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Types of Education, Achievement and Labour Market Integration over the Life Course

Editors

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Editorial

Types of Education, Achievement and Labour Market Integration over the Life Course

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Abstract
Over the last 15 years, research on the effects of different types of education on labour market integration and labour market outcomes has evolved. Whereas much of the early work analysed school-to-work transition outcomes, the focus of more recent studies has shifted to the relationship between educational achievement and mid- and long-term labour market outcomes. The overarching question of this body of research asks whether the allocation to different types of education leads to different skill sets, to different employment opportunities and to jobs offering unequal wages, job autonomy or job security. However, pivotal issues related to the comparison of vocational and general types of education or upper-secondary and tertiary-level qualification remain ambiguous and are hampered by a lack of suitable data and methodological problems. The aim of this issue is to further this debate and to provide more insights into the relationship between individual and contextual factors, allocation within the educational system, educational achievement and labour market outcomes over the life course. The 12 articles collected in this issue highlight the importance of focussing on the specific features and functions of different education tracks and programs, of applying data and methods suitable for such analyses and of considering the interplay of different determinants of education outcomes, such as social origin, gender or ethnicity.

Keywords
career trajectories; general education; labour market outcomes; returns to education; vocational education and training

Issue
This editorial is part of the issue “Types of Education, Achievement and Labour Market Integration over the Life Course”, edited by Irene Kriesi (Swiss Federal Institute for Vocational Education and Training, Switzerland) and Juerg Schweri (Swiss Federal Institute for Vocational Education and Training, Switzerland).

1. Introduction

In the face of high rates of youth employment in many Western countries, educational system characteristics have become the centre of attention in research as well as in educational policy. Some countries deal with the school-to-work transition primarily by diversifying post-secondary and tertiary education programmes, i.e. by offering different types of colleges and college degrees. Other countries also allow for different types of education on the upper-secondary level, typically with an emphasis on vocational education and training (VET). Countries with strong VET have been shown to fare better in integrating young people swiftly into the labour market after completion of education (Bol & van de Werfhorst, 2016; Breen, 2005; de Lange, Gesthuizen, & Wolbers, 2014; Ryan, 2001; Shavit & Müller, 1998; van der Velden & Wolbers, 2003; Winkelmann, 1996; Wolter & Ryan, 2011; Zimmermann et al., 2013). This has been attributed to the high level of occupational specificity of VET, which increases initial productivity and reduces the immediate need of on-the-job training. As a result, the

strengthening of VET has been proposed as a remedy for difficulties at labour market entry. However, the literature that goes beyond the question of unemployment at labour market entry reveals a more complex picture.

2. Previous Research and Open Questions

Country comparisons suggest that the effect of vocational education on job quality differs between countries. Vocational education reduces job mismatch more strongly in countries with a tight link between the educational system and the labour market and a high share of dual VET (e.g., Levels, van der Velden, & Di Stasio, 2014; Wolbers, 2003). However, country comparisons are hampered by not being able to disentangle the effect of the national system, the type of education (vocational and general) and of differences in the student composition within VET and general education, which differs markedly between countries. In order to draw sound conclusions regarding the interplay of education and context factor, comparative data including skill measures would be useful.

The simple distinction between general education and VET does not take into account that general and vocational education programmes vary in their degree of occupational specificity (Backes-Gellner & Geel, 2014; Forster & Bol, 2017; Grønning, Kriesi, & Sacchi, 2018; Lazear, 2009; Muja, Blommaert, Gesthuizen, & Wolbers, 2019; Müller & Schweri, 2015; Ormiston, 2014). Recent research has shown that occupation-specific skills facilitate labour market entry irrespective of whether they had been acquired in programmes typed as vocational or general (Eggenberger, Rinawi, & Backes-Gellner, 2018; Forster & Bol, 2017; Heijke & Meng, 2011; Menze, 2017; Vogtenhuber, 2014). Furthermore, occupational specificity, and in particular firm-based VET, impacts labour market entry more strongly than job quality, such as the match between training and job content (Muja et al., 2019). However, this positive effect on finding a job is short-lived and does not translate into more positive employment outcomes in the long run (Lavrijsen & Nicaise, 2017; Neyt, Verhaest, & Baert, 2018; Verhaest, Lavrijsen, Van Trier, Nicaise, & Omey, 2018).

The bulk of research comparing different types of education focuses on European countries. However, recent research shows that in some countries, VET is not so much an alternative to general upper-secondary education, but a stepping-stone to entering the labour market successfully. Corseuil, Foguel and Gonzaga (2019) show that the apprenticeship program in Brazil, adopted at a large scale after the year 2000, increased employment in permanent jobs and educational attainment of young workers compared to their peers who entered the labour market via temporary jobs without apprenticeship. Field, Linden, Malamud, Rubenson and Wang (2019), who randomly allocated scarce slots for oversubscribed vocational schools in Mongolia, find sizeable positive employment and earnings effects for those students who were admitted to a vocational school.

There is some evidence that VET falls short in teaching numeracy and literacy skills, thus contributing to increased achievement inequality (e.g., Brunello & Rocco, 2015; van de Werfhorst & Mijs, 2010). In the same vein, some studies suggest that there may be a trade-off between a smooth labour market entry and long-term disadvantages of vocational compared to general skills regarding employment and wages (Forster, Bol, & van de Werfhorst, 2016; Hanushek, Schwerdt, Wössmann, & Zhang, 2017; Korber & Oesch, 2019; Lavrijsen & Nicaise, 2017). The results on the timing and magnitude of the disadvantage of VET in the later career are, however, controversial, and some studies find no disadvantages for VET graduates at all (Hall, 2016; Malamud & Pop-Eleches, 2010; Schweri, Eymann, & Aepli, 2019). Furthermore, there is some evidence of considerable heterogeneity between fields, as Espinoza and Speckesser (2019) show for Great Britain, where workers with higher vocational education in STEM fields receive considerably higher returns than many university graduates.

Some studies imply that the relationship between skill specificity and labour market outcomes differs between upper-secondary and tertiary education (Brunello & Rocco, 2015; Culpepper, 2007). A recent study by Bol, Ciocca Eller, van de Werfhorst and DiPrete (2019) shows, for example, that a strong link between the training programme and the labour market generally leads to higher wages for tertiary-level graduates. For workers with upper-secondary education only, this relationship only manifests itself in countries with a highly occupation-specific dual training system.

In summary, it remains unclear whether and to what extent different types of education and skills at the upper-secondary and tertiary level matter for educational achievement and long-term labour market outcomes beyond the school-to-work transition. Furthermore, the possible mechanisms explaining different career outcomes have been little investigated. Given the rapid changes in skill demand, triggered by technological developments, more knowledge on the sustainability of different types of education and skills is required.

3. Aim of and Contributions to the Thematic Issue

The aim of this thematic issue is to shed more light on the relationship between educational attainment, employment and job quality beyond labour market entry and its context-dependency. The issue includes 12 contributions which focus on different countries—including Germany, Switzerland, Austria, Great Britain, Spain and Norway—and types of education. They also vary regarding the outcomes of interest and the studied context factors, which include work tasks, socio-economic background, gender, migration background, birth cohorts and institutional contexts.

Several of the contributions look at facets of educational attainment. Grønning and Trede (2019) analyse

whether VET outcomes are related to labour market segments. Using the example of Swiss health care, they show that apprenticeship training is affected by patterns of labour market segmentation. The allocation of apprentices to a specific training segment affects their chances to enter tertiary-level education after completion of upper-secondary VET. The contribution highlights the heterogeneity of VET and shows that the early allocation within the training system may have long-lasting consequences for career and income prospects.

Zimmermann and Seiler (2019) identify five dominant educational pathways in Switzerland—vocational, vocational & tertiary, specialized secondary & tertiary, academic mixed and academic—which determine young people's labour market outcomes in adulthood. The authors show, firstly, that net of ability, SES and gender strongly influence the chosen pathway. Secondly, the five pathways lead to markedly different occupational status and income prospects. The findings also highlight that pathways, which include secondary or tertiary-level vocational education, lead to considerably lower income prospects for women than for men.

Bratsberg, Nyen and Raaum (2019) analyse whether education programmes targeted at adults in Norway succeed in reducing the correlation of parental education and their children's educational attainment at the upper-secondary level. Using register data, they show that substantial proportions of Norwegian men and women still complete upper-secondary education after age 25. Four main routes for adults to an upper-secondary degree all contribute to this result. Even in these programs, the selection of participants is biased towards individuals with higher parental education but less so than in education programmes before 25. Therefore, adult vocational qualifications reduce the overall social gradient quite substantially, with the "experience-based route" to vocational qualifications being most effective.

Using a qualitative approach, Barroso-Hurtado and Chan (2019) compare the perspectives of Austrian and Spanish young adults who had entered lifelong learning programmes. Drawing on the concept of transition regimes (Walther, 2017), the authors analyse the relationship between institutional context characteristics and young people's transition experiences and life plans. The results illustrate that the outcomes of educational programmes, including the opportunities, perspectives and support they provide, vary considerably between the employment-centred transition regime in Austria and the under-institutionalized transition regime in Spain, which strongly relies on family support and informal networks.

Income is an important indicator of job quality. Consequently, several of the contributions in this issue look at the income prospect of different types of education. Rohrbach-Schmidt (2019) investigates the relationship between the level of education, work tasks and income by comparing German workers with university and VET degrees within the same occupational group. The results show that employees with university degrees complete higher shares of abstract and lower shares of manual tasks compared to employees with VET degrees. This affects income differences between the two groups because abstract tasks are related to higher wages, more so than manual tasks, on average. Yet, non-routine manual tasks are rewarded with wage gains in highly specific manual occupations. This indicates that the occupational specificity of tasks matters in addition to the task types.

Sander and Kriesi (2019) compare the long-term wage prospects of upper-secondary and tertiary-level VET in Switzerland. Based on a quasi-panel approach, the contribution estimates that on average and across the entire working life, the completion of a tertiary-level vocational degree leads to eleven per cent higher returns. However, the wage gains related to tertiary-level degrees differ considerably between occupational training groups. In line with the assumptions of the skill-biased technological change approach, returns to tertiary-level vocational training increase with increasing shares of analytic, interactive but also manual non-routine tasks, which are difficult to execute solely with machines.

Glauser, Zangger and Becker (2019) compare wages of bachelor and master degree holders in Switzerland five years after graduation. They focus on cohort differences and ask whether the institutionalization of bachelor's degrees after the Bologna reform affected the returns to this type of education compared to a master's degree. They find a persistent income advantage of labour market participants who completed a master rather than a bachelor's degree, which stabilized across birth cohorts after the introduction of the latter in 2004. The results also confirm findings from previous research, which showed that the income prospects of university graduates differ considerably by field of study and are highest for economics, medicine and pharmacy.

The contribution of Luchinskaya and Dickinson (2019) distinguishes between different types of further training after completion of full-time education and investigates their relationship with wages. The authors show that the reasons for further training differ between workers with different occupational status. Those with routine occupations more often undergo training in order to get started in their job or to do health and safety training, whereas workers in intermediate or higher managerial and professional occupations more often undertook training to improve their skills. Furthermore, the findings reveal that not all types of training lead to higher wages, and some types, such as health and safety training, are even associated with wage loss. Types of training which help to maintain or improve skills are associated with small wage gains manifesting themselves after several years only. Workers in lower-level occupations are not only less likely to participate in training, but they are also more likely to have done a type of training that is not associated with wage gains.

Diverging from the bulk of previous research comparing VET with general education, Korber (2019) inves-

tigates the income and employment prospects of workers with upper-secondary VET and compulsory education in Switzerland and Great Britain—two countries which differ regarding the specificity and standardization of their VET systems. By using a pseudo-cohort approach, the author shows that in both countries, upper-secondary VET provides an employment and wage advantage over compulsory education and on-the-job training only. However, the employment advantage is considerably larger in Great Britain than in Switzerland, confirming that the relationship between the type of education and labour market outcome is dependent on the context.

Employment is also the focus of Kratz, Patzina, Kleinert and Dietrich's (2019) contribution. It analyses changes in employment patterns of workers with general and vocational education across cohorts. The findings imply that the employment advantage of people with VET, which was consistently found in previous research for early working life, is larger for younger cohorts than for those born before 1980. Furthermore, a part of the employment disadvantage found for vocationally trained men in their late working life may be attributed to poor health—possibly induced by the more demanding working conditions in jobs for vocationally trained men. The findings of this contribution reveal the limits of cross-sectional analysis. They highlight that previous evidence, showing that individuals with general education "overtake" those with vocational education late in their careers (Hanushek et al., 2017), necessarily relies on few and relatively old cohorts, whose experiences may differ from those of workers born later.

Wicht, Müller, Haasler and Nonnenmacher (2019) broaden the perspective on job quality by considering not only wages but also job security, job autonomy and the match between abilities and demand. Furthermore, and unlike most studies, they are able to control for literacy skills by using the PIAAC data. Their findings pertaining to Germany show that workers with initial VET earn less and experience less job autonomy compared to those with advanced VET or academic qualifications. Whereas workers with advanced VET also had lower earnings compared to their academically educated counterparts, their level of job autonomy was comparable. In sum, the contribution shows that job quality differs between workers with different types of education, even after taking basic skills into account.

Naseem (2019) compares the educational achievement and labour market integration of British-born female graduates with Pakistani and Algerian parents. By using a qualitative approach, the contribution reveals how the intersection of gender, ethnicity and socio-economic background shapes the choice of higher education institution and subsequent career trajectories. In order to comply with cultural and religious gender roles, women had to compromise regarding their choice of university. Furthermore, both groups of women—and particularly those from working-class families—faced prejudice and disadvantages at labour market entry but managed to improve their position over time by building their "identity capital" and perceived employability. The contribution thus highlights how long-term labour market outcomes depend on a complex interplay of types of education, gender, gender-role constraints and individual agency.

4. Conclusions

Taken together, the contributions in this issue provide new insights into the complex relationship between types of education, educational achievement, individual and contextual factors and labour market outcomes at various stages in the life course. The results highlight, on the one hand, that different types of education go along with different employment opportunities and job quality in the long-run, and even for individuals working within the same occupation (Glauser et al., 2019; Korber, 2019; Rohrbach-Schmidt, 2019; Wicht et al., 2019). On the other hand, several contributions provide evidence that—despite these differences—there is considerable heterogeneity within types of education. VET, higher education as well as further training after labour market entry are linked to heterogeneous outcomes, which differ markedly by the chosen occupational field/level or type of training (Bratsberg et al., 2019; Grønning & Trede, 2019; Luchinskaya & Dickinson, 2019; Sander & Kriesi, 2019). Furthermore, the contributions on this issue show that there is interplay between types of education and ascribed characteristics, such as gender, social origin or migration background. Occupational outcomes tied to certain types of education differ for men and women, people with and without a migration background (Naseem, 2019; Zimmermann & Seiler, 2019) as well as by the national context (Barroso-Hurtado & Chan, 2019; Korber, 2019). In a similar vein, educational attainment in adulthood and the concomitant labour market outcomes are related to individuals' social background and occupational status (Bratsberg et al., 2019; Luchinskaya & Dickinson, 2019). Last but not least, two cohort comparisons provide the first tentative evidence that the relationship between types of education and labour market outcomes may have changed over time (Glauser et al., 2019; Kratz et al., 2019). However, the reasons are difficult to pinpoint with the available data. Changes across cohorts may be due to changing education contents and teaching methods as well as due to changes in the labour market structure.

Despite providing new insights, the contributions of this issue also highlight that many open questions and challenges remain. This is partly due to a lack of longitudinal data, which would allow the observation of an individual's entire working life. A useful example is the Norwegian register data used by Bratsberg et al. (2019). Thanks to the full population information, this contribution is able to trace all adults and investigate their educational or occupational attainment over a period of 15 years. Furthermore, this kind of data also allows a

comparison of birth cohorts and thus the investigation of changes over time.

However, register data alone does not solve the pivotal problem of causality, which hampers the vast majority of studies in this field. In order to identify the advantages, disadvantages and trade-offs between different types of education and to formulate sustainable policy recommendations, it would be necessary to pinpoint the causal effects of education. The selection of individuals with different unobserved characteristics into different types of education severely limits the comparability of outcomes between different education groups. Such selection processes differ between education programs, countries, and across time. One important improvement are indicators of individual ability, which have hitherto not been available in most large-scale longitudinal data sets. If such data existed for several countries, it could help to disentangle the role of the institutional context vis-à-vis the skills composition of groups of individuals with certain types of education.

Another issue, which would shed more light on the advantages and disadvantages of VET versus general education, pertains to the heterogeneity of these types of education as well as to country differences regarding their characteristics. As recent research has shown, the distinction between broad types of education masks the large differences within types (Forster & Bol, 2017; Grønning et al., 2018). There is some early evidence that such differences go along with unequal labour market outcomes between social groups (Grønning, Kriesi, & Sacchi, 2019; Zimmermann & Seiler, 2019). Further research is needed on the measurement and conceptualization of such differences, on their possible effects on educational and labour market outcomes as well as on the intersectionality of educational characteristics and social group membership, such as social origin, gender or ethnicity.

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Conflict of Interests

The authors declare no conflict of interests.

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Article

Does It Matter Where They Train? Transitions into Higher Education After VET and the Role of Labour Market Segments

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Abstract
Due to a higher demand for tertiary education, continued educational achievement has become important for the career development of young people with vocational education and training (VET). In this article, therefore, we examine whether the labour market segment of the training firm influences VET diploma holders' likelihood of entering tertiary education. In Switzerland, companies from a wide range of industries and with different institutional characteristics assume a large part of the responsibility for training. Thus, the training firm's position in the labour market impacts apprentices' education and training. Drawing upon segmentation theories, we argue that structural differences between training firms in different labour market segments result in varying opportunities and incentives for higher education. Our analyses are based on a longitudinal national survey of healthcare apprentices who were trained in the primary healthcare segment (hospitals) or in the secondary healthcare segment (nursing homes). Propensity score matching results show that VET diploma holders who were trained in the primary segment were more likely to enter tertiary education than those who were trained in the secondary segment. This finding implies that the structural conditions in the training firm matter for young workers' careers by affecting further educational achievement.

Keywords
apprenticeship; higher education; labour market; tertiary education; training firms; vocational education and training

Issue
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1. Introduction

In light of the increasing complexity of working tasks and a higher demand for tertiary education, the long-term labour market integration and mobility of individuals with an upper-secondary vocational education and training (VET) diploma have been discussed in the social sciences (e.g., Forster & Bol, 2018; Lavrijsen & Nicaise, 2017). VET diploma holders, i.e., two-thirds of Swiss school leavers, increasingly face hurdles when entering the labour market because of growing competition from more experienced workers and workers with tertiary education (Salvisberg & Sacchi, 2014). In this context, the role of education system characteristics in labour market integration has received growing attention. In particular, research has shown that the degree of specificity of an education programme increases individuals' chances of finding a (skill-adequate) job upon labour market entry (e.g., Eggenberger, Rinawi, & Backes-Gellner, 2018; Forster & Bol, 2018; Menze, 2017; Vogtenhuber, 2014). Furthermore, the importance of the firm has been established by research showing that individuals with highly specific, firm-based VET have higher income upon labour market entry than individuals with school-based training

(Jonker, van Ophem, & Hartog, 2006; Müller & Schweri, 2009) but are less mobile (Müller & Schweri, 2009). However, further differences in education structures within VET, e.g., the types of training firms and their impact on mid- and long-term labour market outcomes and interrelated educational trajectories, have received little attention.

The vocational education system in Switzerland is highly specific and strongly linked to the labour market. The dual training system combines workplace training with vocational schooling. Approximately 90% of individuals in upper-secondary VET train in a firm-based apprenticeship programme in one of the approximately 230 training occupations (State Secretariate for Education Research and Innovation [SERI], 2016). Although the training programmes have highly standardised curricula and examinations, there are large differences in the work conditions and training quality between firms within training occupations (Hupka-Brunner & Kriesi, 2013). We draw upon segmentation theory, which states that firms can be clustered into segments according to structural characteristics, to discuss the differences between training firms and their impact on further career decisions. Apprentices experience a segment-specific work environment during training because they spend a large share of their training time in the firm. This influences their perception of career possibilities within their occupation and subsequent transitions into tertiary education. Therefore, in this article, we ask how the labour market segment of the training firm influences upper-secondary VET degree holders' likelihood of entering tertiary education.

The transition from VET to higher education is highly relevant considering that tertiary education is one of the most important measures for VET-diploma holders to keep up with the increasing skill demand and to secure long-term labour market participation (Gomensoro et al., 2017). For workers with a VET occupation, career opportunities and higher education are strongly linked, as early career progression for this group is often contingent upon occupation-specific tertiary level training (Sacchi, Kriesi, & Buchmann, 2016). Lifelong learning and permeable education systems have also been stressed as solutions for retaining a competent and up-to-date workforce (European Center for the Development of Vocational Training, 2012). Thus, seen from both an individual and an economic perspective, access to tertiary education for those with a vocational upper-secondary degree is crucial for their long-term labour market chances.

To examine our research question, we use the example of healthcare. This has several advantages. First, the healthcare field is divided into two distinct fields, with structural characteristics similar to the primary and secondary segments discussed in the segmentation literature (acute and long-term care). Second, we have data on a homogenous student group who have the same degree and face the same admissions requirements for a limited number of tertiary education options. Thus, we avoid bias in our estimates due to different requirements or the number of options in different training occupations. Third, the Swiss healthcare sector is characterised by a shortage of nursing staff of all education levels (Mercay, Burla, & Widmer, 2016). Therefore, it is highly unlikely that transitions into higher education function as a strategy to avoid unemployment and that the results are driven by unemployment risk.

2. Vocational Education in Swiss Healthcare

The healthcare assistant apprenticeship is the third-most-chosen training programme in the upper-secondary level in Switzerland (SERI, 2016). This training occupation was established not only to provide skilled care workers in the healthcare field but also as a recruitment pool for tertiary nursing education (Oertle Bürki, 2008). The matching process of young individuals and training firms follows a labour market logic, where the compulsory school leavers have to apply for an apprenticeship placement and be hired at a healthcare institution during the three years of training. Almost half of the apprentices train in nursing homes while around a third train in hospitals; the remainder train in homecare, rehabilitation, or psychiatric institutions (Trede, 2015). Healthcare assistant apprentices spend 3.5 days a week on average in their training firm and 1.5 days in vocational school. Although the practical training in most cases is limited to one firm, the diploma is general in the sense that the curriculum and exam criteria are the same for all apprentices independent of where they train. Furthermore, the healthcare assistant curriculum was designed with a general orientation to facilitate mobility and secure broad applicability across healthcare segments (Oertle Bürki, 2008). This orientation is possible because apprentices acquire basic occupation-specific skills and knowledge in vocational school and inter-company courses in addition to the practical segment-specific training (Wettstein, Schmid, & Gonon, 2017). Thus, after graduation, healthcare assistant diploma holders are qualified to work in all healthcare segments, undertaking care and nursing tasks supervised by registered nurses.

