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Vocational Pathways to Higher Education: Real or False Chances?

Claudia Schuchart and **Benjamin Schimke**

School of Education, University of Wuppertal, Germany

Correspondence: Claudia Schuchart (schuchart@uni-wuppertal.de)

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Abstract

In this study, we examine whether vocational pathways to a higher education entrance certificate (HEEC) via upper secondary vocational schools lead to wages in the first five years of the occupational career that are comparable to the wages achieved after following the "royal roads" in general education, which lead directly to HEEC. We derive hypotheses on wage differences and the reasons for these differences from classical labour market theories such as human capital theory and labour queue theory, which we test using the German NEPS-SC6-ADIAB study with 1,256 male and 1,197 female employees. Applying multilevel regression analyses and Kitagawa-Blinder-Oaxaca decomposition analyses, we find that graduates from direct pathways earn between 12% (men) and 18% (women) higher wages than graduates from vocational pathways to HEEC. For both men and women, these lower wage levels for the members of the latter group are first of all due to the lower level of their further educational attainments (vocational training/university [of applied science] degree) and school-related competencies. Furthermore, female graduates from vocational pathways are more likely to be overqualified for their jobs and have less access to better-paying "closed" occupations than graduates from direct pathways. We conclude that vocational pathways to HEEC cannot fully compensate for disadvantages in labour market opportunities that arise due to an early stratified educational system, and the extent to which they can be compensated is not the same for men and women.

Keywords

occupational career; returns to education; upper secondary education; vocational schools

1. Introduction

There is some evidence that the earlier general education academic tracks—which lead directly to a higher education entrance certificate (HEEC)—are separated from non-academic tracks, the larger the differences

between graduates from different tracks in labour market returns (Bol & van de Werfhorst, 2013; Brunello & Cecci, 2007; van de Werfhorst, 2021). However, early stratified systems often open up in upper secondary education and offer vocational pathways to HEEC via vocational schools at the upper secondary level (European Commission, 2017). Students who leave lower secondary education with a qualification below the HEEC level are thus given a "second chance" to obtain a HEEC and improve their future labour market opportunities. The results of Dustmann et al. (2017) indicate that vocational pathways may help to compensate for the disadvantages of early stratification and therefore represent a "real" (and not a "false") second chance (Inbar, 1995).

In many countries, both vocational and academic educational pathways lead to HEEC. Although educational systems differ between countries, professional pathways have in common that they provide vocational knowledge, whereas academic pathways do not. A look at the international findings shows heterogenous results (for England see Capsada-Munsech & Boliver, 2021; for England and Denmark see Birkelund et al., 2021; for Finland see Heiskala et al., 2021; for Germany see Schuchart & Schimke, 2019). Against this background, in this article, we systematically compare the labour market returns of direct and vocational pathways to HEEC by examining differences in hourly wage returns to different pathways. Although recently, scholars have paid more attention to the returns of different pathways to HEEC, most of the relevant studies compare graduates with a HEEC from different pathways with graduates without a HEEC (for Great Britain see Birkelund et al., 2021; Capsada-Munsech & Boliver, 2021; Heiskala et al., 2021; Sullivan et al., 2018). Therefore, findings mostly indicate that achieving a HEEC is more rewarding than foregoing it. Only a few studies compare different pathways to obtaining a HEEC (Capsada-Munsech & Boliver, 2021; Heiskala et al., 2021; Schuchart & Schimke, 2019), and it remains unclear whether they have an impact on earnings—and, if so, to what extent.

Graduates from vocational pathways to a HEEC are less likely to enter higher education (for the case of Germany see Spangenberg & Quast, 2023) and, if they do, they are more likely to drop out before graduation (for Germany see Müller & Schneider, 2013; for Italy see Cannistrà et al., 2022). However, studies that use characteristics of further educational attainment such as a higher education degree as an explanatory variable (Capsada-Munsech & Boliver, 2021; Heiskala et al., 2021) do not identify whether the existence or non-existence of a higher education degree explains income differences between graduates from direct and vocational pathways to HEEC. By applying Kitagawa-Blinder-Oaxaca decomposition analyses, we aim to examine the extent to which differences between graduates from vocational and academic pathways to HEEC can be accounted for by further educational attainment.

Finally, even if controlling for selectivity and further educational attainment, wage differences between graduates from different pathways seem still to exist (for the case of women see Capsada-Munsech & Boliver, 2021; Heiskala et al., 2021; Schuchart & Schimke, 2019) and have not been explained by recent studies. Therefore, we aim to go beyond this and consider further explanatory factors, namely two signalling mechanisms: We suggest that the risk of overqualification and the access to highly attractive occupations can vary by pathway to HEEC, keeping selectivity characteristics and further educational attainment constant.

We use the example of Germany, where the educational system is an "archetype" (Schindler, 2017) of an early stratified system at the lower secondary level I (see Figure 1). After primary school, pupils are sorted into academic tracks leading directly to the HEEC (*Abitur*)—for example, at a *Gymnasium*—and non-academic

tracks, which do not lead directly to the HEEC—for example at a *Realschule*/*Hauptschule*. However, the non-academic tracks are not a dead end, and after graduation, pupils can, for instance, enter upper secondary education at a vocationally-oriented school, choosing a two-year (e.g., *Fachoberschule*) or a three-year (e.g., *berufliches Gymnasium*) "alternative" pathway to the HEEC (*Abitur* or *Fachhochschulreife*; see Figure 1 and, for a more detailed description, Section 2.1). Our study focuses on the general question of the extent to which the disadvantages of early stratification can be compensated for by offering vocational pathways to obtaining a HEEC.

