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Educational Pathways and Dropout From Higher Education in Germany[1]

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Abstract

Extending access to higher education leads 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 test this empirically by analysing pre-tertiary pathways in retrospective life-course data from the "Adult Education and Life-Long Learning" stage of the German National Educational Panel Study (NEPS) and assessing time dependency with event history analysis. Results suggest that prior educational pathways substantially influence dropout rates in Germany. Students taking the direct pathway via the *Gymnasium* 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 influence dropout rates significantly at universities of applied sciences.

Keywords

1 Introduction

Modern societies respond to economic competition in times of accelerated technological change by increasing the proportion of higher education graduates. They pursue this goal by opening 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, the newly entitled groups might face higher obstacles to obtaining a higher education degree. If chances are unequal between established and newly entitled groups, any effective strategy to increase the proportion of tertiary graduates must include not only opening but also retention strategies.

Dropout from higher education is quite prevalent in modern societies. Between 1992 and 2001, about one-fifth to one-quarter of students in Germany (21–25 per cent) quit higher education without graduating. Whereas dropout at universities ranged from 20–26 per cent, dropout at universities of applied sciences was 17–22 per cent of first-year students in the same time span (Heublein, Hutzsch, and Schreiber, 2009: 6). In terms of direct costs, 'lost' time, and foregone opportunities as well as foregone income, the timing of dropout is crucial and consequential for the further career. At which point in time students quit higher education seems to depend heavily on the type of degree: Dropout of students heading for the recently introduced bachelor and master degrees primarily takes place within the first two half-year semesters (63 per cent of all dropouts), whereas dropout in study programmes heading towards the traditional diploma degrees reaches only 20 per cent in the same time and is distributed more equally over the first 4 years. Although the majority of those who drop out in the latter study programmes quit studies within the first 4 years of higher education, a considerable proportion of 35 per cent still leaves afterwards (Heublein et al., 2009: 49).

In the United States, a large body of literature on the dropout and persistence of students in higher education has built up since the 1970s. For example, Bean (1980), Pascarella, Pierson, Wolniak, and Terenzini (2004), Spady (1970), and Tinto (1975) have all had a strong influence on the research field with their idea that students' persistence depends on their integration into the social and academic community at their college. These findings probably do not transfer directly to Europe because of the major differences between higher education systems. Despite the empirical relevance of dropout in Europe, there have been very few extensive studies of its underlying mechanisms in European countries.

Drawing on the theory of Bourdieu (e.g. 1977), Berger (2000), Longden (2004), Reay, Davies, David, and Ball (2001), and Thomas (2002) have used qualitative methods to highlight the cleavages between the habitus of origin and the institutional habitus for students from a lower social background. These cleavages are difficult to overcome and often lead to dropout. In addition, psychological studies have analysed how dropout relates to motivation, interest, self-concept, self-efficacy, emotional stability, conscientiousness, or learning strategies (e.g. Brandstätter, Grillich, & Farthofer, 2006; Schiefele, Streblow, and Brinkmann, 2007). From a sociological point of view, Hadjar and Becker (2004) have studied dropout among sociology students in two German universities from a rational choice perspective, and Georg (2009) has focused on disentangling individual and institutional factors contributing to dropout with a multilevel analysis. Both of these studies, however, were restricted to cross-sectional data using the self-rated intention to quit college studies rather

than actual dropout. Turning to large-scale longitudinal analyses, at least two recent studies have focused on dropout among certain groups in Europe. Reisel and Brekke (2010) examined dropout of ethnic minority groups in a comparison between Norway and the United States. Mastekaasa and Smeby (2008) used data from Oslo University to tackle how female versus male student dropout relates to study choice and the gender composition of study programmes. A little less recently, Meulemann (1992) used retrospective data from a German secondary school cohort born in 1955 to analyse how biographical circumstances and starting positions influence dropout at universities.

Apart from these exceptions, sociological studies searching for mechanisms of dropout based on recent large-scale, longitudinal nationwide data are very scarce in Europe. In this article, we want to contribute to the research field by trying to gain insights into the mechanisms of dropout from a life-course perspective using recent longitudinal nationwide data. We tackle the question whether dropout risks differ between groups that traditionally have had broad access to higher education and groups to whom access has been opened up by policy efforts during the educational expansion: Do social origins and previous secondary or post-secondary educational pathways impact on dropping out of higher education, and, if so, during which period of higher education?

2 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. 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.

There are different types of higher education entrance qualification. A full higher education entrance certificate (*Abitur; allgemeine Hochschulreife*) can be acquired at the *Gymnasium* or at certain technical schools, and entitles the holder to take up studies at all higher education institutions in all fields of study. A subject-bound higher education entrance certificate (*fachgebundene Hochschulreife*) is offered by vocational secondary schools such as the *Berufs-* and *Fachoberschule* and entitles the holder to higher education studies in certain fields of study. Finally, there is also a higher education entrance certificate with restricted access to universities of applied sciences (*Fachhochschulreife*). This contains a school-based and a vocational part. The school-based part can be obtained at all schools offering the general higher education entrance certificate, but the full qualification, which also contains a vocational part to be obtained within a certain time of internship or other working experience, is offered at vocational schools such as the *Fachoberschule*, *Fachschule*, or *Berufsschule* (Autorengruppe Bildungsberichterstattung, 2010, Table F1-7web). In the years 1995 to 2008, the vast majority (70–76 per cent) of students with higher education

entrance qualifications had the general higher education entrance certificate. It is also possible to enter higher education without a school-based entrance certificate via a special exam for the talented (*Begabtenprüfung*) or through vocational qualifications. However, only about 1 per cent of students access higher education on these paths (Autorengruppe Bildungsberichterstattung, 2010: 118, Table F1-4A).

Whereas educational inequality in completing secondary education decreased during the period of educational expansion, social inequality in post-secondary decisions increased (Mayer, Müller, and 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 entitlement (Becker and Hecken, 2009; Hillmert and Jacob, 2003; Mayer et al., 2007; Müller and Pollak, 2004; Reimer and Pollak, 2010; Schindler and Reimer, 2011). The decision whether to enter higher education or to take up other pathways after the *Abitur* depends more strongly on class-specific choices (secondary effects) than on class-specific ability differences (primary affects), and the impact of secondary effects on this decision is even growing in importance (Schindler and Reimer, 2011).

Those who have decided to take up higher education studies differ in their educational biography depending on their social origins. According to Jacob and Weiss (2010), a total of 30–37 per cent of university students in the birth cohorts 1955 to 1971 have passed through the standard sequence from primary school to *Gymnasium* to university. Higher social classes follow this standard sequence significantly more often. In the 1971 cohort, about 40 per cent of students with a higher social background passed through the standard sequence compared to 29 per cent with a lower background. In spite of the expansion of the *Gymnasium*, these class differences have remained stable over time (Jacob and Weiss, 2010).

The decision to enter higher education involves options in itself. The higher education system in Germany is binary: 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.

Universities of applied sciences were introduced between 1969 and 1971 to replace the former schools of engineering (*Ingenieurschulen*). Their share of first-year students increased from 26 per cent in 1975 to 38 per cent in 2008 (Autorengruppe Bildungsberichterstattung, 2010, Table F2-1A). This differentiation between universities and universities of applied sciences within the higher education system also leads to social inequalities. 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 the different institutions award 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: the chance to acquire a position in the service class and especially the higher service class is

much higher for university graduates, although differences had decreased somewhat in 1995 in comparison to 1982 (Müller, Brauns, and Steinmann, 2002).[2]

3 Theoretical Considerations

This section considers explanations for why and when students drop out. We refer to theories on differential learning environments, to rational-choice-based theories of educational decisions, and to the concept of social and academic integration.