Formally, after completing their VET, healthcare assistants have the same access rights to higher education regardless of where they trained. The numerous tertiary education options for healthcare assistants within the healthcare field are depicted in Figure 1. These degrees are either acquired at a college for higher education (e.g., activation specialist, expert in surgical technology; ISCED 5B) or, with the prerequisite of a vocational baccalaureate, at a university of applied science (e.g., physiotherapy, midwife; ISCED 5A; see Figure 1). The most frequently chosen option is nursing studies, which are provided at both educational institutions. Registered nurses can further specialise by finishing an Advanced Federal Diploma or a Master of Science. At the colleges for higher education, dual degrees are the standard. This means

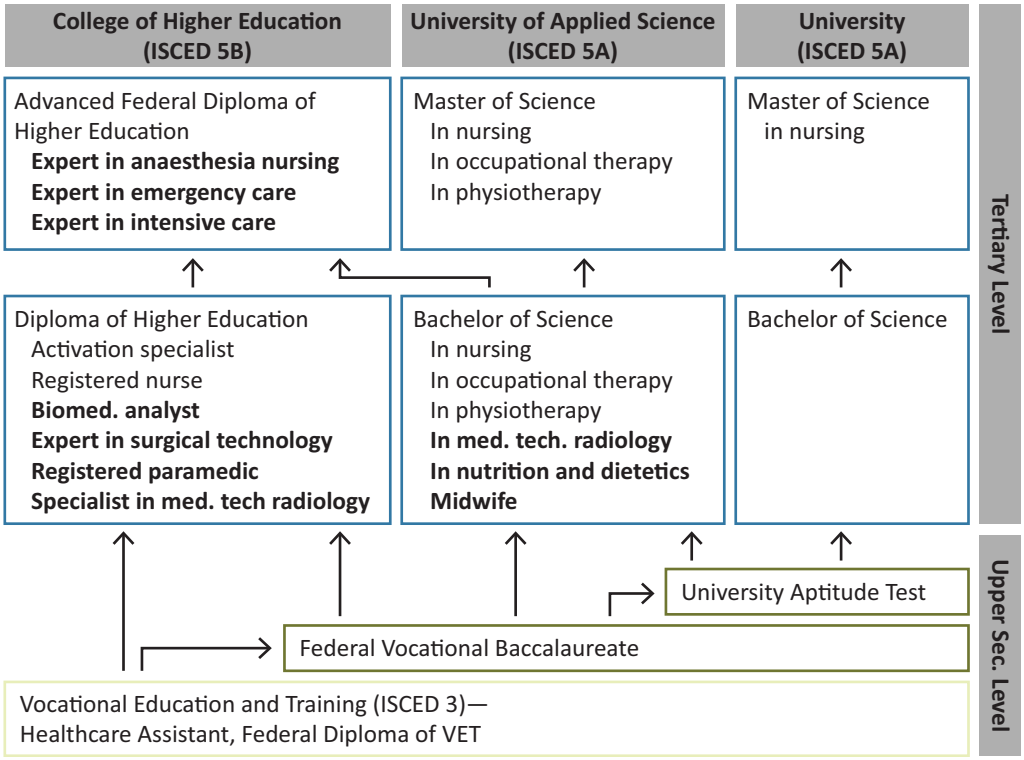

Figure 1. The Swiss healthcare education system. Source: Adapted from Trede et al. (2017) and Dolder and Grünig (2016). Notes: The figure depicts pathways and occupations common in long-term and acute care in the time period of 2011–2016. Education programmes/occupations in bold pertain to hospitals only. The ISCED 1997 classification is used.

that students are employed by a healthcare institution and alternate between on-the-job training and studies at the college. At universities of applied science, internships in different healthcare institutions are required. Access to study programmes outside the field of healthcare requires additional experience or education.

Regardless of the dual nature of healthcare assistant and nursing education, both occupational profiles are general. This means that the healthcare education systems allow licenced healthcare assistants and registered nurses to work in different healthcare segments independent of where they acquired practical training. However, empirically, licensed healthcare assistants who enter tertiary education seldom have experience from a different training segment than the one in which they trained. Only 11% of the apprentices in acute and long-term care gather work experience as a healthcare assistant outside their training segment before they enter tertiary education.[1] Even rarer are healthcare assistants who move from long-term care to hospitals before entering tertiary education (5%). Those who do not enter tertiary education during their early career move around more frequently. Of this group, 47% have work experience from different healthcare fields during their first five years on the labour market. It is unlikely that many of these will enter tertiary education later. In the healthcare field, 75% of the VET diploma holders enter tertiary education within six years after their initial training (Swiss Federal Statistical Office [BFS], 2011).

3. Labour Market Segmentation

3.1. Theories of Labour Market Segmentation

We apply theories of labour market segmentation to analyse the role of the training firm for transitions into higher education. These theories posit that firms with similar characteristics can be clustered into segments. Although there are disagreements regarding the number of segments (Doeringer & Piore, 1971; Lutz & Sengenberger, 1974; Tolbert, Horan, & Beck, 1980), the contributions point to similar characteristics distinguishing the segments. Segments are identified depending on the wage level, qualification level, distribution of qualifications, contract forms, hierarchical structure, and capital intensity of the firms (Averitt, 1968; Baron & Bielby, 1984; Piore, 2000; Preisendörfer, 1987; Sengenberger, 1975). In the primary segment, jobs are diverse, and tasks within these jobs are complex. Therefore, these firms have a high demand for highly competent and educated employees, and they are interested in retaining these employees. This is done by offering attractive (open-ended) contracts, internal career opportunities, and wage raises in accordance with seniority (Jacoby,

[1] These numbers are based on own calculations using data from a longitudinal study with a representative sample of healthcare assistant apprentices. For more information on the data, see Section 5.1.

1990; Kalleberg, 2003). Internal career options depend on extensive hierarchical structures and diverse horizontal specialization possibilities or niche-positions within the firms. Particularly in large firms in the primary segment, internal firm ladders are prevalent (Sengenberger, 1975). However, these ladders are often interconnected with education requirements, and formal degrees can give access to specific positions and functions within the same institution. In secondary segments, working tasks require a low education level, and firms mostly have a homogenous workforce that conducts uniform tasks. Because this segment is characterised by less complex tasks as well as a shortage of staff, it comprises a high share of unskilled workers (Buchmann, Sacchi, & Kriesi, 2002). Training new employees is less time- and cost-intensive, thus, workers are easily substituted. Therefore, possibilities for specialization and further education are scarce, and internal advancement opportunities and wage gains because of seniority are uncommon.

The Swiss labour market is divided into occupation-specific subsegments (Sacchi et al., 2016). Mobility within these occupation-specific subsegments is possible for formally qualified workers with a segment-specific VET diploma (Sacchi et al., 2016). However, based on the segmentation literature, we posit that some of these occupation-specific subsegments, such as health care, are further divided into primary and secondary labour markets, which affect the career opportunities of the former apprentices. Therefore, our key assumption is that characteristics, which are specific for the primary and secondary segments, impact individuals' perceptions of career opportunities and consequent choices to enter higher education.

3.2. Labour Market Segments in Swiss Healthcare

The Swiss healthcare system can be divided into two main segments: acute care, i.e., hospitals, and long-term care, i.e., nursing homes. Several of the structural characteristics of these two segments are in line with the description of the primary and secondary segments used in the segmentation literature. First, the acute care segment is characterised by higher financial resources than the long-term segment (Camenzind & Sturny, 2013). Second, there is a large gap in the average education level of the staff in hospitals and nursing homes. Around 70% of nursing and care staff in hospitals have a tertiary degree while this is only the case for approximately 30% in nursing homes (Mercay et al., 2016). Furthermore, hospitals are characterised by a lower share of unskilled workers than nursing homes (11% and 29%, respectively; Mercay et al., 2016). Third, the skill dispersion, i.e., the diversity of occupations, is higher in acute care than in long-term care. The work force in hospitals is comprised of a somewhat different set of occupations with tertiary education requirements than the workforce in nursing homes or other healthcare segments (see Figure 1 in Section 2; the occupations in bold letters are prevalent in hospitals only). Tertiary healthcare occupations such as biomedical analyst or expert in anaesthesia work in hospitals but not in nursing homes. Consequently, nursing homes and hospitals also offer internship opportunities in different occupations. In nursing homes, only a few therapeutic occupations are represented in addition to the nursing staff (Dolder & Grünig, 2016). In contrast, a wide range of options for specialisation after apprenticeship are situated in the acute care segment. In both segments, some shorter courses without formal degrees can give access to training functions, minor management functions (e.g., day- or shift-supervision), or area specialisation (e.g., wound management). However, they yield low returns compared to a tertiary degree, and there is no further career progression foreseeable for these positions. These (minor) career options are mainly concentrated in the long-term segment (Trede et al., 2017). Fourth, the hierarchical structure in hospitals is more complex than in nursing homes (Mächler, 2014). There is a higher demand for tertiary educated personnel across several levels in hospitals. Furthermore, field specialisations and management positions at different levels are more prevalent than in long-term care. Although career progression is not limited to the firm, internal job ladders (for the tertiary trained) are more common in hospitals than in long-term care because of the larger firm size, higher skill dispersion, and hierarchical structure in hospitals. However, internal advancement often includes being hired by the hospital during studies at colleges of higher education (Mächler, 2014). Fifth, task diversity is higher in acute care than in long-term care. Nursing homes are characterised by stable and routine situations of long duration while hospital situations are more unstable and more frequently non-routine, leading to shorter task sequences and higher task complexity. Last, due to the more complex and demanding tasks, the extensive hierarchy, and higher financial resources, the wages for tertiary educated nursing staff are higher on average, and the wage range is wider in hospitals than in nursing homes (Jung, 2019). The wages of healthcare assistants in the two segments are similar. A tertiary degree can thereby lead to higher wage gains in hospitals than in nursing homes. In sum, acute care resembles the ideal typical primary labour market segment while long-term care is similar to the secondary segment.

Our central assumption is that the training firm segment shapes apprentices' perception and choice of further education through three different mechanisms: information, incentives, and supportive work environment. Because of their diverse work environment, apprentices in the primary segment are likely to have more information about their different tertiary education options, subsequent career possibilities, and corresponding wage gains than apprentices in the secondary segment. Further, apprentices in nursing homes are confronted with less benefits from a tertiary education than their counterparts in hospitals. In nursing homes, there are less education and career possibilities as well as limited wage

development associated with a tertiary degree. Furthermore, healthcare assistants in nursing homes more frequently make minor career steps that are less time consuming and costly than a tertiary degree (e.g., training functions, shift supervision; (Trede et al., 2017). These career possibilities are less accessible for healthcare assistants in hospitals because they are more often performed by tertiary educated staff in these institutions. In sum, healthcare assistants who were trained in nursing homes have fewer incentives to continue into higher education than healthcare assistants who were trained in hospitals. This assumption is supported by previous research, showing that perceived career opportunities are important for nursing turnover within firms as well as the intention to leave the profession altogether (Hayes et al., 2012; Kankaanranta & Rissanen, 2008). Additionally, those with high extrinsic motivation and high wage expectations are more likely to express and to realise the intention of entering a tertiary degree (Schweri & Hartog, 2017; Trede & Schweri, 2014). Last, because hospitals have a higher demand for tertiary educated nursing staff and use healthcare assistant apprentices as a recruitment pool for jobs requiring tertiary degrees, this work environment is more likely to encourage apprentices to continue into further education or to hire them in the context of a dual study programme. Nursing homes, with less demand for tertiary educated healthcare staff and, thus, fewer training positions for students becoming registered nurses, are less likely to support healthcare assistants through further training. Based on these mechanisms, we hypothesise that VET diploma holders who were trained in hospitals enter tertiary education more often than VET diploma holders who were trained in nursing homes.

4. Individual Level Determinants of Transitions into Higher Education

Previous research has shown that the transition into tertiary education after apprenticeship training is highly influenced by individual characteristics. In this section, we first discuss the effect of social origin in particular and how it moderates the effect of the training firm segment. Thereafter, we review other individual level determinants.

We have argued that the training firm segment impacts information about tertiary education options, the incentives to enter such education, and the support to do so. A longstanding tradition within social research emphasises how social origin, i.e., parents' educational background, financial situation, and cultural and social resources, affect transitions into higher education through precisely these mechanisms as well (Boudon, 1974; Esser, 1991; for an overview see Kristen, 1999). In line with these arguments, findings show that parents with higher education have a positive effect on both the intention to enter tertiary education and the actual transition net of individuals' performance (Buchmann, Kriesi, Koomen, Imdorf, & Basler, 2016; Denzler, 2011; Schmid & Gonon, 2016; Trede & Kriesi, 2016). We argue that because some individuals already receive information and support and have higher incentives to enter tertiary education due to their socioeconomic background (SES), training in a hospital might not add a benefit in this respect. First, through their own education, parents with tertiary degrees are more likely than parents without higher education to know about different higher education options and the benefits thereof and to communicate these to their children. Thus, when school leavers from a high social origin start their apprenticeship, they would already have information on tertiary education options and their benefits. Consequently, training in a hospital would yield less new information than for school leavers with parents without a tertiary degree. Second, individuals with higher SES are more likely to enter tertiary education because their cost-benefit calculation differs from those with lower status (Boudon, 1974; Esser, 1991). For the latter group, maintaining parents' status often requires an upper-secondary degree only. Thus, the benefits of a tertiary education are not as high as for the former group.

Furthermore, those with a lower social background have less financial and cultural resources. Thereby, a tertiary degree represents higher costs and risks (Becker & Hecken, 2007). They might assess their likelihood of successfully entering and completing a tertiary degree as lower than those with higher SES. Training in the primary segment could partly correct for this background-specific high cost and risk assessments and shed light on the benefits of a tertiary degree. Thus, training in a hospital would influence the incentives to enter higher education for those with low SES while less so for those with a higher SES. Last, practical support in families with low social origin, e.g., to apply for a higher degree or to find an internship, might be limited because parents and their social network have limited experience with higher education. Furthermore, because the benefits of tertiary education are less known to this group and the costs are higher, parents might not encourage their children to choose this path (Becker & Hecken, 2007). Thus, the support and encouragement in hospitals might be especially relevant for this group. In sum, individuals with a high SES are already motivated to enter higher education because of their social background and to receive support and relevant information through other channels than the training firm. Therefore, the information and support provided in hospitals should be more relevant for individuals with low SES. Thus, we hypothesize that the positive effect of training in a hospital is stronger for those with low SES than for those with high SES.

Further individual level determinants of higher education include intellectual abilities and school achievement. Reading skills or math competencies (Buchmann et al., 2016; Schmid & Gonon, 2016) as well as higher compulsory school tracks and grades (Trede & Kriesi, 2016) have a positive effect on the probability of enter-

ing tertiary education. Men are more likely to enter the tertiary A level than women while the results for the influence of a migration background are mixed (Schmid & Gonon, 2016; Trede & Kriesi, 2016). In Switzerland, admission requirements for tertiary education vary between the language regions and cantons. Because of this, healthcare apprentices in the French-speaking cantons have a higher likelihood to enter the tertiary A level than those living in the German-speaking cantons (Kriesi & Trede, 2018; Trede & Kriesi, 2016). Furthermore, a gap year or periods of unemployment upon labour market entry can have scarring effects regarding later labour market outcomes (Helbling & Sacchi, 2014; Sacchi & Meyer, 2016). In addition, lower compulsory school tracks or gap-year activities can hamper the transition into upper-secondary vocational training (Dustmann, 2004; Helbling & Sacchi, 2014; Sacchi & Meyer, 2016).

5. Data and Methods

5.1. Data and Sample

For our analysis, we exploit a longitudinal survey of healthcare assistant apprentices. The full cohort of healthcare assistant apprentices who finished their apprenticeship training in 2011 was surveyed in vocational school one year before the completion of the training. In the first wave, a high response rate of 95% was reached (n = 2,089). The two subsequent surveys were conducted online one year and five years after the completion of the apprenticeship training with 53% and 48% response rates, respectively. Because nearly the full cohort participated in the first survey, we can use inverse probability weighting to account for disproportionate panel attrition (Wooldridge, 2010).

The structure of the data allows us to observe the transitions into higher education within five years after the completion of the apprenticeship training. In the healthcare field, 75% of the VET diploma holders enter tertiary education within six years after their initial training (BFS, 2011). Thus, we capture the majority of transitions with the time frame used. We restrict the samples to individuals who were 15–18 years of age at the beginning of their apprenticeship and trained either in acute care institutions or in long-term care institutions.[2] At this age, young people typically start an apprenticeship; thus, it constitutes our main interest. After accounting for missing values, the sample consists of 597 individuals.

5.2. Propensity Score Matching

Because apprentices are not randomly assigned to training institutions but go through an application process, a simple comparison of the tertiary education rates in the two institutions would be biased. The selection of apprentices into training institutions is likely to be based on individual characteristics that simultaneously affect their probability of training in the acute care segment (treatment) and of the transition into tertiary education (outcome; also see Section 5.3). To overcome this possible selection bias, we use propensity score matching. This technique matches individuals in the treatment group with similar individuals in the control group (training in long-term care), where similarity is based on estimated treatment probabilities. In a first step, we estimate the propensity score, i.e., the probability of being trained in an acute care institution, using a logit model based on a set of covariates. In a second step, similar individuals in the two groups are identified by using the propensity score. Finally, the average treatment effect is computed as the difference in outcomes between the matched groups.

Propensity score matching offers two main advantages. First, since it is a semi-parametric approach, it reduces the risk of potential misspecification of the relationship between the treatment and expected outcome (Morgan & Harding, 2006). Second, per the common support condition, it only compares individuals who are actually comparable based on observable characteristics. This condition states that groups of individuals who have the same distribution of observed characteristics except for the treatment are compared. The treatment itself must be conditionally independent of the possibly confounding characteristics (the conditional independence assumption). Thus, a limitation of this method is that we can only account for selection into treatment given the observed variables. Furthermore, the influence of the individual characteristics on the transition into higher education could not be empirically depicted since the matched treatment and control group are similar concerning these characteristics.

5.3. Outcome, Treatment, and Matching Variables

Our binary outcome variable is *transition into higher education*, which takes the value 1 if the individual was enrolled in or had finished tertiary education five years after completing their apprenticeship training and 0 otherwise. In our sample, the share of tertiary educated individuals amounted to 74%, of which 10% had studied outside of the healthcare field. We defined the treatment and the control group based on the type of training institution. Individuals who trained in an *acute care institution* (hospital) during their apprenticeship belong to the treatment group while individuals who trained in a *long-term care institution* (nursing home) belong to the control group.

To estimate the propensity score, we use variables that are likely to simultaneously affect selection into treatment and transition into further education at the

[2] We excluded individuals who were trained in psychiatric institutions, rehabilitation, and home care or for whom we had no information on the training institution (19.2% of the initial sample). These institutions might be classified as belonging either to the primary or secondary segment depending on their tasks and structure.

tertiary level. The variables entering the model either hardly vary over the time period in question, or they pertain to the time before the apprenticeship. Thus, they are independent of the treatment. We focus on variables affecting the likelihood of training in the primary segment because the work conditions and career opportunities in hospitals can attract more able and motivated school leavers with a higher SES. Furthermore, the living area impacts the availability of training locations in the two segments, especially since the apprentices generally live with their parents during the apprenticeship. Thus, external sorting, self-selection mechanisms, and regional constraints can have an impact on the allocation into the training segments.

In detail, individual school performance is proxied by the *type of track at lower-secondary school*. Compulsory school provides nine years of schooling, and the pupils are divided into lower, middle, and higher requirement tracks around the age of twelve. Individual characteristics were indicated by *gender*, *age at VET entry*, and *migration background*. The migration background variable captures whether the respondent was born outside of Switzerland. Place of residence at the time of training is captured with two variables: cantons and rural living area. Cantons, which collaborate in offering healthcare education, were combined. The dummy for rural living area versus urban living areas, i.e., metropolitan areas and agglomerations, is based on federal urbanisation measures for 2014 (for a detailed description, see Goebel & Kohler, 2014). SES is captured by three variables. Parents' cultural capital is captured by a dummy indicating whether the respondents' parents have *more than five bookshelves* at home. The *highest level of education of the parents* differentiates between compulsory school, upper-secondary VET (including baccalaureate), and tertiary education. The highest *professional position of the parents* is a categorical variable indicating if both parents are not working (unemployed, homemaker, or pensioner) or if at least one of the parents is working as an employee, is self-employed, or is employed in a management position. We further indicate *delayed entry* into the apprenticeship because of three months or more of unemployment, participation in a further year of schooling, or completion of an internship-like training programme. Last, we account for the *pre-apprenticeship motivation* to enter higher education. The respondents were asked to report if 'Healthcare Assistant' was their desired occupation when they started the apprenticeship. We distinguish between those who stated that this was their desired occupation, those who saw it as a step towards another occupation, and those who saw it as their second choice or not at all as their desired occupation.

5.4. Sub-Group Analysis of Individuals with High and Low SES

To test whether the effect of treatment differs between those with high and low SES, we estimate the propensity score separately for those with parents with a compulsory or upper-secondary degree and those with parents with a tertiary degree based on the same set of covariates as in the main model. However, due to the lower number of cases in each subgroup, age is included as a continuous variable and canton as a categorical variable with three groups (West & South, Central & North, and East). This yields the highest covariate balance in the two sub-samples compared to other specifications. Thereupon, the average treatment effect for each group was computed.

6. Results

6.1. Descriptive Results

Table 1 shows the sample composition by training firm segment. As expected, individuals who trained in hospitals enter higher education more often than individuals who trained in nursing homes. Five years after training, 81% of those who trained in hospitals had entered tertiary education while this share amounts to 68% for those who trained in nursing homes. We can further confirm that individuals who trained in the primary and secondary segments differ significantly regarding several characteristics. Those who did their apprenticeship in nursing homes are older and more often finished the lower compulsory school track than those who trained in hospitals. Regarding SES, we find that those who trained in the primary segment have parents in management positions more often and have unemployed parents less often than those who trained in the secondary segment. The distribution of apprentices in acute and long-term care differs between the cantons. Furthermore, the control group more often delayed their apprenticeship because of a practical year, a tenth school year, or a period of unemployment. Last, the majority of healthcare assistants who trained in long-term care had perceived this as their desired occupation before they started training while their counterparts in acute care had seen the profession as a stepping-stone to a higher degree. However, the treatment and the control group have similar percentages of women, persons with migration backgrounds, and persons living in rural areas. Overall, we find the expected differences between those who trained in hospitals and those who trained in nursing homes.

One of the key advantages of propensity score matching is that we can compare groups of individuals who are comparable in relevant observed characteristics. To make sure this assumption holds, we first exclude healthcare assistants from the analysis whose propensity score does not match the propensity score of anyone in the opposite group, i.e., individuals that fall outside of the common support. Figure 2 shows a large overlap of the propensity score for the two groups. The number of excluded individuals not overlapping is low (n = 24). Second, to assess the quality of the sample

Table 1. Sample composition by training segment.