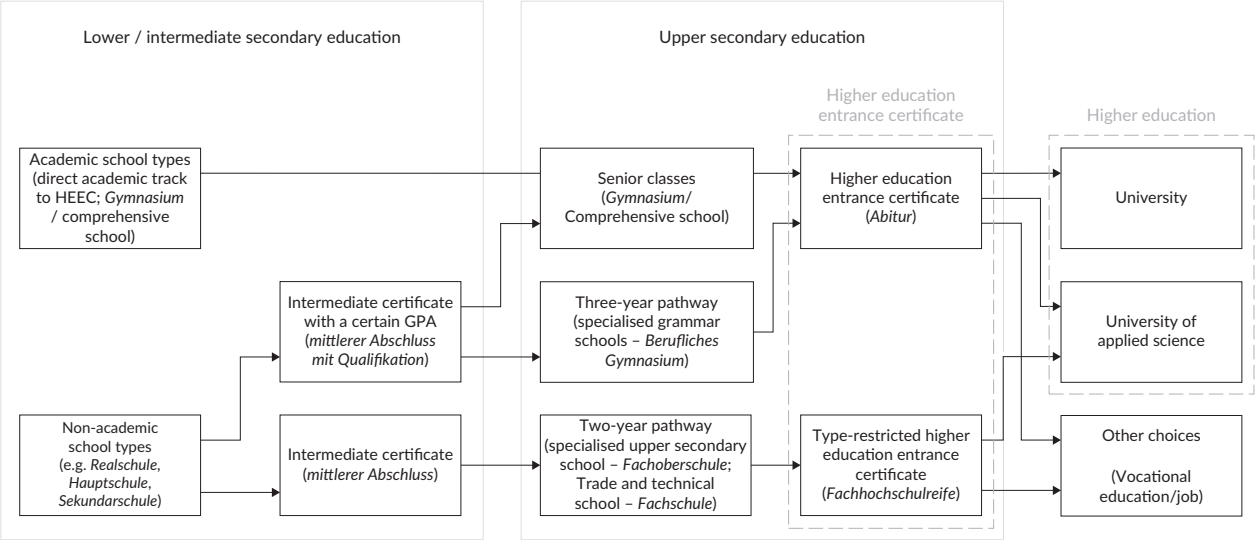

Figure 1. Pathways to the higher education entrance certificate. Notes: For ease of understanding, this is a simplified presentation and some Federal states may deviate from it; not all possible pathways are depicted here; three-year and two-year pathways are referred to as "alternative pathways to HEEC."

2. Empirical and Theoretical Background

2.1. Direct and Alternative Pathways to HEEC in Germany

In Germany, alternative pathways to the HEEC (*Abitur* and *Fachhochschulreife*) at vocationally-oriented upper secondary schools are of utmost importance. In 2022, 13% of all HEECs were awarded in three-year vocational pathways to higher education, 25% in two-year vocational pathways to higher education, and 62% in direct (general education) pathways to higher education, mostly at Gymnasium and Gesamtschule (Statistisches Bundesamt, 2023a, 2023b). In the following, we focus on alternative pathways at vocationally-oriented schools, where the majority of programmes that lead to a HEEC teach general knowledge as well as basic vocational knowledge. Only a small minority of the programmes award a HEEC in addition to a vocational qualification.

Pupils who graduate from non-academic school types in intermediate secondary education with a certain grade-point average can follow a three-year pathway at a vocationally-oriented school that leads to a general HEEC for universities and universities of applied sciences (see Figure 1). Graduates with the same qualification but a lower grade-point average can follow a two-year pathway at a vocationally-oriented school that leads to a HEEC for a university of applied sciences. Subsequently, both groups can enter higher

education or take a VET (vocational education and training) course. To ensure nationwide recognition of both a general HEEC and a HEEC to study at a university of applied sciences, there are various agreements between the ministers of education and cultural affairs of the federal states on the general curricular requirements (Kultusministerkonferenz, 2001, 2006). However, there are qualitative differences between the different pathways to the HEEC. The curricular requirements for a HEEC in direct academic and three-year alternative pathways to a general HEEC are comparable, and students have to take central exams at the end of the programme. Nevertheless, performance studies show clear differences in mathematics, sciences, and English in favour of the direct academic pathway (e.g., Leucht et al., 2016). Pathways to eligibility in a university of applied sciences take two years, of which a considerable part must be devoted to practical work, and there are no central exams (Schuchart, 2013). Graduates from these pathways show weaker academic performance than graduates from both academic and three-year alternative pathways (Schuchart & Schimke, 2019).

2.2. Empirical Research

Previous research has repeatedly shown that the higher the level of educational attainment, the better the returns (Heckman et al., 2016; Manzoni et al., 2014; OECD, 2014). Regarding school types in upper secondary education, Capsada-Munsech and Boliver (2021) find differences in favour of academic school types compared to vocational school types in weekly income among 25-year-old adults in raw models without covariates. The results of Heiskala et al. (2021) support this finding for the probability of being employed in the service class between 30-year-old graduates from different upper secondary tracks (for Denmark see Birkelund et al., 2021; for Germany see Schuchart & Schimke, 2019).

2.3. Theoretical Explanations of Wage Gaps Between Graduates From Different Pathways to a HEEC

Some attention has been devoted to a systematic explanation of the impact that horizontal characteristics have on labour market outcomes. Gerber and Cheung (2008) highlight four mediating mechanisms: Institutions may be successful, to a different extent, in (a) increasing the productivity of their students (human capital), (b) endowing them with social capital, (c) signalling better productivity to employers (signalling effects), and (d) attracting more able students (selectivity). Selectivity is of great importance, as pupils choose the pathway to the HEEC after lower secondary education based on their performance, interests, and career aspirations. However, in this article, we are interested in the effects that are generated by characteristics of the vocational pathways themselves and, for this reason, we treat selectivity as a methodological problem and not as an *explanans*. Against the background of the predominantly public character of the German educational system, we assume that social capital built up in upper secondary education is of negligible significance for labour market returns. In the following, we focus on the remaining mechanisms productivity and signalling.