3.1 Mechanisms Linking Educational Pathways and Dropout From Higher Education

Having passed through a series of selective transitions on their way to higher education, first-year entrants might well be quite similar in their achievement level and equally able to cope with tertiary studies. What makes us believe that they might nonetheless differ according to which educational pathway they have taken?

According to research on differential learning environments, the school, the classroom, and teaching characteristics impact on the further development of achievement and attitudes (e.g. Cervini Iturre, 2005; Dar and Resh, 1986; Opdenakker, Van Damme, De Fraine, Van Landeghem, & Onghena, 2002). Especially in countries with highly stratified educational systems, the school track influences competencies (Dronkers, van der Velden, and Dunne, 2012: 25). The mechanisms underlying the effects of differential learning environments are as follows: Schools differ in institutional characteristics such as curricula and teaching traditions. Also, teachers in different school forms are differently trained. Length of study programmes along with the requirements and contents of teacher training vary between school types. Due to these institutional differences, students attending different school tracks might develop differently even if they have the same initial level of competencies. School types differ not only in institutional characteristics but also in the composition of their pupils in terms of performance levels and socio-economic background. This composition might influence individual motivation, attitudes towards school and learning, as well as aspirations. Thus, school effects can be differentiated as institutional and compositional effects that—on top of individual and family related factors—explain differences in performance gains of pupils attending different tracks (Baumert, Stanat, and Watermann, 2006).

Indeed, several studies have shown that tracking leads to a differential development of competencies after controlling for the initial level of performance (see Dronkers et al., 2012; Maaz, Trautwein, Lüdtke, and Baumert, 2008). The homogeneous learning environments

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[2] The "contrasting nature" (Mayer, Müller, and Pollak, 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. The process of restructuring has already gone quite far within a short period: Whereas higher education studies before the Bologna process offered the former German higher education degrees (*Diplom, Magister, Staatsexamen*), 23 per cent of study programmes already offered a bachelor or master degree in the study year 2004/2005. This increased to 82 per cent in 2010/2011. Only a few study programmes such as law, pharmacy, medicine, and part of teacher training still offer state examinations, and a few study programmes such as music, art, and theology still offer a diploma. In this article, however, we still concentrate mainly on study programmes heading towards the traditional degrees, because only a small part of the sample is already subject to this recent development.

have a differential influence on students' levels of achievement. High-performing students are considered to profit most from tracking (Baumert et al., 2006: 110–11) or to be less sensitive to the achievement level in their classroom, whereas the achievement of low-performing students is influenced more strongly by the classroom composition (Dar and Resh, 1986). However, institutional and compositional effects also impact on the development of social inequalities. Whereas they foster performance differences between school tracks, they seem rather to decrease inequalities within school tracks (Maaz et al., 2008). Thus, once in a *Gymnasium*, pupils from a lower social background benefit in the same way as pupils from a higher social background from institutional characteristics and composition effects. However, the probability of attending a *Gymnasium* at the same level of competencies is much lower for a child from a lower social background. Thus, due to the distribution to different types of schools, social inequality increases on the secondary level.

The composition of students and consequently the probability that the individual will meet peers with certain characteristics may influence achievement and the further educational career. Academic performance might be influenced by the level of achievement through competition and motivation as well as by 'the interaction between peers, in particular their level of conversation, shared hobbies, books and out-of-class activities' (Harker and Tymms, 2004: 179). But educational aspirations might also be influenced: at the *Gymnasium*, there is a greater chance of meeting students aiming towards a higher education degree, whereas at other schools, the majority of peers are heading towards non-tertiary vocational training. At the beginning of tertiary studies, this might distract students with upwardly mobile educational biographies because alternative educational pathways are more salient when observed in peers. For example, if peers are already earning their own money after a shorter vocational training, this might contribute to the decision to quit higher education. First-year students coming from schools in which the majority of students are aiming towards non-tertiary vocational training might also experience attitude differences compared to fellow tertiary students. This might lead to difficulties in integration that are also considered to impact on dropout rates (Tinto, 1975).

Furthermore, according to the big-fish-little-pond effect (Marsh, 1987), students otherwise sharing the same achievement level will develop a higher self-concept if they are attending a school with a lower average achievement level. This effect also remains stable after graduating from secondary school (Marsh, Trautwein, Lüdtke, Baumert, & Köller, 2007). At the *Gymnasium*, the majority of students acquire a higher education entrance certificate and move on to higher education. On the educational pathways outside the *Gymnasium*, however, the only students entering higher education are—relative to their classmates—the most highly achieving and motivated ones. These students who develop a high level of academic self-concept at school might experience substantial losses of academic self-concept when they enter a higher education institute at which the average performance level is higher. This might also foster the inclination to dropout.

Nonetheless, the more rigorous selection processes in longer and less institutionalized pathways require even higher motivation and tenacity compared to the standard higher tracks (Breen and Jonsson, 2000). These assets might help to master times of frustration in tertiary studies: students who reach higher education via more indirect pathways thus might

be a selection of very motivated and tenacious students who should, in turn, be less vulnerable to dropout.

Compared to tertiary students without vocational qualification, students with a vocational qualification are more likely to have good opportunities on the labour market and, therefore, also a stronger incentive to quit tertiary studies. In the stratified German labour market, school leavers without (tertiary or non-tertiary) vocational qualifications face higher risks of labour market exclusion even if they have the highest school-leaving certificates (Giesecke, Ebner, and Oberschachtsiek, 2010). Thus, those who have already obtained a vocational qualification can step back more easily into the labour market as soon as tertiary studies do not meet their expectations. They might also still be in contact with persons from their former working environment who can provide them with information on open positions and thus enhance opportunities and reduce costs of job search (Granovetter, 1973). Hence, the alternative of quitting studies and entering the labour market should be more attractive for students with vocational qualifications.

3.2 The Role of Social Origins

As mentioned above, educational pathways before higher education are class-specific (e.g. Becker and Hecken, 2009; Jacob and Weiss, 2010; Reimer and Pollak, 2010; Schindler and Reimer, 2011): students from higher classes have more often taken the standard path than students from lower classes. If pathways offside the academic track produce higher dropout rates, this should result in social inequality of dropout.

According to Tinto (1975, 1993), 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 who find it easy to fulfil academic requirements based on values and norms of the academic system are considered to be less at risk of quitting tertiary studies before graduation. Students from a higher social background have less difficulty in understanding the culture of higher education, because their access to a higher level of social and cultural capital through their family relations (Pascarella et al., 2004) makes it easier for them to integrate. Similar arguments can be found in studies following the tradition of Bourdieu (Jones and Thomas, 2001; Thomas and Quinn, 2006; Reay, 1998) that highlight the cleavages between the habitus of origin and the institutional habitus, and show how difficult it is for students from a lower social background to overcome these cleavages. Hansen and Mastekaasa (2006), for example, found that after controlling the secondary school grade-point average, students at Norwegian universities get higher grades when they have higher levels of cultural capital.

According to the principle of relative risk aversion (Breen and 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 losing their status of origin by dropping out of higher education. Hence, dropout involves higher costs for students with highly educated parents than for students whose parents have no tertiary degrees. Even when they have already achieved a vocational qualification before entering tertiary education, the barrier to dropping out should be lower for students from a lower social background, because they will probably be able to maintain the same status as

their parents even without graduation. Students from a higher social background with prior vocational qualifications, however, would still risk status demotion if they were to drop out.