	Long-Term Care		Acute Care		Total			
	Mean	SD	Mean	SD	Mean	SD	% Bias	% Bias Matched
Tertiary Education	0.68	0.47	0.81*	0.39	0.74	0.44		
Age at VET Entry								
15 years	0.07	0.25	0.12*	0.33	0.09	0.29		
16 years	0.39	0.49	0.48*	0.50	0.43	0.50	17.3	−10.9
17 years	0.35	0.48	0.31	0.46	0.33	0.47	−7.9	6.7
18 years	0.20	0.40	0.09*	0.29	0.15	0.35	−29.2	−0.1
Migration Background	0.09	0.28	0.06	0.23	0.07	0.26	−10.4	1.3
Female	0.93	0.25	0.93	0.26	0.93	0.26	−1.2	2.9
Compulsory School Track								
Lower Level	0.35	0.48	0.21*	0.41	0.28	0.45		
Middle Level	0.60	0.49	0.70*	0.46	0.65	0.48	21.6	−5.4
Higher Level	0.05	0.22	0.08	0.28	0.07	0.25	13.3	3.6
Parents' Education Level								
Compulsory School	0.06	0.23	0.03	0.17	0.04	0.20		
Upper-Secondary Degree	0.63	0.48	0.60	0.49	0.61	0.49	−6.6	0.0
Tertiary Degree	0.32	0.47	0.38	0.48	0.35	0.48	12.2	1.4
Parents' Employment Status								
Unemployed/Homemaker/ Pensioner	0.04	0.20	0.01*	0.12	0.03	0.17	−16.8	7.9
Employed	0.34	0.47	0.27	0.45	0.31	0.46		
Self-employed	0.25	0.43	0.23	0.42	0.24	0.43	−2.6	−0.4
Management position	0.37	0.48	0.48*	0.50	0.43	0.49	21.8	−3.7
More than Five Bookshelves	0.33	0.47	0.30	0.46	0.32	0.47	−6.0	−6.7
Delayed VET-Entry	0.47	0.50	0.28*	0.45	0.38	0.48	−39.0	5.4
Rural Living Area	0.44	0.50	0.39	0.49	0.41	0.49	−9.5	−5.9
Canton								
BE	0.23	0.42	0.14*	0.35	0.18	0.39		
AG	0.09	0.28	0.06	0.23	0.07	0.26	−12.8	7.2
BS	0.04	0.19	0.08*	0.28	0.06	0.24	19.6	0.8
FR	0.03	0.17	0.02	0.14	0.03	0.16	−5.1	−2.1
GR	0.04	0.19	0.03	0.18	0.04	0.18	−1.1	0.2
SG	0.11	0.32	0.13	0.34	0.12	0.33	5.2	1.1
SH	0.01	0.11	0.01	0.12	0.01	0.12	0.9	−1.0
SO	0.02	0.15	0.04	0.19	0.03	0.17	8.8	−4.2
TG	0.04	0.19	0.03	0.16	0.03	0.18	−6.7	0.1
TI	0.03	0.16	0.00*	0.06	0.02	0.12	−18.9	4.1
GE & VD	0.06	0.24	0.03	0.17	0.05	0.21	−13.5	−3.5
VS	0.05	0.22	0.02	0.14	0.04	0.18	−15.2	0.8
Central CH	0.14	0.34	0.18	0.38	0.16	0.36	11.5	−4.4
ZH	0.12	0.33	0.22*	0.42	0.17	0.38	26.2	5.4
Pre-Apprenticeship Motivation								
HA was the Desired Profession	0.70	0.46	0.47*	0.50	0.59	0.49		
HA as a Stepping Stone	0.25	0.43	0.50*	0.50	0.37	0.48	53.1	2.0
HA as a Second Choice	0.05	0.22	0.03	0.16	0.04	0.20	−12.7	−0.8
N	306		291		597			
Mean Bias							14.2	3.3

Notes: HA = Healthcare Assistant; *$p < 0.05$.

balance, we tested for differences in means across the two matched groups. The mean bias before matching is 14.2% while the mean bias amounts to 3.3% after matching (see Table 1). Concerning the separate matching results for those with high and low SES, the bias is reduced from 25.5% to 5.4% for those with tertiary educated parents and from 17.6% to 3.6% for those with parents with upper-secondary degrees (results not shown).[3] These results show that we compare similar individuals based on the observed characteristics.

[3] Sub-group results showing the sample composition before and after matching as well as bias reduction are available upon request.

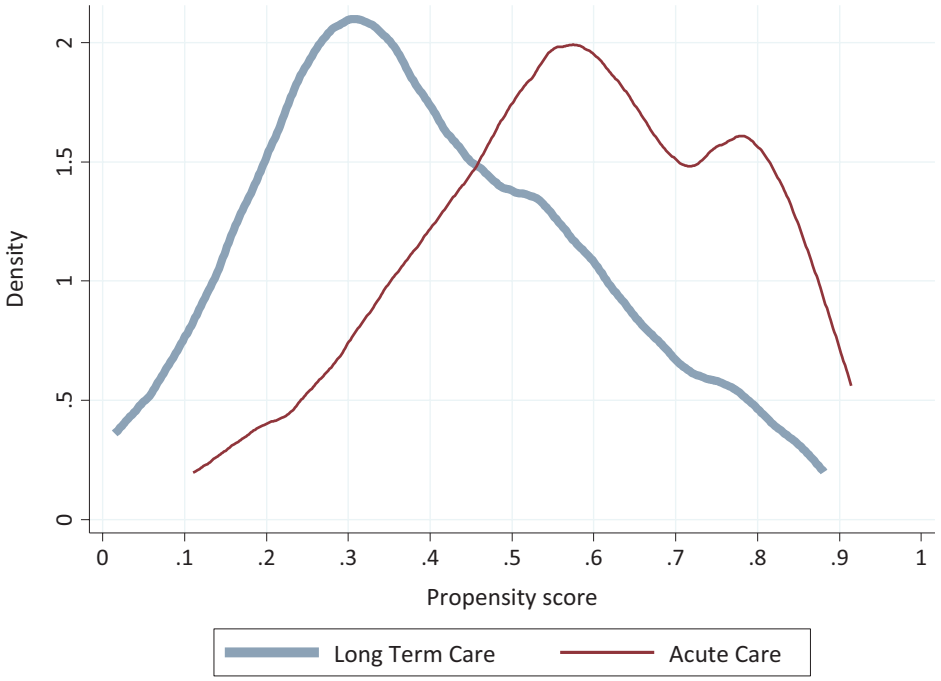

Figure 2. Kernel density plot of the estimated propensity scores, calculated separately for the treatment and control groups.

6.2. Main Results

The average treatment effect for the full sample, i.e., the average effect of training in acute care compared to training in long-term care, is shown in Table 2 in the first row. The main results in the first column confirm our hypothesis that the training firm segment impacts transitions to higher education. Those who trained in acute care have a 9.4 percentage point higher probability of entering tertiary education than those who trained in the long-term segment. Thus, the descriptive difference in the transition into higher education rates does not solely arise from the different composition of apprentices in nursing homes and hospitals. A large part of this difference is due to the allocation to the training firm segments. This finding supports our assumption that the extensive career opportunities, higher demand for tertiary degrees, and more favourable wage prospects in hospitals impact the choice of healthcare assistants to enter tertiary education. To assess whether our main results are biased by disproportionate panel attrition, we first include inverse probability weights[4] and, second, use the larger sample surveyed one year after the apprenticeship. These results are presented in the second and third column in Table 2. The average treatment effect for the full sample, controlling for attrition, only marginally differ from the main results. The average treatment effect varies between 8.3 and 9.4%.

Next, we turn to the estimated average treatment effect for those with parents with no more than an upper-secondary education (second row). In accordance with our second hypothesis, the main results show that training in hospitals is more important for those with low SES than for those with high SES. The positive effect of being trained in acute care for healthcare assistants with parents with compulsory or upper-secondary education is significant at a 10% level. For these individuals, training in hospitals increases the likelihood of entering tertiary education after VET by 9.2%. The treatment effect for healthcare assistants with parents with low education is similar to the average treatment effect for the full sample (0.094). Thus, it is likely that our overall result for all respondents is driven by the higher number of individuals with parents with no more than an upper-secondary degree in the sample. The analysis, considering attrition, shows stable effects of having parents with low education in both size and significance (the average treatment effect ranges from 0.092 to 0.109). It seems that particularly those with low SES can benefit from the structural characteristics of a hospital. If this group had not entered training in a hospital, they likely would have had less incentives to enter higher education, experienced less support, and had less information about their advancement possibilities and the benefits thereof.

Last, the average treatment effect for those with at least one parent with a tertiary education is shown in the third row in Table 2. The main results show that for individuals with parents with tertiary education, training in a hospital has a small negative and statistically insignificant effect (−0.029). Furthermore, the weighted estimation for this group shows a positive effect of training in the primary segment (0.062). However, this effect is not

[4] The inverse probability weights are calculated with a probit model with attrition as the dependent variable and the matching variables as well as the variables used by Trede (2015, p. 176) as the independent variables. The treatment effects are then calculated using the product of the inverse probability weight and the propensity score weight from the main model (DuGoff, Schuler, & Stuart, 2014).

Table 2. Treatment effects of training in a hospital on the transition into higher education.

	Main Results				Including Attrition Weights				Transition within One Year after VET			
	Average Treatment Effect	(SE)	N Treated	N Control	Average Treatment Effect	(SE)	N Treated	N Control	Average Treatment Effect	(SE)	N Treated	N Control
Full Sample	0.094*	(0.043)	281	292	0.083*	(0.037)	269	281	0.094*	(0.039)	397	432
Parents' Education Level												
Secondary Degree	0.092+	(0.049)	178	199	0.109*	(0.051)	171	194	0.097**	(0.049)	241	300
Tertiary Degree	−0.029	(0.066)	107	90	0.062	(0.070)	102	88	0.106*	(0.064)	159	127

Notes: **p < 0.01, *p < 0.05, +p < 0.1; Epanechnikov Kernel Matching with bootstrapped standard errors in parentheses, each with 200 repetitions. N Treatment and Control: number of matched Individuals in the treatment and control groups.

significant and is still smaller than the effect for those with parents with low education. Last, the analysis with the larger sample surveyed one year after training show similar, positive, and significant effects for both groups (0.106). Thus, overall, the average treatment effect for those with parents with higher education varies somewhat. This could be due to a low number of cases in this group. Another possible explanation could be that the effect of training in a hospital is strong for both groups immediately after the apprenticeship but wears off more quickly for those with more highly educated parents. Although training in a hospital might foster the motivation to enter a tertiary degree for those with less educated parents, they might want to work for some years to be able to finance their higher education and living costs during further studies. For those with parents with higher education, financial barriers should not be as important. Therefore, the motivation boost given by training in hospitals would predominantly lead to direct transitions. Thus, the effect of the training firm segment fades out more quickly for the higher educated. However, because of the inconclusive results, the effect of the training firm segment for individuals with high SES needs further consideration.

7. Discussion and Conclusion

In this contribution, we focus on the relationship between the types of education and mid- and long-term labour market outcomes by asking whether the labour market segment of the training firm impacts former apprentices' likelihood to enter tertiary education. We highlight the role of the training firm segment, a hitherto neglected topic in research considering education system characteristics. This research has largely focused on differences between general and vocational education tracks and failed to incorporate the heterogeneity within the VET-system. Further, we draw upon segmentation theory to discuss the heterogeneity and the impact of training institutions and test our hypotheses based on longitudinal data concerning apprentices in the healthcare field.

Our findings show that allocation to training firm segments matters; those who trained in the primary segment have a higher likelihood to enter tertiary education than those who trained in the secondary segment. This result is particularly striking, considering that VET diploma holders formally have the same access to tertiary education independent of their training segment. Nevertheless, the finding supports the assumption that the structural characteristics of the training firm segment, such as financial resources, average education level, skill dispersion, hierarchical structure, task diversity, and wages, can impact how individuals perceive their career opportunities. Furthermore, we find that those with lower SES particularly seem to benefit from training in the primary segment. This could be because training in the primary segment gives access to resources that this group cannot access through their parental home. Thus, training in the primary segment could compensate for initial disadvantages due to lower SES.

Both theoretical and practical implications can be derived from this result. First, dominant theoretical approaches explaining educational transitions have mainly focused on individual determinants like gender (e.g., Griga, Hadjar, & Becker, 2013), social origin (e.g., Denzler, 2011), migration background (e.g., Trede & Kriesi, 2016), or expected returns (Schweri & Hartog, 2017). Our results show that when education programmes are strongly linked to the labour market, labour market characteristics also influence these transitions. We have described a range of structural characteristics in the two labour market segments that impact apprentices' career perceptions through their experience in the training firm. Investigating the distribution of these characteristics across firms and assessing the relative importance of these different characteristics for career decisions would shed more light on the relationship between the meso-level, i.e., firms, and individuals' educational

choices. This relationship should be relevant not only for apprentices but also for other groups alternating between education and work, e.g., trainees, interns, adult learners, or regular students with part-time jobs.

Second, in the highly stratified Swiss education system, several bottlenecks regulate access to VET, such as entering dual training compared to postponing the training with an additional year of schooling (Sacchi & Meyer, 2016) or the access to the favoured occupation. These bottlenecks influence individuals' chances and reinforce earlier disadvantages (Hupka-Brunner, Sacchi, & Stalder, 2010; Protsch & Solga, 2016). Our results show that access to the primary segments during the apprenticeship can represent a further bottleneck, which may also reinforce disadvantages. In particular, those from lower compulsory school tracks and those with less favourable SES face difficulties entering training in the primary segment. This can, in turn, hamper their access to information about tertiary education and its advantages.

Third, the strong differentiation between the segments during training can hinder career development and lead to drop-outs. This is especially relevant in the healthcare sector where staff shortage is high (Mercay et al., 2016). If individuals who train in the secondary segment do not receive information about further possible career steps or see appropriate advancement options, they might rather opt out of the profession altogether, as results concerning nurse turnover suggest (Hayes et al., 2012). Furthermore, this argument is supported by the fact that licensed healthcare assistants' mobility from the secondary to the primary segment is very low (see Section 2). Thus, career development through mobility into the primary segment seems to be limited and dropping out might be the most accessible option. An interesting avenue for further research would therefore be how training firm segments impact individuals' likelihood of leaving and re-entering the occupation or the labour market during their life course.

A major advantage of our study is that we can draw upon longitudinal data and use propensity score matching methods. This enables us to reduce the potential selection bias. By matching apprentices with training in the hospitals and those with training in nursing homes according to their SES, living area, and motivation, we can compare the outcome of similar individuals in the two segments. However, our findings are limited by the fact that we can neither fully control for individuals' intellectual abilities nor the differences in apprenticeship recruitment strategies of hospitals and nursing homes. Furthermore, our results are limited to the healthcare field. Future research could benefit from applying our theoretical framework to a wider set of occupations where individuals train in a primary or a secondary field.

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Conflict of Interests

The authors declare no conflict of interests.

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Article

The Relationship between Educational Pathways and Occupational Outcomes at the Intersection of Gender and Social Origin

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Abstract
In this article, we are interested in the differences in the educational pathways and subsequent labour market outcomes by social origin and gender. We apply sequence analyses to model the educational trajectories and conduct regression analyses to determine how the individual's own social status and the salary at labour market entry differs. First, our results show that educational pathways vary by parental status and gender when controlling for reading and mathematics/science skills. Men and pupils with a lower socioeconomic background are overrepresented in vocational education, whereas women and pupils with a more privileged socioeconomic background more often pursue general and academic tracks. Second, these different trajectories lead to unequal occupational status and income. Besides these indirect effects, significant direct effects of parental status and gender on the individual's own occupational status and salary can be found. Together, these findings provide a broad overview of the emergence of inequalities by gender and social origin over the early life course, ranging from differences in skills learned in school to labour market outcomes.

Keywords
education; gender; inequality; labour market; social origin; wage gap

Issue
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1. Introduction

Unequal opportunities for attaining higher education or a decent salary can intersect and combine to cumulative (dis)advantages. When Ralf Dahrendorf wrote his "plea for an active education policy" under the title "Education is a Civil Right" (Dahrendorf, 1965) in the 1960s, he mentioned three main groups of children that were being underrepresented in secondary school: rural children, working-class children, catholic children (with some reservations), and girls. While Dahrendorf was aware that these groups may intersect, he did not further investigate this circumstance. Nevertheless, the artificial Figure of the "catholic working-class girl from the countryside" was born (Allmendinger, Ebner, & Nikolai, 2010; Becker, 2007; see also Peisert, 1967). With social changes, such as, for example, the expansion of education, post-industrialisation, increasing globalisation and (at least in legal terms) gender equality, the symbolic figure of cumulative educational disadvantage has transformed from the "worker's daughter" to the "migrant son" (Geißler, 2005). Indeed, girls caught up with boys in their educational attainments and have even started to outnumber them in terms of higher educational qualifications (C. Buchmann & DiPrete, 2006; DiPrete & Buchmann, 2013). However, this should not hide the fact that first, improved education has not translated into equal work opportunities for men and women

(Blau & Kahn, 2017; Charles, 2011) and second, persons with a lower socioeconomic family background may not only be disadvantaged in the education system, but also in the labour market (Mood, 2017).

In the current research, we are interested in how social origin and gender interact and shape early life courses from the end of compulsory school to the first years in the labour market. The questions we try to answer in this article are the following:

1. Are there differences in student performance by parental status and gender?
2. Are there differences in educational pathways by parental status and gender, overall and net performance (primary and secondary effects of social origin)?
3. Do these differences lead to unequal outcomes in young adults' early working life, namely occupational status and income?

Our main interest lies in describing the overall relationship between parental status and gender and educational trajectories, as well as subsequent labour market outcomes, rather than in identifying causal mechanisms that might be responsible for the differences. Theoretically, we combine two lines of argumentation: First, we draw on the literature on primary and secondary effects of origin (Boudon, 1974; Bourdieu & Passeron, 1971; Breen & Goldthorpe, 1997). Second, we complement this with theories on gender segregation in education and employment (Charles & Bradley, 2002, 2009). Throughout the article, we adopt an intersectional approach that considers different dimensions of social inequality simultaneously (McCall, 2005). For our analyses, we draw on a unique longitudinal dataset that covers Swiss adolescents from the moment they took the Programme for International Student Assessment (PISA) Test in the year 2000 until 2014, when they were around 30 years old. To take advantage of the panel data, we model the pathways of post-compulsory education using sequence analysis. Compared to previous research, our article has the advantage of offering a broad view on emerging inequalities by gender and social origin, and, thus, contributes to a general understanding of processes translating unequal opportunities into inequalities in outcomes.

2. Previous Research and Theoretical Background

Research in educational inequalities is often based on the theories of primary and secondary effects of social origin, initiated by the seminal work of Boudon (1974) and further developed by many others (Breen & Goldthorpe, 1997; Erikson & Jonsson, 1996). Briefly, primary effects indicate that children from different social origins differ in their school performance. Children born into higher social classes generally perform better in school because they have more economic and cultural resources at their disposal that lead to more education-specific support (Becker & Lauterbach, 2010). In addition to these primary effects, children from a higher social origin reach higher levels of educational achievement, even if their performance is equal to that of their counterparts from a lower social origin. In the literature, these secondary effects of social origin have been explained by differential decisions based on rational cost-benefit calculations. According to the relative risks aversion model (Breen & Goldthorpe, 1997), the main aim is to obtain as much education as is necessary to avoid downward mobility (compared to the social position of the parents). More cultural approaches indicate that different educational decisions by social class could also be due to subcultural norms concerning the value of education, caused for example by class-specific socialisation or by a desire for conformity (Paulus & Blossfeld, 2007).

A few studies have taken an intersectional approach to analyse the effects of different ascriptive characteristics on school performance (primary effects). They mainly find that boys with a low socioeconomic family background particularly perform worse at school (Entwisle, Alexander, & Olson, 2007; Glaesser & Cooper, 2012). Strand (2014) does not find any interactions between socioeconomic status and gender. Gottburgsen and Gross (2012) additionally find heterogeneous effects, depending on whether reading or mathematics skills are concerned (see also Becker & Müller, 2011). Intersectional approaches assessing secondary effects are less common. Breen, Luijkx, Müller and Pollak (2009), as well as Becker and Müller (2011), take a historical approach and try to assess how educational expansion and increasing gender equality in education interact. They show that gender and class differences in educational inequality have declined. While Becker and Müller (2011) find that gender differences in class inequalities have changed over time, according to Breen et al. (2009) they have remained rather stable. Explanations for why gender differences vary by social class have been rather vague so far. The main argument is that gender stereotypes, such as beliefs in gender-specific traits or personality differ by social class (see for example Kriesi & Buchmann, 2014).

Primary and secondary effects of social origin do not only influence the level of education one attains, but there is also a horizontal dimension to it. In other words, within a certain level of education, students from different class backgrounds do not necessarily study the same subjects (Becker, Haunberger, & Schubert, 2010; Reimer & Pollak, 2005; van de Werfhorst, 2002). Such horizontal differences are relevant because they may translate to vertical stratification as fields of study differ in terms of subsequent labour market opportunities (Reimer & Pollak, 2005). Theoretically, several mechanisms can lead to these differences. According to van de Werfhorst (2002), there is a cultural aspect of intergenerational transmission. Children get more information on the fields of study of their parents and are there-

fore more likely to choose a similar subject. Reimer and Pollak (2005) indicate further aspects that may lead to different choices of field of study by social origin that are drawn from rational choice considerations, namely the perceived difficulty of a subject, the study duration, subsequent job security and opportunities to attain a favourable class position and achieve high incomes (Reimer & Pollak, 2005, p. 7). For a more detailed discussion of the primary and secondary effect on the choice of the subject of study, see also Becker et al. (2010).

Glauser (2015) discusses how the mechanisms of primary and secondary effects shape gender differences in educational outcomes. Primary gender effects emerge because girls generally show a greater willingness to learn, have a more positive attitude towards school than boys and, as a result, achieve better school grades on average (Glauser, 2015, Chapter 4.3.2). Secondary effects can be identified by the fact that girls are more likely than boys to choose more demanding training paths at the same levels of performance. In the Swiss education system, this happens mainly because they have restricted career prospects within vocational education, which is historically rooted in the highly gender-segregated manufacturing and industrial sector (Imdorf & Hupka-Brunner, 2015; Imdorf, Sacchi, Wohlgemuth, Cortesi, & Schoch, 2014). Hence, for boys, vocational education is more attractive because they find a wide range of male-typical occupations that offer good career prospects, including, for example, opportunities for further education (Glauser, 2015).

