]
Age at enrolment				0.09**		0.09**
				[0.02]		[0.02]
Pathway 1			*ref.*	*ref.*	*ref.*	*ref.*
Pathway 2			0.50**	0.15		
			[0.18]	[0.21]		
in year 1–2					0.67**	0.32
					[0.23]	[0.26]
in year 3–8					0.30	-0.05
					[0.27]	[0.29]
Pathway 3			0.45*	0.40*		
			[0.18]	[0.18]		
in year 1–2					0.64**	0.59*
					[0.24]	[0.24]
in year 3–8					0.23	0.19
					[0.27]	[0.27]
Pathway 4			0.64**	0.18		
			[0.21]	[0.25]		
in year 1–2					0.40	-0.06
					[0.31]	[0.34]
in year 3–8					0.85**	0.39
					[0.27]	[0.29]

*Notes. Source: NEPS SC6; own calculations. Standard errors in brackets. [+] p < 0.10, * p < 0.05, ** p < 0.01.*
Number of persons: 1,704; number of events (dropouts): 289. Controls (not reported in the table for the sake of clarity, see Table A3 in the Appendix for complete results): gender, entry year of tertiary studies (linear and squared), changing from university to a university of applied sciences, type of higher education entrance certificate. Due to low numbers of events per pathway in each single time period, Models 5 and 6 include constraints for educational pathways indicating that the effect for the first year equals the effect for the second year, and the effect for the third and fourth year equals the effect for the fifth to eighth year.

Model 3 indicates that pre-tertiary pathways seem to matter: students who came to university via the direct standard pathway have significantly lower dropout rates than students with a more complex educational history. This result favours the hypothesis that the learning environment of the *Gymnasium* eases integration and endurance at university (Hypothesis 1). Pathways with vocational training seem to induce the highest dropout rates. This is consistent with the hypothesis that these students are distracted from higher education more strongly, because of better alternative labour market opportunities and lower relative benefits from higher education, than students without additional vocational qualifications (Hypothesis 2).

In Model 4, we find that older students are more prone to drop out and that this explains higher dropout rates of students who obtained a vocational qualification before tertiary studies as expected in Hypothesis 3. However, pre-tertiary pathways and age at enrolment correlate highly. For example, 75 per cent of university students on Pathways 1 or 3 are respectively 21 years and 1 month and 21 years and 6 months old or younger, whereas 75 per cent of university students on Pathways 2 or 4 are respectively at least 24 years and 10 months and 27 years and 6 months old.

In Models 5 and 6, we introduced time-varying effects in order to test how the influence of the covariates on dropout develops over the duration of tertiary studies – in Model 5 without, and in Model 6 with, controlling for age at enrolment. We find results at the university to be consistent with the hypothesis that pre-tertiary pathways matter more strongly in the beginning and lose their impact later, which might be due to newly acquired knowledge and networks at university (Hypothesis

7). This seems to be the case for at least the standard pathway combined with vocational training and the upwardly mobile pathway without additional vocational qualifications. Students who have taken these pathways before entering university have higher dropout rates in the first 2 years than students who have followed the standard pathway, whereas these effects are less pronounced and not statistically significant afterwards. This is not the case, however, for students who have combined an upwardly mobile pathway and a vocational qualification. These students are more prone to a late dropout after the first 2 years. The effects on early dropout of students in Pathway 2 and the late dropout of students in Pathway 4 are no longer significant when age at enrolment is taken into account (Model 6).

Results for the universities of applied sciences differ from those from academic universities in four major points (see Table 5). First, social origins do not impact on dropout rates, so Hypothesis 5 has to be rejected. Second, vocational qualifications before tertiary education do not increase dropout rates significantly. This supports the hypothesis that the universities of applied sciences are more successful in retaining students with vocational qualifications because of their more practical orientation (Hypothesis 4). Third, older students do not differ significantly from younger students in their dropout risk. Fourth, effects of pre-tertiary pathways do not vary significantly over time. It has to be taken in account, however, that the sample and the total number of dropouts are smaller at universities of applied sciences, and thus the probability of significant effects is lower[3].