3.3 The Role of Time

Literature on dropout emphasizes that dropout should be seen as a process in time (e.g. Alexander, Entwisle, and Kabbani, 2001). Drawing on the social anthropologist van Gennep's (1960) considerations on the establishment of membership in traditional societies, Tinto distinguishes three stages of integration at a higher education institute: separation, transition, and incorporation. According to this, students shift from their original community of family, secondary school, and friends to another when starting their tertiary studies. They must 'separate themselves, to some degree, from past associations in order to make the transition to eventual incorporation to the life of the college' (Tinto, 1988). Within different stages of the integration process, determinants change in their importance for dropout. Tinto argues, for example, that social contacts are most crucial in the first months, whereas academic integration gains in importance towards the end of studies (Tinto, 1997).

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—especially if they are a selection of exceptionally motivated students. Furthermore, newly gained knowledge should gain in importance compared to knowledge 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 et al. (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 and benefit calculations. According to human capital theory (e.g. Becker, 1993), 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. Additionally, they risk losing the human capital gained through their vocational training if they do not use it (Burda, 2001). This should result in an early dropout of students with prior vocational qualifications.

4 Hypotheses

Hypothesis 1a: Drawing on differential learning environments, we expect that students who reach higher education offside the standard academic track of the *Gymnasium* will have higher dropout risks because they are more likely to be in contact with peers who have non-tertiary career plans, they are less specifically prepared for higher education, and they experience losses in terms of their self-concept.

Hypothesis 1b: Based on findings that less institutionalized and longer pathways require a higher level of motivation, however, we expect students who reach higher education via upwardly mobile paths to be a selection of extremely motivated and tenacious students who, in turn, should have lower dropout risks.

Hypothesis 2: According to sociological and economic models on educational decisions, we expect higher dropout risks for vocationally qualified students because their better opportunities on the labour market and higher probabilities of status maintenance reduce the costs of quitting studies.

Hypothesis 3: If educational pathways before higher education have an impact on dropout rates, we expect that they partly explain social selectivity in dropout because educational pathways are class-specific.

Hypothesis 4: Because students with more highly educated parents have access to a higher level of resources, more easily 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 from less well educated parents.

Hypothesis 5: 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 what was learned at school. 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 6: We expect the effects of pre-tertiary pathways and social origin to be less pronounced at a university of applied sciences than at an academic university, because the former has a more practical orientation. Preparation for theoretical work may be less important, thereby reducing any advantage of the standard pathway. At the same time, practical experience obtained in a previous vocational training might be addressed within the curriculum, leading to lower dropout rates of students with vocational qualifications than at a university. The more practical orientation might also make students from lower social backgrounds experience fewer cultural cleavages.

5 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 data include detailed retrospective information on education, work career, and family as well as extensive cross-sectional information on various subjects. The entire education and labour market history is surveyed on the basis of spells, thus we can identify starting points, durations and successful completions of tertiary studies. The study population consists of 11,649 individuals born between 1944 and 1986 who were surveyed in 2009/2010. The sample is sub-divided into the ALWA sample containing 6,572 respondents from the birth cohorts 1956 to 1986 who were recruited in 2007 by the forerunner study *Working and*

Learning in a Changing World (ALWA) and the NEPS sample containing 5,077 respondents recruited for the first wave of the NEPS.

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 the situation in West Germany (see Solga, 1997). Also, the change of systems is likely to have had an impact on the study careers of persons who started studying in the German Democratic Republic (GDR). Finally, due to differences in the educational systems, pre-tertiary educational pathways might not have had the same impact on dropout in the GDR. Therefore, we exclude school and study episodes in the NEPS sample that are found to have taken place in the GDR. This information not being available for the ALWA sample, we exclude ALWA cases 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 do not consider persons who have immigrated to Germany after the age of 7 years, spent more than a year abroad during their school career, or studied in a tertiary institution abroad. Cases with missing values are excluded list-wise from the analysis.

We restrict our analyses to study episodes at the university and university of applied sciences (both ISCED-level 5A). We exclude ISCED-level 5B institutions such as universities of cooperative education (*Berufsakademien*), business academies (*Wirtschaftsakademien*), or academies of public administration (*Verwaltungsakademien*) that are not recognized comprehensively as university-level institutions by federal law. Although some colleges of public administration (*Verwaltungsfachhochschulen*) that prepare students for upper grade civil service are recognized as university-level institutions, we do not include these because they cannot be separated from colleges of public administration that are below university level.

We analyse dropout from first tertiary studies[3] as the dependent variable defined as leaving first tertiary studies without a degree and not attending higher education again within the following 12 months. Using this definition, we avoid considering changes in the field of studies as dropouts.

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[3] We concentrate on *first* tertiary studies because causes for the dropout from second or subsequent tertiary studies are likely to differ from those for dropout from first tertiary studies: persons in second or subsequent tertiary studies are older, often have already obtained a first tertiary degree, and are more strongly subject to external obligations such as childcare. Furthermore, advanced tertiary studies such as doctorates or other postgraduate programmes differ from first tertiary study programmes in length and structure. Therefore, in many respects they are not comparable to first tertiary studies and should be studied separately.

Table 1: Types of pre-tertiary pathways

Type of pathway	School type at lower secondary level	Vocational and educational training at upper secondary level
(1) Standard	*Gymnasium*	No vocational training
(2) Standard + voc. qualification	*Gymnasium*	Vocational training
(3) Upwardly mobile	Other than *Gymnasium*	No vocational training
(4) Upwardly mobile + voc. qualification	Other than *Gymnasium*	Vocational training

For the purpose of the present analysis, we distinguish four types of educational pathway after primary school and before tertiary entrance. Students classified in the first two pathways have attended the Gymnasium before Grade 10 or, more precisely, before 10 years after they entered the educational system. Whereas students on the first path go to university without further vocational training, students on the second path gain a vocational qualification before entering higher education. Pathways 3 and 4 are upwardly mobile in the sense that students attend the higher or lower vocational track (*Haupt-* or *Realschule*) at the lower secondary level and switch later to an upper secondary school offering a higher education entrance certificate. Here again, we distinguish between paths with vocational training and those without. Whereas the succession of educational stages in Pathways 1 to 3 is (mainly) straightforward, the succession at upper secondary level of students classified as Pathway 4 is left unspecified. They might first gain a higher education entrance certificate and then a vocational qualification, but they might also do it the other way around. The standard pathway is introduced into the models as reference category.

Social origin is measured by the parents' highest educational degree. Students who have at least one parent with a higher education degree are contrasted with students whose parents have an educational level beneath a tertiary degree. Here again, we do not consider the ISCED-level 5B qualifications as higher education degrees.

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. Four first-year student cohorts between 1960 and 2010 (1960–1973, 1973–1985, 1986–1998, 1998–2010) are introduced because changes in the study conditions and in the composition of college students may have an impact on dropout. We control for changing between university and university of applied sciences because it might relate to social origins and dropout. The difference between 4- and 2- year colleges in the United States has been found to have an impact on the probability of completing studies and to be related to social origins (Goldrick-Rab and Pfeffer, 2009). The grade-point average of the highest school certificate is 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 standardize the grade-point average by the year of graduation. Additionally, we reverse the standardized values so that higher values indicate better grades.

In order to test our hypotheses and to take the time dependency of dropout into account, we use the method of event history analysis. This method allows a dynamic modelling of the transition into a destination state and helps to handle the issue of censoring (Singer and Willett, 2003). For the bivariate analysis, we estimate functions indicating the proportion of persons who have dropped out (H^a) or completed (H^b) tertiary education until a certain point in time (see Rohwer, 2006).

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

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

r^a represents the transition rate of dropout, r^b 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 compute the survivor function with the Kaplan Meier method.

