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Educational aspirations of students in vocational upper secondary schools in Germany

Nadine Dörffer^{1,2*} and Nicole Tieben²

*Correspondence:

Nadine Dörffer
n.doerffer@tu-berlin.de
¹Technical University of Berlin,
Berlin, Germany
²Leibniz University Hannover,
Hannover, Germany

Abstract

In the wake of educational reforms starting in the 1970s, a variety of alternative pathways to higher education was institutionalised in Germany. Research usually finds that students from vocational pathways are less inclined to enter higher education, but largely ignores the diversity of vocational upper secondary schools and the variety of options after graduation. This study examines students' educational aspirations across different vocational upper secondary school types and asks how differences in aspirations can be explained. We extend prior research by considering the institutional heterogeneity of the German upper secondary and tertiary system and the role of institutional restrictions. Using data from the DZHW Panel Study of School Leavers 2015, the results show that the aspirations differ by the type of upper secondary school but that a considerable share of these differences to students of the traditional *Gymnasium* can be explained by institutional restrictions imposed by the type of higher education entrance certificates. Moreover, prior vocational qualifications and performance seem to play a role for some school types, whereas socio-economic background does not explain much of the association. Controlling for these factors, the aspirations of students in *Berufoberschule* and *Fachoberschule* do not differ substantially from those in the traditional *Gymnasium*, suggesting that especially *Berufoberschule* works as a "highway to higher education". In contrast, a substantial share of students in *Berufliches Gymnasium* and *Berufsfachschule* are much less interested in university studies and instead use their certificates for better access to vocational education and training. Notably, across all school types, we observe a high proportion of students with no clear preference shortly before graduating from upper secondary education.

Keywords Educational aspirations, Education system, Germany, Higher education, School types, Upper secondary education, Vocational education and training, Vocational schools

Introduction

Among international education researchers and practitioners, the German education system is known for two features: First, its historically tracked structure in secondary education, combined with a relatively early and strict segregation of students

(Allmendinger 1989; Blossfeld et al. 2016). Second, its well-established system of vocational education and training (VET) is an attractive alternative to higher education (Solga et al. 2014). This system was criticised for creating dead-end educational roads and unequal chances of obtaining a higher education degree. Already since the early 1970s, but increasingly in the wake of the European Higher Education Area initiatives and the Prague communiqué (2001), the system was gradually reformed to meet the core goals of widening participation and recognition of prior learning (Wolter 2012). Widening participation was mainly implemented by a massive expansion of general upper secondary education, but on top of that, a number of vocational upper secondary school types were established and broadly institutionalized. These types of schools offer a vocational profile next to the general upper secondary curriculum. Some programmes primarily aim to provide a formal qualification for skilled employment, others have a vocational profile but primarily aim to lead students to a higher education entrance certificate (HEEC). Moreover, many previously existing types of schools (e.g., full-time vocational schools) were complemented with HEEC streams that – under certain conditions – award a HEEC together with a qualification for skilled employment upon graduation. Obtaining a HEEC via a vocational route is not a marginal phenomenon. Currently, approximately one-third of all students in German higher education have gained their HEEC at a vocational school type (Autor: innengruppe Bildungsberichterstattung 2024).

Although these vocational upper secondary schools have a high relevance in the German school system, little is known about the educational aspirations of vocational school students and how they differ between the specific school types. Often, research on alternative pathways to higher education aggregates various school types into broader categories (e.g., “vocational schools” or “school types with a restricted HEEC”, Heine et al. 2010; Lörz 2013) to better address the heterogeneity of vocational school types and reduce analytical complexity. Further, national and international research findings generally indicate that graduates from vocational schools are less likely to pursue higher education (Bittmann and Schindler 2020; Farías and Sevilla 2015; Holm et al. 2013; Lörz 2013; Schuchart and Rürup 2017; Van den Broeck et al. 2020; Vandellannote and Demanet 2021), but this also ignores institutional variation that may generate differences in student’s aspirations. Specialised research on German vocational school types and their students’ aspirations and transitions to higher education has considered the variation of school types in upper secondary education in more detail and partly differentiates between different general and vocational pathways to higher education (e.g., Schindler 2014; Quast et al. 2025). This research suggests that the educational aspirations of students differ between the various types of vocational schools. However, this research is mostly focused on selected school types and particular federal states (Schuchart et al. 2015; Watermann and Maaz 2004) and leaves questions about the plurality of vocational school types unanswered.

However, we argue that not only higher education aspirations are of interest for the analyses of educational plans of vocational upper secondary school students in Germany, but suggest that the “universe of options” after graduation with a HEEC comprises more than higher education – especially for students of different vocational upper secondary school types. Prior studies mostly applied binary concepts of future destinations and examined whether graduates strive to enter higher education or not (Bittmann and Schindler 2020; Heine et al. 2010; Schindler 2014; Schuchart 2019; Schuchart

and Schimke 2022; Watermann and Maaz 2006). Therefore, we suggest a multinomial approach that includes VET, higher education at universities and universities of applied sciences (UAS), and having no clear preference for an educational option. We know that vocational school students are generally less inclined to enter universities, but instead prefer VET or programmes of higher education at UAS (Lörz 2013; Schneider et al. 2020; Spangenberg and Quast 2023; Watermann and Maaz 2004). However, it is unclear how students of vocational upper secondary schools differ in their aspirations towards these different educational options. So, the first aim of this contribution is to scrutinise the educational aspirations of students in different types of vocational upper secondary schools.

The second aim of our contribution is to analyse how differences in educational aspirations between school types can be explained. Differences in student's aspirations between the school types can be explained by selection processes, the resulting path-dependencies and composition effects, by additional effects of exposure to specific school cultures and milieus, but also through institutional restrictions that come with specific types of formal qualifications awarded upon graduation from different school types. We derive hypotheses on the importance of performance, socio-economic background, the type of HEEC, and vocational qualification, because we assume that these at least partly explain the relationship between school type and educational aspiration.

We hence propose the following research questions: *How do students in vocational types of upper secondary education vary in their aspirations for different post-graduation pathways? How can these differences in educational aspirations between vocational school types be explained?* Overall, this contribution sheds light on the institutional diversity of upper secondary education in Germany and how vocational pathways to HEECs are associated with students' post-graduation plans theoretically and empirically.

The remainder of this paper will first give an overview of the upper secondary education system in Germany and contrast the traditional pathway to a HEEC via the *Gymnasium* against alternative routes through different types of vocational upper secondary schools. Previous research about higher education aspirations and transitions of students from different types of upper secondary schools will briefly be summarised before we present our theoretical assumptions regarding the aspirations of vocational upper secondary school leavers. Based on a representative school leaver panel, we present the results of descriptive analyses and multinomial logistic regressions for a detailed investigation of the educational aspirations of students in vocational upper secondary schools in Germany.