2.3.1. Productivity

Education acquired within the pathways to a HEEC can be understood as human capital because it leads to skills and competences relevant to future professional productivity, and this is associated with income (Becker, 1975; Mincer, 1958, 1974). There are reasons to assume that graduates from different pathways to the HEEC differ in their relevant characteristics even if selectivity is held constant. One of the most important reasons for this is further educational attainment: Graduates from vocational pathways to a HEEC

are less likely to enter higher education than graduates from direct pathways to a HEEC (Spangenberg & Quast, 2023). This is particularly true for graduates from two-year vocational schools, of whom only about 50% enter higher education, compared to about 80% that come from specialised grammar schools and direct pathways. There may be a number of reasons for this; for example, graduates from two-year pathways acquire less knowledge than graduates from other pathways due to the shorter length of their course. Furthermore, the level of academic performance is lower among students of vocational pathways to a HEEC compared to students of direct pathways to higher education (Leucht et al., 2016; Rahn & Fuhrmann, 2023), and the former may feel academically less prepared to enter higher education. Students of vocational pathways to a HEEC receive less encouragement and support from their teachers to achieve a university degree instead of a vocational training qualification (Bittmann & Schindler, 2021; Dörffer & Bernhard, 2025; Schuchart, 2019, 2025) and they are less motivated to enter higher education (Schuchart & Schimke, 2022). Furthermore, even if graduates from vocational pathways enter higher education, they are more likely to drop out than graduates from direct pathways (Cannistrà et al., 2022; Herbaut, 2022; Müller & Schneider, 2013). Finally, two-year vocational schools lead to eligibility into universities of applied sciences and thus to a limited range of high-status professions.

2.3.2. Signalling

Thurow (1975) argues that wages are not paid for individual productivity but for jobs. Employees must be trained on the job to achieve the productivity required for their job. It is assumed that the higher the level of academic and vocational education achieved, the higher the degree of trainability and the lower the training costs for the employer. Other education-related characteristics such as the pathway via which the qualification was achieved can also serve as a signal. Two mechanisms can be derived from signalling theory that may be relevant for wage differences between the different pathways to a HEEC.

2.3.2.1. Access to Attractive ("Closed") Jobs

Employers rank applicants according to their educational (and other) characteristics in a labour queue, which they match to a queue of vacant jobs in which the best job with the highest requirements and the highest rewards is at the top. Access to advantageous jobs depends not only on an applicant's qualifications but also on the supply of applicants with the same qualifications. Education is, therefore, a "positional good" (Hirsch, 1977; Ultee, 1980), because an applicant's position in the labour queue is pivotal. If there are many applicants with the same academic and vocational qualification—a situation to which the establishment of vocational pathways to a HEEC has contributed (Schindler, 2017)—more differentiated signals of trainability, such as the pathway to a HEEC, are taken into consideration in the choice of suitable candidates.

Labour queues can be reduced by setting qualification requirements that exclude all candidates who are not adequately qualified (van de Werfhorst, 2011, p. 543; see also Bol & Weeden, 2015; Weeden, 2002). This so-called "occupational closure" is associated with higher earnings, job security, and career options than less closed occupations (Bol & Weeden, 2015; Giesecke et al., 2020; Weeden, 2002). These assumptions are derived from closure theory, and we use them within the framework of labour-queue theory. According to Giesecke et al. (2020, p. 164), it is particularly employees at the beginning of their career who benefit from the exclusion of competitors from closed occupations. Employers have to assess which applicants are best trained to fill a vacant position effectively and efficiently (Giesecke et al., 2020). If two or more equally

qualified candidates apply for a position, applicants are ranked by employers in a queue according to their assumed future performance (Sørensen, 1983). Even given the same educational qualifications, employers could expect less productivity from graduates from vocational pathways to a HEEC because their level of academic performance is lower than that of graduates from grammar school (Leucht et al., 2016), and because pathways from vocational schools do not have the same prestige as direct pathways.

2.3.2.2. Overqualification

A mechanism that also results from the assumption of "education as a positional good" is that employers always prefer applicants with the highest level of schooling over applicants with lower levels, even if a lower level of education would be sufficient (Thurow, 1975; van de Werfhorst, 2011). The selection of high performers who can deal with unfamiliar tasks is particularly important in light of the assumption that wages are paid for jobs and not for individuals. Hence, some applicants have to do jobs for which they are overqualified, and this is associated with a wage penalty in comparison with employees who are more closely matched to their jobs (see Kracke et al., 2018; Leuven & Oosterbeek, 2011).

2.4. Summary and Research Hypotheses

2.4.1. Income Differences According to Pathway

There are reasons to assume that graduates from different pathways to HEEC differ in characteristics relevant to the labour market. First of all, performance requirements are less demanding in two-year pathways than in the other pathways, and individuals may be less motivated to achieve higher levels of further educational attainment (for instance, a university degree instead of a vocational training qualification). Furthermore, since the duration of schooling is shorter for the two-year pathway than for both the three-year pathway and the direct pathway, they acquire fewer cognitive skills than graduates from these other programmes. Direct academic as well as three-year pathways formally have the same academic requirements and lead to the same qualification in the same amount of time (Kultusministerkonferenz, 2001, 2006), whereas two-year pathways lead to eligibility for universities of applied sciences and thus to a limited range of high-status professions. Therefore, classical human capital theory would conclude that there are no differences in initial wages between graduates from three-year alternative and direct academic pathways but lower wages for graduates from two-year pathways (hypothesis 1). However, job competition theory suggests that graduates from direct pathways who apply for a job may signal higher trainability or better future performance than graduates from three-year alternative pathways for the following reasons: They have already performed better than others in primary school and, compared to graduates from alternative pathways, their academic performance level is higher (Leucht et al., 2016). Compared to the three-year alternative pathway, the two-year pathway leads not only to a reduced range of occupational options but also signals lower trainability or future performance for the reasons mentioned above. Therefore, job candidates should be positioned differently in the labour queue according to their pathway to HEEC, and hypothesis 2 is therefore that wages at the beginning of an individual's career should be highest for graduates from an academic pathway, lower for graduates from the three-year alternative pathway, and lowest for graduates from the two-year alternative pathway to HEEC.

2.4.2. Explanations for Income Differences According to Pathway

Following human capital theory, differences in overall educational attainment and school-related cognitive skills should explain differences at the beginning of a career (hypothesis 3). According to job competition theory, higher levels of further educational attainment signal better trainability. This theory additionally predicts that wage differences between graduates from different pathways to a HEEC could at least partly be explained by the fact that access to closed and highly attractive occupations should vary according to the pathway (hypothesis 4). Furthermore, since graduates with formally equal qualifications from different pathways are placed in the labour queue in a hierarchy, the risk of overqualification may be systematically related to the pathway to HEEC, and this could explain wage differences (hypothesis 5).