For the multivariate analyses, we estimate transition rate models. The transition rate is the intensity of experiencing an event under the condition of not having experienced the event before (Blossfeld and Rohwer, 2002).

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

Transition rate models are able to take time-varying covariates into account and to estimate time-varying effects. The underlying dependent process is the monthly duration in first tertiary studies ending with an event for dropouts.

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 introduce 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 14 per cent of the original risk set at university and 9 per cent of the original risk set at the university of applied sciences. We run the models separately for the university and the university of applied sciences because these two 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.

6 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.

6.1 Descriptive Results

Table 2: *Prevalence of pre-tertiary educational pathways*

	University			University of applied sciences		
Types of pre-tertiary pathways	**Freq.**	**%**	**%***	**Freq.**	**%**	**%***
(1) Standard pathway	1,297	71	70	299	33	30
(2) Standard pathway + voc. qual.	190	11	10	166	18	18
(3) Upwardly mobile pathway	202	11	13	126	14	14
(4) Upw. mobile pathway + voc. qual.	135	7	7	325	35	38
Total	1,824	100	100	916	100	100

Source: NEPS: SC6: 1.0.0; own calculations.
*Standardized weights based on Mikrozensus 2009.

Table 2 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 regarding the prevalence of each pathway in the population. The distribution differs largely between the two higher education institutions. The majority of first-year students (70 per cent) reach the university via the standard pathway. The remaining 30 per cent are distributed fairly equally across the three other pre-tertiary pathways. At the university of applied sciences, however, the picture is different: Here, less than every third student has taken the standard pathway. In comparison to university students, students at the university of applied sciences more often have obtained a vocational qualification before entering higher education. The largest group reaches the university of applied sciences via an upwardly mobile pathway combined with a non-tertiary vocational training (38 per cent). Also, the combination of the standard pathway with a vocational qualification is more frequent at the university of applied sciences (18 per cent) than at university (10 per cent). Students from higher and lower social backgrounds differ largely in the pathways they have taken before entering higher education (see Tables A3 and A4 in the appendix). In both higher education institutions, the proportions of students with more highly educated parents who have taken the standard pathway are much higher compared to those of students with less educated parents. At the university of applied sciences, 45 per cent of students with at least one parent who completed tertiary education have taken the standard pathway and 20 per cent the upwardly mobile pathway with vocational qualifications. Students whose parents have not graduated from higher education reveal the opposite

picture: 45 per cent reach the university of applied sciences via the upwardly mobile pathway with vocational qualifications, whereas only 25 per cent pass through the standard pathway.
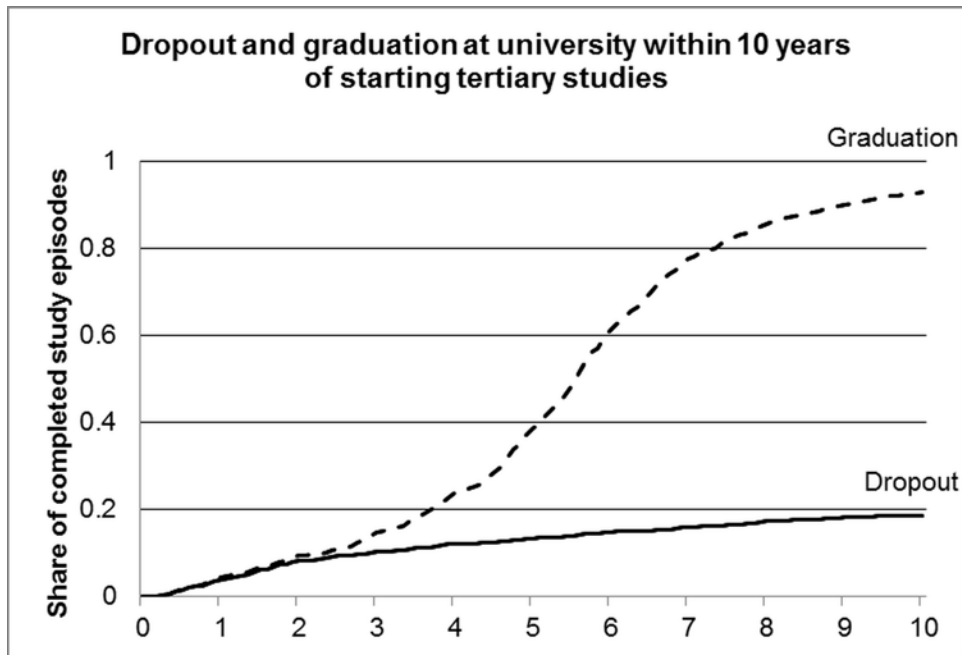
Source: NEPS: SC6: 1.0.0; own calculations
Number of events: 320 dropouts, 1,204 graduations

Figure 1: *Proportion functions of dropout and graduation from higher education at university based on survivor functions (Kaplan Meier method)*
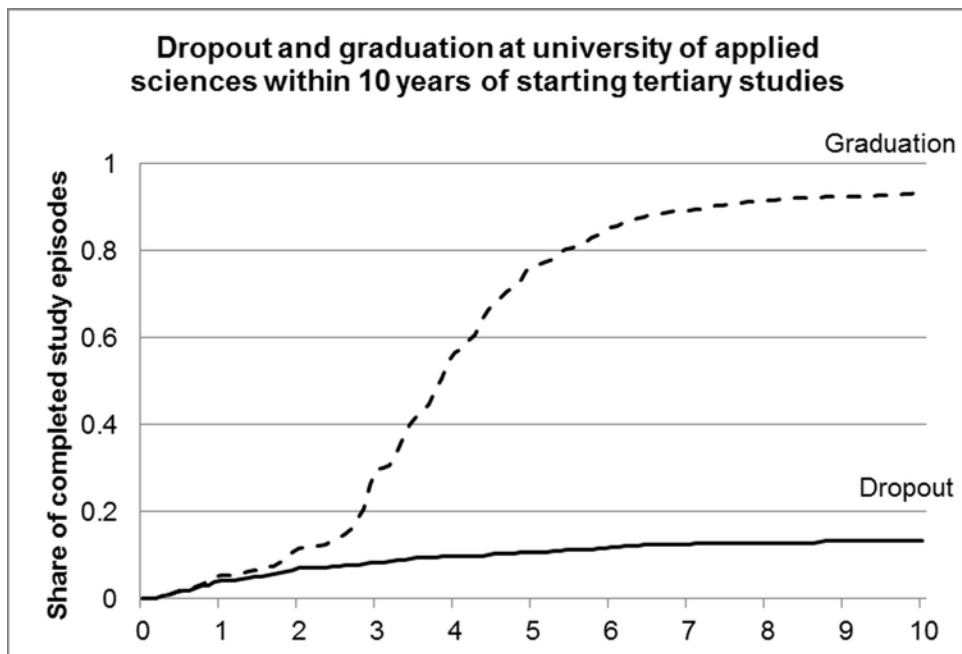
Source: NEPS: SC6: 1.0.0; own calculations.
Number of events: 116 dropouts, 705 graduations.

Figure 2: *Proportion functions of dropout and graduation from higher education at university of applied sciences based on survivor functions (Kaplan Meier method)*

The functions indicate the proportions of persons who leave 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 university, students there graduate later than those at the university of applied sciences. In the first 3 years, graduations are extremely rare, but more than half of the dropouts have already taken place.

