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Breaking Barriers? Social Inequality in Pathways to Higher Education Between General and Vocational Schools in Germany

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Abstract

Pathways to higher education through vocational upper secondary schools (VUSSs) are intended to increase permeability. However, in both VUSSs and general upper secondary schools (GUSSs), participation is socially selective. This article examined differences between GUSS and VUSS students in (a) the attainment of a higher education entrance qualification (HEEQ) and (b) the subsequent transition to higher education. Taking entry selectivity into account, we analysed the extent to which inequalities between GUSS and VUSS in both outcomes could be explained by differences in school achievement and educational considerations—namely, cost–benefit perceptions, expected success, and status maintenance motives. Using data from the German National Educational Panel Study (NEPS; Starting Cohort 4), we selected a sample of individuals who entered upper secondary education in either VUSS or GUSS (N = 5032). Two binary dependent variables were used to indicate (a) the successful attainment of an HEEQ and (b) the subsequent transition to higher education (as opposed to vocational education and training). The results from logit models indicated that VUSS students were significantly less likely to obtain an HEEQ and progress to higher education. This association was smaller but still persistent when controlling for entry selection, school achievement, and educational considerations (AME_{HEEQ} = −0.047, $AME_{\text{transition}}$ = −0.150). However, when intake selection was considered in the logit models, school achievement and educational considerations during upper secondary education were insignificant in explaining why VUSS students were less likely than GUSS students to obtain an HEEQ and enter higher education.

Keywords
benefits of education; costs of education; higher education entrance qualification; school achievement; social origin; status maintenance; transition to university; upper secondary education; vocational education; permeability

1. Introduction

During periods of educational expansion, secondary school and higher education systems worldwide have undergone significant institutional differentiation, contributing to keeping educational pathways open for attaining higher educational outcomes. Countries with educational tracking (e.g., Austria, Belgium, Germany, Netherlands, and Switzerland) and those with mixed systems—including both comprehensive and tracked education (e.g., France, the United Kingdom, and Italy; see Triventi et al., 2016)—have undergone systemic secondary education reforms that have increased permeability in two ways. First, these reforms have facilitated track mobility and subsequent transition to general upper secondary schools (GUSSs) following the successful completion of non-academic lower secondary education (Hallinan, 1996; Jacob & Tieben, 2009). Second, educational routes via alternative pathways have been extended or created at the upper secondary school level to pave the way to higher education entrance qualifications (HEEQs) following the completion of lower secondary education (i.e., International Standard Classification of Education [ISCED] 2). These routes have been established as vocational upper secondary schools (VUSSs) within either general education systems (e.g., *lycée technologique* in France) or vocational education systems (e.g., *Istituto Tecnico* in Italy, *Berufliches Gymnasium* in Germany, *Berufsfachschulen* in Switzerland; see Murdoch et al., 2014; Shavit & Müller, 2000). As a result, in addition to vocational training and preparation for work, vocational school systems provide different, more academic types of schooling that prepare students for tertiary education (Iannelli & Raffe, 2006). Certificates attained in VUSS consist of (a) general HEEQs, (b) subject-specific HEEQs (allowing entrance to general universities for certain subject areas), and (c) HEEQs for certain lower-tier higher education institutions (e.g., technical colleges or universities of applied sciences).

At the upper secondary level, social inequality is evident based on students' placement into GUSS and VUSS tracks. Students from non-academic family backgrounds or with a lower socioeconomic status are more likely to attend VUSS (Herbaut et al., 2019; Panichella & Triventi, 2014). Prior research has investigated how the type of upper secondary school attended influences the relationship between social origin and the chances of successfully attaining an HEEQ (Hällsten & Thaning, 2018; Hänni et al., 2022) as well as the association between social origin in the chances of transitioning to higher education compared to employment or vocational education and training (VET; Becker & Glauser, 2018). However, the extent to which upper secondary schools themselves, as well as students' achievement and educational considerations during upper secondary education, influence HEEQ attainment and the transition to higher education—while controlling for selection into different upper secondary schools—remains to be examined. The aim of this article is to investigate these relationships with respect to GUSS and VUSS, which we refer to as two different upper secondary school tracks.

Germany's education system provides the context for examining the educational transitions and attainment of both GUSS and VUSS students in relation to the influence of social inequalities. In this highly stratified system, the traditional route to HEEQs is via GUSS (*Gymnasium*). Hence, the choice of school at the transition

from primary school to secondary school is, to some extent, a landmark decision regarding higher education access. However, permeability in relation to HEEQs is often attained through VUSS. In Germany, 33% of all HEEQs are attained at VUSS—of these HEEQs, 39% are general and 61% are for lower-tier higher education institutions (KMK, 2024).

In the German context, several studies have analysed social selectivity in educational routes to higher education and the use of second-chance pathways (Hillmert & Jacob, 2010; Lörz, 2013; Schindler & Bittmann, 2021; Schuchart, 2006). While these studies provided valuable insights, they did not distinguish between GUSS and VUSS (e.g., Buchholz & Schier, 2015; Schindler et al., 2024; Schindler & Lörz, 2011; Schuchart & Schimke, 2022), focused solely on a specific region (e.g., the TOSCA study that is based on data of one particular German federal state; Watermann & Maaz, 2006), or did not provide a (distinct) analysis of the predictors associated with HEEQ attainment or higher education enrolment (e.g., Spangenberg & Quast, 2023). Our study's perspective—namely the relationship between upper secondary differentiation, HEEQ attainment, and higher education access—has therefore not been extensively analysed regarding two main predictors: educational considerations and school achievement. Taking entry selectivity into account, orientations toward continuing education, the acquisition of competencies, and student achievement can vary between GUSS and VUSS. As a result, the chances of attaining an HEEQ and transitioning to higher education differ between students and graduates from GUSS and VUSS. Research on upper secondary education reforms in Scandinavia has analysed the effects of extending vocational education programmes by adding further general content that allowed graduates access to higher education (e.g., Hall, 2016; Ollikainen & Karhunen, 2021). It was found that extending vocational programmes for the attainment of HEEQs did not necessarily promote stronger enrolment in higher education. Investigating the German education system could therefore make a substantial contribution to research on alternative routes to higher education.