Table 5. Piecewise constant exponential models on dropout from universities of applied sciences within 8 years of starting tertiary studies

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year 1	-8.51	-12.64[+]	-14.53[+]	-14.62[+]	-13.77[+]	-13.84[+]
	[7.22]	[7.37]	[7.45]	[7.48]	[7.48]	[7.50]
Year 2	-8.74	-12.85[+]	-14.73*	-14.82*	-13.98[+]	-14.05[+]
	[7.22]	[7.37]	[7.45]	[7.48]	[7.48]	[7.50]
Year 3–4	-9.11	-13.21[+]	-15.07*	-15.17*	-14.52[+]	-14.59[+]
	[7.23]	[7.38]	[7.46]	[7.49]	[7.49]	[7.52]
Year 5–8	-8.40	-12.56[+]	-14.45[+]	-14.54[+]	-13.78[+]	-13.84[+]
	[7.25]	[7.40]	[7.47]	[7.50]	[7.51]	[7.53]
Parents: CASMIN 1a/1b/1c	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Parents: CASMIN 2a/2b	-0.23	-0.19	-0.17	-0.18	-0.18	-0.19
	[0.27]	[0.27]	[0.27]	[0.27]	[0.27]	[0.27]
Parents: CASMIN 2c	0.23	0.23	0.33	0.33	0.33	0.33
	[0.32]	[0.33]	[0.33]	[0.33]	[0.33]	[0.33]
Parents: CASMIN 3a/2b	0.08	0.01	0.07	0.07	0.07	0.07
	[0.25]	[0.24]	[0.25]	[0.25]	[0.25]	[0.25]
GPA of highest school certificate		-0.89**	-0.90**	-0.90**		
		[0.15]	[0.15]	[0.15]		
in year 1					-1.01**	-1.01**
					[0.27]	[0.27]
in year 2					-1.05**	-1.05**
					[0.31]	[0.31]
in year 3–4					-0.90**	-0.90**
					[0.30]	[0.30]
in year 5–8					-0.53	-0.53
					[0.33]	[0.34]
Age at enrolment				-0.01		-0.00
				[0.03]		[0.03]
Pathway 1			*ref.*	*ref.*	*ref.*	*ref.*
Pathway 2			0.14	0.15		
			[0.30]	[0.32]		
in year 1–2					-0.05	-0.03
					[0.39]	[0.40]
in year 3–8					0.36	0.37
					[0.46]	[0.47]
Pathway 3			0.73*	0.73*		
			[0.29]	[0.29]		
in year 1–2					0.72*	0.72*
					[0.36]	[0.36]
in year 3–8					0.69	0.69
					[0.46]	[0.46]
Pathway 4			0.01	0.02		
			[0.29]	[0.30]		
in year 1–2					-0.23	-0.22
					[0.36]	[0.37]
in year 3–8					0.30	0.31
					[0.40]	[0.41]

*Notes. Source: NEPS SC6; own calculations. Standard errors in brackets. [+] p < 0.10, * p < 0.05, ** p < 0.01.*
Number of persons: 863; number of events (dropouts): 113. Controls (not reported in the table for the sake of clarity, see Table A4 in the appendix for complete results): gender, entry year of tertiary studies (linear and squared), changing from a university to a university of applied sciences, type of higher education entrance certificate. We did not control for changing from a university of applied sciences to an academic university because of too few events in this group. Due to low numbers of events in each single time period, Models 5 and 6 include constraints for educational pathways indicating that the effect for the first year equals the effect for the second year, and the effect for the third and fourth year equals the effect for the fifth to eighth year.