Ultimately, we assume that gender differences in educational pathways are mainly due to horizontal segregation and that this can lead to vertical stratification. However, we believe that horizontal segregation in vocational education and fields of study is not merely due to differential career prospects for men and women, but that it is rooted in a very persistent "gender-essentialist ideology" (Charles & Bradley, 2009). This gender ideology adheres to beliefs in differences between men and women, in how they are and how they ought to be (Eagly & Sczesny, 2008). Accordingly, social roles such as occupations are also gendered. As such, technical or manual occupations, as well as leadership positions, are considered to be more typically masculine, whereas caring or teaching domains are seen as intrinsically feminine. According to the role congruity theory (Eagly & Diekman, 2006; Eagly & Karau, 2002), people try to act in a manner that is consistent with their gender, because if they do not, they may face negative consequences. This gender-essentialist ideology is very deeply rooted. For example, Schwiter et al. (2014) have shown that boys and girl develop occupational preferences and aspirations that correspond to their own gender at a very early age (see also M. Buchmann & Kriesi, 2012).

Whether these gender stereotypes differ by social class is less researched (for a detailed account of gender and class stereotyping in an elite labour market see Rivera & Tilcsik, 2016). England (2010) argues that as long as upward mobility (or at least avoidance of downward mobility) is possible within ones gender-typical occupations, people will tend to continue to choose a field of study or a job that corresponds to their own gender. Consequently, for lower and middle-class women, it is easier to remain in a gender-segregated female job, while for upper-class women this is less true, as female-typical jobs are often lower in status (England, 2010). This means that the interplay between gender and social origin shapes young adults' school trajectories and subsequently influences their labour market opportunities.

In sum, although the mechanisms might not be the same, the choice of field of study simultaneously differs according to social origin and gender. So far, analyses mainly of gender sociology and labour economics have focused on horizontal gender segregation, while research into educational sociology has dealt with both aspects, gender segregation and segregation by parental status, but not conjointly. We, therefore, attempt to consider both gender and social stratification in the educational trajectory, including aspects of horizontal and vertical segregation.

Vocational education plays an important role in Switzerland's dual training system. It offers different possibilities to access tertiary level education, such as, for example, colleges of higher education, universities of applied sciences and, in some cases, universities. However, the ideal route to university continues to be via baccalaureate school. For more detailed information on the Swiss educational system, see for example Imdorf, Koomen, Murdoch and Guégnard (2017), Glauser (2015, Chapter 2.1) or Imdorf and Hupka-Brunner (2015).

In line with the theories above and due to the specificity of the Swiss educational system, it can be assumed that the higher the socioeconomic status of the parents, the better the school performance of children and the more likely it is that they will follow an academic educational trajectory. We believe that this is more the case for girls than for boys, because vocational education, including further training in male-dominated occupations, offers more beneficial educational and, subsequently, job opportunities for boys than for girls. Access to female-typical jobs in the health sector and teaching is provided via general schools at the secondary level.[1]

3. Data and Methods

3.1. Data

We use the Swiss data from PISA 2000 (Adams & Wu, 2003) and the subsequent panel data of TREE (Transitions from Education to Employment; 2016), which is a follow-up panel of students who have participated in the PISA 2000 survey, consisting of 9 waves, collected between 2001 and 2014. We only consider persons who participated in each of the nine waves. This con-

[1] For younger cohorts, this is less so the case. In 2002, the healthcare assistant apprenticeship was created and it is now an important route to nursing.

siderably reduces our sample but is necessary to conduct the sequence analysis.

To analyse students' skills in reading, mathematics and science, we used the "Warm estimates" from the PISA 2000 database. These scores consist of the weighted averages of correct answers to all questions of a specific category. The weighting procedure follows Warm's (1989) method of a weighed likelihood estimate (WLE). The main focus of the PISA 2000 tests was reading skills. All students answered the reading assignments, but half of them answered only either the mathematics or the science tasks. To reach a larger number of cases we combined the two scores of mathematics and science. We used the scores from the tests that students have taken, whether mathematics or science. If both tests were taken, we calculated their mean score. Another variable used from the PISA database is the socioeconomic status of the parents. We use the international socioeconomic index (ISEI), either from the father or the mother, depending on which one is higher (dominance approach). This score is based on the students' information on their parents' occupation (Adams & Wu, 2003). We are aware that the socioeconomic status only measures one aspect of social origin and that there are also other, especially cultural, aspects to it, often measured by parental education. These different resources may have distinct effects in intergenerational transmission. Specifically, Marks (2011) argues that parental education is more important for children's school success than parental class. Education is important, as highly educated parents are better able to help their children with homework and exam preparations. On the other hand, high-status families have more economic resources, which are also beneficial for children's school success. Further, mothers and fathers may not have the same influence on sons and daughters (Korupp, Ganzeboom, & Van Der Lippe, 2002). While the role of the mother has been ignored for a long time, more recent studies also take her into account (Beller, 2009; Korupp et al., 2002). Some authors combine the different cultural and economic aspects of the social origin of the mother and the father in one multidimensional variable (Blossfeld, 2019; Marks, 2011; Meraviglia & Buis, 2015). This strategy has some advantages, namely approaching social origin in a more comprehensive way and taking the whole family as a unit of analysis.

We apply the dominance method and use the highest parental ISEI as a proxy for social origin. This way we are able to maintain the descriptive strength of our analyses. Using the ISEI allows us to predict our outcomes over the whole distribution of the parental status, which cannot be achieved in an intuitively understandable way with a multidimensional approach. Further, our main outcomes are the person's own socioeconomic status and their salary, which justifies using parental occupational status as an explanatory variable. Using the dominance approach, mothers may not be adequately represented. In our case though, the highest parental ISEI is the father's in 60% of the cases, whereas the mother's ISEI is higher in 40% of the cases. We conducted some additional robustness checks, using the highest parental education instead of the ISEI, which leads to largely comparable results to those based on parent's ISEI (see Section 5).

In each of the nine cross-sectional waves, the school and work situation of the participants was recorded in detail. Additionally, TREE provides an episodic dataset for the job episodes 2003–2014 and a beta version of educational episodes 2010–2014. For the time before 2010, we had to rely on cross-sectional information on the individuals' educational status to construct the episodes. In a further step, we merged the datasets of education and the job episodes and constructed a variable called "state" that indicates the education or job state of each episode, which has the following values:

- Vocational education and training (VET) at the secondary level (e.g., apprenticeship);
- Upper secondary specialised school (secondary, spec.) (e.g., schools that prepare for further education, mainly in the health sector);
- General secondary education (secondary, academic) (e.g., baccalaureate school);
- Tertiary vocational education (e.g., technical school, upper vocational school, federal exams, college of higher education);
- University of applied sciences;
- University of teacher education;
- University;
- Advanced studies (Certificate / Diploma / Master of advanced studies);
- Other education or training (e.g., internships, language schools);
- Employed;
- NEET (neither in education nor employed).

Besides the educational clusters based on these states (see next paragraph), our main outcome variables are the individuals' own socioeconomic status and their income in 2014, at around age 30. To measure the socioeconomic status, we constructed the ISEI from the ISCO-08 provided in the TREE data. We use the last available observation, which is 2013 or 2014 for around 95% of the individuals. In the regression models, we add a control variable that indicates whether the measurement of the ISEI is current or not. The income variable displays the gross monthly salary in 2014 in Swiss francs, standardised on a fulltime position (maximum 42 hours per week; for more details see Gomensoro et al., 2017, p. 33), and logged when used in regression models. Some of the respondents had several jobs at the time. As there is no clear information in the data on which is the most important job, we chose to consider the job with the highest income. Table 1 displays the (weighted) frequencies, means (or proportions if the variable is binary) and standard deviations of all used variables for men and women separately. Our sample consists of 907 men and 1353 women who have participated in each wave.

Table 1. Descriptive statistics. Source: PISA (2000) and TREE waves 1–9 (weighted; 2016).

	Men			Women		
	N	Mean	St.Dev.	N	Mean	St.Dev.
Warm estimate in reading	905	503.468	85.849	1351	529.380	83.424
Warm estimate in mathematics	506	564.419	87.709	764	538.602	87.680
Warm estimate in science	503	526.138	87.667	728	515.523	85.639
Warm estimate in mathematics/science	804	549.427	87.167	1186	528.824	84.437
Highest parental ISEI	887	49.849	16.460	1337	50.030	17.134
Vocational	907	0.606	0.489	1353	0.496	0.500
Voc. & Tertiary	907	0.153	0.360	1353	0.056	0.229
Specialized Sec. & Tertiary	907	0.007	0.084	1353	0.124	0.330
Academic Mixed	907	0.057	0.232	1353	0.102	0.303
Academic	907	0.177	0.382	1353	0.223	0.416
Current ISEI	872	55.793	20.741	1295	57.732	19.290
Std. monthly gross salary	761	7121.236	3619.881	1136	6575.126	3662.414

3.2. Methods

Empirically, we apply sequence and regression analyses. From the episodic data, we have constructed sequences with monthly information on the education or employment status of each individual. To make sense of the multitude of sequences, we have formed clusters of sequences using the dynamic hamming procedure (Lesnard, 2010), which is a variant of optimal matching. It is especially suitable when all sequences have the same length. The optimal matching procedure compares each sequence with every other and calculates the distances between them. The least number of transformations necessary to match the two sequences determines the dissimilarity between them (see for example Halpin, 2010; Lesnard, 2006, 2010). This procedure results in a distance matrix that contains distances between all individual sequences. In a second step, this distance matrix is used for cluster analysis. Similar sequences will then be grouped together in clusters of educational trajectories (e.g., Brzinsky-Fay & Kohler, 2010). We have performed the calculations with the SADI package for Stata (Halpin, 2017).

To test our assumptions, we conducted several regression models. First, we estimated linear regressions to test the primary effects of social origin on reading and mathematics/sciences skills. To take an intersectional approach, we inserted an interaction term of parental ISEI and gender. Second, we applied a multinomial logit model to estimate the probability of pursuing a particular educational trajectory, conditional on gender and parent's ISEI (including a model net of reading, mathematics/science skills). Third, we conducted linear regressions to estimate the association between social origin and gender and the persons own social status and their income at age 30. We estimated an additional model, controlling for the educational trajectory. Finally, we also estimated the effects of the educational trajectory on own status and salary. For all analyses, we take into account TREE's survey design, which includes calculating clustered standard errors and applying survey weights that also correct for panel attrition (see Sacchi, 2011).

4. Empirical Findings

The first step of our analyses addresses the primary effects at the intersection of social origin and gender. We do so by analysing differences in both reading skills and mathematical and science skills by parental ISEI and gender. Consistent with the existing literature we find differences in school performance (see Figure 1 and Table 2). Pupils coming from families with a high socioeconomic status tend to perform better than pupils from less affluent families. In addition, we confirm previous findings, showing better reading skills for girls and better mathematical and science skills for boys (contrasts female vs. male: 26.3, $p < 0.001$ and -21.8, $p = 0.002$ respectively).

Next, the sequence and cluster analyses determine the educational trajectories of our sample. We found a solution of five clusters to be appropriate. Figure 2 shows the distribution of men and women in those clusters. The first cluster mainly contains the trajectories of vocational education at the secondary level followed by employment or to a lesser extent, by subsequent vocational education at the tertiary level (e.g., college of higher education). This is the most common educational pathway of this cohort, the difference compared to the other clusters is especially pronounced for men. The second cluster differs in the respect that the vocational education at the secondary level is followed by tertiary education, mainly at a university of applied sciences. Men also follow this educational path more frequently than women do. The third cluster is the smallest one in terms of the number of students who chose this educational pathway and it is even more gendered than the previous two: Specialised secondary education that is followed mainly by tertiary vocational education or university of applied sciences and, to a lesser extent, university of teacher education is almost uniquely feminine. The reason for that is that these specialised secondary schools mainly

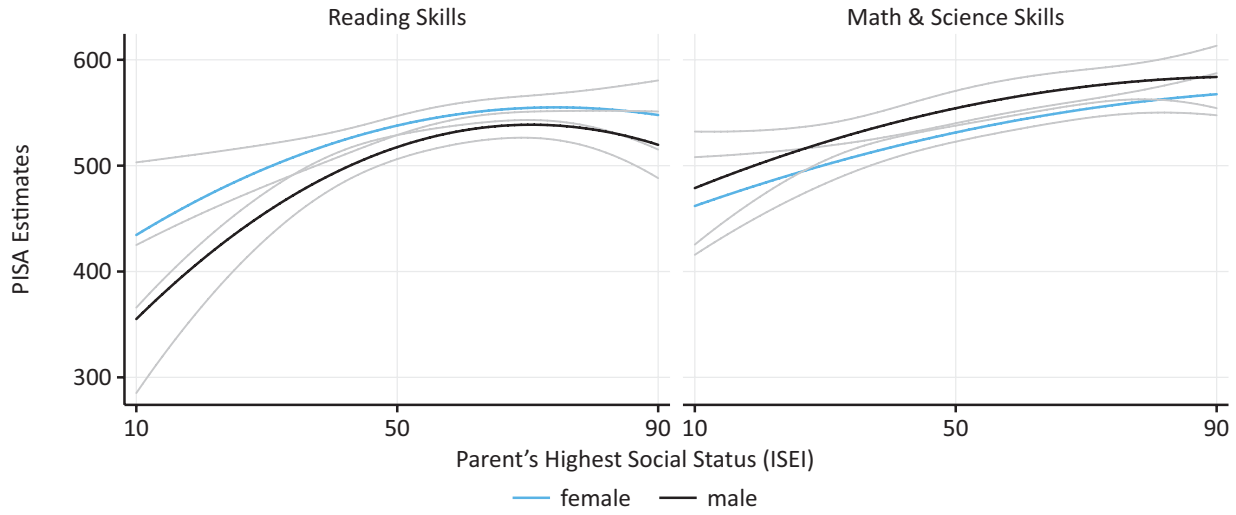

Figure 1. Predictions of reading and mathematics/science skills by parental social status (ISEI) and gender, grey lines: 95%-CI.

Table 2. Effects on reading and mathematics/science skills (OLS coefficients). Source: PISA (2000) and TREE waves 1–9 (weighted; 2016).

	Warm estimate in reading		Warm estimate in mathematics/science	
Women	18.86**	(7.097)	−22.84*	(9.502)
Highest parental ISEI (centred)	1.805***	(0.338)	1.240***	(0.273)
Women*Highest parental ISEI (centred)	−0.536	(0.445)	0.0274	(0.353)
Highest parental ISEI (centred)*Highest parental ISEI (centred)	−0.0501**	(0.0155)	−0.0143	(0.0145)
Women*Highest parental ISEI (centred)*Highest parental ISEI (centred)	0.0209	(0.0221)	0.00393	(0.0177)
Constant	522.4***	(5.835)	557.5***	(8.591)
Observations	2221		1960	

Notes: Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

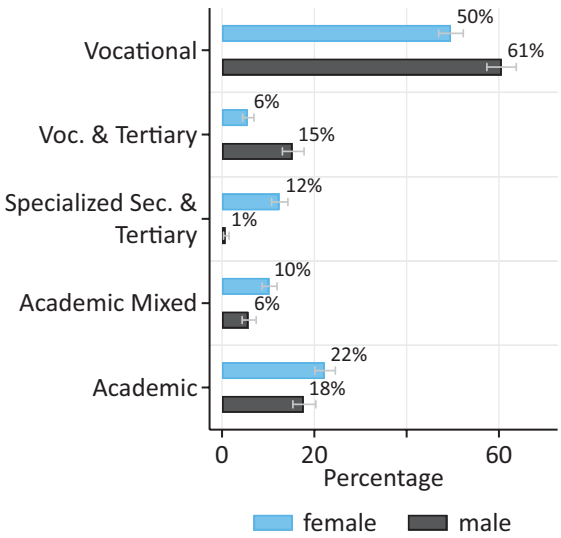

Figure 2. Distribution of men and women in the educational clusters, grey spikes: 95%-CI.

prepare for tertiary education in the health care sector. The final two clusters contain the trajectories starting with general secondary education, followed either by the university of applied sciences or by the university. While the latter is balanced by gender, in the former, which also contains universities of teacher education, women are overrepresented.

The chronogram in Figure 3 displays the five clusters. The colours show the relative proportions of the different states at each point in time.

In the next step, we analyse whether social origin and gender are associated with the probability of belonging to a certain educational cluster. The results are displayed in Figure 4 and 5 and Tables 3 and 4. We find a strong effect of social origin. Pupils growing up in families with lower socioeconomic status have a significantly higher probability of belonging to the vocational cluster. In other words, the lower the parental ISEI the higher the chance that they enter the labour market after their vocational training and do not pursue further education. An equally clear effect we find for cluster five: The higher the parental ISEI, the higher the probability that the students graduate baccalaureate school and enter university. We also find a moderate effect of social origin on the probability of belonging to the vocational & tertiary and to the mixed academic cluster. Conversely, only the proba-

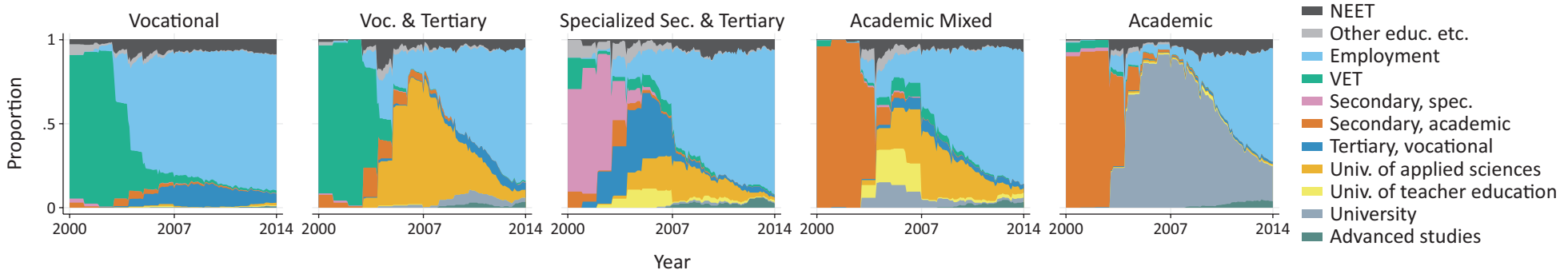

Figure 3. Clusters of educational trajectories.

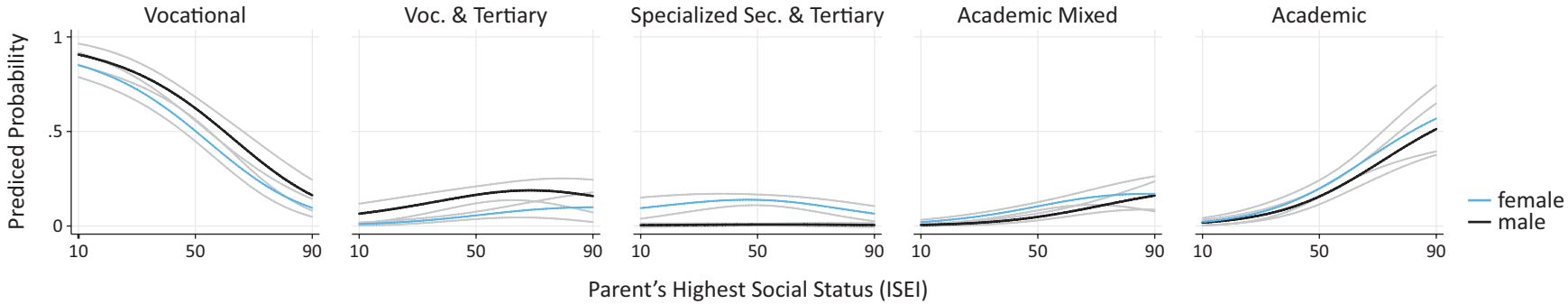

Figure 4. Probabilities of belonging to a certain cluster, by social origin and gender, total effect, grey lines: 95%-CI.

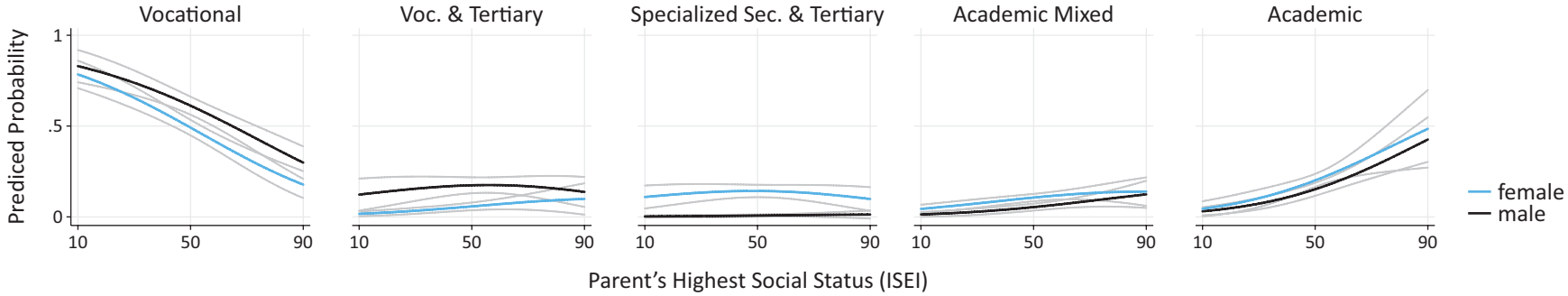

Figure 5. Probabilities of belonging to a certain cluster, by social origin and gender, direct effect, net of reading and mathematics/science skills, grey lines: 95%-CI.

Table 3. Probability of belonging to a certain educational cluster (average marginal effects based on multinomial logistic regression). Source: PISA (2000) and TREE waves 1–9 (weighted; 2016).

	Vocational	Voc. & Tertiary	Specialised Sec. & Tertiary	Academic Mixed	Academic
Women	−0.106***	−0.0976***	0.118***	0.0466***	0.0393
	(0.0320)	(0.0193)	(0.0134)	(0.0130)	(0.0216)
Highest parental ISEI	−0.0105***	0.00147**	−0.000181	0.00218***	0.00702***
	(0.000698)	(0.000478)	(0.000380)	(0.000375)	(0.000781)
Observations	2224	2224	2224	2224	2224

Notes: Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4. Probability of belonging to a certain educational cluster (average marginal effects based on multinomial logistic regression). Source: PISA (2000) and TREE waves 1–9 (weighted; 2016).

	Vocational	Voc. & Tertiary	Specialised Sec. & Tertiary	Academic Mixed	Academic
Women	−0.108***	−0.103***	0.122***	0.0442**	0.0451
	(0.0288)	(0.0196)	(0.0164)	(0.0145)	(0.0233)
Highest parental ISEI	−0.00705***	0.000600	−0.0000470	0.00125**	0.00524***
	(0.000621)	(0.000491)	(0.000430)	(0.000412)	(0.000952)
Warm estimate in reading	−0.00156***	0.000119	0.0000589	0.000472***	0.000913***
	(0.000229)	(0.000140)	(0.000130)	(0.000123)	(0.000189)
Warm estimate in mathematics/science	−0.00121***	0.000264*	−0.000193	0.000329**	0.000809***
	(0.000207)	(0.000129)	(0.000114)	(0.000111)	(0.000130)
Observations	1960	1960	1960	1960	1960

Notes: Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

bility of belonging to the specialised secondary & tertiary cluster is not affected by social origin. These effects are only slightly reduced when controlling for reading, mathematics/science skills, suggesting that a large portion of the observed gradients stem from secondary rather from primary effects of social origin.