The aim of our study is to analyse how the two alternative pathways to higher education—GUSS and VUSS—contribute to unequal chances of attaining HEEQs and transitioning to higher education. We investigate the extent to which school achievement and educational considerations explain differences in the chances of attaining HEEQs and accessing higher education between students in GUSS and those in VUSS. We control for aspects of social origin, prior achievement, and aspirations at the end of lower secondary education, which influence the selection of students for GUSS compared to VUSS. We are particularly interested in whether school achievement and educational considerations during upper secondary education influence the relationship between upper secondary school tracks (GUSS vs. VUSS) and educational outcomes, beyond selection effects into upper secondary tracks. This allows us to evaluate in greater detail why alternative educational pathways affect students' chances of pursuing higher education. We proceed in two steps. First, we compare the differences in attaining HEEQs and entering higher education between GUSS and VUSS students. Second, controlling for indicators of selection into tracks, we test the extent to which school achievement and educational considerations mitigate the differences between GUSS and VUSS students' chances of obtaining an HEEQ and transitioning to higher education. Our research questions are as follows: Are there differences between VUSS and GUSS students (a) in the attainment of HEEQs and (b) in the subsequent transition to higher education? To what extent can these differences be attributed to group differences in school achievement and educational considerations?

2. Theoretical Background and Prior Research

2.1. The German Secondary Education System

After completing primary education, students in Germany are separated into hierarchically ordered educational tracks (lower, intermediate, and upper) in the lower secondary school system. Either these tracks correspond to a specific school type—such as general secondary schools at the upper level (*Gymnasium*)—or two to three tracks are combined into a comprehensive school type. These multi-track schools are named differently in each of the 16 German federal states. Selection after primary education is based on parental choice and mandatory or non-mandatory secondary school recommendations, based on student achievement. At the end of lower secondary education, students attain a lower or intermediate school leaving certificate. The latter enables them to either continue their schooling in upper secondary education or pursue VET. Continuing upper secondary education requires graduates with an intermediate school-leaving certificate to enter the upper secondary school track in a GUSS or VUSS, for which good or very good grades and a second foreign language are usually required for admission (Maaz, 2006). Regulations differ between federal states (Helbig & Nikolai, 2015), but the performance-related barriers to entry for VUSS tend to be lower than for GUSS at the end of lower secondary education (Maaz et al., 2004). Curricula are comparable and final exams are standardised; however, intermediate secondary school graduates may attend fewer lessons in various subjects (e.g., a second foreign language) upon entering upper secondary schools in some federal states. In Germany, students can attain different types of HEEQs through both GUSS and VUSS: (a) the general *Abitur*, which grants access to any tertiary course of study; and (b) restricted HEEQs, which allow access only to certain study fields (*fachgebundene Hochschulreife*) or to universities of applied sciences (*Fachhochschulreife*) (Neumeyer & Will, 2024). For individuals with a secondary school degree, typical VUSSs are *Berufliches Gymnasium* and *Fachgymnasium*, where a general HEEQ (access to universities) can be attained in three years. Other typical options include *Fachoberschulen* (for individuals with an intermediate school leaving certificate) and *Berufsoberschulen* (for individuals who have completed a VET programme), which provide a two-year specialised upper secondary education that allows graduates to attain a HEEQ for lower-tier higher education institutions. In some federal states, these schools provide an additional year for attaining a general HEEQ, which enables graduates to pursue either higher education or VET. Compared to higher education programmes, VET programmes are typically shorter, the costs and the risk of failure tend to be lower, and employment prospects after graduation are favourable (Becker & Hecken, 2008; Müller & Pollak, 2016). However, the long-term returns from higher education tend to be greater compared to those from VET (Kriesi & Sander, 2024).

2.2. Theoretical Framework and Prior Research

Our theoretical framework assumes that VUSS students are less likely than GUSS students to attain an HEEQ and transition to higher education. We expect this to be linked to social origin, prior school achievement, and occupational aspirations at the end of lower secondary education. In addition, we anticipate that students from less privileged families with lower school achievement and stronger aspirations for VET are overrepresented in VUSS, are less likely to attain an HEEQ (H1a), and are more inclined to choose VET over higher education (H2a). This is based on theories of the primary and secondary effects of social origin (Boudon, 1974; Breen & Goldthorpe, 1997; Erikson & Jonsson, 1996) and selection processes during the school trajectory (Mare, 1980). Beyond entry selection, we assume that GUSS and VUSS differ in how they foster school achievement and

shape educational orientations. VUSS students are expected to gain lower achievement and have a stronger preference for VET. Consequently, these factors further reduce their likelihood of attaining an HEEQ (H1b) and pursuing higher education (H2b).