The German system of upper secondary and higher education

Types of higher education institutions and higher education entrance certificates

Although the German education system is known internationally for its historically tracked structure in secondary education, combined with a relatively early and strict segregation of students (Allmendinger 1989), the higher education system is much less vertically differentiated (Wolter 2017). A broad distinction between universities and UAS can be made. UAS offer a full range of bachelor's and master's programmes in fields like engineering, design, business and public administration, or social work and care. Unlike universities, UAS generally do not provide study programmes that lead to state examinations (e.g. medical studies, law, or teaching) and they usually do not

award doctorates. These are an exclusive domain of universities. However, the German higher education system is becoming increasingly differentiated (Wolter 2017): In recent decades dual universities and “universities of cooperative education” (*Berufsakademien*) that offer dual programmes combining higher education and VET gained relevance. Students gain access to these institutions conditional on a HEEC and a training contract with an apprenticeship employer (Cedefop and Bundesinstitut für Berufsbildung 2022). Although these institutions award B.A. degrees, these hybrid organizations of higher education (Graf 2013; Graf et al. 2024) cannot be regarded as “pure” institutions of higher education and their share of students is marginal in comparison to universities and UAS (Wolter 2017).

Access to these higher education institutions is regulated through different types of HEECs that are mostly achieved with graduation from general and vocational upper secondary school types. A general HEEC (*Allgemeine Hochschulreife*) allows students to enter all types of higher education institutions and all fields of study. A field-restricted HEEC (*fachgebundene Hochschulreife*) qualifies for fields of study related to the prior training but does not restrict the type of institution. A type-restricted HEEC (*Fachhochschulreife*) only qualifies for higher education at UAS.

Types of vocational upper secondary schools

Figure 1 shows a simplified overview of the diversity of pathways from vocational upper secondary schools to higher education in Germany. After elementary school, students are assigned performance-based to different lower secondary school types, typically at the age of 10–12 years. From the academic track of lower secondary schools, like the traditional *Gymnasium* (GY) or academic streams of comprehensive schools¹, students often automatically transfer to upper secondary education within the same schools after grade 10. Upper secondary education at GY ends with a general HEEC. After graduation from intermediate school, students can choose between different types of general and vocational upper secondary schools for further education. All of the vocational upper secondary schools² presented in Fig. 1 can award a HEEC upon graduation and are briefly described in the following:

Specialised grammar schools (*Berufliches Gymnasium/Fachgymnasium*, BG) are full-time vocational upper secondary schools. Students enter after graduation from lower secondary school, typically with an intermediate secondary school leaving certificate. The curricula resemble those of general upper secondary schools but are supplemented with profile-specific content (e.g., business and administration, technology, social pedagogy). Upon three years of schooling and graduation, they are awarded a general HEEC.

Specialised upper secondary schools (*Fachoberschule*, FOS) have a more explicit vocational orientation than BG. Students typically enter grade 11 of FOS with an intermediate secondary school leaving certificate, but students with a prior vocational qualification can directly enter grade 12. In grade 11, part-time schooling is combined with a time-intensive internship. Grade 12 consists of full-time schooling. Due to the reduced content from the general upper secondary curriculum, FOS awards a type-restricted HEEC.

¹ Comprehensive schools are another type of general upper secondary school that is comparable to GY.

² We do not consider trade and technical schools (*Fachschulen*) in this description because they are located at the tertiary education level.

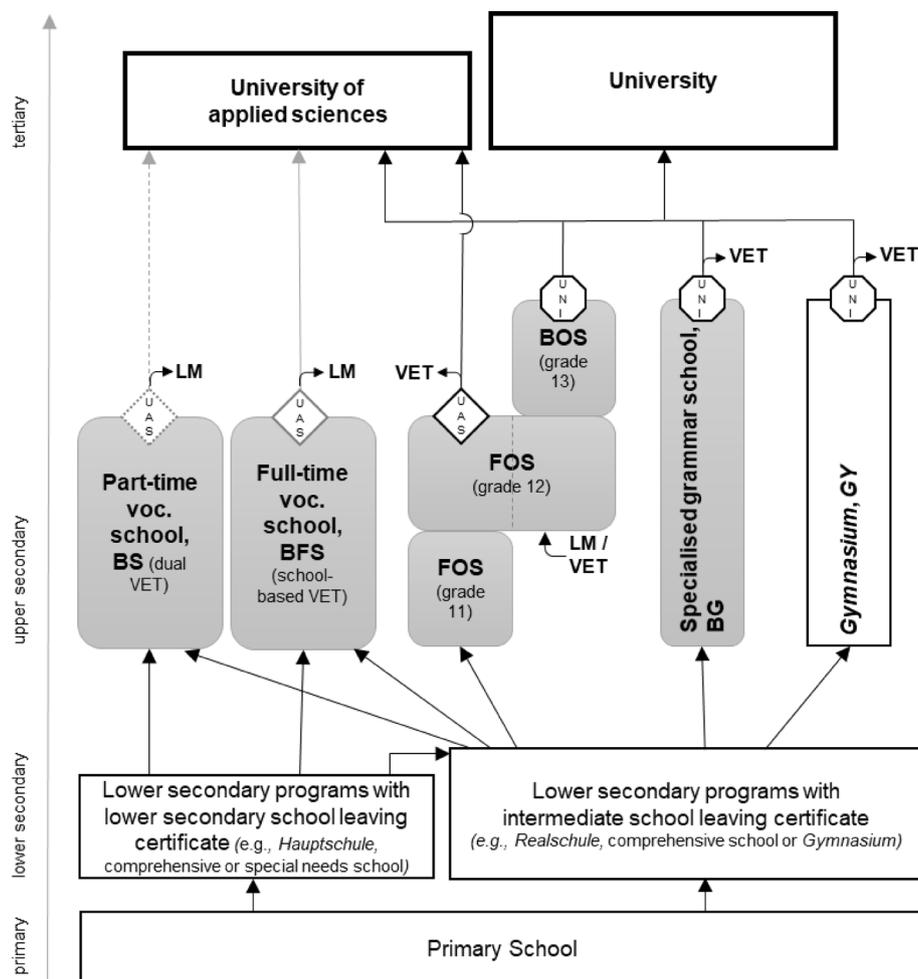


Fig. 1 Pathways from vocational upper secondary schools to higher education. Notes: UAS (diamond): type-restricted HEEC; UNI (octagon): general or field-restricted HEEC; greyed arrows: HEEC not comprehensively institutionalised; dashed and greyed arrows: exceptional HEEC; LM: labour market; VET: vocational education and training. Source: Adapted from (author's publication 1)

Senior vocational schools (*Berufsoberschule*, BOS) are full-time upper secondary programmes, usually for students with a prior vocational qualification. Formally, BOS takes two years (grade 12–13), but in most federal states, grade 12 is completed at a FOS, followed by grade 13 in BOS.³ Like FOS, BOS is designed to lead students to a HEEC but focuses more on the general upper secondary curriculum. Graduates receive a general or a field-restricted HEEC, depending on their achievements in a second foreign language.

