



# Life-Course Differences in Occupational Mobility Between Vocationally and Generally Trained Workers in Germany

Viktor Decker,<sup>a</sup> Thijs Bol,<sup>a</sup> Hanno Kruse<sup>b</sup>

a) University of Amsterdam; b) University of Bonn

**Abstract:** Vocational education is considered beneficial to young workers entering the labor market but disadvantageous late in their careers. Many studies assume that late-career disadvantages stem from lower levels of occupational mobility, but do not explicitly study this mechanism. This study is the first to empirically assess whether and to what extent occupational mobility differs between workers with a general education and those with vocational training and to examine how these differences develop over workers' life courses. Using multilevel linear probability models on panel data spanning 36 years of labor market participation in Germany, we find that vocationally educated workers are less mobile, but only in the first half of their careers. In the second half, mobility rates for vocationally and generally trained workers converge. Our findings support earlier research that links vocational education to less turbulent early careers. Yet, they do not support the notion of late-career mobility disparities between workers with different types of training. Implications for research on education-based differences in career outcomes are discussed.

**Keywords:** occupational mobility; vocational education; life course; career; labor market; Germany

**Citation:** Decker, Viktor, Thijs Bol, and Hanno Kruse. 2023. "Life-Course Differences in Occupational Mobility Between Vocationally and Generally Trained Workers in Germany." *Sociological Science* 10: 857-879.

**Received:** May 3, 2023

**Accepted:** May 26, 2023

**Published:** November 14, 2023

**Editor(s):** Ari Adut, Richard Breen

**DOI:** 10.15195/v10.a30

**Copyright:** © 2023 The Author(s). This open-access article has been published under a Creative Commons Attribution License, which allows unrestricted use, distribution and reproduction, in any form, as long as the original author and source have been credited.

EDUCATIONAL systems around the globe differ in how they equip workers with skills for effective and fruitful working careers. In some countries, schools and colleges focus on conveying general skill sets, including broad knowledge, basic math, and language skills. Such skills are important in a variety of jobs and prepare workers for a constantly changing labor market (Hanushek et al. 2017). Other systems are more strongly built around vocational tracks that provide workers with skills specific to particular occupations. Recently, however, scholars and policymakers have questioned how well occupation-specific education prepares students for their future careers (European Commission 2022, Government Accountability Office 2022, OECD 2010).

Linking students and jobs through vocational education programs is considered beneficial for entry into the labor market (Biavaschi et al. 2012, Ryan 2001, Zimmermann 2013), but recent studies show that the early career advantages that vocational graduates enjoy tend to decrease with age and can turn into late-career disadvantages. Late in their careers, workers whose education was vocational are, on average, less likely to be employed and earn lower incomes than graduates with general educational qualifications (Brunello and Rocco 2017a, 2017b, Forster and Bol 2018, Golsteyn and Stenberg 2017, Hampf and Woessmann 2016, Hanushek et al. 2017, Korber and Oesch 2019, Rözer and Bol 2019).

The mechanism assumed to underlay these late-career disadvantages for vocationally trained workers is that occupation-specific skills provide limited adapt-

ability to changing economic environments (Krueger and Kumar 2004, Rözer and Bol 2019, Weber 2014). That is, workers with specific skills are less able to move between different positions within the labor market and, over their careers, become increasingly locked into their occupations. In contrast, generally trained workers can productively apply their skills across different occupations, allowing them to be mobile and to adapt to change brought by new technologies and global trade.

Although many of the studies cited above assume that occupational mobility connects skill specificity to labor market outcomes such as income and employment probability, virtually none investigate whether and how occupational mobility differs between workers with general and vocational qualifications. In this article, we examine how occupational mobility differs between workers with occupation-specific and general educational qualifications and how differences evolve from labor market entry until retirement. Our contribution is threefold. First, we address questions about the effects of educational specificity on labor market outcomes by explicitly testing the often-held assumption that workers with vocational training are less mobile between occupations than generally trained workers. Second, taking a life-course perspective, we add to ongoing discussions about how path-setting individuals' educational decisions really are for their later careers. Finally, given the socioeconomic and ethnic disparities in the uptake of vocational training, our analysis contributes to a better understanding of the mechanisms that lead to structural inequality in Western labor markets.

To study occupational mobility, we analyze more than 50,000 occupational trajectories from workers in Germany between 1984 and 2020. The German education system provides clearly delineated academic tracks that allow students to learn and develop general skills applicable in a variety of jobs. At the same time, its vocational system is one of the most specific in the world (Bol and Van de Werfhorst 2013, Culpepper 1999). We argue that Germany, compared to other countries, constitutes an "extreme case" (Gerring 2017): if there are life course differences in occupational mobility between vocational and general graduates, we should identify them in Germany.

We find that occupation-specific training is negatively linked to occupational mobility compared to more general training, but only during the first half of workers' careers. Beyond the age of 40, rates of occupational mobility converge. Simultaneously, we find slightly higher relative probabilities for involuntary occupational exits among vocational graduates in the later career phase. Ultimately, our findings question the argument that generally trained workers use their flexible skill sets to move between occupations and secure employment late in their careers.

## Theory

### *Occupational Mobility*

Before discussing our findings in detail, we examine the concept of occupational mobility and possible determinants of change in occupations. An occupation comprises a set of jobs that involve similar tasks and duties and require similar skills. Individuals engage in occupational transitions when they switch to a job

which has a different set of task and skill requirements. Such transitions can involve a change of employer but can also occur within the same organization. Occupational mobility, in this study, describes patterns of transitions between occupations over the course of workers' careers.

Work on the determinants of job mobility suggests that occupational change is generally driven by either structural factors or personal characteristics (Ng et al. 2007). Structural factors refer to macro- and meso-level characteristics that define the conditions under which individual workers operate. They encompass the overall economic conditions in a country, differences between industries and occupational fields, and organizational staffing policies. Such factors can determine job mobility in different ways. For example, economic growth on a national level or in specific fields may lead to an emergence of new firms and positions within existing firms, facilitating mobility into those positions (DiPrete 1993, DiPrete and Nonnemaker 1997). Or economic recession or decline in certain industries may force workers to change occupations in order to remain employed.

Personal characteristics that researchers have considered relevant for job mobility are personality traits, career interests, values, and attachment styles (Ng et al. 2007). For instance, workers with pronounced conscientiousness have been found more likely to experience upward job mobility than others (Tharenou 1997). Vocational interests and perceived self-efficacy in a given occupation have also been considered relevant individual factors (Holland 1997, Taylor and Popma 1990). Individuals who work in occupations that match their interests and self-concepts are more likely to remain, whereas mismatches between vocational interests and jobs are more likely lead to occupational change. Lastly, when assessing mobility from a life-course perspective, decisions to change occupation are often linked to earlier experiences and decisions (Dlouhy and Biemann 2018) as well as to developments outside the work realm.

### *The Role of Occupational Specificity*

But how does the specificity of education affect occupational mobility? Occupational specificity in education refers to the degree to which education and training are specifically tailored to particular occupations. Occupational specificity is considered high when the training focuses on occupation-specific skills and knowledge and channels graduates to one occupation (or to just a few). Compared to other countries, vocational programs in Germany are usually highly occupation-specific as they prepare students to work in a particular profession, for example, as an electrician (Bol and Van de Werfhorst 2013). When occupational specificity is low, educational programs are described as general and provide students with training that can be applied to a variety of occupations.

There is good reason to believe that workers with high occupational specificity are less mobile. First, workers with more specific training usually face a greater risk of losing income when changing occupations disincentivizing occupational mobility. Knowledge, skills, and experiences that ensure a worker's productivity in their current job and make up an integral part of their human capital are often occupation-specific (Kambourov and Manovskii 2009b). Occupation-specific skills

ensure productivity in particular occupations, but do not affect productivity in others. For example, the many skills that are required to work as a welder are hardly transferable to working as a cook. Following this framework, switching occupations likely leads to a drop in income as occupation-specific human capital becomes (partially) unproductive (Kambourov and Manovskii 2009a). Findings from Germany confirm that changing occupations is linked to lower wage trajectories relative to stable employment (Nisic and Trübswetter 2012). Because workers with occupation-specific training possess more occupation-specific capital than workers who followed more general educational programs, they should face more severe income losses when changing occupations.