6.2 Multivariate Results

Table 3: *Piecewise constant exponential models on dropout from university within 8 years of starting tertiary studies*

Variables	Model 1		Model 2		Model 3		Model 4	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Year 1	-5.94**	0.35	-6.25**	0.36	-6.70**	0.38	-6.61**	0.41
Year 2	-5.66**	0.35	-5.96**	0.35	-6.40**	0.38	-6.33**	0.40
Year 3–4	-6.37**	0.35	-6.65**	0.36	-7.09**	0.38	-7.30**	0.41
Year 5–8	-6.13**	0.35	-6.42**	0.36	-6.84**	0.38	-7.92**	0.40
One or both parent(s) with HE degree	-0.34**	0.13	-0.23[+]	0.13	-0.14	0.13		
***Year 1**							-0.47	0.29
***Year 2**							-0.14	0.24
***Year 3–4**							-0.01	0.26
***Year 5–8**							-0.02	0.24
GPA of highest school certificate			-0.48**	0.06	-0.47**	0.06		
***Year 1**							-0.50**	0.14
***Year 2**							-0.32**	0.12
***Year 3–4**							-0.56**	0.13
***Year 5–8**							-0.55**	0.12
Standard pathway + voc. qualification (2)					0.52**	0.18		
***Year 1–-2**							0.76*	0.23
***Year 3–-8**							0.24	0.27
Upwardly mobile pathway (3)					0.44*	0.17		
***Year 1–2**							0.66*	0.23
***Year 3–8**							0.20	0.27
Upwardly mobile pathway + voc. qualification (4)					0.67**	0.21		
***Year 1–2**							0.37	0.31
***Year 3–8**							0.94*	0.26

Source: NEPS: SC6: 1.0.0; own calculations
Number of persons: 1,824; number of events (dropouts): 296
** p < 0.01, * p < 0.05, [+] p < 0.1
Controls (not reported in the table for the sake of clarity, see appendix for complete results): Gender, first-year student cohorts (1960–1973, 1973–1985, 1986–1998, 1998–2010), changing from university to university of applied sciences, type of higher education entrance certificate
Due to low numbers of events per pathway in each single time period, Model 4 includes constraints 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 differ in their dropout risks according to the educational pathway they have taken before university. 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 persistence at university (Hypothesis 1a). We do not find any evidence for the conflicting hypothesis that students who reach higher education via longer and less institutionalized pathways are a positive selection of extraordinarily motivated students (Hypothesis 1b). Pathways with vocational training seem to induce the highest dropout rates. This supports the hypothesis that these students are more strongly distracted from higher education because of better labour market opportunities than students without additional vocational qualifications (Hypothesis 2).

In Model 4, we introduce time-varying effects in order to test how the influence of the covariates on dropout develops over the duration of tertiary studies. Although the effect of having at least one parent with a higher education degree is not significant in any of the time periods, the pattern of decreasing effects seems plausible. In the beginning, students from a lower social background might be more challenged to overcome cultural cleavages when entering university. Thus, differences in dropout rates are higher. Later, adaptation difficulties might diminish. Moreover, a late dropout is more costly and thus less easy for students from a lower social background to both afford and justify.

We find some evidence for the hypothesis that pre-tertiary pathways matter more strongly in the beginning and lose their impact later as newly acquired knowledge and networks at university become more important (Hypothesis 5). This seems to be the case at least for 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 upward mobile pathway and a vocational qualification. These students are more prone to a late dropout after the first 2 years.

Table 4: *Piecewise constant exponential models on dropout from the university of applied sciences within 8 years of starting tertiary studies*

Variables	Model 1		Model 2		Model 3		Model 4	
	Coef.	*SE*	Coef.	*SE*	Coef.	*SE*	Coef.	*SE*
Year 1	-6.60**	0.52	-6.79**	0.52	-7.02**	0.56	-6.89**	0.61
Year 2	-6.86**	0.53	-7.03**	0.53	-7.25**	0.57	-7.15**	0.62
Year 3–4	-7.19**	0.53	-7.34**	0.53	-7.55**	0.57	-7.77**	0.66
Year 5–8	-6.42**	0.55	-6.63**	0.55	-6.85**	0.59	-6.95**	0.67
One or both parent(s) with HE degree	0.11	0.23	0.01	0.22	0.06	0.23		
***Year 1–2**							0.13	0.30
***Year 3–8**							-0.05	0.36
GPA of highest school certificate			-0.68**	0.12	-0.68**	0.12		
***Year 1**							-0.72**	0.20
***Year 2**							-0.77**	0.24
***Year 3–4**							-0.71**	0.23
***Year 5–8**							-0.51*	0.25
Standard pathway + voc. qualification (2)					0.30	0.30		
***Year 1-2**							0.02	0.40
***Year 3–8**							0.71	0.45
Upwardly mobile pathway (3)					0.65*	0.29		
***Year 1–2**							0.65+	0.37
***Year 3–8**							0.68	0.48
Upwardly mobile pathway + voc. qualification (4)					0.08	0.29		
***Year 1–2**							-0.12	0.39
***Year 5–8**							0.38	0.44

Source: NEPS: SC6: 1.0.0; own calculations
Number of persons 915, number of events (dropouts): 113
*** p < 0.01, * p < 0.05, + p < 0.1*
Controls (not reported in the table for the sake of clarity, see appendix for complete results): gender, first-year student cohorts (1960–1973, 1973–1985, 1986–1998, 1998–2010, type of higher education entrance certificate; We do not control for changing from university of applied sciences to the university because of too few events in this group.
Due to low numbers of events in each single time period, Model 4 includes constraints for parental education and 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.

Contrary to the university, the effect of parental education has no statistically significant influence on dropout rates at the university of applied sciences: students with at least one parent having a higher education degree drop out as often as first generation students.

Therefore, the hypothesis that resources, social and academic integration, or costs of status demotion prevent students from higher social background from dropping out (Hypothesis 4) has to be rejected for the university of applied sciences. Students from a lower social background might find it easier to cope with studies at the university of applied sciences because they include more practically applicable content and refer more directly to the labour market (see Hypothesis 6).

We also find that the effects of pre-tertiary pathways are less pronounced at the university of applied sciences than at the university (see Model 3). Students who combined either a standard pathway or an upwardly mobile pathway with vocational qualification do not differ significantly in their dropout rates from students who took the standard pathway. Only students who took the upwardly mobile pathway show a somewhat higher dropout rate that differs significantly from the dropout rate of students who took the standard pathway. This supports the hypothesis that the university of applied sciences is more successful in retaining students with vocational qualifications because it is more practically oriented (Hypothesis 6). It has to be taken in account, however, that the sample and the total number of dropouts are smaller at the university of applied sciences and thus the probability of significant effects is lower.

As Model 4 shows, the effect of a vocational qualification does not become significant in any time period. Regarding upwardly mobile pathways the effect is significant only in the first 2 years, but it does not decline in the time period from third to eighth year. Thus, we do not find the expected decreasing impact of pre-tertiary pathways (Hypothesis 5).

The literature shows that the choice of fields of study relates to social origins (e.g. Ayalon and Yogev, 2005; Becker, Haunberger, & Schubert, 2010). There is also evidence that dropout depends on the field of study (Heublein et al., 2009). 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 A7 and A8 in the appendix).

7   Summary and Conclusion

In this paper, we have analysed the impact of pre-tertiary educational pathways on dropout rates in higher education and the role of time and social origins in this interplay. The 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.