BG, FOS, and BOS are explicitly designed to lead students to a HEEC. None of these school types results in a formal qualification for a skilled occupation. In addition to this sector, other types of vocational schools exist that primarily qualify students for skilled occupations, but policies of permeability prompted some institutions to establish an optional HEEC stream (Neumann and Trautwein 2019). Under certain conditions, students can obtain a type-restricted HEEC in these institutions:

³ The institutional structures of FOS and BOS vary greatly between some of the German federal states. This description outlines the basic structures, which are also described by the Standing Conference of the Ministers of Education and Cultural Affairs (Kultusministerkonferenz 2010, 2020).

The best-known part of the German VET system is dual training. Companies hire apprentices who follow a 2-3-year training programme that typically comprises extended practical units in the companies and schooling in a part-time vocational school (*Berufsschule*, BS). The aim of BS is clearly focused on preparing their students for skilled labour. However, students can follow additional lessons from the general upper secondary curriculum to gain a type-restricted HEEC.

Full-time vocational schools (*Berufsfachschule*, BFS) have different institutional variations, ranging from 1 to 3 years. In contrast to BS, students attend the school full-time and practical units are usually completed as internships at various institutions. The 2- and 3-year VET programmes often result in a full qualification for the skilled labour market and their curricula are closely task-oriented. However, specific programmes exist that also lead to a type-restricted HEEC and others that lead to a type-restricted HEEC only and not to a vocational qualification.

However, it is important to note that VET has a double function in the educational system. On the one hand, some VET programmes provide opportunities for lower secondary school leavers who prefer practical training but still want to keep the option to obtain a HEEC and enter higher education later on. On the other hand, especially VET programmes leading into attractive and well-paid occupations recruit mostly students who already have a HEEC. So, they are also destinations for upper secondary school leavers who already hold a HEEC.

Overall, institutionalised school pathways to a HEEC have diversified in the last decades. They offer more opportunities to enter higher education for students not following the traditional path. The next section summarises the findings on the educational aspirations of students at these different types of vocational schools.

Educational plans of vocational upper secondary school students

Empirical research on alternative pathways to higher education in Germany gained relevance during the last two decades and covers several issues, such as performance differences between school types in upper secondary education (Maaz et al. 2004; Trautwein et al. 2010), aspirations to enter higher education (Finger 2016; Maaz 2006), or differential transition probabilities to higher education (Heine et al. 2010). Within sociology of education, questions around social inequality are in particular focus (Buchholz and Pratter 2017; Dörffer and Bernhard 2025; Hillmert and Jacob 2003; Schindler 2014; Tieben and Rohrbach-Schmidt 2021). It is regularly pointed out that the study aspirations and transition probabilities of students from vocational upper secondary schools are, in general, lower than those of general upper secondary schools (Bittmann and Schindler 2020; Lörz 2013; Schindler 2014; Schuchart and Rürup 2017). Likewise, a type-restricted HEEC is reported to be associated with lower aspirations than a general HEEC (Heine et al. 2010; Quast et al. 2023; Schindler and Bittmann 2021; Schuchart 2019; Tieben and Rohrbach-Schmidt 2014). Other studies find that graduates from vocational types of upper secondary education are more likely to choose VET instead of higher education (Schneider et al. 2020) and – in case they aspire higher education – to enter UAS rather than universities (Lörz 2013; Spangenberg and Quast 2023). These lower aspirations for university studies and higher inclinations for UAS or VET are usually justified in the more practice-oriented higher education programmes of UAS and the strong labour market orientation of VET (Schindler and Reimer 2011). These are particularly attractive

for students from vocational upper secondary schools who already have a high interest in work-related content and practical relevance at upper secondary level (Stöbe-Blossey 2016). However, the studies investigating educational aspirations usually do not differentiate between the various vocational school types.

There is currently no study that covers the broad variety of vocational school types in its investigation of educational aspirations and transitions across all German federal states. Some regional studies do not find pronounced differences in the aspiration to enter higher education between students of GY and BG (Finger 2016; Maaz 2006). However, these studies focus on a detailed investigation of BG in comparison to GY, whereas Schuchart et al. (2015) compare the study aspirations of students in comprehensive schools and several types of vocational upper secondary schools: They report that among FOS students (26%) and BFS students (19%) study aspirations are considerably lower than among students at comprehensive schools (60%) and BG (52%). Regarding the actual transition rates to higher education, a national study (Heine et al. 2010) shows slightly lower transition rates among students from BG and BOS (74%) than from GY (80%). The study also reveals considerably lower transition rates for students of other vocational school types, like FOS (62%) or students of either a BFS or other vocational school types (42%). Schindler (2014) used a national sample of school leavers and presented comprehensive findings on the higher education aspirations of students from a broad set of general and vocational upper secondary school types (e.g., *Gymnasium*, evening schools, BG, FOS, BOS). However, he examines higher education aspirations only and categorises different types of schools into broader sub-categories (e.g., general or vocational institutions offering second-chance education with a general HEEC).

To our best knowledge, there are no quantitative-empirical findings on the level of vocational orientation of students of different vocational school types. Even though some vocational upper secondary school types (FOS, BFS) have been criticised as a “moratorium for orientation” (Giese 2011), all students of vocational upper secondary schools have usually chosen for a specific profile, which suggests a certain vocational interest and a higher level of vocational orientation (Watermann and Maaz 2004).

To summarise, our literature review suggests that – although all school types equip their graduates with a formal HEEC – the students differ considerably regarding their future plans. However, existing research either focuses on particular regions, particular school types, or groups various types of schools into broader sub-categories. Moreover, the studies mostly apply a binary concept of educational plans (study versus not study). We suggest taking a broader set of options into account. The following conceptual framework will elaborate on this.

Theoretical explanations for different educational aspirations

Conventional studies of educational aspirations and decisions usually draw on Rational Choice Theory and Boudon's (1974) concept of primary and secondary effects of social origin. However, rational choice considerations only marginally consider the institutional context in which the decision takes place and we argue that the institutional heterogeneity of German upper secondary education results in specific context conditions that were not fully addressed in previous approaches. After graduation from upper secondary education, a wide range of prospective destinations is available, comprising higher education at a university or a UAS, and non-tertiary training in the VET system.

Moreover, not all students have clearly crystallized occupational aspirations and we suggest including indecision as an outcome at the end of upper secondary education. We therefore propose taking the following aspects of the institutional context into account.

First, students are selected at a very early age into “differentiated learning and development environments” (Baumert et al. 2006). The allocation to different school types is mainly performance-based and school types differ in their entry and examination requirements, curricula, teaching cultures as well as students’ composition regarding socio-economic backgrounds, performance, and ability. Depending on the school type, students acquire skills and knowledge at different rates (Baumert and Schümer 2001; Baumert et al. 2006; Maaz and Dumont 2019). The different types of upper secondary schools differ in their preparation for higher education in terms of fostering their students’ “academic readiness” and teaching scientific propaedeutic knowledge (Asdonk and Sterzik 2011; Tieben 2020; Tieben and Knauf 2019). This may result in school type-specific levels of academic preparation, which is likely to influence the perceived success probability in higher education. This possibly is responsible for pronounced differences in the aspirations for higher education.