However, there are instances in which occupational change is linked to wage growth. For instance, internal promotions in companies usually entail a change in work tasks and therefore qualify as occupational change, but they also tend to be associated with wage increases (McCue 1996). In a similar way, differences in baseline wages between companies or industries can lead to wage increases when changing occupations: a former nurse who starts to work in health consulting may immediately obtain higher wages. Workers with more general training are more likely to have the option of making these types of transitions, and thus we expect higher occupational mobility from workers with less occupation-specific capital. This assumption is supported by findings from Switzerland, where vocationally trained respondents were found to be less likely to switch jobs and have longer average tenure than workers with academic degrees (Weber 2014, p.624).

The second reason workers with more occupation-specific education tend to be less mobile is that structural factors linked to the occupational fields that are typically associated with vocational education constrain their mobility. Vocational education is more tightly linked to jobs in crafts and trades where company growth is often limited and where hierarchical structures remain flat (Biavaschi et al. 2012). Accordingly, opportunities for promotions and career advancement for workers in those companies are limited. In contrast, positions in larger companies in the corporate sector that offer institutionalized upward career trajectories are often occupied by university graduates with more general degrees.

Lastly, workers with specific training may change occupation less frequently because their interests more often align with their work tasks. Vocational programs in Germany strongly emphasize practical experience, and often students are embedded in a dual system where work and study are combined. This also means that workers enter the labor market well-informed about their prospective work and with predefined occupational identities (Shavit and Müller 2006). General degrees, on the other hand, are not linked to specific occupations and provide fewer opportunities to collect on-the-job experience. Hence, occupational change based on mismatches between workers' interests and their actual work should be more likely for workers with less occupation-specific education.

In sum, workers with more occupation-specific training hold more occupation-specific human capital and may therefore face larger prospective income losses when changing occupations. They more often work in fields with limited opportunities for career advancement, and their vocational interests more likely match their

work tasks. Consequently, we hypothesize that occupational specificity in training is negatively associated with occupational mobility (**hypothesis 1**).

There is an alternative line of reasoning that connects occupational specificity and occupational mobility. It argues that workers with vocational qualifications are in fact *more likely* to change occupations, but for very different reasons than those outlined above. Workers with more specific training are exposed to higher job termination risk and are more often forced to change occupations than workers with general training. It is therefore important to distinguish between voluntary and involuntary occupational mobility.

Vocationally trained workers, such as secretaries, cashiers, or bank tellers, tend to undertake routine-intensive tasks that can sometimes be automated, leading to layoffs (Mihaylov and Tijdens 2019, Rohrbach-Schmidt 2019). Routine-intensive tasks are susceptible to automation because they follow well-defined, programmable rules (Autor, Levy, and Murnane 2003). Consequently, workers performing routine-tasks are at risk of technological substitution. Their risk of job termination should therefore be higher compared to workers in occupations that contain more non-routine tasks which are less easy to automate.

A similar argument suggests that occupation-specific skills are more prone to obsolescence than general skills. It posits that the economic environment is ever-changing, and most occupations are therefore also subject to change. This change leads to a devaluation of occupation-specific skills, whereas the value of general skills remains more stable over time (Hanushek et al. 2017). In fact, the argument assumes that only general training enables workers to accommodate changing labor market demands and operate new technologies (Krueger and Kumar 2004). Occupation-specific skills make workers inflexible in the face of economic change, increasing their risk of involuntary job termination relative to workers who hold general skills. To avoid long-term unemployment, displaced workers with largely obsolete skill sets are obliged to retrain and migrate into other occupations, leading to greater occupational mobility.

Taken together, the negative impact of technological change on certain jobs and the continuous devaluation of vocational skills suggest more occupational specificity leads to higher rates of *involuntary* occupational change. Considering the termination risk faced by workers with occupation-specific skills, we hypothesize that the negative link between occupational specificity and mobility stated in hypothesis 1 is more pronounced when examining voluntary transitions only (**hypothesis 2**).

### *Occupational Mobility Over the Life Course*

We argue that disparities in occupational mobility between workers who have received different types of education are likely to vary over the life course. The life-course paradigm sees these differences as resulting from individual choices and lines of action that are enabled and constrained by prior decisions and social structures (Elder 2007, Manzoni, Harkonen, and Mayer 2014). Life-course trajectories in the work domain are sequences of jobs of varying duration and transitions between

those jobs, along with episodes of unemployment. Work trajectories start with the transition to the labor market and end with retirement.

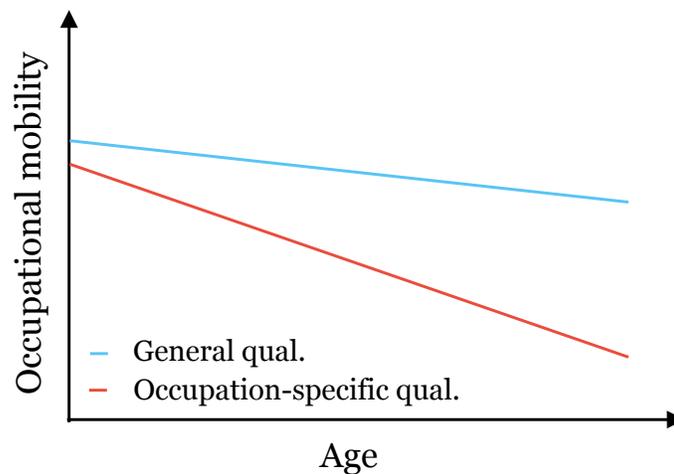
We assume that workers who received occupation-specific training are less likely to change occupations during the early part of their careers than are workers whose education was more general. The main explanation for vocational graduates' relative lack of occupation mobility soon after entering the labor market is that vocational programs create strong linkages between students and specific occupations (DiPrete et al. 2017). For students on vocational programs, occupational choices usually precede their training, and—particularly in Germany—students gain considerable work experience by undertaking company apprenticeships before they graduate. This allows vocational graduates to develop their occupational identities early on and to enter the labor market well-informed about their field of work (Shavit and Müller 2006).

More general educational programs, in contrast, do not predetermine clear occupational pathways and often attribute no time to practical work experience, meaning students acquire little information about their prospective work environment. Consequently, individuals who graduate from general educational programs tend to have more turbulent transitions to the labor market: they are more likely to move between different occupations early in their careers than workers trained for specific professions (Arum and Shavit 1995, Middeldorp, Edzes, and van Dijk 2019).

From here onwards, differences in occupational mobility between vocationally and generally trained workers most likely continue to grow due to different path dependencies in their careers. The concept of path dependence conceives actions as historically conditioned and stresses the importance of past decisions and events for future action (Sydow, Schreyogg, and Koch 2009). The relevance of path dependence for occupational careers has been established by Dlouhy and Biemann (2018). Based on data from Germany, the authors find that high levels of mobility in the early stages of a worker's career are positively associated with mobility in later career stages.

We argue that path dependence more likely leads to lock-in effects for graduates from vocational programs, reducing their occupational mobility, whereas it facilitates mobility for workers with more general skills. For the former group, the process of path dependence is initiated by selecting a specific vocational program. Once graduates begin working in their chosen occupational field, they continuously accumulate occupation-specific skills, which progressively narrow their ability to change occupations. That is, the more they specialize, the more the opportunity costs for occupational change increase. Ultimately, vocationally trained workers become locked into their occupations, leading to low probabilities for occupational change over their working lives.

Workers with more general training, in contrast, are less likely to become locked into an occupation because, as we note above, they are seldom required to choose an occupational path during education and are more likely to be mobile during their first years on the labor market. Early career mobility reduces the amount of occupation-specific human capital they accumulate (Dlouhy and Biemann 2018).