3. Methods

3.1. Data

3.1.1. Survey Information

The data used in this article are a combined set from the Institute for Employment Research (IAB) and the Leibniz Institute for Educational Trajectories (LIfBi), and they are referred to by the abbreviation NEPS-SC6-ADIAB (Bachbauer et al., 2022). They combine individual longitudinal administrative data from contributions to unemployment insurance since 1975 and diverse information on dependent employees including gross earnings with survey data from the German National Educational Panel Study (NEPS; see Antoni et al., 2018a, 2018b). The NEPS is a representative panel survey of Germany inhabitants born between 1944 and 1986 (Blossfeld et al., 2011). One major advantage of this combined dataset is the income data from the administrative source, which are more reliable than self-reports in surveys (Antoni et al., 2019).

3.1.2. Sample Selection

The education system in East and West Germany has been harmonised since 1990. We restricted the data to observations from 1992 onwards since administrative data for respondents working in East Germany were only available from that year on. After combining the administrative and survey datasets and further restricting them to individuals with a HEEC, our sample consists of 1,256 male and 1,197 female employees. Since the impact of educational characteristics on wages is strongest at the beginning of an individual's career (Manzoni et al., 2014), we focus on wages in the first five years after labour market entry. This final restriction results in a total number of person-month observations of 42,742 male and 39,448 female employees between 1992 and 2018.

3.2. Variables

Table A1 in the Supplementary File includes detailed information on the operationalisation of all the variables and sample distributions. Table A2 in the Supplementary File shows the distribution of independent variables in the subsamples of men and women according to their pathway to a HEEC.

3.2.1. Dependent Variables

The respondents' earnings in the administrative dataset are reported on an annual basis, but the measurement itself is a daily wage (a so-called *Tagesentgelt*). To connect the two data sources without gaps, the data are compiled on a monthly basis. Additionally, we used the NEPS survey information on contractually agreed working hours per week to construct the hourly wages and calculated the natural logarithm afterwards.

3.2.2. Independent Variables

Our central independent variable is the educational pathway to HEEC (see also Figure 1). This information is taken from the NEPS, where educational biographies are captured in detail. We differentiate between respondents who graduated from (a) direct academic, (b) three-year vocational, and (c) two-year vocational pathways.

3.2.2.1. Attainment and Indicators of School-Related Skills

Information on further professional qualifications is based on the highest value of the CASMIN classification (Braun & Müller, 1997). We distinguish between those with a vocational training qualification, those with a degree from a university of applied sciences, and those with a university degree (Figure 1).

As further school-related characteristics, we use the self-reported final grades on the HEEC and from the highest educational attainment. School-related cognitive skills represent another source of productivity, trainability, or future performance influenced by schooling (Anghel & Balart, 2017; Hanushek et al., 2015). We use a total of six variables that focus on different performance indicators (Fuß et al., 2016). These are mathematical, scientific, and reading competences, as well as reading speed, receptive vocabulary, and ICT literacy.

3.2.2.2. Access to Closed Occupations

The measurement of "closed occupations" that indicates good working conditions is based on external data from the BIBB/BAuA Employment Surveys (1991–1992, 1998–1999, 2006, 2012, 2018), which are representative cross-sectional surveys covering all German employees who are at least 15 years old and work at least 10 hours a week (for an overview see Rohrbach-Schmidt & Hall, 2020). This database is used to calculate the proportion of employees in a certain occupational group who have the same qualifications. Unfortunately, the classification of these occupational groups is not the same in all the surveys between 1991–1992 and 2018. In order to achieve compatibility between the datasets, we had to use the lowest common denominator of the KldB 1992 at its 2-digit level (the KldB 1992 differentiates between occupations on a four-digit level (Statistisches Bundesamt, 1992). As a result, information on the proportion of employees with a certain qualification is provided for 70 occupational groups. To ensure complete matching to the historical time of the processed NEPS-SC6-ADIAB source, data on the time between the BIBB/BauA Employment Surveys is obtained by linear extrapolation.

3.2.2.3. Overqualification

The measurement of overqualification is based on a combination of objective measurements and indirect self-assessments. With this approach, we aimed to overcome the drawbacks that arise if either only one measurement or the other is used and to combine their advantages (Hartog, 2000, p. 132; Kracke et al., 2018). Self-assessments compare information from formal qualifications with the subjective assessment of the qualification required to perform the job (Verhaest & Omey, 2006), whereas objective measurements use the requirement level of the job performed, which is coded in the fifth digit of the KldB 2010 (Federal Employment Agency, 2011). If the formal qualification exceeds the requirements to perform the job, the employee is considered overqualified. By combining the two measurements, we obtain three categories with corresponding information (adequate qualification, under and overqualification) and a fourth category for which the two indicators did not match (for a comparable operationalisation see Reichelt & Vicari, 2014; Schimke, 2023).

3.2.2.4. Selectivity Indicators

Selectivity is of great importance for access to a pathway to a HEEC: On average, the most able students (in terms of cognitive and non-cognitive presuppositions and skills) are admitted to the academic track after primary school. Less able students are selected for non-academic school types; if they graduate with an intermediate certificate, and depending on their GPA, they can follow one of the vocational pathways into a HEEC (see Figure 1). Therefore, differences in cognitive and non-cognitive prerequisites regulate the selection into different pathways to a HEEC in upper secondary education, and these differences have an impact on labour market returns (Hanushek et al., 2015).

Since ability was not measured before the choice of an educational pathway, we use variables that are considered to be rather stable over an individual's lifespan (Asendorpf & van Aken, 2003; Roberts & DelVecchio, 2000) and that influence the selection into different school types after primary school as well as the choice of pathway to HEEC in secondary school. These include basic cognitive skills (perceptual speed and reasoning), which are part of the performance assessment in the NEPS (cf. Fuß et al., 2016). Furthermore, personal characteristics such as the highest international socio-economic index of occupational status (HISEI; Ganzeboom & Treiman, 2003) as well as the migration background (respondent and/or parents were not born in Germany) are considered (Buchholz & Schier, 2015; Leucht et al., 2016).