Second, we argue that part of the association between school type and aspirations probably is explained by the socio-economic composition of the student population. Effects of socio-economic background on educational decisions are – to a certain degree – independent of performance (Boudon 1974). Students from lower socio-economic backgrounds use vocational pathways to HEECs more often than their peers from more privileged backgrounds and hence are overrepresented in vocational upper secondary schools (Schuchart and Schimke 2022; Watermann and Maaz 2006). They also tend to overestimate the costs of higher education and to underestimate the benefits of a degree and their success probability in higher education (Barone et al. 2018; Becker and Hecken 2009; Daniel et al. 2018). For this reason, it is a common observation that they choose VET rather than higher education, even when they are eligible to enter higher education (Hillmert and Jacob 2003; Müller and Pollak 2008).

Third, considerable institutional constraints arise through path dependencies: the slower pace of learning in lower and intermediate secondary education may hamper a smooth transition to general upper secondary schools after grade 10. This is because until grade 10, a considerable curricular leeway develops between the tracks and many students struggle to catch up in upper secondary education without repeating a grade. For many students, the vocational routes to a HEEC hence are a more feasible alternative (Schuchart and Schimke 2022; Trautwein et al. 2011). However, institutional constraints of these vocational upper secondary school types partly set limitations to the set of available options after graduation. Especially students with type-restricted HEECs at vocational upper secondary schools (BFS, FOS) are not eligible to enter universities (even though there are exceptions) and instead can only choose between VET or higher education at UAS.

Fourth, conventional rational choice approaches assume very linear pathways through the education system and sequential yes/no decisions to take the next level. For some types of German upper secondary schools, this assumption does not hold. Some types of vocational upper secondary schools accommodate high shares of “returners” (Schindler 2014) to the education system who already graduated from VET (i.e. BOS, FOS). These students may deliberately wish to extend their career opportunities by gaining a HEEC

and subsequently pursue higher education. Students from these school types possibly are more likely to strive for higher education than for VET. Other types of vocational upper secondary education (especially BFS) offer VET programmes that result in a formal qualification for skilled employment. These primarily aim to prepare their graduates for the skilled labour market but provide the opportunity to obtain a HEEC upon graduation. It seems safe to assume that a considerable proportion of these students plans to enter skilled employment after graduation instead of moving on to higher education or another VET programme. In this case, the institutional effects do not arise through formal institutional restrictions but rather through the intake of a student population with specific preconditions and plans.

To summarise the above arguments, we derive the following hypotheses: We assume that students who enter vocational types of upper secondary schools have different reasons to obtain a HEEC and develop different aspirations for their subsequent educational and occupational careers than students of the traditional *Gymnasium*. As a general hypothesis, we propose that students in vocational upper secondary schools are more inclined to enter VET than students in GY (H1a). Moreover, they are more inclined to enter UAS (H1b) and less inclined to enter UNI (H1c). We also propose that students in vocational upper secondary schools have a clearer vocational orientation than students in GY and hence are less likely to be undecided (H2). As outlined above, we assume several mechanisms that explain differences in students aspirations between school types. First, we expect that these different aspirations are partly explained by differences in prior performance (H3). Prior performance gives a certain orientation to students regarding their success probability in different types of education and it is reasonable to assume that the choice between different options is strongly influenced by individual expectations of challenges and risks of failure (Barone et al. 2018). We also expect that aspiration differences between school types to a certain degree are explained by socio-economic background (H4). The share of students from lower socio-economic backgrounds is higher in vocational upper secondary schools and “secondary effects” (Boudon 1974) of family background may be responsible for school type-specific aspirations. However, as outlined above, we propose that institutional restrictions contribute considerably to differences in future plans: The type of HEEC sets limitations to the feasible options as a restricted HEEC does not allow free choice between types of institutions and programmes. We therefore assume that the type of HEEC explains school-type differences in aspirations to a certain extent (H5). Moreover, previous vocational experience limits the perceived benefits of additional VET. Some types of upper secondary school accommodate students who already have graduated from VET and hold a formal qualification for skilled employment. It is reasonable to assume that these students primarily enter upper secondary education to gain a HEEC and strive to enter higher education. We therefore propose that prior vocational qualifications explain the school-type differences in aspirations to a certain extent (H6). Moreover, we assume that the influences of these factors described in H3-H6 vary depending on the type of school. In order to maintain an economic number of hypotheses, we omit developing specific hypotheses for each of the school types but will provide details in the results section.

Data and analytical approach

Data

The data base of the following analyses is the DZHW Panel Study of School Leavers 2015 of the German Centre for Higher Education Research and Science Studies (DZHW) (Schneider et al. 2021). The population consists of all students who obtained a HEEC at a general or vocational school across all German federal states in the school year of 2014/15. The panel study tracks these students over several years, beginning in their final year of upper secondary education, approximately six months before graduation. A total of 29905 out of the 60351 contacted students took part in wave 1, resulting in a response rate of 50% (Schneider and Vietgen 2021). The follow-ups took place six months (wave 2) and 3.5 years (wave 3) after graduation. As we are interested in the aspirations at the end of upper secondary school, we use the first wave of the panel study.

Due to our specific interest in differences in educational aspirations between students of vocational upper secondary schools, we restricted the sample to students who are attending these different types of vocational upper secondary schools (BG, BFS, FOS, BOS). We further included the traditional *Gymnasium*, which is the most common pathway to higher education, as a reference category in our models. Students attending other types of general upper secondary education (e.g., comprehensive schools, *Kollegs*) were excluded from the sample ($N=2302$). We further excluded two vocational school types: specialised academies (*Fachakademien*, $N=153$) were excluded because they only occur in Bavaria and trade and technical schools (*Fachschulen*, $N=1104$) because these are schools for advanced VET rather than upper secondary education. Furthermore, we excluded students who omitted the practical part of the type-restricted HEEC ($N=811$) because the school part by itself does not result in a full HEEC. Students in BS were not included in the design of the data collection. After excluding these cases, the remaining number of respondents is $N=25357$ (see Tab. A1 in the appendix).