According to the primary effect of social origin, school achievement is connected to family resources that provide opportunities for parental support, guidance and stimulating learning environments. Therefore, students from less affluent or non-academic families tend to achieve less at school and be less likely to be recommended for an academic school track (i.e., GUSS) after primary school (Neugebauer, 2010). Even when school achievement is comparable between status groups, the secondary effect of social origin means that families from less advantaged backgrounds are less likely to choose an academic school track for their children after primary school (Scharf et al., 2020). At the lower secondary level, students with a more favourable social origin are more likely to remain on an academic school track, while students with lower social origin are likely to leave education early (Dräger et al., 2022; Winkler, 2017). Therefore, at the end of lower secondary schooling, students from privileged social backgrounds are more likely to enrol in GUSS. If individuals choose to continue school at the upper secondary level following completion of lower secondary education, those from less privileged and non-academic family backgrounds are more likely to enter VUSS than to transition and continue their education at GUSS (Busse, 2020; Glauser, 2015; Maaz et al., 2004). They are less likely to meet the achievement-related entry requirements of GUSS due to the primary effects of social origin. Moreover, students who switch to VUSS after completing lower secondary education are more likely to have a stronger vocational orientation than academic orientation (Jüttler et al., 2021; Schuchart, 2019; Watermann & Maaz, 2006), while educational aspirations directed towards VET are stronger among students from lower social origins (Buchmann & Dalton, 2002). These students are therefore more likely to decide on VUSS because it provides a learning environment that is more specialised in vocational orientations than academic orientations. These selection processes result in an overrepresentation of students with lower social origins in VUSS. Due to this entry selection, we expect VUSS students to be less likely to attain an HEEQ and to transition to higher education.

Beyond intake selection, track-specific differences in school achievement and educational considerations during upper secondary school may also explain why GUSS students are more likely than VUSS students to attain HEEQs and to transition to higher education (H1b and H2b). Upper secondary school tracks differ in their curricular requirements, didactic traditions, teacher training, and instructional quality. These institutional conditions can influence learning environments between tracks and lead to different developmental trajectories (Maaz et al., 2008). Differential achievement gains may therefore not emerge solely from selective student intake. In the German lower secondary school system, it has been shown that gains in competences differ between school tracks, even when there is similarity in terms of students' social origin, ability, prior achievement, or aspirations or the social composition of the classroom (Herrmann & Bach, 2025). This indicates that there is a potential institutional effect on competence development. Generally, the GUSS system tends to have an academic teaching culture that corresponds to higher performance requirements and strong teacher qualifications. In contrast, the VUSS system contains a broad variety of school types with different purposes and admission requirements; hence, the variance in teaching cultures, performance requirements, and teaching methods is much more diverse compared to the GUSS system. This may, in turn, relate to differing achievement gains between GUSS and VUSS. As a consequence of the higher average school achievement of GUSS students, it is likely that they are more successful in obtaining HEEQs than VUSS students. They are also expected to be more likely to achieve higher average

grades in their HEEQs, which will allow them to overcome admission restrictions, ultimately making higher education more attractive. We therefore expect that, controlling for selective student intake, school achievement additionally influences the association between upper secondary school tracks and both attaining HEEQs and transitioning to higher education.

Moreover, the two upper secondary school tracks examined in this study may differ in how they shape the educational considerations of students. Empirically, it has been shown that the guidance and the preparation of students for higher education vary between VUSS and GUSS (Dörffer & Bernhard, 2025). VUSSs have been found to differ in their supply of structured and individualised counselling and support for the transition to higher education—especially concerning financial guidance. Furthermore, curricula and teaching methods tend to be less orientated towards the scientific or academic preparation required for higher education. Given the demanding higher education curricula, teachers in VUSSs may have lower expectations about their students' study readiness (Trautwein & Lüdtke, 2004). In addition, GUSSs may exhibit a stronger "college-going culture" (McDonough, 1997; Robinson & Roksa, 2016), which reinforces expectations or norms for pursuing higher education and ultimately fosters motivation and ambition to enrol in a study programme (Schuchart & Schimke, 2022). Against this background, VUSS students may perceive the attainment of an HEEQ—and the subsequent transition to higher education—as more costly and riskier in terms of successful completion than GUSS students (Trautwein et al., 2006).

We formulate the following hypotheses:

> H1a: Selectivity in social origin, prior achievement, and occupational aspirations before entering upper secondary education (partially) explain why GUSS students are more likely than VUSS students to attain HEEQs.
>
> H1b: Irrespective of selectivity effects, group differences in school achievement and educational considerations during upper secondary schooling (partially) explain why GUSS students are more likely than VUSS students to attain HEEQs.
>
> H2a: Selectivity in social origin, prior achievement, and occupational aspirations before entering upper secondary education (partially) explain why GUSS students are more likely than VUSS students to transition to higher education.
>
> H2b: Irrespective of selectivity effects, group differences in school achievement and educational considerations during upper secondary schooling (partially) explain why GUSS students are more likely than VUSS students to transition to higher education.

3. Data and Methods

3.1. Data and Sample

To analyse our research questions, we used data from the Starting Cohort 4 (SC4, grade 9) of the German National Educational Panel Study (NEPS, Blossfeld & Roßbach, 2019; NEPS Network, 2024), as it provides in-depth and longitudinal information on adolescents' pathways from grade 9 in secondary school to upper

secondary education and subsequent trajectories. SC4 comprises a stratified random and representative sample of ninth graders in German secondary schools. The first SC4 survey (wave 1), with a total sample of 16,425 students, was conducted in autumn 2010 in classrooms using paper-and-pencil interviews (PAPIs). A second survey (wave 2) followed in spring 2011; afterwards, surveys took place annually in the classroom using PAPI (waves 3–8). After the respondents left general secondary school, interviews were conducted twice a year (waves 3–13) using computer-assisted telephone interviewing (CATI). For this study, data from different survey waves were used, as we included information collected during lower secondary education as well as information on the upper secondary school attended (GUSS or VUSS), eventual completion with an HEEQ, and subsequent transition to higher education or VET (see Supplementary File, Table A1).