Introducing gender as an additional dimension, the picture remains very similar if we focus only on the most prevalent clusters: While the vocational cluster dominates for lower and middle origin pupils, the academic cluster is the most prevalent for high origin pupils. This general rule holds for both females and males; the only difference lies in the crossing point, which can be found at a lower level of the parental ISEI for females compared to males. These two clusters can be characterised by strong gradients with respect to social origin but only minor differences with respect to gender. The inverse pair of clusters is the specialised secondary and tertiary cluster and the vocational and tertiary cluster. For both, only a minor gradient of social origin can be found, but at the same time, both are strongly gendered. Because of this combination, the specialised secondary and tertiary cluster is an important cluster for females irrespectively of their social origin, while for males the same is true for the vocational and tertiary cluster. No interaction effects between social origin and gender can be found for any of the clusters (see Table 5 and 6).

In the following steps of our analyses, we estimate the effects of school trajectory, social origin and gender on the person's own labour market outcomes in 2014 at the age of about 30 years. We measure labour market outcomes in two ways: The person's own ISEI and their salary. For each outcome, we calculate two models, in the first, we estimate the total effect of social status and gender without controlling for educational trajectory. In the second model, we introduce the educational clusters. The remaining effects can then be interpreted as direct effects, that is, the portion of effect that is not mediated by the educational clusters. For the estimation of social status, we additionally control whether the measurement of the respondents ISEI is current (in 2014) or earlier, in case the person was not working in 2014. For

Table 5. Contrast in average marginal effect of parental ISEI (female vs. male).

	Vocational	Voc. & Tertiary	Specialised Sec. & Tertiary	Academic Mixed	Academic
Highest parental ISEI: female vs. male	−0.000532	−0.000288	−0.000362	0.000257	0.000924
	(0.00146)	(0.00112)	(0.000675)	(0.000743)	(0.00161)
Observations	2224	2224	2224	2224	2224

Notes: Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Source: PISA (2000) and TREE waves 1–9 (weighted) (2016).

Table 6. Contrast in average marginal effect of parental ISEI (female vs. male).

	Vocational	Voc. & Tertiary	Specialised Sec. & Tertiary	Academic Mixed	Academic
Highest parental ISEI: female vs. male	−0.000532 (0.00146)	−0.000288 (0.00112)	−0.000362 (0.000675)	0.000257 (0.000743)	0.000924 (0.00161)
Observations	1960	1960	1960	1960	1960

Notes: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001. Source: PISA 2000 and TREE waves 1–9 (weighted) (2016).

the estimation of the salary, we control whether the person is self-employed or not.

We find a strong effect of the parents' social status on the respondents own social status, displayed in the left graph of Figure 6 (see also Table 5). The effects of the parents' social status are similar for men and women, interaction effects between gender and social origin are not significant. For both genders, the effect is stronger at the lower range of the parental ISEI. It is mitigated to a certain extent when we include the clusters of educational trajectories in the model but remains significant (right graph of Figure 6). In this model, in the top range of the parental ISEI, the effect disappears and the curve becomes flat or even turns slightly downwards for women. However, it must be noted that the confidence intervals at the ends of the curve become quite large.

We conducted the same analyses for the salary at age 30. The left-hand graph of Figure 7 shows again the total effect (see also Table 6). On the right-hand side, the direct effect, controlling for educational trajectories is displayed. We found that the effect of social origin is much stronger for women than for men. When we con-

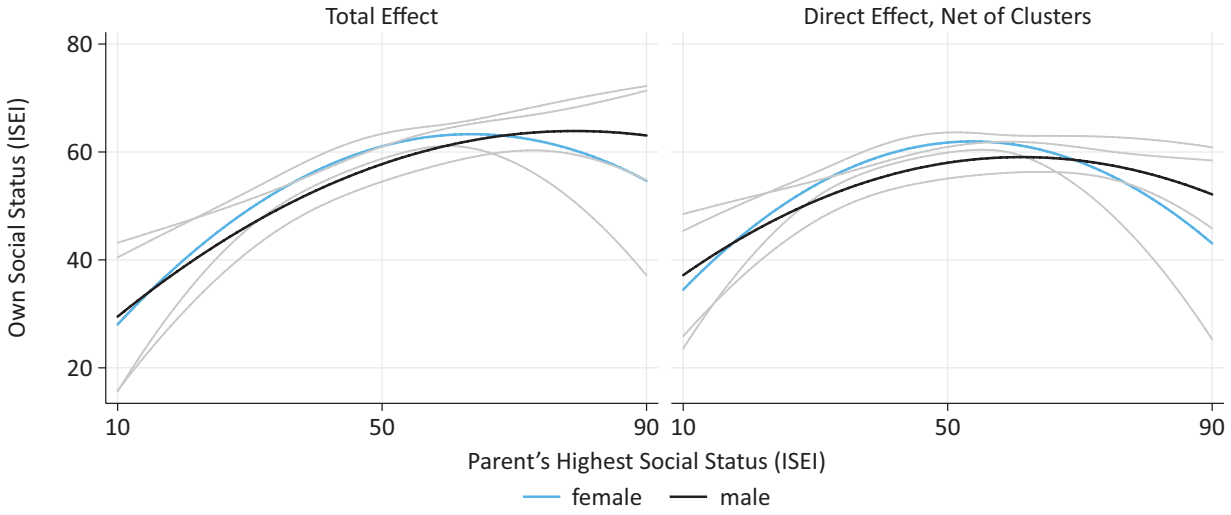

Figure 6. Predictions of social status (ISEI) in 2014 (age ~30) by parental social status (ISEI) and gender, grey lines: 95%-CI.

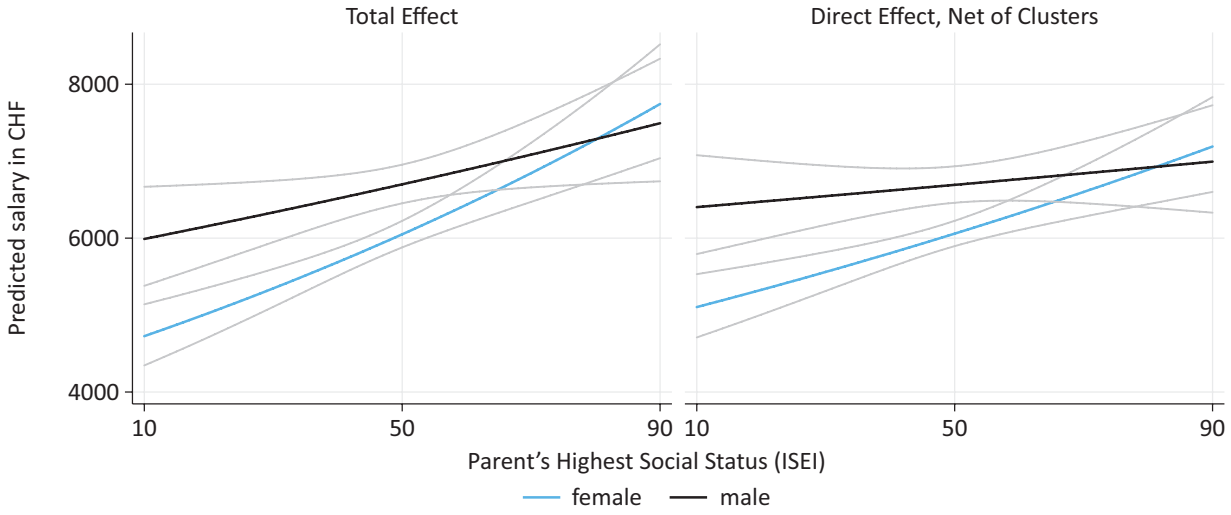

Figure 7. Predictions of salary in 2014 (age ~30), by parental social status (ISEI) and gender; predictions back-transformed from log salary, grey lines: 95%-CI.

trol for the educational pathway, the effect disappears for men, but not for women. In the case of men, the educational trajectory mediates the effects of parental status. In other words: Men, as well as women, tend to follow different educational trajectories depending on their social origin. But when men are undergoing the same education, they then perform comparable jobs that do not differ in pay, regardless of the social status of their parents. In the case of women, on the other hand, the pay varies according to the status of the parents, even if they have the same education, possibly because they do not perform the same jobs. Women with parents who have a low social status are therefore facing a double disadvantage. The intersectional approach is useful to analyse the accumulation and interaction of multiple disadvantages at the time. One possible explanation is that it is less difficult for men with lower or medium family origin to reach reasonable wages because of the specificity of the Swiss dual educational system: In many occupations, a tertiary degree following vocational education can lead to a rather high salary. This concerns mainly male-dominated occupations, such as for example, banking, IT or technical professions. It seems that especially women with parents having a low socioeconomic status end up in low-paid jobs, even when the educational trajectory is controlled for.

Our final analyses concern the effects of educational pathways on status and salary (Table 7). The left side of Figure 8 displays the predicted ISEI by educational cluster. Persons directly entering the labour market after their apprenticeship or pursuing some tertiary vocational education (vocational cluster) reach the lowest social status

Table 7. Effects on social status (ISEI) (OLS coefficients).

			Current ISEI	
Women	−5.159	(14.74)	−9.952	(12.76)
Highest parental ISEI	1.137**	(0.401)	1.022**	(0.343)
Women*Highest parental ISEI	0.427	(0.619)	0.522	(0.560)
Highest parental ISEI*Highest parental ISEI	−0.00718*	(0.00360)	−0.00835***	(0.00307)
Women*Highest parental ISEI*Highest parental ISEI	−0.00514	(0.00617)	−0.00602	(0.00578)
Not current	−2.990	(2.100)	−1.835	(2.586)
Voc. & Tertiary			20.56***	(1.738)
Specialised Sec. & Tertiary			19.01***	(1.848)
Academic Mixed			21.21***	(1.655)
Academic			22.84***	(1.680)
Voc. & Tertiary*Not current			7.890	(5.773)
Specialised Sec. & Tertiary*Not current			−2.118	(6.210)
Academic Mixed*Not current			−3.445	(5.822)
Academic*Not current			−3.390	(4.376)
Constant	18.96	(10.49)	19.49*	(8.805)
Observations	2124		2124	

Notes: Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Source: PISA (2000) and TREE waves 1–9 (weighted) (2016).

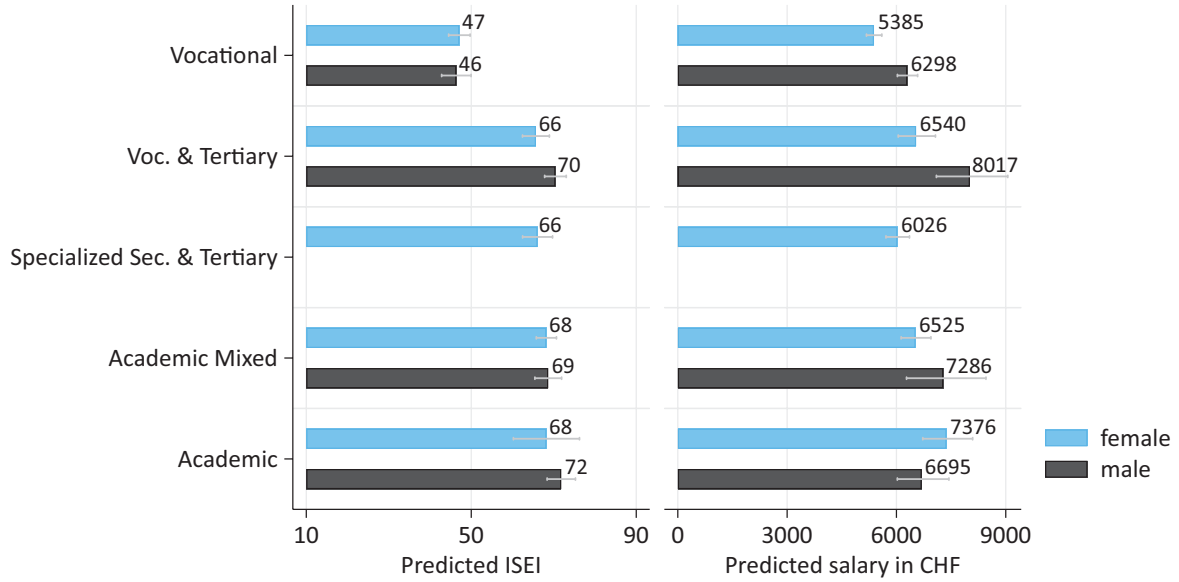

Figure 8. Predicted Social Status (ISEI) and Predicted Salary by Educational Cluster, grey spikes: 95%-CI.

by far. This is true for men and women. The differences in social status between the other educational clusters are less pronounced. Persons following general secondary education and university (academic cluster) reach the highest status at age 30. Men who complete vocational and tertiary education at the university of applied sciences are reaching a similarly high status.

Salary differences between different educational clusters are less pronounced (see the right graph of Figure 8). We find the within-cluster gender difference clearly more pronounced in terms of salary than in terms of status. On the other hand, there are two clusters that yield comparatively low salaries, the vocational and the specialised secondary & tertiary cluster. In the two vocational clusters, we find a significant gender gap, with men reaching markedly higher salaries than women do. Some readers may find it surprising to find that the estimated salary of women who followed the academic educational pathway is higher than the one for men who followed the same pathway. It is, however, important to note that this difference is not statistically significant. In other words: While it is perfectly possible that in this specific population (highly educated, aged ∼30, just left university) women have indeed a higher salary than men, this difference could be the result of chance alone.

5. Robustness Checks

To check the robustness of our results, we conducted some additional analyses. In particular, we sought to rule out three different sources of biases. First, while the cluster solutions found by the dynamic hamming procedure is plausible, it could be argued that it does not sufficiently separate individuals who entered the labour market directly after vocational education training and did not pursue any tertiary education from those with at least some tertiary education. In order to check this, we pre-defined a cluster with all individuals without any tertiary education and used optimal matching to form four clusters with the remaining respondents (Figure 9). This alters the

Table 8. Effects on log salary (OLS coefficients).

	Log std. monthly gross salary			
Women	−0.269***	(0.0807)	−0.263***	(0.0764)
Highest parental ISEI	0.00280*	(0.00127)	0.00110	(0.00119)
Women*Highest parental ISEI	0.00337*	(0.00157)	0.00318*	(0.00145)
Self-employed	−0.0906	(0.0838)	−0.0743	(0.0863)
Voc. & Tertiary			0.209***	(0.0409)
Specialised Sec. & Tertiary			0.0725*	(0.0330)
Academic Mixed			0.129***	(0.0321)
Academic			0.172***	(0.372)
Constant	8.672***	(0.0670)	8.685***	(0.0634)
Observations	1860		1860	

Notes: Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Source: PISA (2000) and TREE waves 1–9 (weighted) (2016).

Table 9. Effects of educational clusters on social status and salary by gender (OLS coefficients).

	Current ISEI		Log std. monthly gross salary	
	Men	Women	Men	Women
Voc. & Tertiary	24.02***	18.56***	0.241***	0.194***
	(2.341)	(2.210)	(0.0663)	(0.0449)
Specialised Sec. & Tertiary	12.41	18.96***	−0.124	0.113**
	(8.632)	(2.154)	(0.220)	(0.0341)
Academic Mixed	22.27***	21.09***	0.146	0.192***
	(2.445)	(1.732)	(0.0792)	(0.0369)
Academic	25.43***	21.10***	0.0613	0.315***
	(2.529)	(4.280)	(0.0581)	(0.0509)
Not current	−2.991	−2.388		
	(3.066)	(2.763)		
Self-employed			−0.0223	−0.0493
			(0.114)	(0.119)
Constant	46.52***	47.27***	8.748***	8.593***
	(1.857)	(1.344)	(0.0227)	(0.0204)
Observations	872	1295	761	1136

Notes: Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Source: PISA (2000) and TREE waves 1–9 (weighted) (2016).

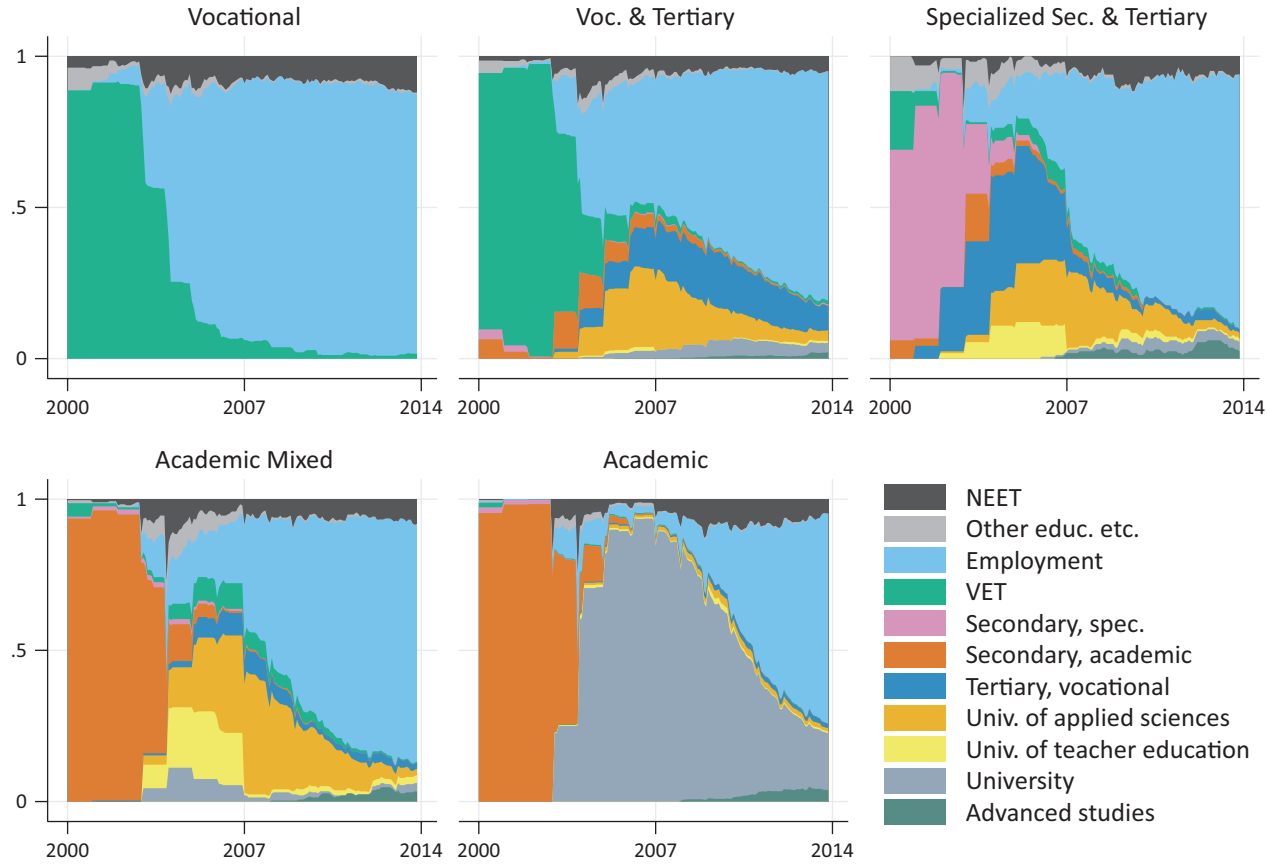

Figure 9. Clusters of educational trajectories, solution with a separate cluster for VET & employment.

size of the two vocational clusters (the second cluster becomes the biggest) but does not substantially change the results of the regressions (results not shown).

Second, at age 30, especially persons who completed tertiary education are in a critical phase of their occupational career. A few more years of experience in the labour market could increase their salary significantly. In order to take this into account, we re-estimated the models predicting log salaries based on a restricted sample including only the respondents who completed their education at least two years prior (see the left panel of Table 10). Using the restricted sample increases the gender gap and decreases the effect of the parental social status of men compared to the original model. Further, as self-declarations of salaries are sometimes unrealistically low or high, in our last model, we excluded the highest and

Table 10. Effects of educational clusters on social status and salary by gender (OLS coefficients). Source: PISA (2000) and TREE waves 1–9 (weighted; 2016).

	Log std. monthly gross salary							
	End of education at least 2 years ago				Exclusion of the lowest and highest 1%			
Women	−0.362***	(0.0856)	−0.350***	(0.0778)	−0.245**	(0.0751)	−0.243***	(0.0699)
Highest parental ISEI	0.00151	(0.00121)	−0.000286	(0.00106)	0.00228*	(0.00109)	0.000824	(0.00106)
Women*Highest parental ISEI	0.00496**	(0.00163)	0.00458**	(0.00146)	0.00295*	(0.00138)	0.00278*	(0.00125)
Self-employed	−0.0800	(0.0888)	−0.0618	(0.0896)	−0.0577	(0.0781)	−0.0408	(0.0796)
Voc. & Tertiary			0.176***	(0.0254)			0.170***	(0.0236)
Specialised Sec. & Tertiary			0.0656*	(0.0310)			0.0786*	(0.0316)
Academic Mixed			0.150***	(0.0339)			0.143***	(0.0307)
Academic			0.202***	(0.0299)			0.144***	(0.0303)
Constant	8.744***	(0.0689)	8.762***	(0.0609)	8.689***	(0.0625)	8.701***	(0.0587)
Observations	1591		1591		1829	1829		

Notes: Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

the lowest percentage (see right panel of Table 10). This does not substantially alter our results.

Third, we calculated all our models using the highest parental education instead of the highest ISEI. The results are similar. We find one slight deviance concerning the effects on the person's own salary: Using parental education instead of parental ISEI, the interaction effect between parental origin and gender is not significant. However, as is the case with the parental ISEI, the effect of parental education is stronger for women than for men and women earn less than men on most parental educational levels (results are available upon the authors' request).

6. Conclusions

In our analyses, we tried to show a global picture of the intersectional effects of gender and social status on the educational trajectories and on subsequent labour market outcomes. The combination of sequence analyses and regressions allowed us to reduce the complexity of individual life courses and use them in explanatory models without sacrificing the strength of the panel data. Further, this procedure allowed us to get an overview of the entire post-compulsory educational trajectory and the first years in the labour market. Our primary aim was to visualise differences by parental status and gender.

In line with our theoretical considerations, we found that first, performance in reading, mathematics/science tasks distinctly differ by parental status and gender at the end of compulsory school. The higher the social status, the better the performance of boys and girls. Besides this origin effect, there is also a gender effect with girls performing better in reading tasks and boys in mathematical and science tasks. Although the interaction effect is not significant, mainly boys with lower status parents face a double disadvantage in the reading tasks. Second, boys and girls from different social family backgrounds follow varying educational trajectories.