**Figure 1:** Expected development of occupational mobility over age for workers with general and occupation-specific educational qualifications.

Consequently, losses of human capital when changing occupations are less severe, which may enable more cost-efficient mobility in later career stages.

Across both groups of workers we expect to find the highest levels of occupational mobility early in their career. Generally trained workers tend to have more complex transitions to the labor market, which should lead to higher overall levels of occupational mobility—particularly early in their careers. Vocational training may facilitate smoother transitions from school to work, but although vocationally trained workers are less mobile than their generally trained counterparts, they are also least constrained (most mobile) in the early phase of their careers. From there on, we expect occupational mobility to decrease for both groups of workers but at *different rates*. Mobility rates for specifically trained workers decrease rapidly as their careers gravitate towards occupational lock-in. Mobility rates for workers with more general training also decrease, but broad skill sets and higher rates of early career mobility still allow for more cost-efficient occupational transitions in later career stages. Thus, we hypothesize that the negative effect of occupational specificity on occupational mobility increases over the life course (**hypothesis 3**). Figure 1 graphically illustrates our expectation.

Finally, one factor that might play a role in determining life-course differences in occupational mobility between specifically and generally trained workers is skill devaluation. Skill devaluation occurs when the introduction of new technologies or changes in the business environment alter the skills required to operate in the labor market. Skill devaluation can force workers to change jobs or take a pay cut, and it can lead to them being replaced by machines or cheaper labor elsewhere.

Research in this field assumes that specific skills depreciate at faster rates than general skills (Hanushek et al. 2017:49, Weber 2014). Specific skills tend to be associated with specific work tasks, and if those tasks are increasingly automated or outsourced to low-wage countries, the associated skills quickly lose their value.

In contrast, broad skills contribute to a range of work tasks, and hence devaluation proceeds slower when the demand for specific tasks decreases.

If specific skills tend to lose more value over time relative to general skills, this will affect the gap in mobility between vocationally and generally trained workers. More specifically, we expect that vocational graduates should face increasing rates of involuntary job termination later in their careers. Workers who are laid off are unlikely to find new jobs in their previous occupations and will be forced to move into other occupational fields to circumvent long-term unemployment. Accordingly, obsolescence of vocational skills leads to increasing rates of involuntary occupational mobility for vocationally trained workers late in their careers. We thus hypothesize that the negative effect of occupational specificity on occupational mobility increases more strongly over the life course when focusing on *voluntary* transitions (**hypothesis 4**).

## Data, Variables, and Method

### *Data*

We use 37 waves of panel data from the German Socio-Economic Panel (GSOEP) collected between 1984 and 2020 (Goebel et al. 2019). The GSOEP is a representative longitudinal survey of German private households that is conducted yearly. It covers a range of different topics, including income, employment, and education, and currently contains observations on approximately 103,400 individuals. Our analysis was carried out using a sub-sample of the initial data set that was restricted to Germany's working population. Table S1 of the online supplement provides a detailed overview of our inclusion criteria and the associated change in case numbers. The resulting analytic sample contains 412,022 person-year observations nested in 52,976 individuals. It represents 55.5 percent of the initial data set on the observation level and 51.2 percent on the individual level. There are slight differences between the analytic sample and the original data set (see Table S2 of the online supplement). The analytic sample contains smaller shares of generally trained workers, secondary level graduates, and female workers. Occupational change is also more likely in the analytic sample. These differences are mainly caused by our exclusion of individuals who are never recorded as employed. The number of person-year observations for each case varies between 1 and 36, with the mean number of observations per case being 7.8 (see Figure S1 of the online supplement). We allow for gaps in individual observation spells.

### *Variables*

*Occupational mobility.* We measure occupational mobility using a binary indicator that captures whether, in any given year, a person enters an occupation that differs from the one held the previous year. Occupations are identified using ISCO-08 classifications. Prior research has established that identifying occupational change from differences in ISCO codes is error prone (Longhi and Brynin 2010, Lynn and Sala 2005). Changes in codes that arise from irregularities in the interviewing

**Table 1:** Descriptive information for all included variables based on the analytic sample.

	N	Mean	SD	Range	Level
Occupational change	412,022	0.062		0-1	person-year
yes (1)	25,645				
no (0)	386,377				
Vocational education	52,976	0.652		0-1	person
vocational (1)	34,542				
general (0)	18,434				
Level of education	52,911	0.175		0-1	person
tertiary (1)	9,273				
secondary (0)	43,703				
Voluntary occupation change	396,243	0.024		0-1	person-year
yes (1)	9,866				
no (0)	386,377				
Involuntary occupation change	394,531	0.020		0-1	person-year
yes (1)	8,154				
no (0)	386,377				
Age	412,022	41.435	11.707	18-65	person-year
Gender	52,976	0.483		0-1	person
female (1)	25,631				
male (0)	27,345				
Migration background	52,976	0.263		0-1	person
migration background (1)	13,974				
no migration background (0)	39,002				
Year of birth	52,976	1967	16	1920-2001	person
Birth cohort groups	52,911			0-4	person
< 1950 (0)	7,262				
1950-1959 (1)	8,538				
1960-1969 (2)	13,098				
1970-1979 (3)	11,328				
> 1979 (4)	12,750				

process may wrongfully be captured as actual change. To address this issue, we restrict our measure of occupational change to observations where individuals explicitly report a change in jobs. This approach has already been successfully used to reduce measurement error in occupational codes with GSOEP data (Longhi and Brynin 2010). Further, we use three-digit ISCO codes to discount change between occupations that are highly similar. Overall, we observe occupational change in six percent of all person-year observations (see Table 1).

*Vocational education.* We use a binary indicator to distinguish vocational and general education. We categorize individuals based on their highest educational qualification at age 25, when most people in Germany have completed full-time education. For individuals who enter the panel at age 26 or older, we use the highest qualification at first observation. For individuals who left the sample before turning 25, we use the highest qualification at last observation. We define individuals as *vocational* if they hold a qualification from a vocational school or from a university of applied sciences. Individuals who hold a secondary school diploma as their highest

qualification or a university degree are defined as *general*. The coding scheme is further illustrated in Figure S2 of the online supplement.

Although using a binary conceptualization of occupational specificity in education is in line with prior research (Brunello and Rocco 2017a, Forster, Bol, and van de Werfhorst 2016, Golsteyn and Stenberg 2017, Hanushek et al. 2017), this neglects the fact that the vocational specificity differs across educational programs even within the two categories of “vocational” and “general” (DiPrete et al. 2017, Forster and Bol 2018). Some vocational programs convey highly specific skills (e.g., welding), whereas others are more broadly oriented (e.g., commercial business administration). Similarly, some university programs are broad (e.g., sociology), whereas others are strongly linked to specific occupational fields (e.g., medicine). Unfortunately, a gradual measure of specificity comes with high data requirements. Hence, in line with earlier studies, we employ a dichotomous measure of specificity at the expense of some observable variation and thus analytic power. We further discuss the potential limitations of this approach in the conclusion.

*Voluntary and involuntary occupational mobility.* We use information about the type of employment termination to create two binary measures that indicate whether occupational change is *voluntary* or *involuntary*. Employer-induced contract termination, plant closure, termination of fixed-term contracts, and transfer at an employer’s request are coded as involuntary terminations. Terminations initiated by the employee, mutually agreed contract dissolution, termination of self-employment, and transfer at own request are coded as voluntary terminations. Other types of employment termination, for example, those due to parental leave or reaching retirement age, are neither coded as voluntary nor involuntary but are part of the reference group of each respective indicator.

*Demographics and controls.* The demographic factor most central to this study is age. The age distribution in the analytic sample is slightly skewed towards older workers (see Figure S3 of the online supplement). In the analysis, we use mean-centered age to maintain interpretable intercepts and divide the variable by ten to improve the readability of the coefficients.