The analytical sample consisted of respondents who had entered upper secondary education (VUSS or GUSS) after completing grade 10 of lower secondary education (N = 5,032; see Supplementary File, Table A2). To examine entry into higher education or VET following graduation from upper secondary education, we further restricted this sample to 3,607 graduates who had obtained HEEQs at VUSS or GUSS (for sample statistics, see Supplementary File, Table A3). Taken together, our analyses are based on two distinct yet interdependent samples: Sample 1, consisting of students attending VUSS and GUSS, and Sample 2, comprising VUSS and GUSS graduates who had entered higher education or VET after completing upper secondary education.

The VUSS and GUSS students differed substantially in terms of the school track they had followed before transitioning to the two upper secondary education pathways. Respondents starting in GUSS mainly followed an academic track (i.e., a *Gymnasium* or a *Gymnasium* branch at a comprehensive school) before completing lower secondary education (80%). Only 20% were enrolled in non-academic tracks (i.e., lower and intermediate secondary school tracks, such as the *Hauptschule* or *Realschule*) before entering GUSS. To progress to GUSS, they had attained intermediate school leaving certificates via lower (e.g., *Hauptschule*) and/or intermediate secondary schools (e.g., *Realschule*). In contrast, 91% of the respondents who started VUSS followed a non-academic track during lower secondary education, while only 9% followed an academic track before entering VUSS (these numbers are not displayed in Table A2). Moreover, the majority of VUSS students in our sample (72%) attended two-year programmes (e.g., *Fachoberschule*) that led only to a restricted HEEQ (e.g., *Fachhochschulreife*) for universities of applied sciences (for details, see KMK, 2021).

3.2. Measures

3.2.1. Dependent Variables

We used two binary-coded dependent variables (DV) for our analyses. The first dependent variable (DV1) refers to students' upper secondary school completion and captures whether students attained an HEEQ (entrance qualification for general universities or universities of applied sciences) at the end of VUSS or GUSS. While a value of 1 indicates successful HEEQ attainment, a value of 0 denotes that upper secondary education was entered but was either left prematurely or the final exam was not passed. For students who attained an HEEQ, the second dependent variable (DV2) focuses on the first post-secondary transition and reports on students' enrolment in higher education—indicated by a value of 1—or VET—indicated by a value of 0—15 months after leaving VUSS or GUSS. The observation period of 15 months is in line with previous

research on post-secondary educational transitions (Neumeyer & Will, 2024), and it allowed us to include the post-secondary choices of school leavers who experienced short delays, such as a gap year.

3.2.2. Independent Variables

The focal independent variable represents the school attended during upper secondary education and distinguishes between GUSS and VUSS. We assigned to VUSS those students who attended any type of vocational school from which a general HEEQ or an HEEQ for universities of applied sciences could be attained, while those assigned to GUSS attended a *Gymnasium*. In investigating and explaining the associations between GUSS and VUSS during upper secondary education and both dependent variables, our empirical model accounts for the intake of those selected for the respective upper secondary schools. For this purpose, we controlled for students' social origin, school achievement, and occupational aspirations at the end of lower secondary education (i.e., before the students switched to VUSS or GUSS). These indicators were largely measured in grade 9, as follows:

- To capture important facets of the multidimensional construct of social origin, we used different indicators. We included parents' highest International Socio-Economic Index of Occupational Status (ISEI-08; see Ganzeboom, 2010) as an indicator of students' socioeconomic status. In addition, parents' highest education level was included using the 2011's ISCED. We distinguished between two main education levels: ISCED 1–3 (reference category) and ISCED 4–6. Both parents' HISEI and ISCED were primarily measured in grade 9 (wave 1). In the few cases where information on parents' indicator was unavailable in wave 1, data from subsequent waves were used.
- School achievement at the end of lower secondary education was measured by grades and standardised competence test scores. The use of grades has two advantages. First, they are a "major information source for students about their school achievement" (Keller, 2016b, p. 9). When making educational decisions, students are typically well aware of their grades (Jackson & Jonsson, 2013, p. 315) and rely on them as a performance indicator to assess their abilities and the educational options available to them (Keller, 2016a). Second, they play a crucial role in admission to higher education. However, grades have certain limitations, as they are not comparable across schools. Hence, we additionally accounted for competence scores as a more objective measure of school achievement or ability (Keller, 2016a). The aim of including competence test scores—alongside school grades—in the analysis was to account for unobserved ability (e.g., Keller, 2016a, 2016b). We used respondents' competence test scores in mathematics and German reading comprehension (measured in grade 9). In addition, we generated grade point averages (GPA) from annual report cards in grade 9, based on students' grades in mathematics and German, inversely recoded from worst to best.
- Given the close connection between educational aspirations and occupational aspirations (Rojewski, 2005, p. 140), we used students' realistic occupational aspirations at the end of lower secondary education to capture the specific occupations that they expected to attain in the future, while taking into account their perceived opportunities, individual resources and external constraints (Heckhausen & Tomasik, 2002; Rehberg, 1967). The relevance of realistic occupational aspirations to career-related behaviour was indicated by their correlation with our focal variables. Such aspirations at the end of lower secondary education were significantly and negatively associated with the probability of attending a VUSS ($r = -.26$, $p < 0.001$) but significantly and negatively associated with the probability of entering higher education after leaving upper secondary education ($r = .32$, $p < 0.001$). Realistic

> occupational aspirations were measured using the following open-ended question: "Considering everything you know now, what occupation will you actually pursue in the future?" (NEPS, 2019, p. 91).