Our findings suggest that pre-tertiary pathways have an effect on dropout from higher education. At university, we find that pathways offside the academic track or including a

vocational qualification have higher dropout rates than the standard path. This is in line with Hypothesis 1a that students offside the standard pathway face adaptation difficulties, and that students with vocational qualifications might be distracted by better labour market opportunities (Hypothesis 2). At the university 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 institution as predicted by Hypothesis 6. The upwardly mobile pathway without vocational qualification, however, is connected to higher dropout rates at the university of applied sciences as well. We find no support for the conflicting hypothesis Hypothesis 1b that students offside the academic pathway are a selection of exceptionally motivated students who are thus less vulnerable to dropout.

As far as social origins are concerned, there is some evidence at the university that the class-specific choices of educational pathways influence social selectivity in dropout (Hypothesis 3): 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 4 that students with more highly educated parents are less prone to dropout 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 anticipated in Hypothesis 5, at the university, 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 university 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 university of applied sciences, students from a lower social background and students who reach higher education offside the standard pathway experience lower cultural cleavages (Hypothesis 6).

Our hypotheses are based on theoretical considerations derived from rational-choice-based theories of educational decisions, the concept of differential learning environments, and the concept of social and academic integration. 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 and Jonsson, 2000; Pfeffer and 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 by class background if previous educational pathways are controlled. This might be interpreted as support for the life-course hypothesis (Shavit and Blossfeld, 1993) stating that social background loses its impact on decisions as students become adults and more independent from their parents. Concerning students with vocational qualifications, however, results do not contradict the expectations based on rational choice reasoning: vocationally trained students have higher dropout rates, which is

in line with their having lower dropout costs and better labour market opportunities. However, alternative explanations are possible as well. Students with a vocational qualification may, for example, still be involved more intensively in their former working environment, and this may prevent them from investing as much in tertiary studies as their counterparts.

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, direct tuition fees were not introduced in Germany until 2005. Thus, only a small proportion of the sample is concerned. However, even now, only colleges in a few federal states ask for direct tuition fees, and these usually do not exceed 500 Euros per half-year semester. Of course, living costs might influence dropout as well. For financially deprived students, they might have both a direct effect and an indirect effect on dropout rates, because they might have to work more hours in order to earn their living and thus have less time to invest in studying. Furthermore, opportunity costs of foregone income might have an impact on dropout. However, subsidies and loans for students whose parents cannot support them financially also have to be taken into account. As dropout rates between students of different social origins do not differ once educational pathways are controlled, we do not suppose financial costs to be a major factor in social inequality in dropout from higher education.

To understand the dropout decision more precisely and ascertain whether social origins influence the outcome of this decision via perceived costs, returns, and probabilities of success, it would be necessary to measure these details directly. Such data will be available from the NEPS Starting Cohort 5 – Students: From Higher Education to the Labor Market.

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. Dividing into different pathways means that students attend different schools and are exposed to a different composition of students and different teaching cultures. Consequently, when they enter tertiary education, they have different levels of knowledge, different levels of competencies for dealing with theoretical tasks, and different social networks framing their aspirations. We find this a plausible explanation for our result that dropout rates differ depending on the pre-tertiary pathway.

The concept of social and academic integration was introduced as a mechanism to explain why students with different starting positions due to their educational biography or due to their social background should differ in their risk of dropping out of higher education: First, integration should be easier for students from the standard pathway who have higher chances of associating with other students heading towards a higher education degree and who are more familiar with theory-related tasks. More frequent and more intense social and academic interactions might raise their commitment to degree completion and might be the cause for lower dropout rates. Second, students from a higher social background should also integrate more easily because they are used to similar social environments and more familiar with the academic system. We found support for the first argument because students who reach university via the standard pathway drop out less often. Yet, results are not fully in line with the second argument: Differences in dropout rates by social background disappear after controlling for educational pathways. It is plausible, however, that with increasing duration in the educational system, the impact of the socialization within the

family is outweighed by the impact of socialization at school (Shavit and Blossfeld, 1993). Here again, of course, a more precise test of the theoretical concept would require an assessment of social and academic integration based on direct measures. This will become possible when data from the NEPS Starting Cohort 5 – Students: From Higher Education to the Labor Market are available.

Apart from path dependency, results also point out that time dependency plays an important role in dropout. Students with less specific preparation for higher education and—as a tendency—also students from a lower social background seem to face higher adaptation challenges at the beginning of their tertiary studies—at least at university. This is consistent with other research reporting that students from a lower social background have difficulties at the beginning of their tertiary studies (Goldrick-Rab and Pfeffer, 2009: 115; Tinto, 1988). The variation of dropout rates over time underlines the importance of taking time into account as an additional dimension instead of analysing dropout at just one point in time. Modelling dropout as a process with time-specific dropout intensities can help to reveal sensitive phases in which certain groups are especially vulnerable to dropout.

Two characteristics of the German education system seem to be highly important for our results: high stratification (Allmendinger, 1989) and highly standardized vocational education (Blossfeld and Stockmann, 1999). If differential learning environments before tertiary education influence dropout risks from higher education, then differences in dropout rates should be less extreme in less stratified systems in which tracks are less separated, more permeable, and less socially selective. However, social inequality in dropout might then be mediated by choice of schools. Furthermore, the effect of a previous vocational qualification on dropout rates should be lower in countries with a less standardized vocational system. First, in these countries, fewer students entitled to higher education should be attracted by vocational training before higher education; and second, labour market returns to vocational qualifications should be lower in relation to higher education degrees and thus make dropouts more costly.

What does this mean for social inequality in dropout when we look at countries with less stratified and standardized educational systems? First, if pathways into higher education differ less and are less socially selective, starting positions at higher education entrance should be more equal. Second, lower labour market returns to vocational training might lead to lower numbers of risk-aversive students of lower social origin being attracted to vocational training before higher education and to lower numbers of vocationally qualified students quitting tertiary studies. Further comparative research testing these hypotheses empirically should lead to a better understanding of the institutional effects on social inequality of dropout from higher education.

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Appendix

Table A1: *Distribution of characteristics in the sample at certain points in time at the university*

Variables	Year 0		Year 2		Year 5	
	N	*%*	*N*	*%*	*N*	*%*
Number of persons	1,824	100	1,646	100	1,063	100
Women	837	46	750	46	451	42
Men	987	54	896	54	612	58
First-year student cohorts						
1960–1973	202	11	190	12	92	9
1973–1985	652	36	606	37	447	42
1985–1998	501	27	454	28	326	31
1998–2010	469	26	396	24	198	19
Change univ. to univ. of applied sciences	0	0	25	2	37	4
Type of HE entrance certificate	1,747	96	1,584	96	1,030	97
Fields of study						
Medicine	180	10	172	10	128	12
Teacher training	391	21	364	22	180	17
Humanities/Arts	325	18	286	17	185	17
Natural sciences/Mathematics	296	16	263	16	194	18
Engineering	207	11	185	11	132	12
Law	115	6	104	6	65	6
Business/Economics	210	12	178	11	122	11
Other	105	6	96	6	58	5
One or both parent(s) with HE degree	702	38	646	39	428	40
GPA of highest school certificate (mean)	.15		.19		.25	
Pre-tertiary educational pathways						
Standard pathway (1)	1,297	71	1,204	73	790	74
Standard pathway + voc. qualification (2)	190	10	150	9	86	8
Upwardly mobile pathway (3)	202	11	175	11	116	11
Upwardly mobile pathway + voc. qualification (4)	135	7	117	7	71	7

Source: NEPS: SC6: 1.0.0; own calculations

Table A2: *Distribution of characteristics in the sample at certain points in time at the university of applied sciences*