Boys are overrepresented in the vocational tracks, while girls more often attend general secondary schools. We suspect that an important reason is the gender-typical choice of occupation. In the vocational track, the range of male-dominated occupations is much vaster and it subsequently offers better labour market prospects. Female dominated jobs that offer some labour market prospects usually require general secondary education. The choice of an educational pathway is consequential for subsequent labour market success. We show that men and women following the academic track, as well as men following the vocational & tertiary track, reach the highest status, while individuals in the vocational cluster by far reach the lowest status.

In terms of salary, we find a strong gender pay gap, particularly within the vocational clusters. Despite the crucial importance of educational trajectories, effects of social origin remain significant and women especially face a "class pay gap". The presented overview shows that the post-millennial Swiss educational system is still stratified by parental status and gender. The argument often raised by public opinion that boys are disadvantaged at school proves to be only partially true when looking closely. It concerns mainly the reading skills of boys with disadvantaged family backgrounds. Next, girls cannot entirely transform their educational advantages into equal labour markets success. This again mainly affects girls from disadvantaged backgrounds who have the worst labour market prospects.

These analyses show that it is important to take an intersectional approach when analysing education and labour market inequalities. The strength of the presented analyses is the detailed description of young adults' educational trajectories and their first years in the labour market. With this approach, we are not able to explain in detail how these differences in our outcomes emerge. To get more insight into these mechanisms, one needs to limit the analyses on one or two outcomes. This concerns particularly the occurrence of horizontal segregation by parental status and gender and its effects on the different labour market outcomes. In addition, our operationalisation of social origin is limited. It would be interesting to combine different aspects of social origin, such as, for example, social class, status or education of the father and the mother, using an index to account for the family level of this factor. Alternatively, the distinct effects of the father's and the mother's social status on boys and girls should be analysed more closely. Gaining more knowledge about the different mechanisms, considering an intersectional approach of gender, social origin and possibly other attributes, for example, migrant status would also help to formulate policy advice.

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Conflict of Interests

The authors declare no conflict of interests.

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Article

Adult Vocational Qualifications Reduce the Social Gradient in Education

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Abstract
Many youth leave school early without an upper secondary education, impeding their chances in the labor market. Early school leavers come disproportionately from families with low parental education. In some countries, there are alternative routes to upper secondary qualifications as adults. Does adult attainment reduce initial social differences in educational attainment, or does it reinforce such differences? Norway is one of the countries where many attain upper secondary qualifications in adulthood. Using individual data from administrative registers, we follow five Norwegian birth cohorts (1973–1977) from age 20 to 40. We document that the association between parental education and upper secondary completion declines monotonically with age, ending at age 40 about 35% below that at age 20. We also document that the alternative routes to adult qualifications recruit students of different family backgrounds. In particular, adults who acquire vocational qualifications via the experience-based route come from families with lower education than other groups. Our evidence suggests that institutions that offer opportunities for certifying qualifications acquired at work mitigate social gradients, fostering more equal opportunities within the education system.

Keywords
adult qualifications; family background; intergenerational education; vocational education and training

Issue
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1. Introduction

The links between social background and educational attainment are well documented (e.g., Hansen, 1997; Rumberger, 1987). Parental educational attainment is a particularly important factor (Haveman & Wolfe, 1995). The persistence in educational outcomes across generations is high in many countries, with a parent-child correlation in years of schooling of about 0.4 (Hertz et al., 2007). While early school leaving is more frequent among adolescents growing up in low-education families, educational systems that offer opportunities for adults to acquire qualifications may mitigate such social differences. In many countries, including Norway, a considerable number of early school leavers acquire formal qualifications as adults (OECD, 2014, p. 54).

Our study contributes to the literature on social gradients in education by studying acquisition of qualifications during adulthood for those who left school early without completed upper secondary education. Do upper secondary qualifications acquired as adults influence how educational attainment differs by parental education? Drawing on longitudinal data from Norwegian administrative registers, we track the educational attainment of individuals through age 40 and document how the association between parental education and upper secondary completion changes with age. Evidence from Norway is informative because a large number of adults

acquire upper secondary qualifications for the first time in their 20s and 30s and a high proportion of these achieve vocational qualifications. We examine four alternative routes to adult qualifications—experience-based vocational certification; adult apprenticeships; school-based vocational degrees; and academic tracks. Since the first two routes rely heavily on learning at work, they may recruit differently compared to school-based tracks. As traditional learning environments may present an obstacle to completion of upper secondary education for those growing up in low-education families (Illeris, 2004), our main hypothesis is that tracks based on learning at work will reduce attainment differences by parental education.

Although the persistence in educational outcomes across generations is strong, the correlation coefficient between years of schooling of parent and child varies across countries and over time (Breen, Luijkx, Müller, & Pollak, 2009; Hertz et al., 2007). How strongly educational attainment relates to parental schooling will depend on institutional characteristics, both for the education system at large and for specific routes. There is substantial variation across educational systems (see, e.g., Blossfeld, Buchholz, Skopek, & Triventi, 2016). Compared to more uniform systems, the effects of social background tend to be stronger when students sort into different tracks at an early age, especially for entry into higher education (see, e.g., Ammermueller, 2013; Müller & Karle, 1993). Norway has a uniform system that would be expected to produce comparatively small inequalities in attainment. Early tracking is in Europe often associated with dual systems with a higher level of specificity of vocational skills in the vocational track. If both tracks give access to good jobs and stable employment, sorting by social background presents less of a challenge to norms of equality and inclusion than when labor market outcomes are very different—which has been an argument in defense of educational systems with early tracking, such as that in Germany (Shavit & Müller, 2006). The lower entry rates to higher education among youth with low education backgrounds in such systems may still be regarded as problematic from a social inequality perspective (Powell & Solga, 2011). Even selection into vocational education relates to family educational background. Participation in vocational education is skewed in favor of medium rather than low and high education families (Beicht & Walden, 2015), while school leavers tend to have a low education family background.

Focusing more specifically on adult learning, the general literature on participation in adult learning (see, e.g., Blossfeld, Kilpi-Jakonen, Vilhena, & Buchholz, 2014) documents large differences in participation according to background characteristics, indicating that adult learning does not necessarily reduce the correlation between attainment and parental years of schooling. The scarce prior evidence on participation in "second chance" education for adults who left school early, points to social gradients in attainment similar to the patterns observed for youth. Glorieux, Heyman, Jegers and Taelman (2011) study two different adult institutions/routes based on courses and home studying respectively. While they attract different groups, both institutions recruit participants from higher socio-economic backgrounds than students who never complete upper secondary education, leaving the authors to conclude that neither route is very effective in mitigating social inequality. In the US, evidence from the General Education Development (GED) test suggests that those who complete the GED test have a parental education background similar to those who complete high school in their youth, but lower than those who go on to college (Heckman, Humphries, & Mader, 2010, p. 15).

Social recruitment patterns in adult education are likely to reflect the specific institutions available for obtaining adult qualifications. In the studies cited above, the institutions require that adults either return to a classroom setting or study at home/alone (to pass a test). Previous research on adult learning suggests that institutions requiring adults to return to the classroom or study at home maintain educational differences by family background. The reason is that adults with a low parental education background often have low motivation for re-entering school-based learning and learn more easily if learning is integrated with work (see, e.g., Illeris, 2004, 2006; Knowles, 1978). This may be due to negative experiences with traditional school learning (Illeris, 2004). The Norwegian case provides an opportunity to study how adults sort into routes since the institutions offer alternatives that rely heavily on workplace training as well as traditional school-based programs.

Our evidence on the associations between parental schooling and offspring education should not be interpreted causally as effects of higher parental education. Typically, estimates of parental education effects reflect selection on other factors (whether genetic or environmental) that are positively correlated with attainment in both generations. Using alternative identification strategies, Holmlund, Lindahl and Plug (2011) conclude that intergenerational schooling associations are largely driven by such selection. The motivation for our study is to provide evidence on the role of adult educational institutions in reducing inequality rooted in family background differences. For this, it is of minor interest whether the impact of parental education reflects causal mechanisms or captures other correlated factors.

2. Adult Completion of Upper Secondary Education

The starting point for our analysis is that the fraction of a birth cohort with completed upper secondary education increases with age. This pattern reflects that some youth take more than the statutory number of years to complete their upper secondary schooling, and that some adults return to school or certify their workplace training. In Norway, the statutory graduation age is 19 or 20, depending on the academic or vocational track, but as

Figure 1 shows, fully 14.0% of men and 10.2% of women complete upper secondary education between ages 20 and 25 (age at end of calendar year). Completion during adulthood is also common: among women, 7.6% acquire upper secondary qualifications between ages 25 and 40, while the male adult completion rate increases by 6.5 percentage points.

In Figure 1 we also split the sample in two according to parental education, i.e., by whether or not at least one parent had completed upper secondary education. There are large visible differences in completion according to parental education, but an important point from Figure 1 is that this differential declines with age. While the completion differential for men is 21.5% at age 20, it shrinks to 18.0% at 25, and is further reduced to 14.5% at age 40. For women, the differential declines from 21.7% at age 20, via 18.0% at age 25, to 13.1% at age 40. The declining female differential largely reflects that many women with low parental education complete upper secondary between age 25 and 40.

3. Adult Vocational Education Institutions

In this section, we briefly outline the Norwegian education system, with an emphasis on the vocational education and training (VET) system and the routes available for adults to acquire vocational qualifications.

Primary and lower secondary education is uniform and lasts ten years. At age 16, youth enter upper secondary education and select into 13 distinct programs of which eight are vocational. The eight vocational first-year programs branch out to 52 second-year courses and apprenticeships in almost 200 trades. Students may switch from a vocational program to an academic program during the course of study. Apprenticeship is an integrated part of nearly all vocational upper secondary programs. Most vocational programs follow the 2 + 2 model, with two years in school followed by two years of apprenticeship training. After completing the apprenticeship period, apprentices who pass the trade examination achieve a certificate in a particular trade. Two prominent typologies of the VET system distinguish between the liberal, state-based and the dual systems (Busemeyer & Trampusch, 2012; Greinert, 2004). The Norwegian VET system has been characterized as a hybrid system, combining elements from the dual and the state-based systems (Nyen & Tønder, 2014; Olsen, Høst, & Michelsen, 2008). It is worth noting that the Norwegian education system is not based on early tracking of students into academic or vocational tracks, even though apprenticeships form a pivotal part of the VET system.

Norwegian youth have the statutory rights to upper secondary education, and although not compulsory, 98% of 16-year-olds begin upper secondary education. In recent years, between 40 and 45% of 16-year-olds have started in a vocational program (Nyen, Skålholt, & Tønder, 2015). However, less than half end up with formal vocational qualifications after four years. This is because of dropout and delayed completion, but also because many students in certain programs exercise the option of switching to an academic program.

Educational attainment in Norway is relatively high with 83% of 25 to 54-year-olds having completed education at ISCED levels 3–4 (EQF 3) or above in 2017 (Eurostat, 2018). However, the share of young adults (age 20 to 24) with completed upper secondary educa-

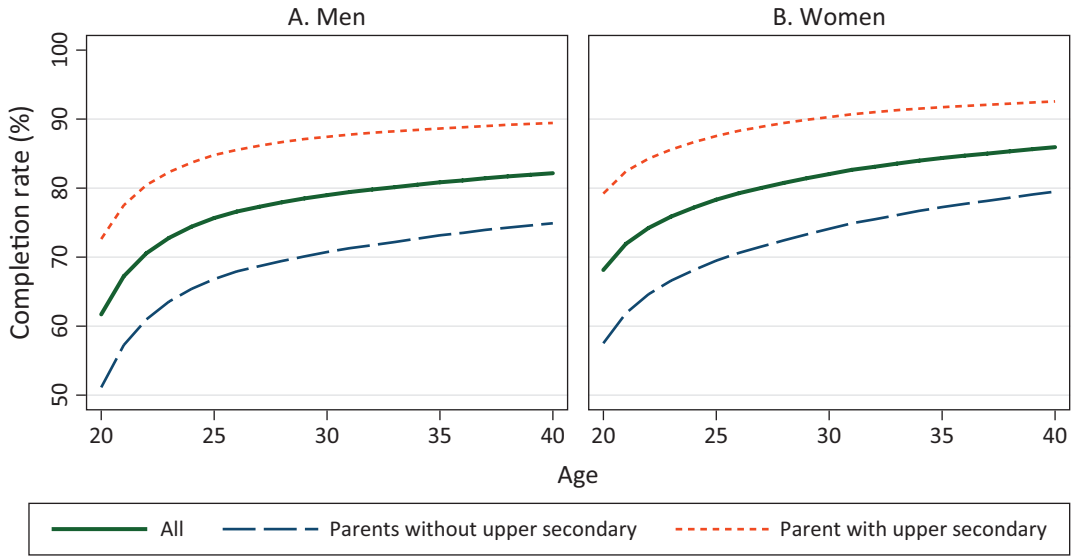

Figure 1. Completion of upper secondary education by age, gender, and parental education. Notes: Samples consist of 1973–1977 birth cohorts, with Norwegian-born parents and valid education data, and present in the country. Observation counts are 129,712 men and 124,109 women at age 20, declining to 125,207 men and 121,127 women at age 40. Data extracts are further described in Section 4. Completion rates for men are 61.7% (age 20), 75.7% (25), and 82.2% (40), and for women 68.1% (age 20), 78.3% (25), and 85.9% (40). Parental education is observed at age 15. The two parental education samples are of comparable size (51% had two parents without completed upper secondary education).

tion (ISCED 3) is below the EU average. What makes overall attainment high is that many complete upper secondary education in their 20s or 30s (see Figure 1).

The high adult completion rate reflects that several routes are available for completing upper secondary education as adults. For vocational qualifications, the two main routes are adult apprenticeships and the experience-based route. Both lead to the same qualifications as those achieved by youth. Adult apprenticeships are similar to youth apprenticeships, but adults can have all their training at the workplace, except for that in general subjects. The experience-based route gives adults who can document a long and varied practice within a trade the chance to acquire the trade certificate, provided they pass a written exam and the ordinary trade examination. Most candidates take a theoretical preparatory course as well. The experience-based route accounts for as much as one third of all new trade certificates each year (Bratsberg, Nyen, & Raaum, 2017). Contrasting the two routes, adult apprenticeship is a training scheme at the workplace available to both those previously employed and non-employed, while the experience-based route provides a chance for employed workers without formal vocational qualifications to certify the skills they have gained informally or through non-formal training.

Historically, a third vocational route has also been important, as many adult women, in particular, have completed school-based vocational educations in health care that have led to formal qualifications. These are three-year school-based vocational courses leading to upper secondary qualifications. The most important of these programs, the auxiliary nurse program, closed in 2006 and was replaced by the apprenticeship-based health care worker program. For adults wanting to complete general, academic upper secondary education, there are adult education institutions for part-time studies that can be combined with work, forming a fourth route to adult upper secondary qualifications. This category also covers students accepted into higher education through validation of prior learning. In sum, in the empirical analyses that follow, we study four alternative routes to adult completion of upper secondary education: the experience-based route, adult apprenticeships, school-based vocational courses, and the academic track. Our hypothesis is that adult acquisition of upper secondary qualifications reduces the social gradient in education. Because re-entry into a classroom setting is known to represent a participation barrier for adults with a low parental education background (Illeris, 2006), we expect the routes based on workplace learning, and especially the experience-based route, to contribute more to the reduction in the social gradient than the vocational routes based on in-school learning and the academic track.

4. Data and Empirical Approach

Our study draws on merged individual records from two administrative registers, the central population register and the national education database. We first extracted all records of individuals born to two Norwegian-born parents between 1973 and 1977 and kept observations where the individual and both parents have valid registrations in the education database. The education database allows us to study completion through 2017, when the youngest of these cohorts was 40 years of age. Detailed data on routes to vocational qualifications are first available in 1998, limiting complete records for the five birth cohorts to the age span 25 to 40. For this reason, and because we want to study adult routes to upper secondary completion, we focus on those who had not completed upper secondary at age 25. For simplicity of language, we use the term "dropouts" for this group, even though they have finished compulsory schooling. We track their attainment between 25 and 40, restricting samples to individuals present in Norway at age 40. Nevertheless, for completeness Figures 1 and 3 cover the broader age span 20 to 40 because the displayed statistics do not require data on adult route to completion. The various restrictions reduce the overall sample by 5.9% and leave us with analysis samples of 125,207 men and 121,127 women. In these samples, 76.1% of men and 78.5% of women had completed upper secondary by age 25 (see Table 1, column 2). The data requirement that we observe parental education means that we exclude immigrants from the study population. Records from the national education database indicate that immigrants are overrepresented among those acquiring vocational upper secondary qualifications in adulthood, and we may therefore ignore an important link between adult education and reduced social inequality. We leave this topic for future research.

In Figure 2, we focus on dropouts without formal upper secondary qualifications at age 25 and show the fraction with completed upper secondary education at each age through 40. In this subsample, one in four men and one in three women had acquired vocational qualifications or completed upper secondary through the academic track by age 40. As the figure shows, men and women take somewhat different routes. For men, the experience-based route to the trade certificate is most common. For women, the academic track and school-based vocational education are more important (see also Table A1 in the Appendix which gives the top five fields of study by gender and route to adult completion).

In the study of adult completion and the alternative routes to adult upper secondary qualifications, we relate completion to family background measured by the sum of the parent's statutory years of schooling. We discuss this operationalization further in Section 6. Table 1 shows that the various groups differ importantly along this measure: while parental years of schooling is 24.5 and 24.4 on average among men and women who completed upper secondary by age 25 (column 2), parental schooling is considerably lower at 21.2 and 20.8 for men and women who completed via the adult experience-based route (column 3). Of the four adult routes, parental education is higher among those completing via the aca-

Table 1. Descriptive statistics: parental education.

			By adult route to completion age 40				
	All	Completed age 25	Experience based	Apprentice	School-based vocational	Academic track	Not completed age 40
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
A. Men							
Mother educ	11.6	11.9	10.5	10.7	10.6	11.6	10.6
	(2.45)	(2.52)	(1.75)	(1.99)	(1.99)	(2.48)	(1.87)
Father educ	12.2	12.6	10.7	11.2	11.3	12.0	10.9
	(2.91)	(2.96)	(2.13)	(2.41)	(2.39)	(2.83)	(2.31)
Parental educ	23.8	24.5	21.2	22.0	21.9	23.6	21.5
	(4.67)	(4.76)	(3.09)	(3.58)	(3.69)	(4.54)	(3.48)
Observations	125 207	95 247	3 327	1 200	271	2 843	22 337
Sample share		0.761	0.027	0.010	0.002	0.023	0.178
B. Women							
Mother educ	11.6	11.9	10.2	10.5	10.3	11.1	10.4
	(2.43)	(2.50)	(1.53)	(1.79)	(1.65)	(2.21)	(1.70)
Father educ	12.1	12.5	10.6	10.7	10.7	11.5	10.7
	(2.89)	(2.94)	(2.21)	(2.21)	(2.21)	(2.62)	(2.18)
Parental educ	23.7	24.4	20.8	21.2	21.0	22.6	21.1
	(4.63)	(4.71)	(2.87)	(3.28)	(2.99)	(4.05)	(3.19)
Observations	121 127	95 134	1 865	866	2 038	4 214	17 037
Sample share		0.785	0.015	0.007	0.017	0.035	0.141

Notes: Sample mean (standard deviation), by gender and route to completion of upper secondary education. Samples consist of individuals born in Norway between 1973 and 1977 to Norwegian-born parents with valid education data, and who were present in the country at age 40. Parental education is the sum of mother and father's years of schooling, observed at age 15 of the offspring.

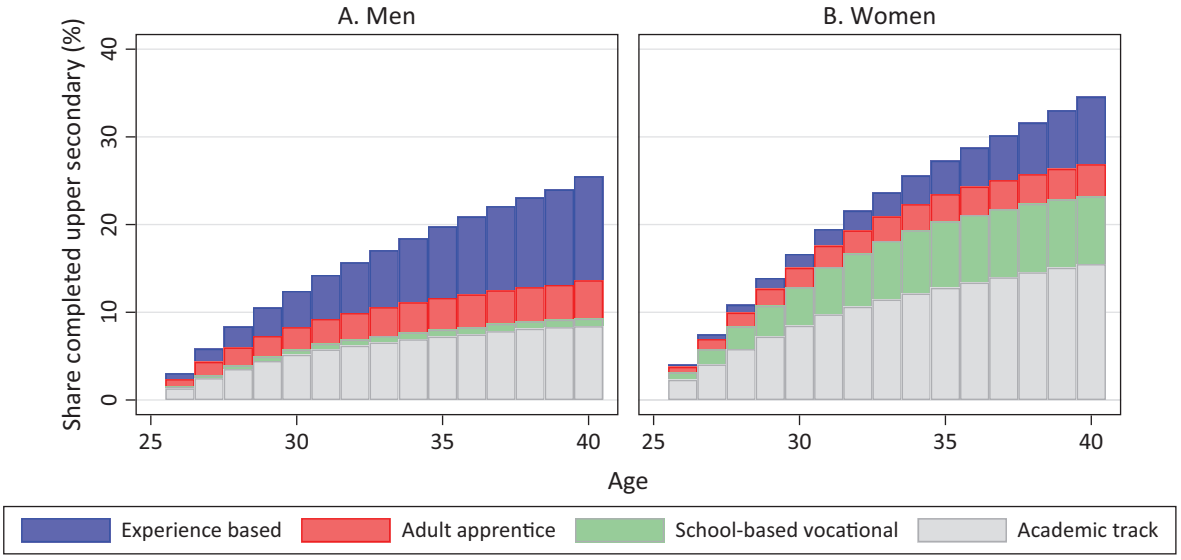

Figure 2. Routes to completion of upper secondary education if dropout at age 25. Note: Observation counts are 29,960 men and 25,993 women.

demic track than the three vocational routes. Of particular note, parental education is lower for the experience-based group than even for those who did not complete upper secondary education by age 40 (column 7), hinting that the route may play an important role in reducing differences in attainment by parental background.

Our empirical analyses build on estimation of the linear probability model. The baseline regression model relates completion at a certain age to the sum of parental schooling:

$$C_{ai} = \alpha_a + \beta_a(SM_i + SF_i) + \varepsilon_{ai}, \quad (1)$$

where C is an indicator variable for completed upper secondary education, SM and SF denote years of schooling of mother and father, and a indexes age and i the individual. When we examine the alternative adult routes to

qualifications, we estimate four separate linear probability models:

$$C_{ji} = \alpha_j + \beta_j(SM_i + SF_i) + \varepsilon_{ji}, \quad (2)$$

where j indexes the four routes (experience-based; apprentice; school-based vocational; and academic track) and C_j is an indicator for completion of upper secondary via route j between ages 25 and 40. In other words, in the next section we model upper secondary completion as a function of parental attainment, assuming that the marginal effect of parental schooling is constant and that schooling of the two parents is equally important for the offspring, and ignoring other family attributes that may affect completion of upper secondary schooling. In Section 6, we relax each of these assumptions.