Further we adjust for different demographic characteristics such as level of education, birth cohort, gender, and migration background. With the expansion of academic education, the share of generally trained workers in Germany has increased across cohorts (Ammermueller and Weber 2005), as has the probability of changing occupations (Seibert 2007). Women in Germany are more likely than men to enter vocational education (Hecken 2006) and less likely to change occupations (Fitzenberger and Kunze 2005). Lastly, individuals with a migration background in Germany are less likely to hold a vocational degree (German Federal Ministry of Education and Research 2020), although it has been shown that men of Turkish origin, one of the largest migrant groups in Germany, are more likely to experience career mobility than the ethnic majority (Hartmann 2016).

To measure the level of education, we use a binary indicator that distinguishes secondary and tertiary qualifications. Employing a simple binary measure allows us to adjust for level-of-education confounding while avoiding issues of collinearity with our measure of occupational specificity. Figure S2 of the online supplement summarizes how levels and types of education are defined. Further, we use year of

birth where 1920 is centered to 0. When using birth cohort groups, we differentiate between five categories: “<1950”, “1950–1959”, “1960–1969”, “1970–1979”, and “>1979”. Lastly, we use binary indicators for gender (female=1) and migration background (no migration background=0, migration background=1).

### *Method*

In the analyses, we use multilevel linear probability models with individual random intercepts. Including individual random intercepts allows us to account for variation in average probabilities for occupational change across individual workers, which accommodates the two-level data structure. For models that include age, we add random age slopes to relax the assumption of equal age trajectories across workers and to avoid unmodelled cluster-driven heteroskedasticity and cluster-correlated error terms for cross-level interactions that involve age (Heisig and Schaeffer 2019).

Random-effects models are well-suited for our analyses, given that (unlike fixed-effects models) they accommodate time-constant covariates such as our measure of occupational specificity. Further, we use linear probability modeling instead of logistic regression. Logit models are commonly used to assess binary outcomes, as they provide better model fit when probabilities are close to 0 or 1 and keep predictions within those bounds. However, log odds and odds ratios are also notoriously difficult to interpret, and linear models often yield similar results (Hellevik 2009). We compared the results from our linear models with marginal effects obtained from multilevel logit regression and found that the differences are negligible (additional analyses available upon request). Consequently, we report results from linear models to ease interpretation.

To allow for differences in age trajectories between vocationally and generally trained workers, we include interaction terms between age and our measure of occupational specificity. To account for potential non-linearity in the relationship between age and occupational mobility, we consider different functional forms by adding (interactions with) age polynomials up to the fourth degree. To select the best fitting model, we compare the Akaike information criterion (AIC) and the Bayesian information criterion (BIC) as indicators for model fit and consider the significance of the age terms (Forster and Bol 2018). Additionally, we visually compared margins plots of our models with a graphical representation of a model where age is measured categorically.

We find that the model that includes quartic age has the lowest AIC and BIC while all interaction terms remain significant. The margins plot for this model reported in Figure 2 aligns well with a graphical representation using categorical age (Figure S4 of the online supplement). All reported results rely on this age specification. We additionally supply marginal effects and probabilities to ease interpretations of interaction effects in the discussion of our main results. To ensure comparability when reporting on voluntary and involuntary occupational mobility, we also focus on models based on quartic age when discussing the results. Equation 1 formally denotes a multi-level model predicting occupational change for individual  $i$  at time point  $t$  as used in this study.

$$\text{Occ}_{ti} = (\beta_0 + u_{0i}) + (\beta_1 + u_{1i})\text{Age}_{ti} + \beta_2\text{Voc}_i + \beta_3\text{Age}_{ti} * \text{Voc}_i + \beta_4\mathbf{X}_{ti} + e_{ti} \quad (1)$$

The equation contains age, vocational education, an interaction term of the two variables, and a vector of control variables  $\mathbf{X}_{ti}$ . An individual intercept  $u_{0i}$  is added to the global intercept  $\beta_0$ , and an individual age slope  $u_{1i}$  is added to the age coefficient  $\beta_1$ . The model assumes linear age effects on occupational change and is thereby equivalent to M3 in Table 2. The model can be extended to accommodate non-linearity by adding age polynomials and additional interaction terms with vocational education, as shown in Equation 2. We use the same specifications but with different dependent variables to model voluntary and involuntary occupational change.

$$\text{Occ}_{ti} = (\beta_0 + u_{0i}) + (\beta_1 + u_{1i})\text{Age}_{ti} + (\beta_2 + u_{2i})\text{Age}_{ti}^2 + [\dots] + \beta_3\text{Voc}_i + \beta_4\text{Age}_{ti} * \text{Voc}_i + \beta_5\text{Age}_{ti}^2 * \text{Voc}_i + [\dots] + \beta_6\mathbf{X}_{ti} + e_{ti} \quad (2)$$

## Results

### *Modeling Differences in Occupational Mobility*

Table 2 presents the results from multi-level linear probability models predicting the probability that workers change occupations. Across all models, we find a negative effect for vocational education, indicating that workers who received vocational training are on average less likely to change occupations than generally trained workers are. Without additional controls (M1), we find that the average probability for generally trained workers to change occupations each year is 7.2 percent. Vocational graduates are on average 1.1 percentage points less likely to move occupations, which corresponds to a difference of 15.3 percent.

When adding control variables (M2), the average difference between vocational and general education declines to 0.6 percentage points, and when age is included (M3), the predicted gap becomes 0.5 percentage points for workers of average age. In M4, which is our best fitting model, the reported difference between vocationally and generally trained workers is 0.4 percentage points for workers of average age, while adjusting for other covariates. To obtain a valid measure across age groups, we calculate the average marginal effect, which is 0.05 percentage points. Considering that the marginal probability of changing occupations is 6.6 percent for general graduates, vocational graduates are on average 8.1 percent less likely to change occupations according to M4. We obtain a standard error of 0.1 percentage points for the marginal effect. This indicates moderate variability across repeated samples and suggests that the interval between 4.7 and 11.4 percent covers the true population difference with 95 percent certainty.

In sum, our findings suggest that across age groups, vocationally trained workers are slightly less likely to move between occupations than workers with a general education, supporting our prediction in hypothesis 1.

**Table 2:** Multilevel linear probability models predicting occupational change.

	Occupational change			
	M1	M2	M3	M4
Vocational education	-0.011*	-0.006*	-0.005*	-0.004*
	(0.001)	(0.001)	(0.001)	(0.002)
Age/10			-0.019*	-0.036*
			(0.001)	(0.001)
Age/10 * Vocational education			0.005*	0.016*
			(0.001)	(0.002)
Age <sup>2</sup> /10				0.016*
				(0.002)
Age <sup>2</sup> /10 * Vocational education				0.004*
				(0.002)
Age <sup>3</sup> /10				0.006*
				(0.000)
Age <sup>3</sup> /10 * Vocational education				-0.03*
				(0.000)
Age <sup>4</sup> /10				-0.004*
				(0.000)
Age <sup>4</sup> /10 * Vocational education				0.001*
				(0.000)
Control variables	No	Yes	Yes	Yes
Intercept	0.072*	0.006	0.038	0.050
	(0.001)	(0.085)	(0.086)	(0.086)
Observations	412,022	412,022	412,022	412,022

\*  $p < 0.05$ .

*Notes:* Coefficients in M2, M3, and M4 are adjusted for level of education, gender, migration background, and year-of-birth fixed effects. Coefficients of control variables and random-effect components are omitted. The unabridged models can be found in Table S3 of the online supplement. Standard errors are presented in parentheses.

Next, we separately examine voluntary and involuntary occupational change. Table 3 combines models for both outcomes. Models M5 and M7 only contain the measure of specificity as predictor (similar to M1 of Table 2, whereas the covariates included in M6 and M8 are equivalent to those in M4 of Table 2).