Summary and conclusion

In this paper, we have analysed the impact of pre-tertiary educational pathways and social origins on dropout rates in higher education, and the role of time in this interplay. Our findings suggest that pre-tertiary pathways have an effect on dropout from higher education. At university, we find that pathways other than the academic track or including a vocational qualification have higher dropout rates than the standard path. This is in line with Hypothesis 1, that students from outside the standard pathway face adaptation difficulties, and that students with vocational qualifications might be less committed to graduating because they have lower additional benefits from a tertiary degree (Hypothesis 2). At the universities of applied sciences, pathways with vocational training do not show significantly higher dropout rates, which might be due to the more practical orientation of the institutions as predicted by Hypothesis 4. The upwardly mobile pathway without vocational qualification, however, is connected to higher dropout rates at the universities of applied sciences as well. The age of students at enrolment to tertiary education seems to explain to a great extent why students with vocational qualifications are more prone to drop out from tertiary education. If age is an approximate measure for the amount of external responsibilities and obligations due to children or a demanding job, this can be interpreted as support for Hypothesis 3. However, further variables would have to be included, such as the birth of a child or working time, in order to have more direct evidence. Moreover, this interpretation has to be viewed with caution, because age at enrolment correlates highly with pre-tertiary pathways, and might therefore serve as an approximate measure of whether students have obtained a vocational qualification or not. As far as social origins are concerned, there is some evidence that, at university, the class-specific choices of educational pathways influence social selectivity in dropout (Hypothesis 5): at university, students with more highly educated parents have lower dropout rates. If the educational pathways are taken into account, the effect of social origins is reduced and ceases to be statistically significant. Thus, we find no support for Hypothesis 6a, that students with more highly educated parents are less prone to drop out due to their access to higher levels of social, cultural, or economic capital or due to the motive of status

maintenance, once prior educational decisions are taken into account. However, these prior educational decisions are socially selective. Thus, there might be indirect effects of the motive of status maintenance via the pre-tertiary career. As expected in Hypothesis 6b, tertiary students with lower social origins might be positively selected on the basis of unobserved characteristics, which help them to counterbalance the disadvantages of their social background.

As anticipated in Hypotheses 7 and 8, at the universities, the effect of pre-tertiary educational pathways on dropout rates seems to weaken over the duration of studies – at least with respect to the standard pathway with vocational qualification and the upwardly mobile pathway without vocational qualification. At the universities of applied sciences, we do not find this pattern of decreasing effects of educational pathways. Considering that adaptation difficulties might be a major cause for early dropout, this finding fits the hypothesis that at the universities of applied sciences, students from a lower social background and students who reach higher education from outside the standard pathway, experience lower cultural divisions (Hypothesis 4). However, due to the lack of direct measures of adaptation, further research is needed to carefully test this hypothesis in more detail.

Regarding the arguments based on theories of educational decisions, we find that the risk of dropping out of higher education is influenced by decisions taken years before. Because the decisions for educational pathways are class-specific, they partly explain social inequality in dropout. This result confirms the well-established finding that educational decisions are path-dependent (Breen & Jonsson, 2000; Pfeffer & Goldrick-Rab, 2011). At the same time, results point in the direction that the dropout decision – although depending on previous class-specific decisions for educational pathways – is not influenced directly by social background when previous educational pathways are controlled. This might be interpreted as support for the life-course hypothesis (Shavit & Blossfeld, 1993) stating that social background loses its impact on decisions as students become adults and more independent from their parents.

Having no means to measure the financial situation of the respondents during their studies, we do not focus on the impact of financial costs on dropout. However, at least we can say that direct

tuition fees cannot play an important role in our sample, because they were not introduced in Germany until 2005 and impact on only a small proportion of the sample.

Drawing on the concept of differential learning environments, we argued that students are differently socialized and prepared for higher education depending on the educational pathway they have taken beforehand. We find this a plausible explanation for our result that dropout rates differ depending on the pre-tertiary pathway. However, it is not the only possible explanation, and a more precise test of the theoretical concept would require more detailed and direct measures. Apart from path dependency, results also point out that time dependency plays an important role in dropout. Modelling dropout as a process with time-specific dropout intensities can help to reveal sensitive phases in which certain groups are especially vulnerable.