Variables

Dependent variable

To test our hypotheses, we identify four prospective destinations after graduation from upper secondary education: VET, UAS, university (UNI), and no clear preference. These destinations were derived from two items that indicated the intention to enter higher education or VET after graduation (Do you intend to start higher education? Do you intend to start vocational education and training (e.g. an apprenticeship) after school? Both items had the answer categories: yes, definitely – yes, probably – possibly – no, probably not – no, definitely not). In addition, a question about the preferred type of higher education institution was chosen to differentiate between preferences for UNI and UAS. As hybrid types of higher education, universities of cooperative education (*Berufsakademien*) and administrative colleges (*Verwaltungsfachhochschulen*) were coded as “UAS”. We excluded students who have neither expressed a desire to start higher education nor VET ($N=234$), because the case number is too low for detailed analyses of a separate category. The proportion of those not planning any further education is below 1.2% at all types of schools, with the exception of BFS (4.1%). Students who are either unsure about their future educational path or who express similarly high aspirations for different educational options were coded as “no clear preference”. We acknowledge that this is a heterogeneous category, but parsimony considerations

and small case numbers advised us to conflate this group. The upper panel of Table 1 shows frequencies and bivariate distributions across school types of the prospective destinations.

Independent and control variables

Our main explanatory variable is the type of upper secondary school. We differentiate between GY (*Gymnasium*), BG (specialised grammar school, *Berufliches Gymnasium*), BFS (full-time vocational school, *Berufsfachschule*), FOS (specialised upper secondary school, *Fachoberschule*), and BOS (senior vocational school, *Berufsoberschule*). We further test if the school types are associated with the individual performance in school and included the grade point average (GPA) that was reported by the respondents half a year before graduation. The GPA in German schools is not fully standardized and therefore is not an “objective” measurement of actual performance. Yet, we argue that GPA roughly informs students about their relative position in their peer group (i.e. school type, federal state) and that GPA for most students is the only source of information regarding their performance and success probability in future education. For this reason, it seems reasonable to assume that educational aspirations are associated with GPA. The measurement follows the grading system in German upper secondary education (0–15, higher grades indicating better performance). Students’ family background was measured binary with a variable that indicates whether at least one parent had gained a higher education degree (yes = 1, no = 0). We further integrate the type of HEEC as an explanatory variable. The variable differentiates between a general (= 0, including field-restricted HEECs) and a type-restricted HEEC (= 1). Additionally, we integrated a measure of vocational qualification. This variable is coded 1 (= yes, with graduation) for currently enrolled students in a fully qualifying programme, 2 (= yes, previously) for completed qualifications in the past, and 0 (= no) if neither applies.

We further included variables to control for gender, migration background, age, and federal state affiliation, which are associated with educational aspirations after obtaining

Table 1 Distributions of categorical variables

	GY	BG	BFS	FOS	BOS	Total	
	% (col.)	N	% (col.)				
Prospective destination							
VET	12.6	21.5	34.7	30.8	4.7	3975	17.3
UAS	13.9	18.5	34.9	31.1	45.7	4382	19.1
UNI	50.8	36.2	7.5	16.5	30.7	9423	41.0
No clear preference	22.8	23.7	23.0	21.6	19.0	5191	22.6
Family background							
Non-academic	37.1	51.5	62.4	59.5	70.0	10203	44.4
Academic	62.9	48.5	37.6	40.5	30.0	12,769	55.6
Type of HEEC							
General & field-restr.	100.0	100.0	1.5	7.5	44.9	18174	79.1
Type-restricted	0.0	0.0	98.5	92.5	55.1	4798	20.9
Prior vocational qualification							
No	99.9	96.1	57.0	74.4	10.9	20792	90.5
Yes, with graduation	0.0	2.8	20.2	0.0	0.0	371	1.6
Yes, previously	0.1	1.2	22.8	25.7	89.1	1809	7.9
Total N	15075	2535	1490	3198	673	22972	
Total %	65.6	11.0	6.5	13.9	2.9	100.0	

DZHW Panel Study of School Leavers 2015. Weighted, absolute and relative numbers rounded

a HEEC. As women with a HEEC are slightly less likely to transfer to higher education, in particular to UAS (Lörz 2013; Lörz and Mühleck 2019), we controlled for gender (1 = female, 0 = male). Students with a migration background show regularly very high aspirations for higher education (especially at UNIs) rather than VET compared to their native peers (Kristen et al. 2008). Therefore, we controlled for migration background, which considers if at least one parent was not born in Germany (yes = 1, no = 0). In order to distinguish between age-related effects and effects due to completed VET, we controlled for age at the time of the interview (in categories ranging from “below 18” to “25 and older”). Since the federal states offer different institutional opportunities for correcting educational trajectories (Kurz and Böhner-Taute 2016) and, consequently, the combinations of school type, type of HEEC and vocational qualification is state-dependent, we included a variable controlling for each of the sixteen German federal states to exclude specific federal state effects.

Missing data

The share of missing data on individual variables does not exceed 4.7% (see Tab. A1 in the appendix). Cases with missing values were removed from the dataset. Our final data set contains 22972 cases. We are aware that a higher number of missing data combined with listwise deletion might lead to less efficient results and potentially sample bias (Rubin 1987). This is why we have applied multiple imputation with chained equations (Azur et al. 2011) and calculated all multivariate models with additional imputed data sets ($M=20$). The results stemming from the imputed samples (see Tab. A2 in the appendix) show high similarities to our results without imputed data. Because we highly value the bivariate findings, we refrain from presenting the multivariate results based on the imputed data set only. Through the bivariate analyses, we can enrich the general knowledge about the educational aspirations of students of different upper-secondary school types and later, in the stepwise model, explain what factors shape the connection between school type and aspirations.

Analytical approach

As a first step, we ran bivariate analyses to get an impression of the characteristics and aspirations of students towards the different prospective destinations and their distributions within different school types. In a second step, we ran multinomial logistic regressions with the four prospective destinations (VET, UAS, UNI, no clear preference) as categorical dependent variable (Long and Freese 2014). We specify the following models: (1) control variables + school type, (2) model 1 + GPA, (3) model 2 + family background, (4) model 3 + type of HEEC, and (5) model 4 + prior vocational qualification. These specifications allow us to investigate if and to what extent the bivariate associations between school types and prospective destination are explained by the included variables. For ease of interpretation of the regression results, we calculated average marginal effects (AMEs). AMEs are not calculated in relation to a baseline category, but instead to the average of all other characteristics of the dependent variable. Across all four destinations, the AMEs add up to zero because the destinations are mutually exclusive. An increase of the AME of one outcome category hence is necessarily at cost of a decrease in at least one of the other categories. We further plotted the AMEs with *coefplot* (Jann 2014). Regarding the non-linear properties of logistic regressions, plotting the AMEs

enables comparability across models and eases interpretation of the results. It is nevertheless important to note that AMEs do not “correct” the non-linearity of a logistic estimation, but that they represent the average effect across the distribution of x (Howell-Moroney 2024; Mood 2010). Due to the stratified, random cluster sampling of the study, all analyses were weighted using a provided cross-sectional weight which corrects for a disproportional sampling of gender, school groups, and federal states (Schneider and Vietgen 2021). For multiple imputation, we used *mimrgns* (Klein 2014). All analyses were calculated using Stata 18.