*Voluntary mobility.* In M5, the average probability for generally trained workers to voluntarily change occupations is 2.7 percent each year, whereas workers with vocational training are 0.4 percentage points less likely to change voluntarily. When adjusting for other covariates (M6), the difference decreases to 0.2 percentage points for workers of average age. The marginal average probability of changing occupations for general graduates in M6 is 2.5 percent. Thus, vocationally trained workers are predicted to be 8.1 percent less likely to change occupations voluntarily than generally trained ones. With a standard error of 0.1 percentage points, the estimate is relatively imprecise. The associated interval that captures the population differences in voluntary change rates between vocationally and generally trained workers with 95 percent certainty ranges from 2.9 to 13.2 percent.

Our findings do not therefore support hypothesis 2, which proposed that due to differences in termination risk, mobility differences between workers with occupation-specific and general degrees would be more pronounced when examining voluntary transitions alone. For both voluntary and overall transitions (M4) we find an average differences of 8.1 percent between vocationally and generally trained workers.

*Involuntary mobility.* When examining involuntary change, M7 indicates no average difference in mobility between vocationally and generally trained workers. When adjusting for other covariates (M8), vocational graduates are predicted to be 0.2 percentage points less likely to change occupations after leaving a job involuntarily than general ones. Averaging over age groups, the marginal difference is 0.1 percentage points or 4.2 percent, indicating that vocational graduates are on average slightly less like to move occupations compared to general ones. Yet, the estimate is relatively imprecise and statistically insignificant.

### *Life-course Differences in Occupational Mobility*

How do rates of occupational mobility develop over the course of workers' careers? Figure 2 displays predicted marginal probabilities to change occupations over age for vocationally and generally trained workers, based on M4 of Table 2. We observe that occupational mobility trajectories for vocationally and generally trained workers develop rather similarly with regards to age. For both groups, occupational change rates increase during their early careers. After reaching a peak between 25 and 30, occupational change rates level off.

The most fundamental difference we find between the mobility trajectories of vocationally and generally trained workers is that the latter are predicted to reach and maintain higher average rates of occupational change over the first half of their careers than the former. After entering the labor market, mobility rates for generally trained workers increase more steeply than those for workers with vocational training. Vocational graduates reach their highest predicted probability for occupational mobility at age 26, with 9.1 percent, whereas general graduates reach 11.2 percent at age 27. Thereafter, mobility rates for both groups converge. At age 42, differences between the two groups become insignificant.

There is, however, a period late in workers' careers when the model predicts slightly higher mobility rates for vocational graduates than for general ones. Computing the predicted marginal difference between the two groups reveals that vocationally trained workers are slightly more likely to change occupations than workers with general training between 47 and 57. The largest difference is predicted at age 52, with a probability of 4.2 percent for generally trained workers and 4.8 percent for vocationally trained ones.

In sum, we find higher early-career mobility rates for general graduates compared to vocational ones, which supports hypothesis 3. However, we also expected that differences between the two groups would grow over the life course. Instead, we find that rates of occupational change become more similar in the second half of workers' careers until the pattern reverses and vocationally trained workers temporarily become more mobile than generally trained ones.

**Table 3:** Multilevel linear probability models predicting voluntary and involuntary occupational change.

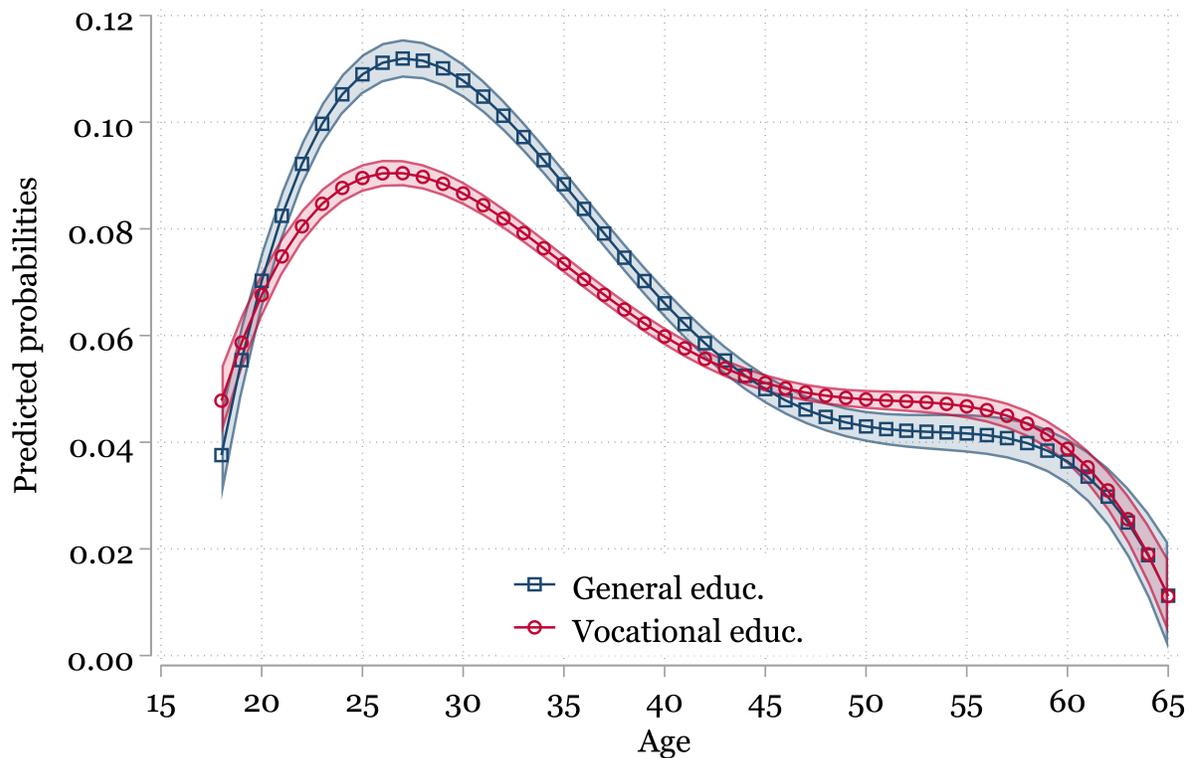
	Voluntary occupation change		Involuntary occupation change	
	M5	M6	M7	M8
Vocational education	-0.004*	-0.002	-0.000	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)
Age/10		-0.014*		-0.011*
		(0.001)		(0.001)
Age/10 * Vocational education		0.003*		0.006*
		(0.001)		(0.001)
Age <sup>2</sup> /10		0.004*		0.006*
		(0.001)		(0.001)
Age <sup>2</sup> /10 * Vocational education		0.000		-0.000
		(0.001)		(0.001)
Age <sup>3</sup> /10		0.002		0.002
		(0.000)		(0.000)
Age <sup>3</sup> /10 * Vocational education		-0.000		-0.002*
		(0.000)		(0.000)
Age <sup>4</sup> /10		-0.001*		-0.002*
		(0.000)		(0.000)
Age <sup>4</sup> /10 * Vocational education		-0.000		0.000
		(0.000)		(0.000)
Control variables	No	Yes	No	Yes
Intercept	0.027*	0.024	0.020*	0.023
	(0.001)	(0.054)	(0.000)	(0.049)
Observations	412,022	412,022	412,022	412,022

\*  $p < 0.05$ .

*Notes:* Coefficients in M2 and M4 are adjusted for levels of education, gender, migration background and contain year-of-birth fixed effects. Coefficients of control variables and random-effect components are omitted. The unabridged models can be found in Table S4 and Table S5 of the online supplement. Standard errors are presented in parentheses.

Lastly, we separately examine career differences in occupational mobility for voluntary and involuntary transitions. Findings are presented in Figure 3. They indicate that across types of education, both voluntary and involuntary occupational change most frequently occurs early in workers' careers and becomes less likely as careers progress. Counter to the expectation formulated in hypothesis 4, we find no indication that generally trained workers maintain higher levels of voluntary mobility than vocational graduates during the latter part of their careers (left panel of Figure 3).