School achievement and educational considerations during upper secondary education were measured using the following indicators. To assess the influence of school achievement during upper secondary education, we generated the GPAs of annual report cards in grade 11, based on students' grades in mathematics and German, inversely recoded from worst to best. To investigate the influence of educational considerations during upper secondary school, we used indicators referring to both higher education and VET, measured in grade 12 or 13. The operationalisation for educational considerations included respondents' perceptions of the benefits, direct costs, opportunity costs, probability of success, and the corresponding expectancy of status maintenance in relation to both higher education and VET (for a summary of the operationalisation, see Supplementary File, Table A1). The benefits of higher education and VET were captured using four items related, for example, to students' expected prospects of securing a well-paid job if they completed a higher education or vocational education programme. Scale reliability is satisfying for both educational options ($\alpha = 0.7$). The perceived direct costs of higher education or VET refer to the financial costs or burden associated with completing the respective educational option, whereas the *perceived opportunity costs* were determined by asking the students how great the loss of income due to limited opportunities to earn money to cover living costs would be if they were to study or enter VET. The perceived probability of success was determined by asking the students how likely they thought they were to successfully complete higher education or VET. Perceptions of the probability of status maintenance were assessed through students' beliefs about the extent to which higher education or VET could help them achieve a job similar to or better than their parents' jobs. Answer categories for all indicators ranged from 1 (*lowest agreement*) to 5 (*highest agreement*; see Table A1). Table A4 reports the correlations between the variables (for the correlations for the restricted sample of VUSS and GUSS graduates, see Supplementary File, Table A5).

3.3. Analytical Strategy

To investigate our hypotheses on attaining an HEEQ (DV1) and the subsequent transition to higher education (DV2), we applied diverse empirical analyses. All analyses were conducted using Stata 18. We imputed missing information on the independent variables using Multivariate Imputation by Chained Equations (Azur et al., 2011). In line with the recommendations from simulation and validation studies (von Hippel, 2007), both the dependent and independent variables were included in the imputation model. Missing values were imputed jointly across the full sample of students attending VUSS and GUSS. After the imputation of missing values, we excluded respondents with missing information on the dependent variables. To increase the efficiency of our imputation model, we included auxiliary variables, such as school track in grade 9 and students' perceptions of their parents' educational expectations. Furthermore, 20 imputation datasets were generated to increase the robustness of imputations. Parents' HISEI, as well as students' GPA, competence scores, and occupational aspirations, were *z*-standardised for all multivariate analyses.

To investigate our hypotheses, we applied a logistic regression approach (Best & Wolf, 2015). Average marginal effects (AMEs) were reported to display the average effect of our independent variables on the probability of attaining an HEEQ (DV1) and entering higher education (DV2), given that the respective covariates were held constant at their values (Stata command *mimrgns*). AMEs are robust against scaling and allow for comparability across logistic regression models (Best & Wolf, 2015). We estimated three nested models: Model 1 shows the

relationship between attending VUSS and the dependent variables without controls, Model 2 adds controls for the intake selection (i.e., parents' HISEI, parents' ISCED, and prior achievement), and Model 3 includes the indicators for school achievement (i.e., GPA and competence test scores) and educational considerations measured during upper secondary education. To avoid overcontrol bias, we refrained from including additional control variables, such as respondents' academic self-concept (Grätz, 2022). For comparing coefficients and average marginal effects across models, we used the Stata command *mecompare* (Mize et al., 2019) and pooled the estimates over the 20 imputed datasets.

4. Results

4.1. Descriptive Findings

GUSS and VUSS strongly differed with regard to the social origin of their students (see Supplementary File, Table A2). For VUSS, the (*z*-standardised) HISEI was −0.5, while for GUSS it was 0.7 (Cohen's $d = -0.54$, $p < 0.001$). The share of students with an academic family background was 59.8% for VUSS compared to 81.7% for GUSS (Cohen's $h = -0.49$, $p < 0.001$). Differences between GUSS and VUSS were also found in school achievement at the end of lower secondary education—that is, GPA in grade 9 (Cohen's $d = -0.46$, $p < 0.001$), reading competence (Cohen's $d = -0.77$, $p < 0.001$), and mathematical competence (Cohen's $d = -0.89$, $p < 0.001$). In addition, at the end of lower secondary education, VUSS students showed significantly lower realistic occupational aspirations than GUSS students in terms of the ISEI of expected occupations (Cohen's $d = -0.77$, $p < 0.001$). Concerning school achievement and educational considerations during upper secondary education, the differences between GUSS and VUSS were only small or moderate. For example, VUSS students perceived higher benefits of VET (Cohen's $d = 0.29$, $p < 0.001$), expected a higher probability of completing VET (Cohen's $d = 0.28$, $p < 0.001$), and anticipated a higher probability of maintaining their social status through VET (Cohen's $d = 0.56$, $p < 0.001$) compared to GUSS students.