5. Results

To set the stage for the empirical analysis, we first display results from 42 separate estimations of equation (1) by age and gender. Figure 3 shows the estimates of the coefficient of parental education, along with their 95% confidence interval. At age 20, the coefficient estimate is 0.029 for both men and women, showing that initial completion relates very strongly to family background. A coefficient of 0.029 means that an additional year of parental schooling is associated with a 2.9 percentage point higher completion rate. However, this advantage declines with age: at age 25, it stands at 2.4 percentage points, and at age 40, it is 1.9 points for men and 1.8 points for women (see also Table 2). In other words, the social gradient in education diminishes substantially with age.

As columns 1 and 2 in Table 2 show, over the age interval 25 to 40, the gradient declines from 0.0235 to 0.0192 (0.0043 or 18%) for men, and from 0.0243 to 0.0175 (0.0068 or 28%) for women. The decline is highly statistically significant with p-values below 0.0005 for each gender (not shown in the table). The last four columns report the route-specific coefficients from estimations of equation (2) and reveal a consistent pattern across gender and routes, with completion in adulthood more likely the lower is the educational attainment of parents.

Although each of the four adult routes contributes to the reduction in the social gradient between age 25 and 40 (the sign of the parental education coefficient is negative across routes and gender), the roles of the various routes differ, and even so by gender. For men, vocational certification based on work experience is particularly important for two reasons. First, qualifications are frequently acquired via this route (2.7% of the male sample, or 11.1% of male dropouts). Second, the route relates strongly and negatively to parental education. Many men acquire academic qualifications, but the association of this route with parental education is much weaker than for the experience-based route (compare columns 3 and 6). Because, by construction, the increase in the completion rate between 25 and 40 is equal to the sum of the fractions completing via the four adult routes, the sum of the parental education coefficients in columns 3–6 equals the difference between coefficients in columns 2 and 1. A convenient way of decomposing the change in the social gradient is therefore to divide each route-specific coefficient by the overall reduction in the gradient. According to this metric, for men the experience-based route accounts for fully 73.5% of the decline in the social gradient in education between ages 25 and 40 (see column 3, row labeled "contribution to decline").

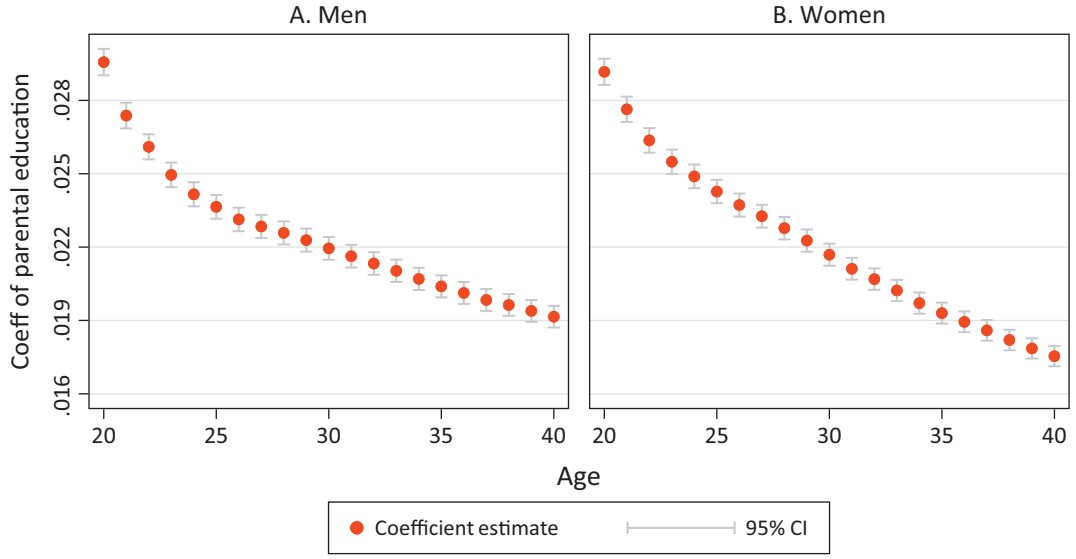

Figure 3. Completed upper secondary education: coefficient of parental education, by age and gender. Note: Scatter points are the coefficient estimates from 42 regressions run separately by age and gender of completion of upper secondary on parental education.

Table 2. Completion of upper secondary education by ages 25 and 40, by gender and by adult route. Effects of parental education.

			Completion age 40 by adult route			
	Completed age 25 (1)	**Completed age 40** (2)	**Experience based** (3)	**Apprentice** (4)	**School-based vocational** (5)	**Academic track** (6)
A. Men						
Parental educ	0.0235***	0.0192***	−0.0032***	−0.0008***	−0.0002***	−0.0002*
	(0.0003)	(0.0002)	(0.0001)	(0.0001)	(0.0000)	(0.0001)
Contribution to decline			0.735	0.188	0.044	0.036
Adj R^2	0.0659	0.0545	0.0084	0.0015	0.0004	0.0000
Observations	125 207	125 207	125 207	125 207	125 207	125 207
Mean dep var	0.761	0.822	0.027	0.010	0.002	0.023
B. Women						
Parental educ	0.0243***	0.0175***	−0.0021***	−0.0008***	−0.0021***	−0.0017***
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Contribution to decline			0.310	0.124	0.314	0.257
Adj R^2	0.0753	0.0545	0.0062	0.0021	0.0059	0.0019
Observations	121 127	121 127	121 127	121 127	121 127	121 127
Mean dep var	0.785	0.859	0.015	0.007	0.017	0.035

Notes: */**/*** statistically significant at 10/5/1% level. Standard errors are reported in parentheses. Row labeled "contribution to decline" shows the ratio of regression coefficient to the reduction in overall coefficient between ages 25 and 40.

Women are more evenly distributed across the alternative routes, even if adult apprenticeships are less frequent than for men. The contributions to the decline in the gradient are also more similar across routes. More women than men complete via the academic track, and the association with parental education is stronger than for men.

Further insight into the social gradient of adult secondary completion can be gained by focusing on those who had not completed at age 25. While Table 2 examined the contributions of the four adult routes to the decline in the social gradient, in Table 3 we explicitly study dropouts at age 25 and address differences in adult recruitment patterns across routes. First, however, column 1 of Table 3 shows that the overall adult completion rate remains strongly and positively associated with parental education. Even among dropouts, having more educated parents increases the probability of completion between ages 25 and 40. The average parental education effect is substantial—an additional year of parental education is associated with a 1.15 percentage point higher completion rate among males and 1.40 percentage point higher completion among females. The recruitment into experience-based qualifications is, however, very different from that of the academic track. While the academic track is (strongly and) positively associated with parental attainment (see column 5), it is quite the opposite for the experience-based route (column 2): for both men and women, having less educated parents actually increases the likelihood of certification via work experience.

The parameters in Tables 2 and 3 are not necessarily causal effects of parental education. However, when we condition on dropouts at age 25, the role of unobserved common factors driving education in both generations is less clear than for education among youth. For example, dropouts with highly educated parents are likely to hold other characteristics or face constraints that hamper adult completion, simply because they have not completed as expected by age 25.

Our evidence clearly documents that adults who acquire upper secondary qualifications have less favorable parental education than those who complete before age 25. The vocational routes are particularly important in explaining why the social gradient declines with age. This conclusion is however based on a parsimonious model where (i) educational attainment of both parents are equally important, (ii) marginal effects of more educated parents are constant, and (iii) other family characteristics are left out of the equation. In the next section, we extend the framework along each of these dimensions in order to address whether our results are robust to such specification issues.

6. Extensions and Robustness Checks

6.1. Education of Mother vs. Father

In Table 4, we relax the assumption that mothers and fathers are equally important for completion of upper secondary education, and report estimates from an extended regression model where attainment of each parent enters additively. The first two columns replicate the specifications of Table 2, columns 1 and 2, allowing the coefficients of mother and father´s schooling to take different values. Importantly, whether we consider the attainment of the mother or the father, the key mes-

Table 3. Completion of upper secondary education, age 40. Conditional on dropout age 25.

		Completion age 40 by adult route			
	Completed age 40 (1)	**Experience based** (2)	**Apprentice** (3)	**School-based vocational** (4)	**Academic track** (5)
A. Men					
Parental educ	0.0115***	−0.0039***	0.0009***	0.0002	0.0144***
	(0.0007)	(0.0005)	(0.0003)	(0.0002)	(0.0005)
Adj R^2	0.0091	0.0020	0.0003	0.0000	0.0316
Observations	29 960	29 960	29 960	29 960	29 960
Mean dep var	0.255	0.111	0.040	0.009	0.095
B. Women					
Parental educ	0.0140***	−0.0032***	−0.0003	−0.0020***	0.0194***
	(0.0009)	(0.0005)	(0.0003)	(0.0002)	(0.0007)
Adj R^2	0.0097	0.0017	0.0000	0.0006	0.0314
Observations	25 993	25 993	25 993	25 993	25 993
Mean dep var	0.346	0.072	0.033	0.078	0.162

Notes: */**/*** statistically significant at 10/5/1% level. Standard errors are reported in parentheses.

sage from the prior section persists—the relationship between parental education and offspring completion attenuates between ages 25 and 40. According to the estimates in Table 4, for men the role of mother's attainment declines by 17% and that of father's attainment by 20% (compared to the overall decline of 18% in Table 2). For women, the relationships attenuate by 27% (mother) and 29% (father), compared to 28% in Table 2.

The last four columns of Table 4 examine completion by adult route for dropouts at age 25. Again, the chief lesson from the baseline model prevails—the experience-based route reduces the social gradient most strongly. Whether we consider male or female dropouts, or schooling of the mother or the father, parental attainment exhibits a statistically significant, negative relationship with acquisition of qualifications via the experience-based route. Conversely, for dropouts, adult completion through the academic track relates positively to parental attainment, whether of the mother or the father.

The estimates in columns 1 and 2 indicate that schooling of the mother has a greater influence on female completion than schooling of the father. This conclusion rests on the particular metric used, however. As Table 1 showed, years of schooling exhibit much less variation across mothers than fathers, and when we evaluate the influence of parental education in terms of standard deviations, results show the same relationship with mother and father's schooling. To illustrate, at age 40, a one

Table 4. Completion of upper secondary education: mother's vs. father's years of schooling.

			Completion age 40 by adult route among dropouts			
	Completed age 25 (1)	**Completed age 40** (2)	**Experience based** (3)	**Apprentice** (4)	**School-based vocational** (5)	**Academic track** (6)
A. Men						
Mother educ	0.0233***	0.0194***	−0.0034***	0.0002	−0.0003	0.0178***
	(0.0006)	(0.0005)	(0.0010)	(0.0006)	(0.0003)	(0.0009)
Father educ	0.0236***	0.0189***	−0.0043***	0.0015***	0.0005*	0.0118***
	(0.0005)	(0.0004)	(0.0008)	(0.0005)	(0.0003)	(0.0008)
Adj R^2	0.0658	0.0545	0.0020	0.0003	0.0001	0.0321
Observations	125 207	125 207	29 960	29 960	29 960	29 960
B. Women						
Mother educ	0.0264***	0.0193***	−0.0046***	0.0005	−0.0042***	0.0264***
	(0.0005)	(0.0005)	(0.0010)	(0.0007)	(0.0010)	(0.0013)
Father educ	0.0227***	0.0162***	−0.0022***	−0.0009*	−0.0004	0.0144***
	(0.0005)	(0.0004)	(0.0008)	(0.0005)	(0.0008)	(0.0011)
Adj R^2	0.0754	0.0547	0.0017	0.0000	0.0008	0.0327
Observations	121 127	121 127	25 993	25 993	25 993	25 993

Notes: */**/*** Statistically significant at 10/5/1% level. Standard errors are reported in parentheses.

standard deviation increase in either mother or father's schooling increases the completion rate of daughters by 4.7 percentage points. The only finding in Table 4 that is invariant to standardization of parental schooling is the result in column 6. For dropouts, the attainment of the mother is more important than that of the father for adult completion of upper secondary education through the academic track.

6.2. Decreasing Returns to Parental Education?

Our baseline model assumes that parental education predicts offspring completion linearly, but, as the binned scatter plots in Figure 4 show, the data reveal a clear pattern of decreasing returns. The increase in the completion rate associated with an additional year of parental education declines when parents are highly educated. Our main interest, however, is the role of completion during adulthood and we see from the figure that marginal effects of parental education are lower (the curve is flatter) at age 40 than age 25. To account for decreasing marginal effects of parental education, we replace the linear model with a second order polynomial of parental attainment. In Table A2 in the Appendix, we report marginal effects of parental education evaluated at median parental attainment and find that the decline in the social gradient is similar to that revealed by the baseline, linear model.

Figure 5 displays binned scatter plots in the sample of dropouts at age 25, comparing the alternative routes to adult qualifications. There is little indication that the linearity assumption is not justified and Table A2 con-

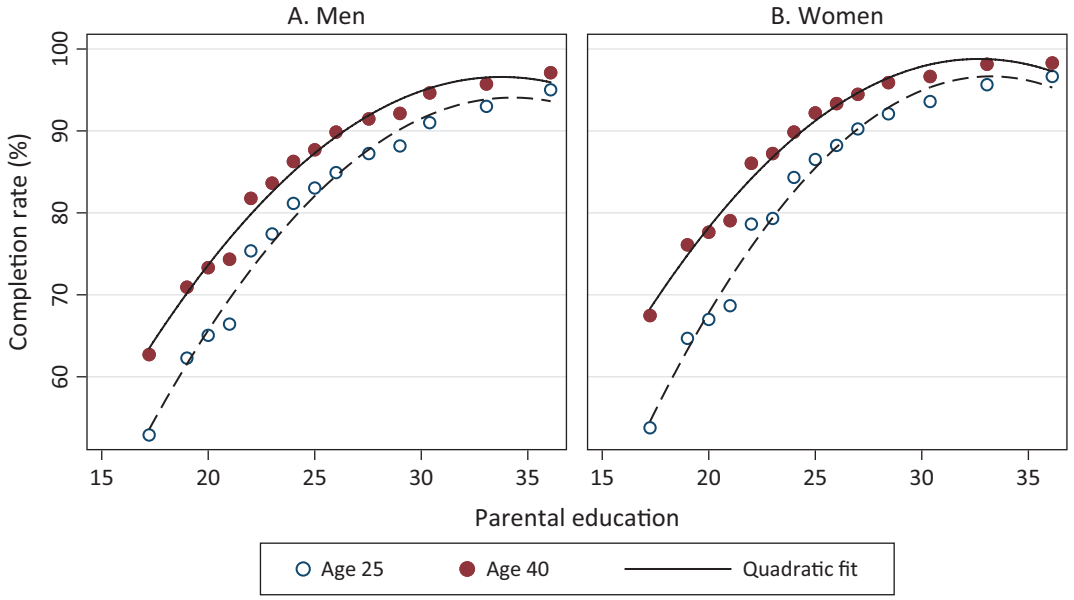

Figure 4. Binned scatter plots of relationship between parental attainment and completion of upper secondary education, by age and gender.

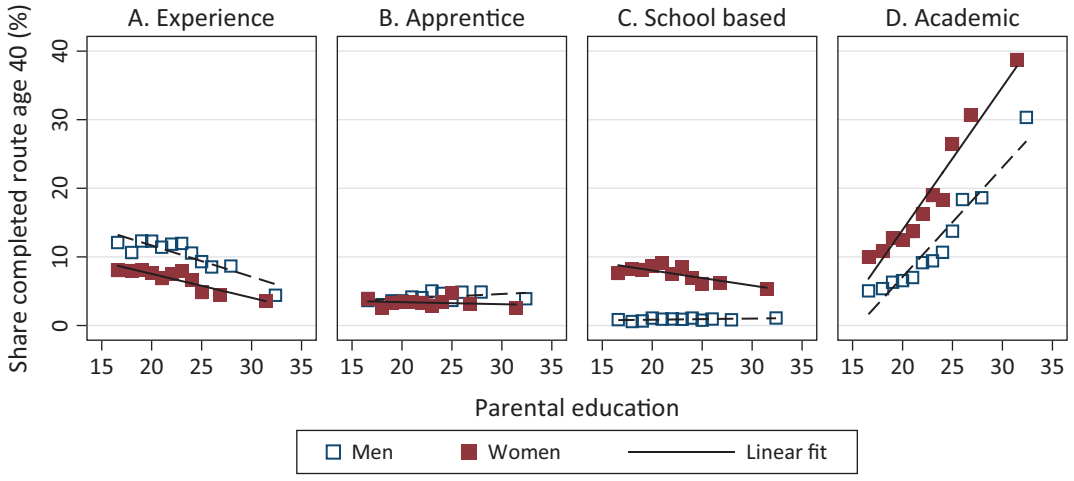

Figure 5. Adult completion of upper secondary education and parental education. Binned scatter plots by route of completion. Note: Samples consist of dropouts age 25, observation counts are 29,960 men and 25,993 women.

firms previous results. Evaluated at the median, an additional year of parental education is associated with a lower probability of experience-based vocational qualifications, while completion through the academic track is more likely. The point estimates are comparable to those of the linear model reported in Table 3. This shows that our conclusions do not hinge on the assumption of a constant marginal effect of parental education.

6.3. Accounting for Other Family Background Characteristics

Family background is more than parental education. Next, we check whether our findings are robust to an extended representation of family background, addressing the question of whether parental education simply reflects other characteristics. In Table A3 in the Appendix, columns 1 and 2, we compare the associations between parental attainment and completion at ages 25 and 40, controlling for other commonly used indicators on family background such as parental earnings, age at childbirth, marital status, and municipality of residence at age 19. Not surprisingly, the parental education coefficients are moderately lower than those in Table 2 but remain statistically significant and the relative attenuation between age 25 and 40 is of similar magnitude to that in Table 2. Further, the pattern of lower coefficients (i.e., lower social gradient) at age 40 extends to other family characteristics like parental earnings and marital status. Finally, as in Table 2, there is a distinct decline in the adjusted R-squared from age 25 to age 40, showing a reduction in the overall association between completion of upper secondary education and parental background characteristics.

In the sample of dropouts at age 25, the patterns of Table 3 remain unaffected by the inclusion of other family characteristics (see Table A3, columns 3 to 6). While dropouts with low educated parents are more likely to acquire experience-based qualifications, they are less likely to complete through the academic track. Higher parental earnings raise the probability of academic qualifications but is unrelated to vocational qualifications acquired through work experience.

7. Discussion and Conclusion

Youth who do not complete upper secondary education disproportionately have parents with low educational attainment (see, e.g., Rumberger, 1987). For youths our study confirms prior evidence (Hansen, 1997): even in the relatively uniform Norwegian education system with high completion rates, there is a strong social gradient in educational attainment. For example, we find that, at age 25, one more year of parental education is associated with an increase in upper secondary completion by 2.4% for both men and women.

Our focus is on the role played by institutions that offer opportunities for adults to complete upper secondary education. Does adult attainment reduce initial social differences in education, or does it reinforce such differences? Our main contribution has been to document differential patterns across alternative routes to adult qualifications and, in particular, to analyze the role of routes based on workplace learning. Using individual panels from administrative registers, we study upper secondary completion through age 40 for five birth cohorts (1973–1977). We find that the influence of parental education on upper secondary completion declines with age, meaning that the total qualifying activity for adults does mitigate social gradients. At age 40 one more year of parental education is associated with an increase in upper secondary completion of 1.9% and 1.8% for men and women respectively—still a substantial correlation, but significantly lower than at age 25. Adults who complete upper secondary education for the first time come more often from families with high educational attainment compared to those who do not complete by age 40, but less so than those who complete as youths.

An important finding is that alternative routes to upper secondary qualifications recruit from different family education backgrounds. The experience-based route unequivocally lowers the social gradient as completion through the route is negatively correlated with parental education, both in the total sample (Table 2) and when we condition the sample on those who did not complete secondary education by age 25 (Table 3). In its absence, many of those who acquire qualifications through this route would likely not complete upper secondary education at all (for a qualitative study of adults who complete this route see Aspøy & Tønder, 2017). For men, the experience-based route explains 74% of the reduction of the correlation between parental education and attainment between ages 25 and 40. For women, the figure is 31%. It is reasonable to attribute the special recruitment pattern of the experience-based route to the low threshold it establishes. The experience-based route builds on informally gained competence at the workplace and does not require re-entry into the classroom or self-studying. Previous research indicates that such requirements represent a strong barrier to entry for individuals with a low-education family background (see, e.g., Illeris, 2006). A second route based on learning at work, adult apprenticeships, is similar to the experience-based route in that it does not require extensive re-entry into classroom settings, but it still entails an active decision to enter training for a prolonged period. This route does not have the same low parental education selection profile as the experience-based route but is not particularly associated with high parental education either. The same is true for the now marginal school-based vocational routes, although for women without upper secondary qualifications at age 25, the route does correlate with low parental education. Among dropouts at age 25, adult completion through the academic track correlates clearly with a high parental education background. It is interesting to note that each of the four alternative routes

still contributes to a weakening of the social gradient from age 25 to 40, even the academic track, because the correlation with parental education is weaker than it is for completion as youths.

At first glance, our evidence appears at odds with prior research suggesting similar social recruitment patterns among adults and youth (Glorieux et al., 2011). Partly this is true; partly the difference is superficial. Like previous research, our study shows that those who complete as adults do have parents with more education than those who never complete upper secondary education. But we also show that adult qualifying activities reduce the social gradient in completion, and as such reduce social inequalities. More importantly, our case differs from previous studies in that we also examine adult education routes based on workplace learning. We show that especially one such route, the experience-based route, has a different social recruitment pattern and attracts adults with low parental education. This institution plays an important role in reducing the social gradient and seems to work differently than institutions studied in prior research. While our conclusion is that all adult routes studied to some extent reduce the social gradient, the experience-based route is the strongest contributor.

Our analysis reveals substantial gender differences. Men use the experience-based route extensively. As mentioned above, completion through the experience-based route explains almost three quarters of the reduction in the correlation with parental education from age 25 to 40, with apprenticeship a distant second. For women, the pattern is more mixed. All qualifying routes reduce the correlation between parental education and attainment from age 25 to 40. Women qualify more often through the academic track and the school-based vocational route, which explains why both contribute substantially to the reduction in the correlation with age, despite the academic track's association with a higher parental education than the other three routes. The gender patterns relate to gender segregation in the Norwegian education system and labor market. Gender segregation in the education system seems to be stronger in systems with strong vocational education principles linked to occupational labor markets (Imdorf, Hegna, & Reizel, 2015). In Norway, men choose VET and apprenticeships to a higher degree than women who more often go on to higher education as adults. VET itself is highly gender segregated across fields. School-based vocational tracks have almost exclusively existed in the health care field and have primarily attracted women.

The empirical analysis does not account for "anticipation effects", whereby the existence of adult routes to upper secondary qualifications affects the educational choices of youth. In the US, scholars have documented that access to GED induces dropout among young high school students (Heckman, Humphries, LaFontaine, & Rodriguez, 2012). However, interviews with individuals who have completed vocational qualifications as adults through the experience-based route show that they were not aware of this route, or indeed any adult route, while they were young (Aspøy & Tønder, 2017). Generally, studies of school dropouts show that dropout decisions reflect the current life situation of youth, sometimes with little forward calculation of options (e.g., Thrana, 2016).