Still, analyzing voluntary and involuntary occupational change separately brings two important points to light. First, whereas there is almost no difference in voluntary mobility late in workers' careers, vocationally trained workers are more likely to move occupations involuntarily in their fifties. Accordingly, the late-career mobility gap reported in Figure 2 is largely driven by involuntary transitions. Second, the graphs indicate that vocationally trained workers face an increased risk

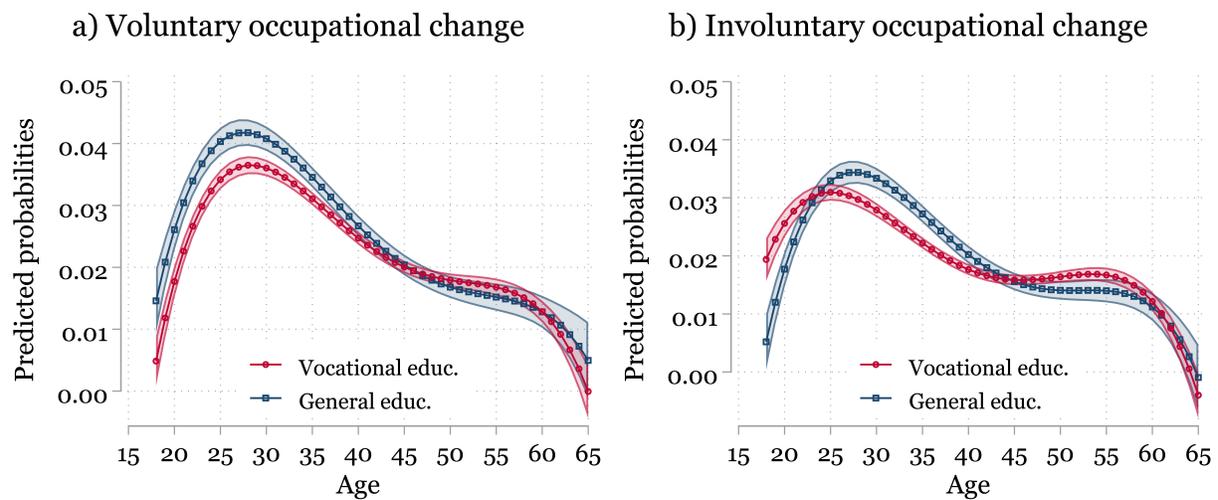


**Figure 2:** Predicted marginal probabilities to change occupations by age. *Notes:* Predictions are obtained from multi-level linear probability models with individual random intercept and random age slopes. Age-terms up to quartic age are interacted with type of education. Predictions are adjusted for level of education, gender, migration background, and year of birth. Areas around prediction lines represent 95 percent confidence intervals.

of involuntary mobility between occupations right after entering the labor market. This suggests that transitions from study to work for vocationally trained workers may in fact be less smooth than often assumed.

### *Sensitivity Checks*

We carried out several sensitivity checks to assess the robustness of our findings. First, because age-specific estimates are computed while pooling individuals from different birth cohorts, our findings are prone to cohort bias. Individuals observed at a younger age tend to belong to more recent birth cohorts and are both more likely to hold general educational qualifications (Ammermueller and Weber 2005) and to switch occupations (Seibert 2007). Hence, higher relative occupational mobility rates for generally trained workers early in the career may partially result from structural differences between birth cohorts which may also explain parts of the overall downward age trend.



**Figure 3:** Predicted marginal probabilities to change occupation voluntarily and involuntarily by age. *Notes:* Predictions are obtained from multi-level linear probability models that consider either voluntary or involuntary transitions. Age-terms up to quartic age are interacted with type of education. Predictions are adjusted for level of education, gender, migration background, and year of birth. Areas around prediction lines represent 95 percent confidence intervals.

To assess potential cohort bias in our findings, we model rates of occupational change for vocationally and generally trained workers by age while allowing for differences between cohort groups. Results are presented in Figure S5 of the online supplement. We find a consistent pattern across birth cohort groups: higher rates of occupational change for generally trained workers in the first career half are followed by a convergence in rates of change. The cohort analysis further indicates consistency in downward age trends. Lastly, we find that the mobility surplus for vocational graduates in the second career half is largely driven by individuals from older birth cohorts (before 1950) and appears less present among more recent cohort groups.

The second crucial factor we assess to ensure the robustness of our findings is the role of level of education. Although most estimates presented above have been adjusted for differences in qualification, we did not assess whether differences between vocational and general graduates are consistent across groups defined by level of education. To assess the role of level of education, we compare individuals with secondary and tertiary qualifications. Results are displayed in Figure S6 of the online supplement.

When modeling occupational change rates by age separately for individuals with secondary and tertiary education, we find that in both groups, generally trained workers are more likely to change occupations early in their careers relative to vocational graduates, whereas the difference is more subtle for workers with tertiary degrees. Differences in the second career half, however, depend on the level of qualification. For holders of secondary school diplomas, we observe no difference in change rates, whereas among holders of tertiary qualifications, vocationally

educated individuals change occupations more frequently than their general counterparts. This does not suggest that graduates from applied science universities are particularly mobile—their mobility rates compare to those of secondary-level graduates—but that graduates from general universities tend to move less than all other educational groups later in their careers. This difference is particularly marked for involuntary transitions. We discuss this finding in more detail below.

Finally, we assess whether our findings differ by gender. Prior studies have emphasized the importance of examining gender differences when assessing educational disparities in employment outcomes (Forster and Bol 2018, Golsteyn and Stenberg 2017). We thus separately model occupational change rates by age for men and women. Results are displayed in Figure S7 of the online supplement. We find that career differences in mobility between vocationally and generally trained workers are to some extent gendered. Although both male and female general graduates show higher early career mobility rates compared to vocationally trained workers, the difference is more substantial among women. Vocationally trained women in particular transition to different occupations less frequently than all other groups and thereby extend the early-career mobility gap between generally and vocationally trained workers. In turn, the increased relative rates of mobility for vocational graduates in the second career half are largely restricted to men.

## Discussion

Researchers working on employment careers have theorized that vocationally trained workers trade early career advantages in employability and wages against disadvantages late in their careers (Hanushek et al. 2017). A key mechanism that is supposed to drive those disadvantages is the inability to adapt to changing labor market demands by moving between occupations (Krueger and Kumar 2004, Rözer and Bol 2019, Weber 2014).

This study was the first to empirically examine the relationship between occupational specificity and occupational mobility over the life course. Analyzing panel data from Germany, we find robust evidence that vocationally trained workers are indeed less mobile between occupations than generally trained workers. However, that difference is limited to the first half of workers' careers. Over the second career half, occupational mobility patterns between workers align. We even find slightly higher mobility rates for vocationally trained workers. The mobility gap, however, is transitory as well as specific to tertiary qualification holders and to workers from older birth cohorts (<1950). Sensitivity checks further reveal that it is largely driven by the low late-career mobility of general university graduates and the high relative occupational change rates of secondary-level graduates, who make up two thirds of the vocationally trained group.

Overall, our findings support the notion that general graduates have less stable transitions to the labor market and change occupations more often than workers with vocational training. Yet, our findings do not confirm that discrepancies in occupational mobility grow over the life course. In line with theory on path dependence, we find that occupational change rates for vocationally trained workers decrease over the course of their careers. However, they decrease even more

strongly for generally trained workers—university graduates in particular—leading to a convergence in mobility that largely persists over the second half of workers' careers.

A potential explanation for converging mobility rates is that higher levels of termination risk amplify mobility rates for vocationally trained workers. To assess this, we examined voluntary and involuntary mobility rates separately. Our results indicate that vocationally trained workers are indeed more likely to change occupations due to lay-offs than general ones, particularly in their early twenties and between age 45 and 50. Robustness checks show that the level of education matters in this context. Secondary-level graduates face higher late-career termination risk, whereas involuntary occupational transitions rarely occur for graduates from general universities. Further, late-career differences largely disappear when examining voluntary transitions only.

Our findings have three important implications for research on career effects of vocational and general education. First, the patterns we have documented in this study do not support the argument that general graduates are highly mobile workers who use their broad skill sets to adapt to changing labor market demands. Late-career change rates for generally trained workers tend to be lower than those for other workers. This suggests that broadly trained workers may achieve higher late-career employment rates and wages not by being particularly mobile but rather by maintaining their positions in a career phase where changing occupations may yield income declines. Accordingly, future research that aims to explain education-based career differences in employment outcomes should consider employment (in)stability.