4.2. Attaining an HEEQ

Estimating the raw association between attending a VUSS and the attainment of an HEEQ without adjusting for other variables revealed a negative and significant relationship, confirming H1a. Compared to GUSS students, students attending VUSS were 18.5 percentage points less likely to attain an HEEQ ($AME = -0.185$, $p < 0.001$; Model 1 in Table 1). After accounting for intake selection (Model 2 in Table 1), the difference between VUSS and GUSS students in attaining an HEEQ decreased to 4.7 percentage points. The results of Model 2 further confirm that social origin, prior school achievement, and occupational aspirations at the end of lower secondary education were relevant to attaining an HEEQ. A higher parental educational level was associated with a higher probability of attaining an HEEQ. In addition, higher achievement—as indicated by students' GPA, reading competence, and mathematical competence—was associated with a higher probability of attaining an HEEQ. In addition, a higher ISEI of the expected occupation was associated with a higher probability of attaining an HEEQ. Therefore, H1a is supported.

After adding respondents' school achievement and educational considerations in upper secondary education to the logistic regression model (Model 3 in Table 1), the gap between VUSS and GUSS students in achieving an HEEQ remained the same but was still significant ($p < 0.001$). In other words, beyond selection into upper secondary schools, school achievement and educational considerations in upper secondary education were

Table 1. Logistic regression model of attaining an HEEQ.

	Model 1		Model 2		Model 3	
	AME	*(SE)*	*AME*	*(SE)*	*AME*	*(SE)*
Attending VUSS (ref.: GUSS)	−0.185***	(0.017)	−0.047***	(0.011)	−0.047***	(0.011)
Parents' HISEI			0.012**	(0.004)	0.006	(0.005)
Parents' ISCED			0.064***	(0.013)	0.055***	(0.012)
GPA in grade 9			0.025***	(0.004)	0.008	(0.005)
Reading competence			0.021***	(0.004)	0.013**	(0.004)
Mathematical competence			0.021***	(0.005)	0.014**	(0.004)
Occupational aspirations (ISEI)			0.031***	(0.004)	0.023***	(0.005)
GPA in grade 11					0.022***	(0.006)
Perceived benefits of VET					−0.020	(0.016)
Perceived direct costs of VET					−0.023*	(0.010)
Perceived opportunity costs of VET					−0.005	(0.010)
Perceived probability to complete VET					0.007	(0.012)
Perceived probability to maintain social status with VET					−0.007	(0.010)
Perceived benefits of higher education					−0.014	(0.016)
Perceived direct costs of higher education					0.000	(0.009)
Perceived opportunity costs of higher education					0.016	(0.010)
Perceived probability to complete higher education					0.036***	(0.008)
Perceived probability to maintain social status with higher education					0.003	(0.012)
Observations	5,032		5,032		5,032	
Pseudo-R^2	0.062		0.206		0.272	

Notes: Logistic regression models (average marginal effects, standard errors in parentheses) with imputed data (20 imputed datasets); the imputation model is based on a joint imputation of Sample 1 (VUSS and GUSS students) and Sample 2 (graduates from VUSS and GUSS); discrete change effects for binary independent variables; GPA = grade point average; HISEI = highest socioeconomic index of occupational status; ISCED = International Standard Classification of Education; levels of significance (two-sided tests): *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. Data: NEPS SC4 SUF 14.0.0, own calculations.

not statistically significant in explaining the gap between VUSS and GUSS students in attaining an HEEQ. This is not in line with H1b. Nevertheless, school achievement and educational considerations in upper secondary education played a role in the attainment of an HEEQ, even when accounting for intake selection into GUSS versus VUSS. Beyond intake selection, students' GPAs in grade 11 and perceived probability of completing higher education were associated with a higher likelihood of attaining an HEEQ. In contrast, higher perceived direct costs of VET were associated with a lower probability of attaining an HEEQ.

4.3. Entering Higher Education After Attaining an HEEQ

To answer hypotheses H2a and H2b, we focused only on students who attained an HEEQ in VUSS or GUSS and switched to higher education or VET after completing upper secondary education. Table 2, which

presents the estimation of the raw association without adjusting for other variables, shows that—compared to GUSS graduates—graduates from VUSS were 38.6 percentage points less likely to enter higher education ($AME = -0.386$, $p < 0.001$; Model 1). Introducing respondents' social origin, prior school achievement, and occupational aspirations at the end of lower secondary education to the logistic regression model led to a decline in the coefficient for attending VUSS. Overall, the gap between VUSS and GUSS graduates entering higher education declined to 17.9 percentage points (Model 2). This supports H2a. The results further showed that the measures to capture intake selection into GUSS versus VUSS (i.e., social origin, school achievement, and occupational aspirations) were associated with the probability of entering higher education after attaining an HEEQ. Among the indicators of social origin, parental HISEI showed a significantly positive association with the probability of entering higher education, while there was no significant association between parents' educational level and the probability of entering higher education.

Table 2. Logistic regression model of entering higher education.

	Model 1		Model 2		Model 3	
	AME	*(SE)*	*AME*	*(SE)*	*AME*	*(SE)*
Attending VUSS (ref.: GUSS)	−0.386***	(0.025)	−0.179***	(0.026)	−0.150***	(0.024)
Parents' HISEI			0.047***	(0.008)	0.019*	(0.008)
Parents' ISCED			−0.040	(0.020)	−0.034	(0.019)
GPA in grade 9			0.045***	(0.008)	0.012	(0.009)
Reading competence			0.023**	(0.007)	0.010	(0.007)
Mathematical competence			0.054***	(0.007)	0.039***	(0.007)
Occupational aspirations			0.067***	(0.008)	0.043***	(0.008)
GPA in grade 11					0.034***	(0.009)
Perceived benefits of VET					−0.115***	(0.016)
Perceived direct costs of VET					−0.003	(0.011)
Perceived opportunity costs of VET					0.011	(0.010)
Perceived probability to complete VET					−0.050***	(0.012)
Perceived probability to maintain social status with VET					−0.047***	(0.011)
Perceived benefits of higher education					−0.002	(0.017)
Perceived direct costs of higher education					−0.014	(0.008)
Perceived opportunity costs of higher education					0.005	(0.010)
Perceived probability to complete higher education					0.107***	(0.010)
Perceived probability to maintain social status with higher education					0.022	(0.014)
Observations	3,607		3,607		3,607	
Pseudo-R^2	0.055		0.148		0.227	