3.2.3. Other Control Variables

In order to prevent the effects of pathways to HEEC from being biased by relevant self-selection decisions or job episode characteristics, we added various control variables to our analyses. The Magnitude Prestige Score of the professional qualification obtained is taken into account as well as labour market experience in months (simple and squared), the number of employment episodes, the occupational job sectors (according to the KldB 2010; see Federal Employment Agency, 2011), and company size. Furthermore, we control for periodic effects by including year dummies in our analyses. We also use firm size as a characteristic of labour market segmentation as it is closely linked to working conditions, wages, and job security (Doeringer & Piore, 1971; Sengenberger, 1987). Large companies tend to have more stable structures, higher wages, and better internal career advancement opportunities than small companies.

3.3. Strategy Analysis

For some of the above theoretical explanations, there are gender differences. Women benefit less than men from higher qualifications, even if they are better qualified (Becker, 1991; Magnusson, 2016; Reshid, 2019). Furthermore, women have less access to closed occupations with attractive working conditions than men (Bol & Weeden, 2015, p. 368) and they are more likely than men to accept overqualification (Addison et al., 2020; Reshid, 2019). It is beyond the scope of this article to test gender differences. However, treating gender merely as a control variable may result in a distorted representation of the effects of different pathways to HEEC on wages. We therefore take gender differences into account by separating the data for males and females into two different samples. All the statistical procedures described in the following were applied to each sample separately.

3.3.1. Multiple Imputation of Missing Data

Item non-response is a problem in all kinds of surveys. Since the missing mechanism of our data is at least MAR (missing at random), multiple imputation is an appropriate technique to deal with these incomplete data in order to avoid inefficient and biased estimations (Rubin, 1987; van Buuren, 2012). Variables were imputed separately for males and females using a fully conditional specification approach and 50 cycles in each sample (see, e.g., van Buuren et al., 2006). An overview of the imputation models and the proportion of missing values for each variable considered can be found in the Supplementary File, Table A3.

3.3.2. Testing Procedures

In our dataset, job episodes are nested in individuals. To test our hypotheses, we have to consider this multilevel structure for all the analyses described in this section. We proceed in several steps. First, we calculate multilevel linear regression models (random intercept models). These analyses are divided into three parts. The first model is bivariate and includes the educational pathways only. With this model, we test hypothesis 1 and 2. In a second model, we only consider selectivity indicators. In a third model, we add our explanatory variables. By calculating this model, our principal aim is to investigate whether our explanatory variables are associated with wages.

In order to test hypotheses 3–5 (whether individual explanatory variables significantly contribute to explaining wage differences by pathways to a HEEC), Kitagawa-Blinder-Oaxaca decompositions are performed separately for each pair of dual comparisons involving the three educational pathways (Blinder, 1973; Oaxaca, 1973) that proved to be significant in the first regression model. These analyses decompose the differences in log wages and split them into an explained part (the result of different endowments) and an unexplained part using the regression coefficients from one pathway as reference. These analyses are calculated using the *oaxaca* module in Stata (Jann, 2008). The nested data structure is taken into account by multilevel model specifications.

4. Results

4.1. Differences Between Pathways

We start with a model for women (Table 1, M1). Women who graduated from direct academic pathways earn 18 percentage points (Calculated by $e^{\beta} - 1$; the percentage points therefore differ slightly from the coefficients in Table 1) more at the beginning of their career than women who graduated from three-year vocational pathways. There are no significant differences between women who graduated from different vocational pathways, despite the one-year difference in the duration of the pathways. The results for men are slightly different (M4). Men who graduated from direct academic pathways earn 12 percentage points more at the beginning of their careers than men who graduated from three-year vocational pathways. Again, there are no significant differences between graduates from three-year or two-year pathways to HEEC. For both men and women, neither the lower wages for women with HEEC from a two-year alternative pathway compared to the other pathways as predicted by human capital theory (hypothesis 1) nor the hierarchical differences predicted by job competition theory (hypothesis 2) could therefore be confirmed fully.

In Models 2 and 5 (Table 1), we look at the effect of selectivity indicators on wages. Due to our sample, which only includes persons who have graduated from pathways to a HEEC, they are of lesser importance for wages. Models 3 and 6 are used to calculate the impact of the various mechanisms discussed in Section 2.2 on wages. For men and women, the wage differences between graduates from vocational and direct pathways to a HEEC are fully explained. Educational attainment is strongly related to wages for both men and women. The higher the level of further educational attainment, the more it is associated with higher wages. Mathematical competence has an additional effect on wages for men. Overqualification leads to a wage penalty of 15 percentage points for women, but it has no significant effect on wages for men. For women, a one-unit increase in the proportion of employees with the same qualification as an indicator for closed occupations is associated with wages that are 40 percentage points higher. However, for men, this proportion has no effect on wages.

4.2. Decomposition Analyses

M1 (Table 1) shows that for women, there is no substantial wage gap between the different vocational pathways. We therefore focus here on the decomposition of wage differences between the direct academic pathway and each of the two vocational pathways (Figures 2a and 2b). Explanations for wage differences can be given for 69% and 96% of these differences, respectively.

Further educational attainment explains a considerable share of the wage gap (19% in Figure 2a and even 49% in Figure 2b). This is exclusively due to the pronounced pathway-specific higher education rates (Supplementary File, Table A4): 57% of graduates from the direct, 40% of graduates from the three-year and only 24% of graduates from the two-year pathway obtained a higher education degree (see Supplementary File, Table A2, university and university of applied sciences). Indicators of school-related skills account for about 20% of the wage differences. In all, hypothesis 3 can be confirmed for both comparisons (Figures 2a and 2b). Access to closed jobs explains 7% (Figure 2a) and 10% (Figure 2b) of the wage differences between graduates from different pathways. This confirms hypothesis 4 for women. The contribution of

Table 1. Random-intercept models for the beginning of occupational careers.