Second, differences in involuntary mobility rates suggest that the late-career stages of workers with occupation-specific degrees tend to be more turbulent and precarious compared to those of university graduates. These findings resonate with the broader question of whether vocational skills are subject to a systematic process of depreciation (Hanushek et al. 2017:49, Weber 2014). Such a process would plausibly lead to substantial differences in occupational change rates between educational groups that gain intensity as individuals age. The differences found in this study are small, however, and do not support the idea of systematic depreciation. Instead, our findings lend support for more modest explanations such as selective displacement from jobs that are affected by technological change.

Finally, this study has focused on the German case, an economy that relies on a renowned apprenticeship system where vocational students obtain highly specific skills. As argued above, disparities between workers with different degrees of skill specificity should be most visible in this setting. Although we cannot draw direct conclusions about other countries, and patterns of occupational mobility surely vary to some extent, it seems unlikely that larger differences between vocational and general graduates would be found in countries where the education system provides students with less specific skills than in Germany.

This study has two central limitations. First, occupational mobility is conceptualized as patterns of realized transitions between occupations. Individuals who leave their job and are unable to find a new one may be considered highly immobile, but they are not recorded as such in this study. Because vocational graduates face lower

relative employment rates late in their careers, such cases of neglected immobility likely occur more often for them than for generally trained workers. Therefore, late-career occupational mobility of vocational graduates may be overestimated to some extent in this study.

Second, as mentioned above, employing a binary measure of occupational specificity neglects the fact that specificity of educational qualifications varies across programs (DiPrete et al. 2017, Forster and Bol 2018). Consequently, although the theoretical mechanisms considered in this study emphasize the role of specific and general education, our analysis may also have measured other aspects linked to different qualifications, such as employers' evaluations of educational credentials.

Irrespective of these limitations, we argue that this study challenges a dominant argument in the growing literature on career effects of vocational and general education. In most studies, vocational and general education are—implicitly or explicitly—understood through the differential ability of vocational and general graduates to be mobile during later career stages. Our results do not provide evidence for substantial differences in late-career mobility. They indicate that further research is needed to understand how occupational mobility and other mechanisms affect late-career employment disparities between workers with a general and vocational education.

## References

- Ammermueller, Andreas, and Andrea M. Weber. 2005. "Educational Attainment and Returns to Education in Germany." *ZEW - Centre for European Economic Research Discussion Paper No. 05-017*. <https://doi.org/10.2139/ssrn.711063>
- Arum, Richard, and Yossi Shavit. 1995. "Secondary Vocational Education and the Transition from School to Work." *Sociology of Education* 68(3):187–204. <https://doi.org/10.2307/2112684>
- Autor, David H., Frank Levy, and Richard J. Murnane. 2003. "The Skill Content of Recent Technological Change: An Empirical Exploration." *Quarterly Journal of Economics* 118(4):1279–1333. <https://doi.org/10.1162/003355303322552801>
- Biavaschi, Costanza, Werner Eichhorst, Corrado Giulietti, Michael J. Kendzia, Alexander Muravyev, Janneke Pieters, Nuría Rodríguez-Planas, Ricarda Schmidl, and Klaus F. Zimmermann. 2012. *Youth Unemployment and Vocational Training. Background Paper for the World Development Report 2013*. Washington, DC.: World Bank.
- Bol, Thijs, and Herman G. Van de Werfhorst. 2013. "Educational Systems and the Trade-Off between Labor Market Allocation and Equality of Educational Opportunity." *Comparative Education Review* 57(2):285–308. <https://doi.org/10.1086/669122>
- Brunello, Giorgio, and Lorenzo Rocco. 2017a. "The Effects of Vocational Education on Adult Skills, Employment and Wages: What Can We Learn from PIAAC?" *SERIEs* 8(4):315–43. <https://doi.org/10.1007/s13209-017-0163-z>
- Brunello, Giorgio, and Lorenzo Rocco. 2017b. "The Labor Market Effects of Academic and Vocational Education over the Life Cycle: Evidence Based on a British Cohort." *Journal of Human Capital* 11(1):106–66. <https://doi.org/10.1086/690234>
- Culpepper, Pepper D., and David Finegold, eds. 1999. *The German Skills Machine: Sustaining Comparative Advantage in a Global Economy*. New York, NY: Berghahn Books.

- DiPrete, Thomas A. 1993. "Industrial Restructuring and the Mobility Response of American Workers in the 1980s." *American Sociological Review* 58(1):74–96. <https://doi.org/10.2307/2096219>
- DiPrete, Thomas A., Thijs Bol, Christina Ciocca Eller, and Herman G. van de Werfhorst. 2017. "School-to-Work Linkages in the United States, Germany, and France." *American Journal of Sociology* 122(6):1869–1938. <https://doi.org/10.1086/691327>
- DiPrete, Thomas A., and K. Lynn Nonnemaker. 1997. "Structural Change, Labor Market Turbulence, and Labor Market Outcomes." *American Sociological Review* 62(3):386–404. <https://doi.org/10.2307/2657312>
- Dlouhy, Katja, and Torsten Biemann. 2018. "Path Dependence in Occupational Careers: Understanding Occupational Mobility Development throughout Individuals' Careers." *Journal of Vocational Behavior* 104:86–97. <https://doi.org/10.1016/j.jvb.2017.10.009>
- Elder, Glen H. 2007. "Life Course Perspective." Pp. 1–6 in *The Blackwell Encyclopedia of Sociology*, edited by G. Ritzer. Oxford, UK: John Wiley & Sons, Ltd.
- European Commission. 2022. *Vocational Education and Training: Skills for Today and for the Future*. Luxembourg: Publications Office of the European Union.
- Fitzenberger, B., and Astrid Kunze. 2005. "Vocational Training and Gender: Wages and Occupational Mobility among Young Workers." *Oxford Review of Economic Policy* 21(3):392–415. <https://doi.org/10.1093/oxrep/gri023>
- Forster, Andrea G., and Thijs Bol. 2018. "Vocational Education and Employment over the Life Course Using a New Measure of Occupational Specificity." *Social Science Research* 70:176–97. <https://doi.org/10.1016/j.ssresearch.2017.11.004>
- Forster, Andrea G., Thijs Bol, and Herman G. van de Werfhorst. 2016. "Vocational Education and Employment over the Life Cycle." *Sociological Science* 3(21):473–94. <https://doi.org/10.15195/v3.a21>
- German Federal Ministry of Education and Research. 2020. *Bildung in Deutschland: ein indikatorengestützter Bericht mit einer Analyse zu Bildung in einer digitalisierten Welt*. 2020. Bielefeld: wbv.
- Gerring, John. 2017. *Case Study Research: Principles and Practices*. 2nd ed. Cambridge: Cambridge University Press.
- Goebel, Jan, Markus M. Grabka, Stefan Liebig, Martin Kroh, David Richter, Carsten Schröder, and Jürgen Schupp. 2019. "The German Socio-Economic Panel (SOEP)." *Jahrbücher Für Nationalökonomie Und Statistik* 239(2):345–60. <https://doi.org/10.1515/jbnst-2018-0022>
- Golsteyn, Bart, and Anders Stenberg. 2017. "Earnings Over the Life Course: General versus Vocational Education." IZA Institute of Labour Economics Discussion Paper Series No. 10593. <https://doi.org/10.2139/ssrn.2931330>
- Government Accountability Office. 2022. *Career and Technical Education: Perspectives on Program Strategies and Challenges*. GAO Publication. 22–104544. Washington, D.C.: U.S. Government Printing Office.
- Hampf, Franziska, and Ludger Woessmann. 2017. "Vocational vs. General Education and Employment Over the Life-Cycle: New Evidence from PIAAC." *CESifo Economic Studies* 63(3):255–69. <https://doi.org/10.1093/cesifo/ifx012>
- Hanushek, Eric A., Guido Schwerdt, Ludger Woessmann, and Lei Zhang. 2017. "General Education, Vocational Education, and Labor-Market Outcomes over the Lifecycle." *Journal of Human Resources* 52(1):48–87. <https://doi.org/10.3386/w17504>