Notes: Includes only graduates from VUSS and GUSS. Logistic regression models (average marginal effects, standard errors in parentheses) with imputed data (20 imputed datasets); the imputation model is based on the joint imputation of Sample 1 (VUSS and GUSS students) and Sample 2 (graduates from VUSS and GUSS); discrete change effects for binary independent variables; GPA = grade point average; HISEI = highest socioeconomic index of occupational status; ISCED = International Standard Classification of Education. Levels of significance (two-sided tests): *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. Data: NEPS SC4 SUF 14.0.0, own calculations.

In addition, higher school achievement in grade 9 in terms of GPA and mathematical and reading competence was associated with a higher probability of entering higher education after graduating from upper secondary school. In addition, respondents' realistic occupational aspirations showed a significant and positive relationship with entering higher education.

After adding the indicators for school achievement and educational considerations measured during upper secondary education (see Model 3), the gap between VUSS and GUSS reduced to 15.0 percentage points ($p < 0.001$). A test of the difference in the AME from Model 2 to Model 3 showed that adding these controls significantly decreased the effect of attending VUSS by 2.9 percentage points ($p < 0.01$). This suggests that, beyond selectivity effects, differences in school achievement and educational considerations between school tracks partly explain why VUSS students are less likely to enter higher education. Net of the controls, students' school achievement and educational considerations during upper secondary education were associated with the probability of entering higher education. This is also assumed in H2b.

5. Discussion

In our study, we investigated differences between two alternative pathways to higher education—GUSS and VUSS—in attaining an HEEQ and transitioning to higher education, as well as the extent to which these differences can be attributed to school achievement and educational considerations when controlling for intake selection—namely, social origin, prior achievement, and occupational aspirations before the entrance to upper secondary education. The German education system provided the context for the analysis, offering a suitable setting for examining the research questions due to its highly stratified secondary school system. For graduates of upper secondary education, training programmes in Germany's VET system provide favourable career prospects and constitute a second important educational option alongside higher education. Our analytical approach did not intend to imply that higher education is generally a superior option for young people compared to VET. For many school leavers, VET is a very attractive option, and they make a conscious decision not to go on to higher education (Di Stasio, 2017; Scholten & Tieben, 2017). However, previous research has shown that the chances of completion and continuation along educational pathways differ between GUSS and VUSS students. Our results can be summarised in three key points:

1. Students who attended VUSS were less likely to attain an HEEQ—and those who attained an HEEQ were less likely to transition to higher education—than students who attended GUSS. The findings of the TOSCA study, which focused on a single German federal state, also showed that VUSS students were less likely to transition to higher education (Maaz, 2006). Our results extend this finding to a representative sample across Germany.
2. GUSS and VUSS students differed widely in their social origin, prior achievement, and occupational aspirations before entering upper secondary education. This selectivity partially explains the association between upper secondary school track and both HEEQ attainment and transitioning to higher education (H1a and H2a).
3. When controlling for intake selection, our logit analyses revealed that school achievement and educational considerations did not account for any additional share of the association between upper secondary school track and the probability of HEEQ attainment (H1b). Nevertheless, students strongly differed in school achievement between school types during upper secondary education. Such differences in school achievement between GUSS and VUSS students were also reported in the

TOSCA study (Watermann et al., 2004). School achievement and educational considerations explain, to a small extent, the association between upper secondary school track and entry to higher education (H2b).

The main findings show how institutional differentiation—not only in Germany—can influence pathways to envisaged educational outcomes. Differentiation of upper secondary education between GUSS and VUSS can be an effective tool to organise the allocation of the heterogeneous student body, paving the way to VET or higher education. VUSS can provide a solid, subject-specific foundation for students who have a stronger vocational orientation or more pronounced professional interests and who want to pursue specific careers in the occupations trained for in the VET system. In many countries, applying for VET often follows a competitive process. In Germany, in particular, an HEEQ can provide advantages in obtaining a more attractive training position. Consequently, a VUSS that leads to an HEEQ is often seen by students as a transitional solution before entering a VET programme. For instance, when asked about their motives for attending a VUSS leading to an HEEQ for lower-tier higher education institutions, students predominantly stated that they wanted to improve their chances of obtaining a training position (by attaining an HEEQ) and—to a lesser extent—that they wished to postpone their career decisions (Deißinger & Ruf, 2006). Moreover, Jüttler et al. (2021) showed that although affected by social origin, the choice between general and vocational education is also driven by individuals' interests.