Results

Bivariate analyses

Table 1 shows the distributions of all categorical variables as cross-tabulations with school type (for cross-tabulations with control variables, see Tab. A3 in the appendix). None of the school types produces clear preferences for specific destinations. Although the majority (50.8%) of GY students plan to enter UNI, around one-quarter of this group either plans to enter VET (12.6%) or UAS (13.9%). For vocational school types, it becomes evident that relatively high shares of students from BG, BFS, and FOS (22–35%) want to enter VET. This is striking, given that all these school types prepare students for higher education and award a HEEC. On the contrary, students from BOS show very high aspirations for higher education at either UAS (45.7%) or UNIs (30.7%). Moreover, it is noticeable that half a year before leaving upper secondary school, 19–24% of the leavers of all school types show no clear preference for a specific educational option.

Further, Table 1 shows that GY is the school type accommodating the highest share of students from academic backgrounds (62.9%). In contrast, in all vocational school types, students with a non-academic background are the majority. Especially BFS (62.4%), FOS (59.5%), and BOS (70.0%) seem to be more receptive to the non-academic student clientele. Further, there is a clear divide between school types regarding the type of HEEC. All GY and BG students receive a general HEEC⁴, while BFS (98.5%) and FOS (92.5%) mostly obtain a type-restricted HEEC. In BOS, 44.9% earn a general or field-restricted HEEC.⁵ Whereas only a marginal number of students in GY and BG had completed a vocational qualification, a majority of 89.1% in BOS and one-quarter (25.7%) in FOS is already trained. BFS is the most heterogeneous: While 57.0% have no prior vocational qualification, one-fifth (20.2%) will obtain a vocational qualification within their educational programme. The remaining 22.8% are already trained.

Figure 2 shows the mean values of current GPA by school type (for comparisons of the means and p-values, see Tab. A4 and A5 in the appendix). GY students report significantly higher performances ($\bar{x}=10.24$) than all other students. In comparison, students of BG ($\bar{x}=9.72$) and BOS ($\bar{x}=9.41$) still report higher performances than students of BFS ($\bar{x}=9.21$) and FOS ($\bar{x}=9.10$). After these descriptive insights, we continue by analysing our data in a multivariate setting.

⁴ Students can theoretically leave these school types (GY, BG) with the school part of a type-restricted HEEC after grade 12, but the study's design does not include these students.

⁵ The shares of students in FOS receiving a general or field-restricted HEEC and students in BOS that receive a type-restricted HEEC are due to differences in the institutional structures of these school types across federal states.

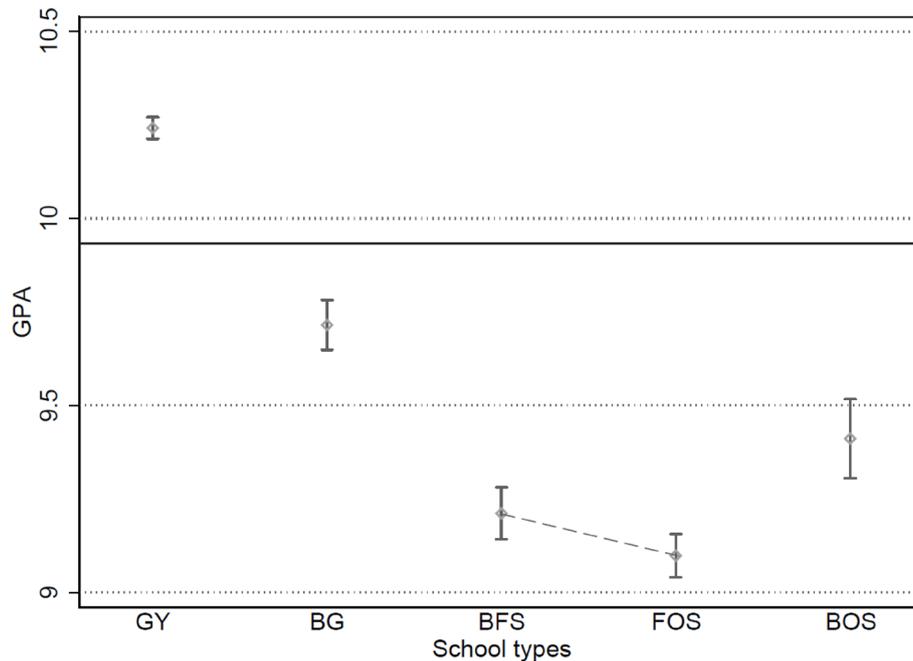


Fig. 2 Mean values of current grade point average (individually stated)

Notes: The horizontal line indicates the mean of the total sample ($\bar{x}=9.93$). Subsample-means that are not connected with a dashed line are significantly different from each other ($p > 0.05$). DZHW Panel Study of School Leavers 2015. $N = 22972$, weighted.

Multivariate analyses

To examine if and to what extent the presented characteristics help to explain the association between school type and the four prospective destinations, we ran a set of multinomial logistic regressions. As these types of analyses result in a large number of coefficients, we plotted the AMEs by school type and prospective destination (Fig. 3).⁶ The position of the markers indicates the average percentage point (pp) difference in the probability of choosing the prospective destination for each school type relative to students in GY (see Table 1 for the baseline distribution). The closer the AME is to zero, the smaller is the difference compared to the reference category (GY). The different markers represent each of the five models. As a reading example, the round marker (M1) in the upper left panel tells us that students from BG are, on average, 10.0pp more likely to enter VET than students from GY. We also can determine that the preference for VET among BG students is at the expense of higher education at a UNI (-11.7pp, see bottom left panel). We chose this presentation of our results, because AMEs allow comparisons across model specifications, so that we can determine, step by step, to what extent the association between school type and aspiration is explained by the explanatory variables. The following section will summarize the most notable observations by school type.

Students of BG show, on average, significantly higher aspirations for VET (+6.8pp) and lower aspirations for UNI (-7.5pp) than students of GY. This difference between the school types cannot be fully explained after including all explanatory variables (M5). Moreover, the models reveal that BG students, on average, do not have significantly

⁶ A detailed table can be found in Table A6 in the appendix.