This study contributes to sociological research on higher education in the following ways: First, it uses nationwide longitudinal data to analyse the inclination towards dropout as a process over time. As far as we are aware, this has not been undertaken so far regarding dropout from higher education in Germany. Second, to the best of our knowledge, the study is the first to apply a multivariate approach to investigate the interplay between previous pathways, social origin, and dropout in Germany. This interplay is an important issue for highly stratified education systems with strong social inequality: Education systems such as Germany with its selective and stratified education system and low tertiary graduation rates have a high interest in encouraging permeability to tertiary education in order to increase graduation rates. According to the results of this study, about 30 per cent of students who enter universities and even about two thirds of students who enter universities of applied sciences in Germany have not taken the standard pathway. Instead, they either did not attend the *Gymnasium* until higher secondary level and/or they completed a vocational qualification before tertiary education. Increasing the non-standard pathways to higher education, which are used more often by students from a lower social background, seems to be one possible way to reduce social inequality in access to higher education. However, this study finds that tertiary students who have taken non-standard pathways

are more vulnerable to drop out from higher education – at least at academic universities, which are the higher education institutions attended by the majority of tertiary students. Thus, on the one hand, non-standard pathways might lead persons who otherwise would not have entered tertiary education to gain a tertiary degree; on the other hand, they are less efficient than standard pathways in terms of leading students to a degree. Therefore, target-oriented support of students with a non-standard educational biography might be a very effective way to counter the loss of potential university graduates during tertiary studies. In our analysis, we suggested some mechanisms that – if further tested with more detailed measures – might give insights into which kind of support is needed. Some answers on how to counter the difficulties of students with different educational biographies might also be found at the more practically oriented universities of applied sciences, in which the dropout propensity does not differ between different pathways.

We find considerable differences between the institutions regarding the effects of covariates on dropout: Parental education, pre-tertiary vocational qualifications, and age, influence dropout at universities but not at universities of applied sciences. Thus, the latter seem to be more successful in attracting and retaining students from lower social backgrounds, with vocational qualifications, and/or with higher ages. Therefore, an expansion of universities of applied sciences might foster permeability between vocational education and tertiary education, and decrease social inequality in the attainment of tertiary degrees. From a critical perspective, however, this could be interpreted as "effectively maintained inequality" (Lucas, 2001), because quantitative inequalities (differences in the proportion of students who complete tertiary education) would be shifted to qualitative inequalities (differences in the distribution over institutions). Following this reasoning, universities would preserve their selectivity, whereas persons with a vocational background and lower social background would be diverted to universities of applied sciences that provide less prestigious degrees and lower labour market returns. However, this would still reduce inequality compared to the status quo in which the expansion of eligibility to tertiary education is leading to students from a lower social background

being diverted to vocational education rather than to the universities of applied sciences (Lörz, 2013; Mayer et al., 2007).

The present analysis has its limitations, because students select different educational pathways themselves, and this selection is dependent on further characteristics that might also play an important role for dropout from higher education. However, we hope to control for the most important of these characteristics by including the grade-point average of the highest educational certificate as a proxy variable of achievement. Another drawback is that period-specific effects might be caused by the changing composition: less motivated students might leave first, so that the remaining population becomes composed more strongly of students resisting any temptation to drop out. However, by controlling for the grade-point average of the school leaving certificate, we hope to rule out at least a part of any composition effects.

Acknowledgements

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Appendix

Table A1. Distribution of characteristics in the sample at certain points in time at universities