Dependent variable: Log-transformed hourly wages	Women						Men					
	M1		M2		M3		M4		M5		M6	
	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.
Educational path, Ref.: Three-year alternative pathway												
Direct direct pathway	0.181 ***	(0.041)	0.164 ***	(0.042)	0.062	(0.043)	0.116 ***	(0.043)	0.122 **	(0.043)	−0.015	(0.045)
Two-year alternative pathway	0.027	(0.050)	0.044	(0.051)	0.005	(0.049)	−0.090	(0.047)	−0.082	(0.047)	−0.068	(0.049)
Selectivity chartacteristics												
General cognitive skills												
Perceptual speed			0.001	(0.003)	−0.006	(0.003)			−0.009 **	(0.003)	−0.023 ***	(0.004)
Reasoning			0.017	(0.011)	−0.000	(0.011)			0.042 **	(0.014)	0.017	(0.014)
Demographics												
Migration background (1 = *yes*)			0.010	(0.048)	0.015	(0.045)			0.028	(0.049)	0.035	(0.052)
Highest ISEI of parents			0.003 **	(0.001)	0.001	(0.001)			0.001	(0.001)	0.001	(0.001)
Further educational attainment												
Educational attainment, Ref.: Vocational training												
Degree from university of applied sciences					0.148 **	(0.050)					0.239 ***	(0.052)
University degree					0.206 ***	(0.047)					0.315 ***	(0.054)

Table 1. (Cont.) Random-intercept models for the beginning of occupational careers.

Dependent variable: Log-transformed hourly wages	Women						Men					
	M1		M2		M3		M4		M5		M6	
	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.
Indicators of school-related skills												
Final grades												
Highest gen. educational qualification					−0.034	(0.036)					−0.003	(0.043)
Highest voc. educational qualification					−0.006	(0.031)					−0.042	(0.045)
Cognitive skills												
Mathematical competence					0.046	(0.024)					0.066 *	(0.027)
Scientific competence					−0.031	(0.025)					0.017	(0.024)
Reading competence					−0.002	(0.019)					0.025	(0.021)
Reading speed					0.000	(0.003)					0.004	(0.003)
Receptive vocabulary					0.004	(0.004)					0.004	(0.005)
ICT literacy					0.031	(0.026)					−0.041	(0.026)
Variables indicating signaling-mechanisms												
Job matching, Ref.: Adequately employed												
Overqualified					−0.154 *	(0.078)					−0.039	(0.070)
Underqualified					0.023	(0.125)					0.411	(1.298)
Access to closed occupations					0.401 ***	(0.105)					0.026	(0.073)
$N_{individual\text{-}months}$	39,448		39,448		39,448		42,742		42,742		42,742	
$N_{individualss}$	1,197		1,197		1,197		1,256		1,256		1,256	

Notes: * $p < 0.05$; * $p < 0.01$; *** $p < 0.001$; calculations based on multiple imputed datasets ($M = 50$); M2 and M4 were additionally controlled for the highest educational qualification (CASMIN) of the parents; for M3 and M6, further controls were added for period effects by including dummy variables for each year, arbitrary matched, MPS of the obtained professional title, labor market experience (linear & quad.), number of jobs, occupational sector, company size, dummy variable for part-time employment, and dummy variable for West Germany.

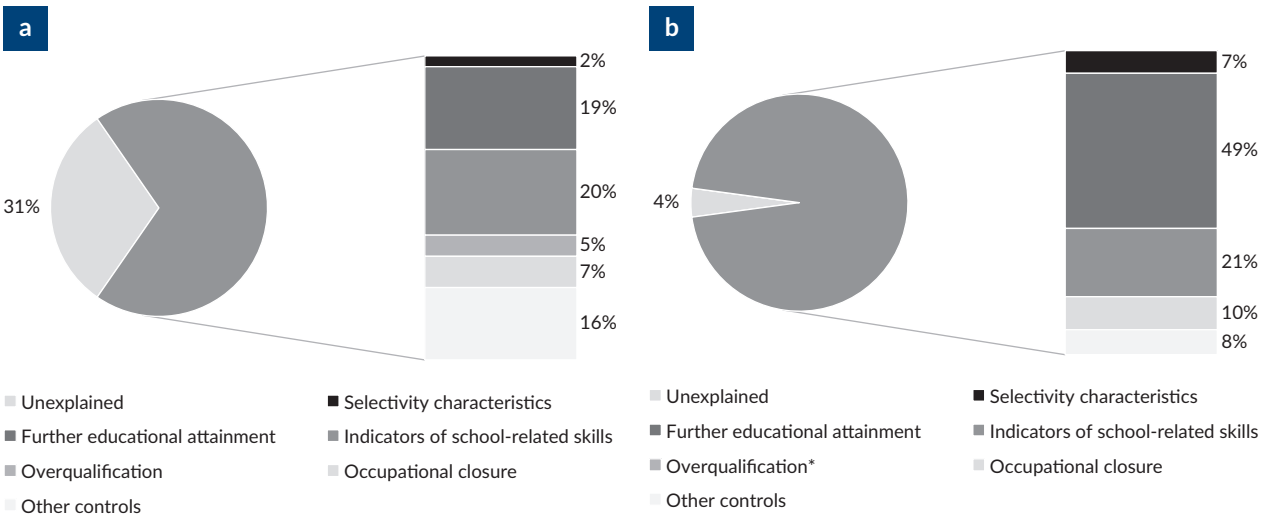

Figure 2. Kitagawa-Oaxaca-Blinder decomposition of wage differentials at the beginning of occupational careers for women: (a) women, direct academic vs. three-year vocational pathway; (b) women, direct academic vs. two-year vocational pathway. Notes: Calculations based on multiple imputed datasets ($M = 50$); detailed results for all variables can be found in the Supplementary File, Table A4; * variables contribution to the explanation of the wage gap is negative.

overqualification to the wage gap is 5% in Figure 2a, but overqualification does not contribute to an explanation of the wage gap between graduates from direct and two-year pathways (Supplementary File, Table A4). Therefore, hypothesis 5 can only be confirmed for the comparison between graduates from direct and three-year vocational pathways.