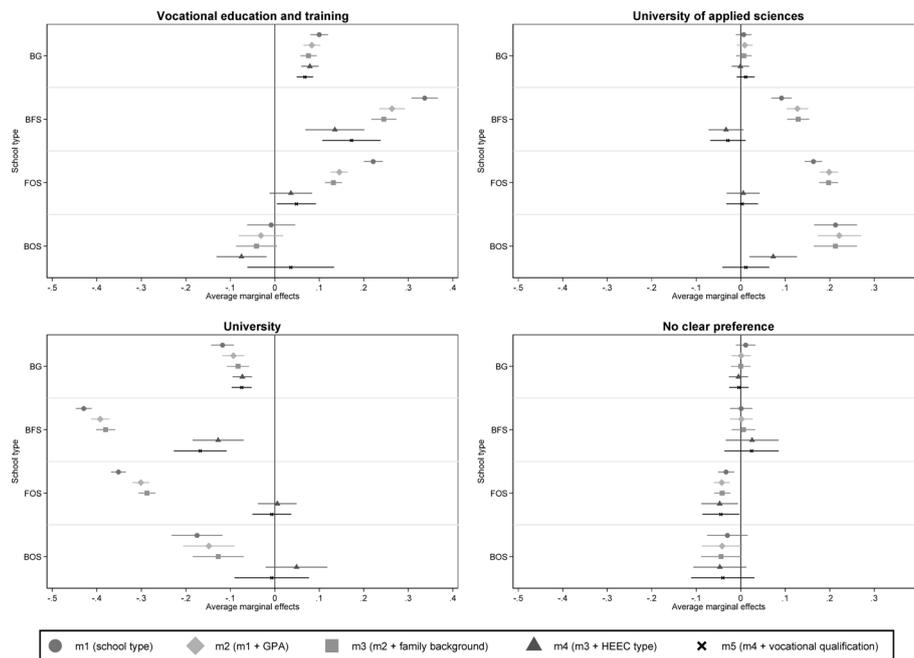


Fig. 3 Results of multinomial logit models (average marginal effects) Notes: Dependent variable: prospective destination; reference category: Gymnasium (GY). All models contain control variables: gender, migration background, age, federal state. DZHW Panel Study of School Leavers 2015. N = 22972, weighted

higher aspirations to attend UAS than GY students and they are not more likely to express clear preferences. The current GPA explains some of the differences in UNI aspirations (M1-2), indicating that lower UNI aspirations partly result from BG students' lower performances compared to GY students. The other explanatory variables reduce the differences only marginally.

Differences in educational aspirations between BFS and GY students can be explained to a large extent by the type of HEEC (M4) and, to some extent, by GPA (M3) and vocational qualifications (M5). The type of HEEC significantly reduces differences to GY students in VET, UAS, and UNI aspirations (M4), which indicates that it is primarily a matter of eligibility that students from BFS do not strive to enter UNI and instead prefer VET or UAS. Differences between BFS and GY students in VET and UNI aspirations decrease to some extent if GPA is controlled for, but increase for UAS aspirations. This reflects the bivariate finding that BFS students show lower performances than GY students, resulting in lower UNI and higher VET and UAS aspirations. Vocational qualification acts as a suppressor variable for VET and UNI aspirations (M4-5): Having no vocational qualification enlarges differences to GY students for VET and UNI aspirations. After the inclusion of all explanatory variables (M5), BFS students are, on average, still more likely to choose VET (+17.2pp) and less likely to choose UNI (-16.8pp) than GY students. Differences in UAS aspirations become non-significant after including the type of HEEC (M4), while differences in having a clear preference were not significant from the beginning.

Differences in aspirations between FOS and GY students are almost entirely explained by the type of HEEC (M4) and GPA (M2). After the inclusion of the HEEC type, differences in VET, UAS, and UNI aspirations diminish to non-significance. In the final model (M5), FOS students show, on average, marginally higher aspirations for VET (+4.8pp)

and a slightly clearer preference for an educational option (−4.5pp) but do not differ in their higher education aspirations to GY students. Therefore, FOS students only show lower UNI and higher UAS aspirations because they usually obtain type-restricted HEECs and because of their lower average performance.

Finally, BOS students show, on average, no significant differences in aspirations to GY students in any educational option after including all explanatory variables (M5). The type of HEEC helps to explain why BOS students initially show higher aspirations for UAS and lower aspirations for UNI, which is – again – to a large extent due to the restricted nature of this certificate. Further, prior vocational qualification acts as a suppressor variable: Having no vocational qualification increases VET aspirations among BOS students. The following chapter will conclude by discussing the overall significance of these empirical findings.

Conclusions

Alternative pathways to higher education have been institutionalised in recent decades to implement policies of widening participation. These pathways gained popularity but previous research showed that students in vocational upper secondary schools are on average less inclined to enter higher education than students in general upper secondary schools, and that they prefer to study at UAS rather than at UNIs. These studies, however, did not fully consider the diversity of vocational types of upper secondary education and the non-binary set of possible destinations for students with a HEEC. We therefore extended previous approaches by applying a multinomial design that includes different types of higher education institutions (UNIs and UAS), VET and having no clear preference. We proposed the following research questions: *How do students in vocational types of upper secondary education vary in their aspirations for different post-graduation pathways? How can these differences in educational aspirations between vocational school types be explained?*

In sum, our results (M1) only partly support the hypothesis that students in vocational upper secondary schools are more interested in VET than GY students (H1a). This is true for BG, BFS, and FOS but not for BOS. In a similar way, model 1 only partly confirms H1b, as BFS, FOS, and BOS students are more likely to strive for UAS than GY students, but BG students are not. H1c is fully confirmed: students from all vocational upper secondary school types are less likely to strive for university than GY students. Our results also reveal that the school-type-differences regarding indecision are smaller than expected: we can confirm H2 only for FOS, where effects are small but significant across all model specifications. Surprisingly, the share of students who do not express clear educational plans six months before graduation from upper secondary school is relatively high across all school types (19–24%). However, as already mentioned, this category is heterogeneous, which may explain the observed non-significant findings.

Overall, we have argued that a differentiated view on vocational school types has to be adopted regarding their students' educational aspirations. In addition, we were interested in how these differences in aspirations can be explained. Our empirical results show that differences in prior performance (H3), institutional restrictions through different types of HEECs (H5), and previous vocational qualifications (H6) explain the associations between school types and prospective destinations to a certain extent. Prior performance only partly and only to a limited extent explains the association

between school type and aspiration: The inclination to enter VET and the aversion to enter UNI are reduced, whereas the inclination to enter UAS is increased when prior performance is controlled. This indicates that students in vocational upper secondary schools do consider their GPA for future educational choices, but that grades do not play a dominant role in the decision. Therefore, we partly confirm H3 as especially for BFS and FOS, GPA does explain the association between school type and aspiration to a non-negligible extent. Socio-economic background seems to be even less influential on educational aspirations. When school type and GPA are held constant, we do not observe a pronounced change in the effect sizes through the introduction of socio-economic background. This does not indicate that socio-economic background is irrelevant, but it is probably much more decisive in earlier decisions. It is plausible to assume that socio-economic background determines the choice of school types but primarily seems to work through path dependencies. We therefore reject H4. The type of HEEC, to the contrary, significantly determines the aspirations and explains the association between school type and aspiration to a considerable degree (H5). As soon as the type of HEEC is controlled (M4), the differences in aspirations between BFS, FOS, and BOS and GY are drastically reduced. We therefore confirm H5 for BFS, FOS, and BOS but not for BG. A vocational qualification is particularly important for students of BOS, less so for students of BFS and FOS. Students with no vocational qualification are generally more likely to strive for VET and less inclined towards higher education at a university. These findings are plausible because we assume that especially students of BOS “return” to the education system after having completed VET with the goal to upgrade their educational certificate and enter higher education. For UAS aspirations, only students of BOS without a vocational qualification less often strive for higher education at UAS. We therefore confirm H6 for students of BOS, BFS, and FOS but not for BG.