	Year 0		Year 2		Year 5	
	No.	%	No.	%	No.	%
Men	921	54	834	54.4	577	57.4
Women	783	46	700	45.6	429	42.6
Entry cohort						
1970–1979	380	22.3	356	23.2	224	22.3
1980–1989	566	33.2	518	33.8	407	40.5
1990–1999	343	20.1	311	20.3	212	21.1
2000–2010	415	24.4	349	22.8	163	16.2
HE entrance certificate						
Other	68	4	54	3.5	31	3.1
General	1,636	96	1,480	96.5	975	96.9
Change of HE institution	0	0	25	1.6	36	3.6
Field of study						
Medicine	168	9.9	160	10.4	120	11.9
Teacher training	360	21.1	334	21.8	173	17.2
Humanities/Arts	293	17.2	257	16.8	171	17
Natural sciences/Mathematics	283	16.6	251	16.4	187	18.6
Engineering	197	11.6	176	11.5	126	12.5
Law	104	6.1	94	6.1	60	6
Business/Economics	200	11.7	172	11.2	115	11.4
Other	99	5.8	90	5.9	54	5.4
Parent's education						
CASMIN 1a/1b/1c	478	28.1	418	27.2	290	28.8
CASMIN 2a/2b	366	21.5	333	21.7	198	19.7
CASMIN 2c	198	11.6	175	11.4	109	10.8
CASMIN 3a/3b	662	38.8	608	39.6	409	40.7
Pathway						
Pathway 1	1,203	70.6	1,115	72.7	747	74.3
Pathway 2	183	10.7	144	9.4	83	8.3
Pathway 3	190	11.2	165	10.8	109	10.8
Pathway 4	128	7.5	110	7.2	67	6.7
GPA of highest school certificate (mean)	0.087		0.119		0.156	
Age at HE entry	21.32		21.2		21.08	
Total	1,704	100	1,534	100	1,006	100

Source: NEPS: SC6: 1.0.0; own calculations.

Table A2. Distribution of characteristics in the sample at certain points in time at universities of applied sciences

	Year 0		Year 2		Year 5	
	No.	%	No.	%	No.	%
Men	555	64.3	472	62.8	101	61.6
Women	308	35.7	279	37.2	63	38.4
Entry cohort						
1970–1979	206	23.9	188	25	27	16.5
1980–1989	254	29.4	233	31	58	35.4
1990–1999	187	21.7	164	21.8	43	26.2
2000–2010	216	25	166	22.1	36	22
HE entrance certificate						
Other	411	47.6	355	47.3	76	46.3
General	452	52.4	396	52.7	88	53.7
Change of HE institution			13	1.7	9	5.5
Field of study						
Engineering	322	37.4	285	38	72	44.2
Business science	135	15.7	112	14.9	21	12.9
Social work/Pedagogics	146	17	132	17.6	24	14.7
Other	257	29.9	221	29.5	46	28.2
Parent's education						
CASMIN 1a/1b/1c	405	46.9	363	48.3	72	43.9
CASMIN 2a/2b	184	21.3	159	21.2	35	21.3
CASMIN 2c	77	8.9	63	8.4	11	6.7
CASMIN 3a/3b	197	22.8	166	22.1	46	28
Pathway						
Pathway 1	287	33.3	257	34.2	53	32.3
Pathway 2	156	18.1	136	18.1	28	17.1
Pathway 3	116	13.4	96	12.8	21	12.8
Pathway 4	304	35.2	262	34.9	62	37.8
GPA of highest school certificate (mean)	-0.029		0.006		-0.066	
Age at HE entry	22.33		22.20		22.26	
Total	863		751		164	

Source: NEPS: SC6: 1.0.0; own calculations.

Table A3. Piecewise constant exponential models on dropout from universities within 8 years of starting tertiary studies

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year 1	-10.53*	-13.56**	-11.46*	-11.64*	-11.55*	-11.72*
	[4.89]	[4.88]	[4.89]	[4.87]	[4.89]	[4.87]
Year 2	-10.23*	-13.25**	-11.15*	-11.33*	-11.18*	-11.36*
	[4.89]	[4.88]	[4.89]	[4.87]	[4.89]	[4.87]
Year 3–4	-10.99*	-13.99**	-11.88*	-12.06*	-11.94*	-12.10*
	[4.89]	[4.89]	[4.90]	[4.88]	[4.89]	[4.88]