Since wage differences were observed between male graduates from direct and vocational pathways (Table 1, M4), two decomposition models are performed (Figures 3a and 3b; see also Supplementary File, Table A4, Models 3 and 4). Between 79% and 62% of wage differences can be explained in both models by the characteristics considered. For men, too, the most important explanatory factor is educational attainment and it accounts for 40% and 34% of the gap. Differences in higher education graduation rates are again noteworthy between graduates from different pathways to a HEEC: 75% of graduates from direct pathways, 55% of graduates from three-year vocational pathways, and 42% of graduates from two-year vocational pathways have a higher education degree (Supplementary File, Table A2). Another significant contribution is made by school-related skills, and they again explain about 20% of the wage gap. Hypothesis 3 is therefore supported.

Access to closed occupations explains 1% of the wage gap between graduates from direct and two-year vocational pathways. However, Table A2 in the Supplementary File shows that graduates from two-year pathways are more likely to work in closed occupations than graduates from direct pathways. The explanation for this finding can only be that these two groups of graduates are in different job segments so that high proportions of employees with the same qualifications are not associated with the same income advantages for graduates from two-year pathways as for leavers from three-year educational pathways. Nevertheless, an increase in the access to closed occupations among graduates from two-year pathways would contribute slightly to closing the wage gap. Hypothesis 4 can therefore only be supported for this comparison, whilst access to closed occupations does not contribute to explaining the wage gap between

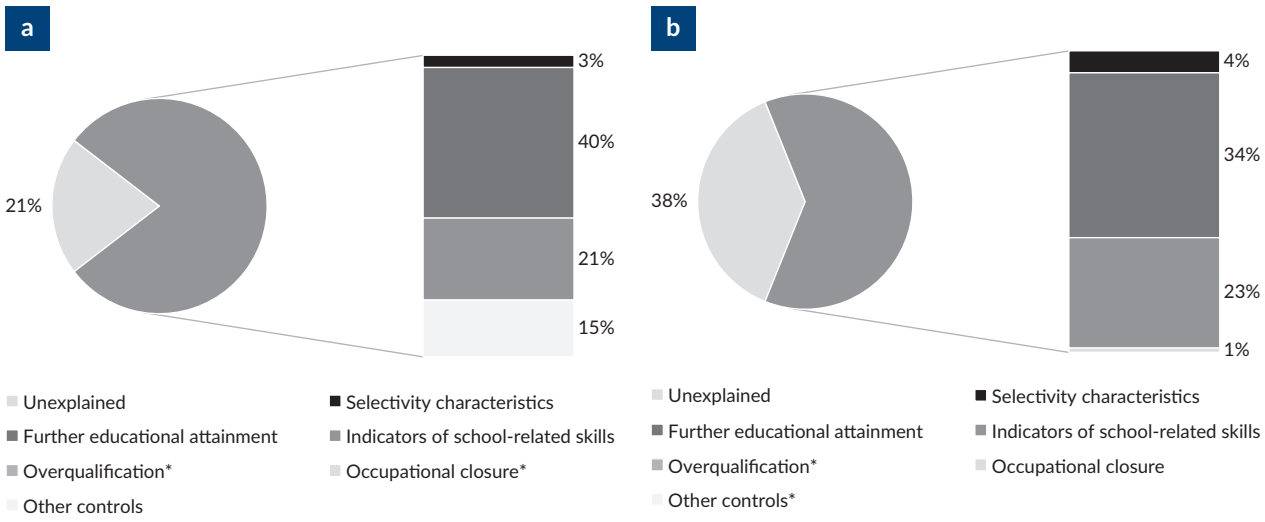

Figure 3. Kitagawa-Oaxaca-Blinder decomposition of wage differentials at the beginning of occupational careers for men: (a) men, direct academic vs. three-year vocational pathway; (b) men, direct academic vs. two-year vocational pathway. Notes: Calculations based on multiple imputed datasets (M = 50); detailed results for all variables can be found in the Supplementary File, Table A4; * variables contribution to the explanation of the wage gap is negative.

graduates from direct and three-year pathways. Overqualification does not contribute to an explanation of the wage gap among men. Therefore, hypothesis 5 cannot be confirmed for men.

5. Summary and Discussion

In this article, we have analysed whether vocational pathways (compared to direct ones) represent a "real" or a "false" second chance (Inbar, 1995) for those who did not take the direct pathway to a HEEC. More precisely, we addressed the question of whether different pathways to a HEEC are associated with different monetary returns and if so, why. The results for the first regression model show significant wage differences for men and women. Graduates from direct pathways to a HEEC have a significantly higher income than graduates from vocational pathways, although there are no differences between graduates from different types of vocational pathway. This finding, in particular, is a somewhat surprising result since the two-year alternative pathway to HEEC is associated with a shorter period of study and eligibility for universities of applied sciences only, which do not offer the most prestigious study programmes. However, the larger curricular share of practical knowledge could turn out to be an important resource, as it brings contacts to the world of employment (Schuchart & Schimke, 2025), which may compensate for the disadvantage of a lower level of general education compared to graduates from three-year alternative pathways early on in individuals' careers. In terms of wages, it therefore does not pay to take the three-year vocational pathway instead of the two-year vocational pathway to a HEEC.

We investigated which mechanisms are related to higher wages for graduates from direct pathways compared to graduates from vocational pathways to the HEEC. The largest share of the wage difference is due to a human capital mechanism, namely further educational attainment (vocational training/university of applied sciences/university) after leaving school and school-related skills. The importance of educational attainment generally supports the findings of studies from different countries (Birkelund et al., 2021;

Sullivan et al., 2018; for higher education see Gerber & Cheung, 2008). Similarly to other studies (Anghel & Balart, 2017; Birkelund et al., 2021; Hanushek et al., 2015), our results show that school-related cognitive skills—in the case of men, mathematical competences—also contribute to an explanation of pathway-specific wages. The mathematical competence measured in NEPS is intended to be realistic, but also to tie in with the PISA measurements (Neumann et al., 2013). It reflects mathematical competence in adulthood, which has developed over the various stages of education and professional requirements. It can be assumed that the acquisition of competences in school forms a basis on which later competences are built and is therefore of particular importance.