Furthermore, German educational policy promotes the equality of VET and higher education (Powell et al., 2012). Vocational schools that award HEEQs and allow successful graduates to have both educational options—VET or higher education—support this objective. However, we argue that the differentiation of the German upper secondary education system into general and vocational school tracks serves not only the described allocation function but also a function for keeping educational pathways open. The latter function aims to ensure that VUSS students are prepared for a successful transition to higher education. Accordingly, previous studies have found no significant differences between GUSS and VUSS regarding the use of types of learning meant to prepare students for higher education (e.g., researching literature in a library, preparing and giving presentations; see Trautwein & Lüdtke, 2004). Transition to VUSS after the completion of lower secondary education is especially attractive for cautious families—or risk-averse—when making educational decisions at the end of primary education. Institutional differentiation in upper secondary education allows families and students to reverse or even postpone decisions, especially when students are at a young age (Winkler, 2020). As our results show, VUSSs are of great importance for this group of students when it comes to (re-)pursuing academic goals, such as following a second-chance pathway.

6. Conclusion

Our study provides novel insights into selection effects and possible processes during GUSS and VUSS education that affect the association between upper secondary tracks and the two investigated educational outcomes. Our results show that the selection effects of social origin, prior achievements, and occupational aspirations largely—but not entirely—explain the differences in educational success and participation between VUSS and GUSS. For both dependent variables, substantial differences remained between the two tracks. The examined processes during GUSS and VUSS schooling—influencing differential school achievement and educational considerations—were not found to explain inequalities between GUSS and VUSS to any great extent. However, this does not rule out that other "socialisation effects" (Schuchart &

Schimke, 2022) that were not analysed in our study could occur during GUSS and VUSS schooling and could further explain differences in the investigated outcomes. Therefore, the remaining gaps between VUSS and GUSS students should be discussed in light of unobserved theoretical mechanisms. Future studies should examine other factors that could contribute to VUSS students having a lower probability of successfully obtaining an HEEQ and pursuing higher education, such as the role of career and vocational counselling (Falco & Steen, 2018), the motivations and interests of students (Holtmann et al., 2021), their knowledge about the education system (Forster & van de Werfhorst, 2019), peer effects (Zwier et al., 2022), instructional quality (Kunter et al., 2013), and regional disparities in school supply (Matthewes & Borgna, 2025).

With regard to selection effects, our study shows that VUSSs typically attract students from certain social backgrounds who tend to have a disproportionately strong orientation towards VET. In this respect, VUSSs may act as catalysers of the—on average—non-academic professional motives of these students, ultimately channelling them into careers that do not necessarily require academic degrees. This finding and its implications are relevant beyond the German context. To ensure that the educational options created through increased institutional permeability actually allow for "barrier-breaking"—meaning the options are more strongly reflected in the educational trajectories of individuals—VUSSs need to provide information, guidance, and counselling to broaden career intentions and choice sets.

The findings of our study have limitations with regard to the following points. First, the indicators for assessing educational considerations related to VET and higher education were measured at a rather late stage of the students' educational trajectory. Therefore, the students' intentions and considerations regarding their subsequent educational pathways were mostly finalised; that is, their decisions had typically already been made. Second, we focused on two different school tracks to higher education and VET in the secondary school system, ignoring the fact that there are even more pathways. These can be summarised as second-chance education, which is part of adult education or further education. Such paths are particularly important for adults who are new entrants in the education system, such as immigrants, or for individuals who decide to upgrade their educational qualifications later in their lives. Third, the associations investigated in our study should not be interpreted as causal effects. Establishing causality would require strong theoretical assumptions about causal paths and relationships between the analysed predictors and outcomes. Although it was not possible to implement a corresponding design due to space constraints, the longitudinal structure of the NEPS data would enable such a research project. Fourth, when comparing the findings for attaining an HEEQ and the post-secondary transition to higher education, it should be considered that our results were based on different samples (i.e., students versus graduates from VUSS or GUSS). The sample of graduates from upper secondary education was already shaped by prior school achievement and educational decisions, which may have led to selection bias (Bernardi, 2012). Fifth, the VUSS track entails a number of different school types with a large heterogeneity in terms of entry requirements and the type of HEEQ awarded (see Section 2.1; see also Schuchart & Schimke, 2025). On the one hand, different types of VUSSs vary in their intake selection (Spangenberg & Quast, 2023), which may correspond to differing chances of attaining an HEEQ and subsequently transitioning to higher education (Innengruppe Bildungsberichterstattung, 2024, pp. 210–211). On the other hand, students may have different motives for entering a certain type of VUSS. Some types of VUSSs specifically cater to individuals who have already completed a VET programme and who want to obtain an HEEQ. It seems plausible that these individuals enter VUSS as a pathway to higher education—that is, with a clear motive to transition to

higher education after obtaining an HEEQ. Other types of VUSSs are predominantly regarded as transitional solutions. Moreover, different types of VUSSs influence the chance of subsequently enrolling in universities compared to lower-tier higher education institutions (Spangenberg & Quast, 2023). Since most of the VUSS students in our sample attended a two-year course leading only to a restricted HEEQ for universities of applied sciences (see Section 3.1), this could have contributed to the gaps observed in the transition to higher education between VUSS and GUSS students. Consequently, future research should distinguish between different types of VUSSs, HEEQs, and forms of higher education and examine students' motives for attending VUSS in greater detail to gain a better picture of the role it plays from individual students' perspectives. Against the background of our results, future studies should also take into account social inequalities in motives and decision-making processes.

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Conflict of Interests

The authors declare no conflict of interest.

Data Availability

This article uses data from the National Educational Panel Study (NEPS; see http://doi.org/10.5157/NEPS:SC4:14.0.0). The NEPS is carried out by the Leibniz Institute for Educational Trajectories (LIfBi, Germany) in cooperation with a nationwide network. All data collection procedures, instruments, and documents were checked by the data protection unit of the LIfBi. The data are available for scientific use.

Supplementary Material

Supplementary material for this article is available online in the format provided by the author (unedited).

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