(Table A3 cont'd)	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year 5–8	-10.76*	-13.77**	-11.65*	-11.82*	-11.67*	-11.83*
	[4.90]	[4.90]	[4.91]	[4.89]	[4.91]	[4.89]
Women	0.19	0.24*	0.23[+]	0.28*	0.23[+]	0.28*
	[0.12]	[0.12]	[0.12]	[0.12]	[0.12]	[0.12]
Entry year	0.12	0.17	0.12	0.08	0.12	0.08
	[0.11]	[0.11]	[0.11]	[0.11]	[0.11]	[0.11]
Entry year sq.	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Change of HE inst.	-0.15	-0.26	-0.21	-0.19	-0.24	-0.21
	[0.45]	[0.45]	[0.45]	[0.45]	[0.45]	[0.45]
General HE entrance certificate	-0.18	-0.05	0.26	0.42	0.29	0.45
	[0.29]	[0.29]	[0.31]	[0.32]	[0.31]	[0.32]
Parents: CASMIN 1a/1b/1c	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Parents: CASMIN 2a/2b	-0.22	-0.16	-0.09	-0.07	-0.09	-0.07
	[0.17]	[0.17]	[0.17]	[0.17]	[0.17]	[0.17]
Parents: CASMIN 2c	0.07	0.16	0.24	0.23	0.24	0.23
	[0.19]	[0.19]	[0.19]	[0.19]	[0.19]	[0.19]
Parents: CASMIN 3a/3b	-0.42**	-0.26[+]	-0.14	-0.12	-0.13	-0.12
	[0.15]	[0.15]	[0.16]	[0.15]	[0.16]	[0.15]
GPA of highest school certificate		-0.67**	-0.66**	-0.64**		
		[0.08]	[0.08]	[0.08]		
in year 1					-0.70**	-0.68**
					[0.18]	[0.18]
in year 2					-0.49**	-0.47**
					[0.16]	[0.16]
in year 3–4					-0.81**	-0.78**
					[0.17]	[0.17]
in year 5–8					-0.70**	-0.66**
					[0.16]	[0.15]
Age at enrolment				0.09**		0.09**
				[0.02]		[0.02]
Pathway 1				*ref.*	*ref.*	*ref.*
Pathway 2			0.50**	0.15		
			[0.18]	[0.21]		
in year 1–2					0.67**	0.32
					[0.23]	[0.26]
in year 3–8					0.30	-0.05
					[0.27]	[0.29]
Pathway 3			0.45*	0.40*		
			[0.18]	[0.18]		
in year 1–2					0.64**	0.59*
					[0.24]	[0.24]
in year 3–8					0.23	0.19
					[0.27]	[0.27]
Pathway 4			0.64**	0.18		
			[0.21]	[0.25]		
in year 1–2					0.40	-0.06
					[0.31]	[0.34]
in year 3–8					0.85**	0.39
					[0.27]	[0.29]

*Notes. Standard errors in brackets. [+] p < 0.10, * p < 0.05, ** p < 0.01. Source: NEPS SC6; own calculations.*
Number of persons: 1,704; number of events (dropouts): 289. Due to low numbers of events per pathway in each single time period, Models 5 and 6 include constraints for educational pathways indicating that the effect for the first year equals the effect for the second year and the effect for the third and fourth year equals the effect for the fifth to eighth year.

Table A4. Piecewise constant exponential models on dropout from universities of applied sciences within 8 years of starting tertiary studies