Of the remaining mechanisms, overqualification only contributes to an explanation of the wage gap between female graduates from direct and vocational pathways to HEEC. This effect may also be related to self-selection effects (Addison et al., 2020; Reshid, 2019) since women are more likely to accept overqualification for family reasons. However, this should theoretically affect all women and not only those from alternative educational pathways to HEEC. It remains unclear why graduates from three-year pathways are more often overqualified than those from two-year pathways (Supplementary File, Table A2).

We found heterogeneous results for closure. For women, working in more closed occupations is associated with higher wages and graduates from direct academic pathways are more likely to be employed in more closed occupations than graduates from vocational pathways (Supplementary File, Table A2). The effect is substantial. For men, we find that access to closed jobs makes only a minor contribution towards explaining the wage gap between graduates from direct and two-year pathways. Furthermore, although graduates from three-year vocational pathways are more likely to be employed in jobs characterised by closure compared to graduates from direct pathways (Supplementary File, Table A2), this difference does not help to explain the wage gap. This does not correspond to a recent finding by Giesecke et al. (2020) on the relationship between closure and wages in the German labour market. However, unlike us, they used a categorical measurement of closure (Giesecke et al., 2020, p. 168) and a much more heterogeneous dataset including persons without HEEC. Further analyses of occupational closure in our subsample of men showed that occupations characterised by closure were more likely to be found in production professions, which were more likely to be chosen by graduates from vocational pathways than by graduates from direct pathways to HEEC. Therefore, in this subsample of men, jobs characterised by closure meant a greater disadvantage than an advantage in terms of income.

However, we have found an explanatory contribution for other labour market characteristics, namely for firm size, which can be seen as an indicator of labour market segmentation. Although we have not theoretically drawn on segmentation theory (Doeringer & Piore, 1971; Sengenberger, 1987), our findings suggest that wage differences between the direct academic and vocational pathways may partly result from selection into internal labour market segments. Both women and men from direct academic pathways are more likely to work in larger companies, and the detailed decomposition results indicate that this partly explains the wage differences (Supplementary File, Table A4). This could indicate that, all other things being equal, graduates from direct academic pathways have better access to larger companies with favourable internal labour markets.

As already mentioned, our data suffer from some limitations. Bias due to the omission of variables is a (potentially) common problem in all kinds of non-experimental studies, including ours. Since we are particularly interested in wage differentials that depend on educational pathways, the independent variable

of interest is time-constant in the period under review. That makes it impossible to eliminate the problem of time-constant, unobserved heterogeneity by time-demeaning our panel data (see, e.g., Andreß et al., 2013). However, the database does enable us to control for a variety of skill-related variables that are correlated with educational pathways as well as earnings. This should at least reduce the potential bias by a substantial amount. Another issue arises from the cross-sectional measurements of these cognitive and non-cognitive skills. These variables stem from a survey that was conducted while the respondents were already being observed in the labour market. We cannot therefore exclude potential problems from reversed causality, according to which individuals in challenging and thus well-paid employment could be more likely, for example, to have good ICT literacy skills *because* of their jobs and not vice versa. The problem of adequately controlling for selectivity with the longitudinal data used in this study is very likely a reason for the unexplained proportions in the decomposition analyses.

6. Conclusion

The wage differences between graduates from academic and vocational pathways can for both men and women mostly be explained by differences in further educational attainments and school-related skills that have been acquired. In Germany, VET graduates earn less over their entire lifespan than university graduates (Autor:innengruppe Bildungsberichterstattung, 2024). If we only take the income perspective, we come to the conclusion that HEEC graduates should use their HEEC to enter higher education. Our theoretical explanations focused primarily on external selection as a possible reason for wage gaps between graduates of different paths to the HEEC. However, our data is not suitable for distinguishing between external and self-selection. It remains therefore unclear whether graduates from vocational pathways to the HEEC have, for example, a lower expectation of success and therefore enter higher education less often.

In addition to further educational attainment, school-related cognitive skills were important for explaining wage gaps. However, two-year pathways to HEEC do not particularly focus on preparing for higher education (Dörffer & Bernhard, 2025; Schuchart, 2025). The teaching of skills that a person needs in order to be successful in higher education is given less weight in vocational schools than in grammar schools (Dörffer & Bernhard, 2025) and, in these pathways, the intention to study decreases during upper secondary education (Holm et al., 2013; Schuchart & Schimke, 2022). Significant efforts should therefore be made to establish “university readiness” as a clear goal in vocational pathways to a HEEC so that graduates of vocational pathways feel able to meet the requirements of university.

We can thus conclude that vocational pathways to HEEC may well be “real chances,” since they are ways to reduce disadvantages in labour market opportunities that arise due to the early stratification of the educational system. However, the advantages of the “royal road to HEEC” cannot be fully compensated for, and the extent to which it can be compensated for is not the same for every subgroup. Future studies should investigate in more detail the conditions under which students of vocational pathways to the HEEC make their educational decisions for subsequent educational steps.

Conflict of Interests

The author declares no conflict of interests. In this article, editorial decisions were undertaken by Ulf R. Hedetoft (University of Copenhagen, Denmark).

Data Availability

The data used in this article are a combined set from the Institute for Employment Research (IAB) and the Leibniz Institute for Educational Trajectories (LIfBi), and they are referred to by the abbreviation NEPS-SC6-ADIAB (https://doi.org/10.5164/IAB.NEPS-SC6-ADIAB7515.de.en.v1; see also Bachbauer et al., 2022). Due to the sensitivity of the income data, we did not have direct access to them. Instead, the analyses were carried out using a remote data access at the Institute for Employment Research (IAB) by submitting our data management and analyses scripts to the Research Data Centre (FDZ) via the software JoSuA. The results were subsequently reviewed and approved by IAB staff.

Supplementary Material

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

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About the Authors

Claudia Schuchart is a professor of empirical educational research at the University of Wuppertal, School of Education. Her research focuses on socialization in classrooms and schools, educational careers, and educational systems.

Benjamin Schimke (MA) is a researcher at the School of Education, University of Wuppertal. His work focuses on determinants and returns of non-formal education, experimental studies in the social sciences (vignette and discrete choice experiments), and methodologies of social science surveys and statistical analyses.