Variables	Year 0		Year 2		Year 5	
	N	*%*	*N*	*%*	*N*	*%*
Number of persons	916	100	796	100	166	100
Women	325	35	293	37	62	63
Men	591	65	503	63	104	37
First-year student cohorts						
1960–1973	103	11	94	12	10	6
1973–1985	293	32	264	33	52	31
1985–1998	259	28	237	30	61	37
1998–2010	261	29	201	25	43	26
Change univ. of applied sciences to univ.	0	0	13	2	9	5
General HE entrance diploma	463	51	406	51	87	53
Fields of study						
Engineering	345	38	306	38	74	45
Business science	139	15	116	15	21	13
Social work/Pedagogics	161	18	146	18	25	15
Other	268	29	227	29	45	27
One or both parents with HE degree	207	23	175	22	45	28
GPA of highest school certificate (mean)	.02		.06		-.032	
Pre-tertiary educational pathways						
Standard pathway (1)	299	33	269	34	52	31
Standard pathway + voc. qualification (2)	166	18	145	18	28	17
Upwardly mobile pathway (3)	126	14	103	13	22	13
Upwardly mobile pathway + voc. qualification (4)	325	35	279	35	64	39

Source: NEPS: SC6: 1.0.0; own calculations

Table A3: *Prevalence of pre-tertiary educational pathways for students whose parents have no HE Degree*

Types of pre-tertiary educational pathways	University			University of applied sciences		
	Freq.	%	%*	Freq.	%	%*
(1) Standard pathway	726	65	64	201	28	24
(2) Standard pathway + voc. qual.	122	11	10	118	17	16
(3) Upwardly mobile pathway	157	14	16	104	15	15
(4) Upw. mobile pathway + voc. qual.	117	10	10	286	40	45
Total	1,122	100	100	709	100	100

Source: NEPS: SC6: 1.0.0; own calculations
*weighted by standardized weights based on Mikrozensus 2009

Table A4: *Prevalence of pre-tertiary educational pathways for students who have one or two parents with an HE degree*

Types of pre-tertiary educational pathways	University			University of applied sciences		
	Freq.	%	%*	Freq.	%	%*
(1) Standard pathway	571	81	79	98	47	45
(2) Standard pathway + voc. qual.	68	10	11	48	23	24
(3) Upwardly mobile pathway	45	6	7	22	11	11
(4) Upw. mobile pathway + voc. qual.	18	3	3	39	19	20
Total	702	100	100	207	100	100

Source: NEPS: SC6: 1.0.0; own calculations
*Standardized weights based on Mikrozensus 2009

Table A5: *Piecewise constant exponential models on dropout from university within 8 years of starting tertiary studies*

Variables	Model 1		Model 2		Model 3		Model 4	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Year 1	-5.94**	0.35	-6.25**	0.36	-6.70**	0.38	-6.61**	0.41
Year 2	-5.66**	0.35	-5.96**	0.35	-6.40**	0.38	-6.33**	0.40
Year 3–4	-6.37**	0.35	-6.65**	0.36	-7.09**	0.38	-7.30**	0.41
Year 5–8	-6.13**	0.35	-6.42**	0.36	-6.84**	0.38	-7.92**	0.40
Women	0.16	0.12	0.20	0.12	0.20	0.12		
*Year 1							0.08	0.25
*Year 2							-0.01	0.23
*Year 3–4							0.51*	0.24
*Year 5–8							0.24	0.23
First-year student cohorts								
1960–1973 (Ref.)								
1973–1985	0.54*	0.24	0.59[+]	0.24	0.55[+]	0.24	0.54*	0.24
1985–1998	0.50*	0.25	0.62*	0.25	0.46*	0.25	0.45[+]	0.25
1998–2010	0.40	0.26	0.52*	0.26	0.41[+]	0.26	0.39	0.26
Change univ. to univ. of applied sciences	-0.15	0.45	-0.23	0.45	-0.21	0.45	-0.22	0.45
Type of HE entrance certificate	-0.29	0.27	-0.14	0.27	0.19	0.29	0.22	0.29
One or both parent(s) with HE degree	-0.34**	0.13	-0.23[+]	0.13	-0.14	0.13		
*Year 1							-0.47	0.29
*Year 2							-0.14	0.24
*Year 3–4							-0.01	0.26
*Year 5–-8							-0.02	0.24
GPA of highest school certificate			-0.48**	0.06	-0.47**	0.06		
*Year 1							-0.50**	0.14
*Year 2							-0.32**	0.12
*Year 3–4							-0.56**	0.13
*Year 5–8							-0.55**	0.12

Table A5 *continued*

Variables	Model 1		Model 2		Model 3		Model 4	
	Coef.	*SE*	**Coef.**	*SE*	**Coef.**	*SE*	**Coef.**	*SE*
Pre-tertiary educational pathways								
Standard pathway (1, Ref.)								
Standard pathway + voc. qualification (2)					0.52**	0.18		
*Year 1–2							0.76*	0.23
*Year 3–8							0.24	0.27
Upwardly mobile pathway (3)					0.44*	0.17		
*Year 1–2							0.66*	0.23
*Year 3–8							0.20	0.27
Upwardly mobile pathway + voc. qualification (4)					0.67**	0.21		
*year 1-2							0.37	0.31
*year 3-8							0.94*	0.26

Number of persons: 1,824; number of events (dropouts): 296

** p < 0.01, * p < 0.05, $^+$ p < 0.1

Due to low numbers of events per pathway in each single time period, Model 4 includes constraints 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.

Source: NEPS: SC6: 1.0.0; own calculations

Table A6: *Piecewise constant exponential models on dropout from university of applied sciences within 8 years of starting tertiary studies*

Variables	Model 1		Model 2		Model 3		Model 4	
	Coef.	*SE*	**Coef.**	*SE*	**Coef.**	*SE*	**Coef.**	*SE*
Year 1	-6.60**	0.52	-6.79**	0.52	-7.02**	0.56	-6.89**	0.61
Year 2	-6.86**	0.53	-7.03**	0.53	-7.25**	0.57	-7.15**	0.62
Year 3–4	-7.19**	0.53	-7.34**	0.53	-7.55**	0.57	-7.77**	0.66
Year 5–8	-6.42**	0.55	-6.63**	0.55	-6.85**	0.59	-6.95**	0.67
Women	-0.29	0.21	-0.16	0.21	-0.16	0.22		
*Year 1–2							-0.65*	0.32
*Year 3–8							0.38	0.30
First-year student cohorts								
1960–1973 (Ref.)								
1973–1985	1.22*	0.53	1.26*	0.53	1.27*	0.53	1.24*	0.53
1985–1998	1.12*	0.53	1.33*	0.53	1.36*	0.54	1.31*	0.54
1998–2010	1.34*	0.53	1.43**	0.53	1.43**	0.54	1.37*	0.54
Type of HE entrance certificate	-0.30	0.20	-0.47*	0.20	-0.47*	0.22		
*Year 1–2							-0.21	0.30
*Year 3–8							-0.75*	0.33
One or both parent(s) with HE degree	0.11	0.23	0.01	0.22	0.06	0.23		
*Year 1–2							0.13	0.30
*Year 3–8							-0.05	0.36
GPA of highest school certificate			-0.68**	0.12	-0.68**	0.12		
*Year 1							-0.72**	0.20
*Year 2							-0.77**	0.24
*Year 3–4							-0.71**	0.23
*Year 5–8							-0.51*	0.25

Table A6 *continued*

Variables	Model 1		Model 2		Model 3		Model 4	
	Coef.	*SE*	**Coef.**	*SE*	**Coef.**	*SE*	**Coef.**	*SE*
Pre-tertiary educational pathways								
Standard pathway (1, Ref.)								
Standard pathway + voc. qualification (2)					0.30	0.30		
*Year 1–2							0.02	0.40
*Year 3–8							0.71	0.45
Upwardly mobile pathway (3)					0.65*	0.29		
*Year 1–2							0.65[+]	0.37
*Year 3–8							0.68	0.48
Upwardly mobile pathway + voc. qualification (4)					0.08	0.29		
*Year 1–2							-0.12	0.39
*Year 3– 8							0.38	0.44

Source: NEPS: SC6: 1.0.0; own calculations

Number of persons: 915; number of events (dropouts): 113

*** p < 0.01, * p < 0.05, [+] p < 0.1*

Due to low numbers of events in each single time period, Model 4 includes constraints for the effects of women, type of HE entrance certificate, parental education, and 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.