- Hartmann, Jörg. 2016. "Assimilation over the Life Course? The Career Mobility of Second-Generation Turkish Men in Germany." *Zeitschrift Für Soziologie* 45(4):281–97. <https://doi.org/10.1515/zfsoz-2015-1016>
- Hecken, Anna E. 2006. "Bildungsexpansion und Frauenerwerbstätigkeit." Pp. 123–55 in *Die Bildungsexpansion*, edited by A. Hadjar and R. Becker. Wiesbaden: VS Verlag für Sozialwissenschaften.
- Heisig, Jan Paul, and Merlin Schaeffer. 2019. "Why You Should Always Include a Random Slope for the Lower-Level Variable Involved in a Cross-Level Interaction." *European Sociological Review* 35(2):258–79. <https://doi.org/10.1093/esr/jcy053>
- Hellevik, Ottar. 2009. "Linear versus Logistic Regression When the Dependent Variable Is a Dichotomy." *Quality & Quantity* 43(1):59–74. <https://doi.org/10.1007/s11135-007-9077-3>
- Holland, John L. 1997. *Making Vocational Choices: A Theory of Vocational Personalities and Work Environments*. 3rd ed. Englewood Cliffs NJ: Prentice Hall.
- Kambourov, Gueorgui, and Iourii Manovskii. 2009a. "Occupational Mobility and Wage Inequality." *Review of Economic Studies* 76(2):731–59. <https://doi.org/10.1111/j.1467-937X.2009.00535.x>
- Kambourov, Gueorgui, and Iourii Manovskii. 2009b. "Occupational Specificity of Human Capital." *International Economic Review* 50(1):63–115. <https://doi.org/10.1111/j.1468-2354.2008.00524.x>
- Korber, Mäilys, and Daniel Oesch. 2019. "Vocational versus General Education: Employment and Earnings over the Life Course in Switzerland." *Advances in Life Course Research* 40:1–13. <https://doi.org/10.1016/j.alcr.2019.03.003>
- Krueger, Dirk, and Krishna B. Kumar. 2004. "Skill-Specific Rather than General Education: A Reason for US–Europe Growth Differences?" *Journal of Economic Growth* 9(2):167–207. <https://doi.org/10.1023/B:JOEG.0000031426.09886.bd>
- Longhi, Simonetta, and Malcolm Brynin. 2010. "Occupational Change in Britain and Germany." *Labour Economics* 17(4):655–66. <https://doi.org/10.1016/j.labeco.2010.02.001>
- Lynn, P., and E. Sala. 2005. "Measuring Change in Employment Characteristics: The Effects of Dependent Interviewing." *International Journal of Public Opinion Research* 18(4):500–509. <https://doi.org/10.1093/ijpor/edl013>
- Manzoni, Anna, Juho Harkonen, and Karl U. Mayer. 2014. "Moving On? A Growth-Curve Analysis of Occupational Attainment and Career Progression Patterns in West Germany." *Social Forces* 92(4):1285–1312. <https://doi.org/10.1093/sf/sou002>
- McCue, Kristin. 1996. "Promotions and Wage Growth." *Journal of Labor Economics* 14(2):175–209. <https://doi.org/10.1086/209808>
- Middeldorp, Marten M., Arjen J. Edzes, and Jouke Van Dijk. 2019. "Smoothness of the School-to-Work Transition: General versus Vocational Upper-Secondary Education." *European Sociological Review* 35(1):81–97. <https://doi.org/10.1093/esr/jcy043>
- Mihaylov, Emil, and Kea G. Tijdens. 2019. "Measuring the Routine and Non-Routine Task Content of 427 Four-Digit ISCO-08 Occupations." *Tinbergen Institute Discussion Paper* 2019-035/V. <https://doi.org/10.2139/ssrn.3389681>
- Ng, Thomas W., Kelly L. Sorensen, Lillian T. Eby, and Daniel C. Feldman. 2007. "Determinants of Job Mobility: A Theoretical Integration and Extension." *Journal of Occupational and Organizational Psychology* 80(3):363–86. <https://doi.org/10.1348/096317906x130582>

- Nisic, Natascha, and Parvati Trübswetter. 2012. *Berufswechsler in Deutschland Und Großbritannien*. SOEPpapers on Multidisciplinary Panel Data Research, No. 442, Deutsches Institut für Wirtschaftsforschung (DIW), Berlin.
- OECD. 2010. *Learning for Jobs: Synthesis Report of the OECD Reviews of Vocational Education and Training*. Paris: OECD. [URLhere](#)
- Rohrbach-Schmidt, Daniela. 2019. "Putting Tasks to the Test: The Case of Germany." *Social Inclusion* 7(3):122–35. <https://doi.org/10.17645/si.v7i3.2025>
- Rözer, Jesper J., and Thijs Bol. 2019. "Labour Market Effects of General and Vocational Education over the Life-Cycle and across Time: Accounting for Age, Period, and Cohort Effects." *European Sociological Review* 35(5):701–17. <https://doi.org/10.1093/esr/jcz031>
- Ryan, Paul. 2001. "The School-to-Work Transition: A Cross-National Perspective." *Journal of Economic Literature* 39(1):34–92. <https://doi.org/10.1257/jel.39.1.34>
- Seibert, Holger. 2007. *Berufswechsel in Deutschland: Wenn Der Schuster Nicht Bei Seinem Leisten Bleibt*. IAB-Kurzbericht No. 200701, Institute for Employment Research, Nuremberg, Germany.
- Shavit, Yossi, and Walter Müller. 2006. "Vocational Secondary Education, Tracking, and Social Stratification." Pp. 437–52 in *Handbook of the Sociology of Education, Handbooks of Sociology and Social Research*, edited by M. T. Hallinan. Springer US.
- Sydow, Jörg, Georg Schreyögg, and Jochen Koch. 2009. "Organizational Path Dependence: Opening the Black Box." *Academy of Management Review* 34(4):689–709. <https://doi.org/10.5465/AMR.2009.44885978>
- Taylor, Karen M., and Joellen Popma. 1990. "An Examination of the Relationships among Career Decision-Making Self-Efficacy, Career Salience, Locus of Control, and Vocational Indecision." *Journal of Vocational Behavior* 37(1):17–31. [https://doi.org/10.1016/0001-8791\(90\)90004-L](https://doi.org/10.1016/0001-8791(90)90004-L)
- Tharenou, Phyllis. 1997. "Explanations of Managerial Career Advancement." *Australian Psychologist* 32(1):19–28. <https://doi.org/10.1080/00050069708259614>
- Weber, Sylvain. 2014. "Human Capital Depreciation and Education Level." *International Journal of Manpower* 35(5):613–42. <https://doi.org/10.1108/IJM-05-2014-0122>
- Zimmermann, Klaus F. 2013. "Youth Unemployment and Vocational Training." *Foundations and Trends® in Microeconomics* 9(1–2):1–157. <https://doi.org/10.1561/07000000058>

**Acknowledgments:** The research was supported by the ERC starting grant From School to Career: Towards A Career Perspective on the Labor Market Returns to Education (ID: 950189). Previous versions of this article were presented at the ISA RC28 conference 2022 at London School of Economics, the ECSR annual conference 2022 at University of Amsterdam, and at multiple events organized by the Dutch Interuniversity Center for Social Science Theory and Methodology.

**Viktor Decker:** Department of Sociology, University of Amsterdam. E-mail: v.v.decker@uva.nl.

**Thijs Bol:** Department of Sociology, University of Amsterdam. E-mail: t.bol@uva.nl.

**Hanno Kruse:** Institute of Political Science and Sociology, University of Bonn. E-mail: hkruse@uni-bonn.de.