Our results suggest that institutional restrictions are a main driver for school type differences in educational aspirations. We acknowledge that performance and socio-economic background probably have a high relevance in previous educational decisions and work through selectivities and path dependencies, but once students are sorted into upper secondary school types, the effects are considerably smaller than the effects of the type of HEEC (for a discussion, see Mare 1980). It is highly desirable but beyond the scope of this contribution to shed light on the mechanisms of this sequential selection. However, our results show that conventionally used concepts of Rational Choice Theory and especially Boudon’s (1974) concept of primary and secondary effects of social origin cannot be applied solely to the investigation of vocational school students’ aspirations without considering the institutional context in which the decision takes place.

Limitations and outlook

Overall, our empirical findings indicate that the educational aspirations of students in vocational types of upper secondary schools vary greatly from each other and from those in GY. These differences can be explained to a large extent by institutional restrictions set by the type of HEEC, by differences in performance, and by previous vocational qualifications. However, the data and methods used may limit the explanatory power of the results.

First, the complexity of the German education system does not allow a comprehensive model that captures all conditions of “inflow” and “outflow” decisions. Our dependent

variable was created by using different indicators of educational aspirations, leading to classification problems and a comparatively heterogeneous “no clear orientation” category. However, it is neither worthwhile to include every possible option after graduation in multinomial logistic regressions nor to drop a substantial number ($N = 1193$) of students from our analytical sample, which would lead to a considerable bias. Therefore, we accept the drawbacks of a heterogeneous category. Despite this, our multinomial approach allowed us to analyse a broader range of educational options after obtaining a HEEC and to go beyond binary classifications (e.g. studying/not studying) conventionally used in the literature. Further, our results are robust against alternative definitions and specifications of the category, like excluding students with higher education and VET aspirations from the “no clear preference” category (additional analyses upon request).

Second, we used GPA as an indicator of performance, which may be considered as not accurate because the final exams across all of these school types are not standardised in Germany, and the grading standards may deviate. We nevertheless argue that students probably evaluate their performance in comparison to their direct peers and use their current GPA as an absolute rather than a relative value.

Finally, we chose a binary measure for socio-economic background that only differentiates students with from students without academically educated parents. However, previous analyses have shown that even the use of a more differentiated variable does not make a substantial difference to the main results (additional analyses upon request). Further, prior research points to the importance of the social composition of students at vocational upper secondary schools (Watermann and Maaz 2006), which appears to be related to students' overall educational aspirations. As we have only included a measure of socio-economic background on the individual but not at the school type level, the association between socio-economic composition and educational aspirations of the overall student population of vocational upper secondary school types has to be explored in more detail in future research.

Despite these limitations, some factors remain unobserved, highlighting the need for future research. Although the presented factors explain most of the differences between school types, pronounced differences for BG and BFS remain in the full model. This indicates that the future plans of these students are to a considerable extent determined by unobserved factors that have to be explored in future research. In line with the considerations of Schuchart (2019), we may speculate that the institutional contexts of the school types shape certain “cultures of study orientation” among students that result in deviating educational aspirations. Further explanatory factors could then be found in the institutional and organisational design of the school types (e.g., curricula, teacher-related attitudes to their students' “academic readiness”, school support for study orientation). Due to our cross-sectional approach, it remains unclear if associations between school type and prospective destinations result from selection (i.e. schools were chosen to accomplish occupational plans) or if processes of adaptation to school culture of learning and vocational orientation and peer group influences play a role. Hence, future research could shed light on the question of how school types are associated with particular attitudes of students and teaching staff. Further, research suggests that plans to study may change after leaving upper secondary school (Jacob et al. 2013), making it worthwhile to examine actual transitions. Although data from the DZHW Panel Study

of School Leavers from wave 2 are available, we focused on aspirations due to many students postponing transitions beyond six months, leading to many incomplete transitions (censored cases) and overall panel mortality. For this reason, the analysis of aspirations was preferred, even if they may differ from realised transitions. However, a recent study shows that the aspiration for and the actual transition to higher education are highly correlated (Christoph et al. 2023).

In conclusion, the role of vocational pathways to higher education remains ambivalent. On the one hand, the policies of diversification and increased permeability are successful because many students – and probably particularly the less privileged – profit from alternative pathways to a HEEC. Especially BOS combine high shares of students with non-linear pathways, non-academic backgrounds, and high aspirations for higher education. On the other hand, our results suggest that not all alternative pathways to a HEEC are only “highways to higher education”, but also to VET. Pathways that result in a type-restricted HEEC (BFS, FOS) pave the way to VET to a non-negligible extent, which raises the question why students acquire a HEEC even though they are aiming for VET. We may speculate that increased expectations of training companies and tendencies for “upskilling” play a role as discussed by Protsch (2014), forcing students to strive for a HEEC to enter a VET programme. This raises the question to what extent this upskilling of VET at cost of additional years in upper secondary education currently corresponds with the interests of training companies in times of a severe “trainee shortage”.

Abbreviations

BFS	Full-time vocational school (Berufsfachschule)
BG	Specialised grammar school (Berufliches Gymnasium)
BOS	Senior vocational school (Berufsoberschule)
BS	Part-time vocational school (Berufsschule)
FOS	Specialised upper secondary school (Fachoberschule)
GPA	Grade point average
GY	Gymnasium
HEEC	Higher education entrance certificate
pp	Percentage points
UAS	University of applied sciences (Fachhochschule)
UNI	University
VET	Vocational education and training

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s40461-025-00195-3>.

Supplementary Material 1

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Author contributions

N.D. has primarily worked on the data preparation and analyses. Both authors substantially contributed to the conception and design of the analyses, the interpretation of results, and the drafting and editing of the manuscript. Both authors read and approved the final manuscript.

Data availability

This paper uses data from the “DZHW Panel Study of School Leavers 2015 - Educational paths of school leavers with a higher education entrance qualification”. The study is part of a series of studies carried out by the German Center for Higher Education and Science Research (DZHW) and financed by the Federal Ministry of Education and Research (BMBF). The data that support the findings of this study are available from FDZ-DZHW. We used the following data set: Schneider H, Franke B, Meine A, Scheller P, Woisch A (2021) DZHW Panel Study of School Leavers 2015 - Educational paths of school leavers with a higher education entrance qualification: Data Collection: 2014-2016. Version: 1.0.1. Data Package Access

Way: On-Site-SUF. Data Curation: Birkelbach, R., Niebuhr, J., Vietgen, S., & Wallis, M. FDZ-DZHW, Hannover. doi: 10.21249/DZHW: gsl2015:1.0.1.

Declarations

Competing interests

The authors declare no competing interests.

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