Source: NEPS: SC6: 1.0.0; own calculations

Table A7: *Piecewise constant exponential models on dropout from university within the first 8 years including fields of study*

Variables	Model 1		Model 2		Model 3		Model 4	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Year 1	-6.98**	0.45	-7.06**	0.46	-7.57**	0.49	-7.48**	0.51
Year 2	-6.69**	0.45	-6.75**	0.46	-7.26**	0.49	-7.19**	0.50
Year 3–4	-7.39**	0.45	-7.44**	0.46	-7.94**	0.49	-8.18**	0.51
Year 5–8	-7.16**	0.45	-7.22**	0.46	-7.71**	0.49	-7.79**	0.50
Women								
*Year 1	0.21[+]	0.12	0.26*	0.12	0.24*	0.12	0.13	0.25
*Year 2							0.04	0.23
*Year 3–4							0.58*	0.25
*Year 5–8							0.27	0.23
First-year student cohorts								
1960–1973 (Ref.)								
1973–1985	0.51*	0.24	0.54*	0.24	0.50*	0.24	0.50*	0.24
1985–1998	0.46[+]	0.25	0.55*	0.25	0.41	0.25	0.40	0.25
1998–2010	0.33	0.26	0.41	0.26	0.32	0.26	0.30	0.26
Change univ. to univ. of applied sciences	-0.12	0.46	-0.16	0.46	-0.14	0.46	-0.16	0.46
Type of HE entrance certificate	-0.27	0.27	-0.14	0.27	0.21	0.29	0.24	0.29
*Year 1								
*Year 2								
*Year 3–4								
*Year 5–8								
Fields of study								
Medicine (Ref.)								
Teacher training	0.81**	0.31	0.57[+]	0.33	0.64[+]	0.33	0.63[+]	0.33
Humanities/Arts	1.28**	0.31	1.03**	0.32	1.08**	0.32	1.09**	0.32
Natural sciences/Mathematics	1.07**	0.32	0.99**	0.33	1.04**	0.33	1.05**	0.33
Engineering	0.91**	0.34	0.77*	0.35	0.79*	0.36	0.80*	0.36
Law	1.27**	0.35	1.04**	0.36	1.16**	0.36	1.16**	0.36
Business/Economics	1.36**	0.31	1.13**	0.33	1.06**	0.33	1.05**	0.33
Other	0.76*	0.37	0.58	0.39	0.61	0.39	0.61	0.39

***Table A7** Continued*

Variables	Model 1		Model 2		Model 3		Model 4	
	Coef.	*SE*	Coef.	*SE*	Coef.	*SE*	Coef.	*SE*
One or both parent(s) with HE degree	-0.32*	0.13	-0.22[+]	0.13	-0.15	0.13		
***Year 1**							-0.49[+]	0.29
***Year 2**							-0.14	0.24
***Year 3–4**							-0.02	0.26
***Year 5–8**							0.00	0.24
GPA of highest school certificate			-0.46**	0.06	-0.46**	0.06		
***Year 1**							-0.49**	0.14
***Year 2**							-0.30*	0.12
***Year 3–4**							-0.55**	0.13
***Year 5–8**							-0.52**	0.12
Pre-tertiary educational pathways								
Standard pathway (1, Ref.)								
Standard pathway + voc. qualification (2)					0.51**	0.18		
***Year 1–2**							0.75**	0.24
***Year 3–8**							0.23	0.28
Upwardly mobile pathway (3)					0.45*	0.17		
***Year 1–2**							0.66**	0.23
***Year 3–8**							0.21	0.27
Upwardly mobile pathway + voc. qualification (4)					0.70**	0.21		
***Year 1–2**							0.38	0.31
***Year 3–8**							0.99**	0.26

Number of persons: 1824; number of events (dropouts): 296

** p < 0.01, * p < 0.05, [+] p < 0.1

Due to low numbers of events per pathway in each single time period, Model 4 includes constraints 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.

Source: NEPS: SC6: 1.0.0; own calculations

Table A8: *Piecewise constant exponential models on dropout from university of applied sciences within first 8 years including fields of study*

Variables	Model 1		Model 2		Model 3		Model 4	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Year 1	-6.57**	0.52	-6.76**	0.53	-7.00**	0.57	-6.87**	0.61
Year 2	-6.83**	0.53	-7.00**	0.54	-7.23**	0.58	-7.13**	0.62
Year 3–4	-7.16**	0.53	-7.30**	0.53	-7.52**	0.58	-7.75**	0.66
Year 5–8	-6.39**	0.55	-6.60**	0.55	-6.83**	0.59	-6.93**	0.68
Women	-0.22	0.23	-0.09	0.23	-0.09	0.23		
*Year 1–2							-0.57[+]	0.33
*Year 3–8							0.43	0.31
First-year student cohorts								
1960–1973 (Ref.)								
1973–1985	1.21*	0.53	1.24*	0.53	1.25*	0.53	1.22*	0.53
1985–1998	1.06*	0.53	1.27*	0.54	1.30*	0.54	1.25*	0.54
1998–2010	1.26*	0.54	1.37*	0.54	1.37*	0.54	1.31*	0.55
Type of HE entrance certificate	-0.28	0.20	-0.45*	0.20	-0.44	0.23		
*Year 1–2							-0.19	0.30
*Year 3–8							-0.72*	0.33
Fields of study								
Engineering (Ref.)								
Business science	0.22	0.27	0.18	0.27	0.17	0.28	0.16	0.28
Social work/Pedagogics	-0.39	0.35	-0.44	0.34	-0.45	0.34	-0.45	0.34
Other	-0.02	0.24	0.02	0.24	0.05	0.24	0.05	0.24
One or both parent(s) with HE degree	0.12	0.23	0.02	0.23	0.07	0.23		
*Year 1–2							0.14	0.30
*Year 3–8							-0.03	0.36

Table A8 *Continued*

Variables	Model 1		Model 2		Model 3		Model 4	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
GPA of highest school certificate			-0.69*	0.12	-0.69*	0.12		
*Year 1							-0.73**	0.20
*Year 2							-0.79**	0.24
*Year 3–4							-0.72**	0.23
*Year 5–8							-0.49[+]	0.26
Standard pathway + voc. qualification (2)					0.25	0.30		
*Year 1–2							-0.03	0.40
*Year 3–8							0.68	0.46
Upwardly mobile pathway (3)					0.67*	0.29		
*Year 1-2							0.66[+]	0.37
*Year 3-8							0.71	0.48
Upwardly mobile pathway + voc. qualification (4)					0.09	0.29		
*Year 1–2							-0.12	0.39
*Year 3–8							0.41	0.44

Number of persons: 915; number of events (dropouts): 113

** p < 0.01, * p < 0.05, [+] p < 0.1

Due to low numbers of events in each single time period, Model 4 includes constraints for the effects of women, type of HE entrance certificate, parental education, and 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 of the fifth to eighth year.

Source: NEPS: SC6: 1.0.0; own calculations