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year 1	-8.51	-12.64[+]	-14.53[+]	-14.62[+]	-13.77[+]	-13.84[+]
	[7.22]	[7.37]	[7.45]	[7.48]	[7.48]	[7.50]
Year 2	-8.74	-12.85[+]	-14.73*	-14.82*	-13.98[+]	-14.05[+]
	[7.22]	[7.37]	[7.45]	[7.48]	[7.48]	[7.50]
Year 3–4	-9.11	-13.21[+]	-15.07*	-15.17*	-14.52[+]	-14.59[+]
	[7.23]	[7.38]	[7.46]	[7.49]	[7.49]	[7.52]
Year 5–8	-8.40	-12.56[+]	-14.45[+]	-14.54[+]	-13.78[+]	-13.84[+]
	[7.25]	[7.40]	[7.47]	[7.50]	[7.51]	[7.53]
Women	-0.29	-0.18	-0.18	-0.18	-0.18	-0.18
	[0.21]	[0.21]	[0.21]	[0.21]	[0.21]	[0.21]
Entry year	0.06	0.15	0.19	0.19	0.17	0.18
	[0.16]	[0.16]	[0.17]	[0.17]	[0.17]	[0.17]
Entry year sq.	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
General HE entrance certificate	-0.30	-0.48*	-0.52*	-0.52*	-0.50*	-0.50*
	[0.20]	[0.20]	[0.23]	[0.23]	[0.23]	[0.23]
Parents: CASMIN 1a/1b/1c	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Parents: CASMIN 2a/2b	-0.23	-0.19	-0.17	-0.18	-0.18	-0.19
	[0.27]	[0.27]	[0.27]	[0.27]	[0.27]	[0.27]
Parents: CASMIN 2c	0.23	0.23	0.33	0.33	0.33	0.33
	[0.32]	[0.33]	[0.33]	[0.33]	[0.33]	[0.33]
Parents: CASMIN 3a/3b	0.08	0.01	0.07	0.07	0.07	0.07
	[0.25]	[0.24]	[0.25]	[0.25]	[0.25]	[0.25]
GPA of highest school certificate		-0.89**	-0.90**	-0.90**		
		[0.15]	[0.15]	[0.15]		
in year 1					-1.01**	-1.01**
					[0.27]	[0.27]
in year 2					-1.05**	-1.05**
					[0.31]	[0.31]
in year 3–4					-0.90**	-0.90**
					[0.30]	[0.30]
in year 5–8					-0.53	-0.53
					[0.33]	[0.34]
Age at enrolment				-0.01		-0.00
				[0.03]		[0.03]
Pathway 1			*ref.*	*ref.*	*ref.*	*ref.*
Pathway 2			0.14	0.15		
			[0.30]	[0.32]		
in year 1–2					-0.05	-0.03
					[0.39]	[0.40]
in year 3–8					0.36	0.37
					[0.46]	[0.47]
Pathway 3			0.73*	0.73*		
			[0.29]	[0.29]		
in year 1–2					0.72*	0.72*
					[0.36]	[0.36]
in year 3–8					0.69	0.69
					[0.46]	[0.46]
Pathway 4			0.01	0.02		
			[0.29]	[0.30]		
in year 1–2					-0.23	-0.22
					[0.36]	[0.37]
in year 3–8					0.30	0.31
					[0.40]	[0.41]

Notes. Standard errors in brackets. [+] *p < 0.10,* * *p < 0.05,* ** *p < 0.01. Source: NEPS SC6; own calculations.*
Number of persons: 863; number of events (dropouts): 113.
Due to low numbers of events in each single time period, Models 5 and 6 include constraints for educational pathways indicating that the effect for the first year equals the effect for the second year and the effect for the third and fourth year equals the effect for the fifth to eighth year.

Endnotes

[1] The "contrasting nature" (Mayer et al., 2007) between universities and universities of applied sciences might have converged to some degree due to the restructuring of study programmes decided in Bologna in 1997. In this article, however, we still concentrate mainly on study programmes heading towards the traditional degrees, because only a small portion of the present sample is already subject to this recent development.

[2] Even when we control for pre-tertiary pathways but not for the grade-point average of the highest school certificate, the effect of parental education is still significant on a 10 per cent level.

[3] The literature shows that the choice of fields of study relates to social origins (e.g. Ayalon & Yogev, 2005). There is also evidence that dropout depends on the field of study (Heublein, Hutzsch & Schreiber, 2010). Moreover, educational pathways might be connected to certain fields of study, making fields of study a potential mediator in the relationship between social origins, educational pathways, and dropout. Unfortunately, our data do not allow us to include fields of study as a time-varying covariate, because interviewers were asked to record only the last major in respondents who changed their field of study. In order to test for robustness, however, we include groups of study fields as time-constant variables. The effects of social origins and educational pathways do not change when the fields of study are included as covariates (see Tables A5 and A6 in the supplementary material).