Our evidence points to favorable effects of policies and institutions that offer opportunities for certification of qualifications acquired at work. There are limitations, however, to what can be achieved with such policies. The experience-based route is, by definition, only available for workers with stable employment. The non-employed need other ways to qualify. Adult apprenticeships also contribute to a lower social gradient in education, although much less than the experience-based route, and is available for individuals previously outside the labor market. A second reservation is that adults going through the experience-based route often are exempted from taking general subjects, which may reduce their capacity to change jobs or industry in response to structural change, but as of yet there are no analyses that substantiate or alleviate such concerns.

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Conflict of Interests

The authors declare no conflict of interests.

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Appendix

Supplementary descriptive statistics and empirical results

Table A1. Top five fields of study by adult route to completion of upper secondary education.

Experience based	Adult apprentice	School-based vocational	Academic track
A. Men			
457901 6.8%	457129 12.7%	461201 27.7%	401101 8.4%
Constr machine oper	Carpentry	Nursing aux skills	General subjects
457129 6.5%	455103 9.6%	455138 7.8%	401110 2.6%
Carpentry	Electr engineering	Comp electr level 4	Suppl university admis
454102 5.2%	457121 9.0%	479901 5.5%	622101 2.6%
Transp terminal oper	Plumbing	Agriculture	Teacher
481905 5.0%	455204 3.9%	455128 4.1%	661120 2.6%
Logistics	Mechanic, light motor	Comp electr level 3	Nursing
481401 4.5%	457118 3.4%	461903 3.4%	661305 1.9%
Transport driver	Painting	Health work	Social educator
N = 3 327	N = 1 200	N = 271	N = 2 843
B. Women			
462101 29.8%	461902 24.0%	461201 56.6%	661120 11.8%
Child care youth work	Care work	Nursing aux skills	Nursing
469907 13.8%	462101 21.7%	469908 18.1%	401101 9.2%
Institutional cleaning	Child care youth work	Medical secretary	General subjects
461903 12.8%	483101 9.0%	464201 3.9%	621105 6.3%
Health work	Ladies' hairdressing	Dental assistant	Pre-school teacher
461902 9.8%	458106 5.3%	466301 3.9%	661305 4.1%
Care work	Institutional cookery	Pharmacy skills	Social educator
442101 4.5%	461903 4.6%	461903 3.0%	622101 3.8%
Retailing	Health work	Health work	Teacher
N = 1 865	N = 866	N = 2 038	N = 4 214

Notes: Six-digit code refers to the Norwegian Standard Classification of Education (NUS2000). One field of study, 461903 Health work, appears in both the apprentice and school-based categories. Within this field, those classified in the school category had their training in school.

Table A2. Completion of upper secondary education; quadratic specification of parental years of schooling.

			Completion age 40 by adult route			
	Completed age 25 (1)	Completed age 40 (2)	Experience based (3)	Apprentice (4)	School-based vocational (5)	Academic track (6)
A. Men						
Parent ed-23	0.0315***	0.0261***	−0.0034***	0.0011***	0.0002	0.0134***
	(0.0003)	(0.0003)	(0.0005)	(0.0003)	(0.0002)	(0.0005)
(Par ed-23)^2	−0.0014***	−0.0012***	−0.0003***	−0.0001**	−0.0000	0.0007***
	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0001)
Adj R^2	0.0744	0.0624	0.0025	0.0004	0.0000	0.0340
Observations	125 207	125 207	29 960	29 960	29 960	29 960
B. Women						
Parent ed-23	0.0337***	0.0248***	−0.0031***	−0.0003	−0.0019***	0.0191***
	(0.0003)	(0.0003)	(0.0005)	(0.0003)	(0.0005)	(0.0007)
(Par ed-23)^2	−0.0017***	−0.0013***	−0.0002*	−0.0000	−0.0002***	0.0006***
	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Adj R^2	0.0878	0.0650	0.0018	0.0000	0.0009	0.0325
Observations	121 127	121 127	25 993	25 993	25 993	25 993

Notes: */**/*** statistically significant at 10/5/1% level. Standard errors are reported in parentheses. The median parental schooling in the sample is 23.

Table A3. Completion of upper secondary education; extended parental background characteristics.

			Completion age 40 by adult route			
	Completed age 25 (1)	**Completed age 40** (2)	**Experience based** (3)	**Apprentice** (4)	**School-based vocational** (5)	**Academic track** (6)
A. Men						
Parental ed	0.0268***	0.0225***	−0.0026***	0.0009**	0.0002	0.0122***
	(0.0004)	(0.0003)	(0.0006)	(0.0004)	(0.0002)	(0.0005)
(Par ed)^2	−0.0014***	−0.0012***	−0.0003***	−0.0001***	−0.0000	0.0006***
	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0001)
Par earnings	0.0110***	0.0094***	0.0004	0.0011***	−0.0001	0.0030***
	(0.0004)	(0.0004)	(0.0007)	(0.0004)	(0.0002)	(0.0006)
(Par earn)^2	−0.0002***	−0.0001***	−0.0001*	−0.0000	−0.0000	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Mother age	0.0040***	0.0033***	0.0000	0.0001	−0.0001	0.0012**
	(0.0004)	(0.0004)	(0.0006)	(0.0004)	(0.0002)	(0.0006)
(M age)^2	−0.0002***	−0.0001***	−0.0001	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0001)
Father age	0.0014***	0.0012***	0.0005	0.0003	0.0002	−0.0005
	(0.0004)	(0.0004)	(0.0006)	(0.0004)	(0.0002)	(0.0005)
(Fath age)^2	0.0000	0.0000	−0.0000	0.0000	−0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Par married	0.1141***	0.0913***	0.0252***	0.0011	−0.0036**	−0.0069
	(0.0042)	(0.0038)	(0.0057)	(0.0035)	(0.0017)	(0.0052)
Par divorced	−0.0207***	−0.0123***	0.0127**	0.0010	−0.0047**	−0.0063
	(0.0048)	(0.0043)	(0.0061)	(0.0038)	(0.0018)	(0.0056)
Adj R^2	0.1171	0.0979	0.0181	0.0085	0.0018	0.0418
Observations	124 957	124 957	29 887	29 887	29 887	29 887
B. Women						
Parental ed	0.0289***	0.0218***	−0.0027***	0.0000	−0.0014***	0.0184***
	(0.0004)	(0.0003)	(0.0005)	(0.0004)	(0.0006)	(0.0008)
(Par ed)^2	−0.0017***	−0.0013***	−0.0001	0.0000	−0.0002***	0.0005***
	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Par earnings	0.0116***	0.0088***	0.0003	0.0000	0.0003	0.0039***
	(0.0004)	(0.0004)	(0.0006)	(0.0004)	(0.0006)	(0.0008)
(Par earn)^2	−0.0003***	−0.0002***	−0.0002**	−0.0000	−0.0000	−0.0000
	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Mother age	0.0052***	0.0033***	0.0008	0.0002	−0.0002	−0.0007
	(0.0004)	(0.0004)	(0.0005)	(0.0004)	(0.0006)	(0.0008)
(M age)^2	−0.0002***	−0.0001***	−0.0001	0.0000	−0.0000	0.0001
	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0001)	(0.0001)
Father age	0.0006	0.0006*	−0.0006	−0.0001	0.0001	0.0014*
	(0.0004)	(0.0003)	(0.0005)	(0.0004)	(0.0005)	(0.0007)
(Fath age)^2	0.0000	0.0000*	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Par married	0.0982***	0.0609***	0.0089*	−0.0042	0.0000	−0.0160**
	(0.0041)	(0.0035)	(0.0049)	(0.0034)	(0.0052)	(0.0070)
Par divorced	−0.0107**	−0.0116***	−0.0040	−0.0015	−0.0065	−0.0022
	(0.0046)	(0.0040)	(0.0053)	(0.0037)	(0.0056)	(0.0075)
Adj R^2	0.1253	0.0979	0.0142	0.0112	0.0069	0.0440
Observations	120 505	120 505	25 909	25 909	25 909	25 909

Notes: */**/*** statistically significant at 10/5/1% level. Standard errors are reported in parentheses. Regression also controls for 428 municipalities of residence age 19. Linear coefficients of parental attainment, earnings, and age are evaluated at sample median values (23 years of schooling, earnings of NOK 789 384, and ages 26 and 28). Earnings are the combined annual earnings of both parents between ages 11 and 15, inflated to 2015 100 000 NOKs. Mother and father's age are at child-birth, and marital status is at age 19 (omitted category is never married).

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Article

Why Enrol in a Lifelong Learning Programme? A Comparative Study of Austrian and Spanish Young Adults

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Abstract
Lifelong learning (LLL) programmes can be perceived as a means of governing youth transitions. Young adults can use such programmes to try to overcome different constraints in their life course. This article explores the decisions of young adults in Vienna (Austria) and Malaga (Spain) who are participating in different LLL programmes that seek to address their transition from unemployment to employment. In order to understand these decisions, we want to explore: (1) how the young adult's experiences influenced their decision to engage with an LLL programme, (2) what role these programmes played in their biographies and (3) how young adults imagine their future. We use two theoretical lenses to explore these questions: bounded agency and projectivity. A comparative study of these two regions provides insight into how different contextual conditions influence young adults' decisions. We perform three different analyses: of the young people's past trajectories and transitions, of their imagined futures, and of their decision to enrol in the programme. Exploring young people's subjective accounts of their pasts and their imagined futures helps to improve our understanding of the role young people believe these programmes play in their lives, why they have decided to enrol in them, and how they use and interpret these pathways through, and in the framework of, different contextual conditions.

Keywords
education; employability; learning programmes; life course; lifelong learning; young adults

Issue
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1. Introduction

The character of life courses has changed in recent decades. During the Fordist period, the arrangement of work, welfare and life course were characterised as highly linear and predictable. In the Fordist life course regime, life phases were organised in a tripartite manner: education during youth, work during adulthood and retirement during old age (Du Bois-Reymond & López Blasco, 2004; European Group for Integrated Social Research [EGRIS], 2001). Scholars such as Walther and Stauber (2006) have questioned this assumption, however. Transitions from youth to adulthood, as well as from education to employment, have become more complex and fragmented, a phenomenon referred to as "destandardisation" (cf. EGRIS, 2001). Today, life courses are understood as less linear, with reversible "yo-yo" movements (cf. EGRIS, 2001; Walther, 2006) during transitions. For example, these movements could take the form of undertaking training, being employed in a temporary job, being unemployed, being retrained and being employed in a different job (cf. Du Bois-Reymond & López Blasco, 2004).

Life courses are also heavily influenced by the institutional configuration of the welfare state. Cultural patterns as well as structural factors interact with insti-

tutional elements. The opportunity structure (Roberts, 2009) in which young adults make their decisions and which enables or constrains their choices is the result of the interaction of various dimensions, such as the labour market and the educational system, but also the welfare system, broadly conceived. Walther (2006, 2017) compiles and enlarges the typology of life course regimes by examining the interdependence among structural and institutional factors (i.e., welfare regimes and the educational system), as well as cultural patterns (i.e., conceptions of youth and narratives about transitions) across different levels of social reality, from micro to macro, and orienting programmes that address transition points in life courses.

Walther's typologies (2006, 2017) distinguish five different transition regimes: universalistic, liberal, employment-centred, sub-protective or under-institutionalised, and post-socialist. Whereas Austria is a continental country characterised as an employment-centred transition regime, Spain belongs to the under-institutionalised regime. In countries classified as employment-centred transition regimes, the education system is more selective and has different tracks. Vocational Education and Training (VET) plays a central role and is relatively standardised, reproducing a highly regulated employment regime. Labour markets are standardised, and young adults who undergo yo-yo transitions must navigate restricted options for individual choice and strong demands. Countries associated with the sub-protective or under-institutionalised transition regime, such as Spain, in contrast, have a low percentage of standard work arrangements and a high rate of unprotected living conditions. This creates a 'dualistic' welfare regime in which the family and informal work play a significant role. School is structured comprehensively but still in fact produces differentiation processes. Vocational Education is weakly developed and largely provided by professional schools. Lack of training and labour market segmentation contribute to very high rates of unemployment. Segmented labour markets produce populations with different characteristics, and skilled occupations and divergent occupational areas are subject to different risks of social exclusion (Du Bois-Reymond & López Blasco, 2004). For instance, segmentation in the Spanish labour market is divided into permanent and temporary jobs (García-Mainar & Montuerga, 2019), as well as full-time and part-time jobs in combination with movements into and out of unemployment. Part-time jobs and such movements affect women especially (Blázquez & Moral, 2014). Young adults experiencing these yo-yo transitions depend greatly on family support, as they receive almost no significant support from the state (Walther, 2006).

A life course perspective and, more specifically, the bounded agency and projectivity approaches, are a useful analytical lens through which to explore and analyse agency and opportunity structures, which are interrelated and determine the life course and its transition points (Heinz, 2010). This article explores the decisions of young adults in a transition phase from unemployment to employment who are enrolled in different public lifelong learning (LLL) programmes connected to the labour market. These programmes provide apprenticeships or training courses in the functional regions of Vienna (Austria) and Malaga (Spain). Functional regions are analytical units used in the YOUNG_ADULLLT project, based on spatial, functional dynamics (Lowden, Pandolfini, & Parreira do Amaral, 2018).

Within the European Union (EU), the idea of LLL has been developed at policy level through the Lisbon Strategy and the Education and Training 2010 programme (Nóvoa, 2010). The Education and Training 2020 programme, a framework for cooperation between EU Member States for the period 2010–2020, is based on an LLL approach and has strengthened this trend, building on the achievements of the 2010 programme.

LLL policies are characterised by the EU as purposeful activities with similar goals and objectives: they stress primarily economic goals and growth but also social inclusion and personal fulfilment (Alves, Neves, & Gomes, 2010). A recent analysis showed, however, that LLL policies and programmes across Europe were oriented to the idea of increasing employability and economic growth (Kotthof et al., 2017). This orientation is also reflected in the way young adults perceive the programmes, as described by Kovacheva, Jacovkis, Startari and Siri (2018).

The EU fosters LLL policies that promote and provide diverse types of education and learning. For instance, they include general and vocational settings, and formal, non-formal and informal contexts, spanning preschool to higher education. Adults and young adults are their main target groups, to a greater extent than children or the elderly (Alves et al., 2010). This wide range of LLL policies—and therefore also of LLL programmes—includes education and training programmes that seek to address the unemployment-to-employment transition of young adults. Some of these programmes, such as those included in this article, are closely related to the VET sphere and to non-formal education settings.

Examining young people's biographies, the way they are influenced by structural, institutional and cultural factors and the manner in which young adults interpret and use the different pathways enables us to search for patterns in the ways in which they use LLL programmes. To understand the decisions that young adults take concerning their participation in an LLL programme, we want to explore:

(1) How their past experiences influenced their decision to take part in an LLL programme;
(2) What role these programmes played in their life course;
(3) How young adults imagine their future.

Our main contribution consists of highlighting young adults' voices and perspectives by exploring the biographies of LLL participants in Vienna and Malaga. A country-

comparison provides useful information regarding similarities and differences in contextual information that can help to better understand the role of structural, institutional and cultural factors. We assume that comparative cross-national analysis will help to depict how different contextual conditions relate to young adults' decisions and projections about their future. This research aims to advance understanding of ways the biographies of young adults reflect the transition regimes differently and how LLL programmes shape their lives in relation to their opportunity structure, past experiences and future plans.

2. Theoretical Framework

2.1. Bounded Agency and the Projectivity Approach

Individuals negotiate their agency with the structures surrounding them in changing landscapes, characterised, for instance, by changes in the labour market. People's lives are connected to these changing living conditions. *Agency* (Evans, 2007) is understood as *bounded*, as temporally embedded and as a socially situated process in which past experiences and future possibilities are reformulated within the contingencies of the present moment. Agency can thus be perceived as a dynamic and temporal process influenced by the environment (Evans & Biasin, 2017). Past trajectories and transition outcomes, identity development, personal interests and projections about the future, and people's perception of their opportunities become relevant to their decision processes (Evans, 2007).

The *projectivity approach* (Emirbayer & Mische, 1998) proposes an analytical lens for exploring the relation between past, present and future. Expectations and aspirations for one's future are shaped by the agency influenced by the past (i.e., previous experiences of patterns of behaviours), moderated by the present and oriented towards the future. While the past is revealed in action as habitual or routine practices, the present is the agency visible in deciding on and executing concrete actions, and the future frames the imagination and creation of the possible, for instance, through the actor's hopes, fears and desires for the future. When young adults construct their narratives, projectivity serves as a framework for their life course. In short, projections are imaginations about the future that guide current behaviour, which in turn shapes interrelated and intertwined outcomes. Horizons of action are different in different contexts (Biggart, Järvinen, & Parreira do Amaral, 2015). The projectivity approach thus helps us to analyse individuals' projections, which can vary along different dimensions, including clarity, intentionality, imagined order and the timing of events (Emirbayer & Mische, 1998).

2.2. Bounded Agency, Projectivity and Enrolment in an LLL Programme

The character of life course transitions has changed over the last 60 years (Du Bois-Reymond & López Blasco, 2004). These transitions are influenced by different societal trends, such as the inflation and importance of educational credentials, diversification in coupling forms (e.g., remarriage), reductions in welfare state provision, structural unemployment and labour market de-regulation, which resulted in increased enforced flexibility and temporary employments (Brückner & Mayer, 2005).

Although life courses are now understood predominantly as de-standardised, most LLL policies and programmes seem to have been developed according to the scheme of standardised and linear life courses (Kotthof et al., 2017). The introduction of LLL policies can be understood as one of policy makers' attempts to govern youth transitions. These policies cover vocational settings, including formal and non-formal contexts (Alves et al., 2010). In both formal and non-formal settings, VET can be included among them. VET is one of the instruments supporting the transition from school and training to work; it also eases the transitions of those who inhabit "wild zones" (i.e., young adults who face greater risks due to increasing uncertainty) and helps them to navigate to more secure "tame zones" (Kelly, 1999). People can therefore use social and educational programmes to overcome different structural constraints (Evans, 2007). They can understand LLL programmes as providers of new life-course opportunities, for instance, in relation to their labour market integration.

Young adults frame the decision to enrol in an LLL programme by considering their past trajectories, their projections about their future and the contingencies of the present moment (Emirbayer & Mische, 1998; Evans, 2007). This decision is influenced and shaped by wider contextual factors, such as the welfare state or the labour market (Evans & Biasin, 2017; Walther, 2006). Pawson (2006) describes programmes as embedded in different levels (macro-meso-micro) and dimensions of social reality. Social change also depends, however, on the characteristics of their participants.

2.3. Young Adults' Living Conditions in Austria and Vienna

As explained in Section 1, Walther's typology of transition regimes describes Austria (Vienna) as an employment-centred country and Spain (Malaga, Andalusia) as sub-protective (Walther, 2006) or under-institutionalised (Walther, 2017). Because typologies are conceived as static, we present the following data on the living conditions of young adults in both regions to refine them.

According to Eurostat data for 2017, rates of Early School Leaving (people aged 16–24 with an ISCED 0–2 classification) differed substantially in Andalusia (23.5%) and Vienna (9.6%). Moreover, the proportion of the age group 30–34 years with an ISCED 5–8 classification was lower in Andalusia (32.3%) than in Vienna (50.4%).

As is to be expected from the typology, the unemployment rates are substantially higher in Andalusia than in Vienna, especially for young people (Figure 1).

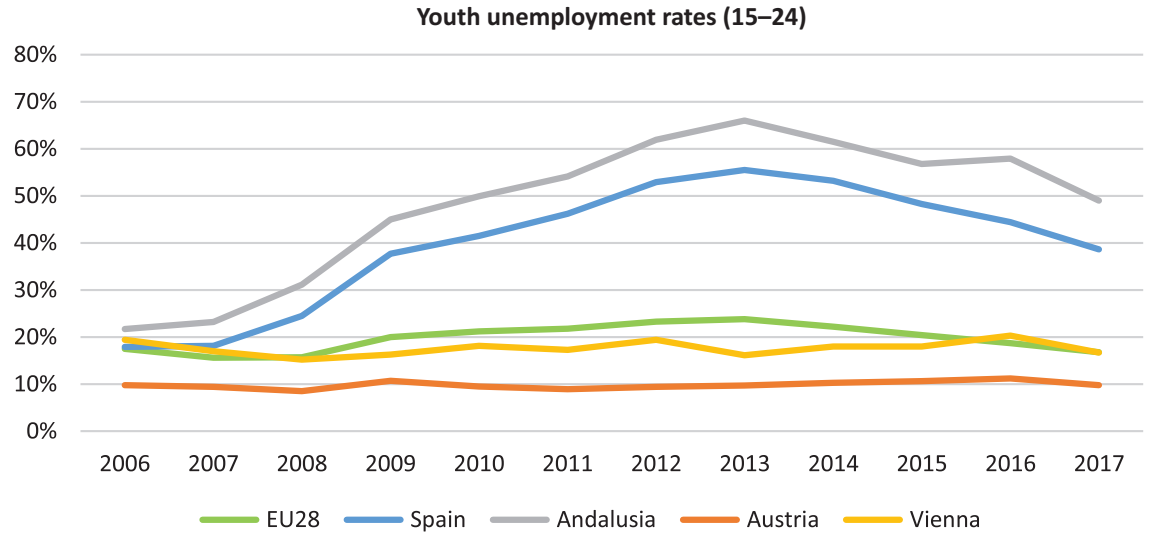

Figure 1. Youth unemployment rates, age group 15–24 years. Source: developed by the authors with Eurostat (2019) data.

Due to a lack of reliable paths to the labour market, which is characterised by situations of generalised unemployment or over-qualification, gaps between the spheres of education, training and labour are higher in under-institutionalised regimes than in employment-centred ones, where youth transitions are more structured. Less-institutionalised transition systems may be related to both greater risks and a wider scope for agency and individualised decisions by young people during their transitions (Evans, 2007), as these people can identify more areas in which to perform alternative strategies for labour integration. Young adults in under-institutionalised regimes thus tend to bridge these gaps actively during their less-institutionalised transitions through self-employment, volunteer work or higher mobilisation of social capital, such as personal contacts (Walther & Stauber, 2006). Self-employment rates increased during the 2007 economic crisis, from 21.8% (2006) to 28.6% (2017) in the functional region of Malaga (Fundación Málaga Desarrollo y Calidad, 2019).

Following Walther (2006), labour markets in employment-centred regimes may be divided into a core with higher levels of standardisation and protection and a more precarious periphery, due perhaps to the fact that young adults with lower ISCED-level credentials are much more vulnerable to temporary contracts than those with higher ISCED levels (Figure 2). In line with the typology, the Andalusian labour market shows higher rates of temporary jobs, which affect all ISCED levels (Figure 2), combined with other forms of precarious and informal employment and over-qualification. For example, Andalusia showed a 51.2% of over-qualification in the first six months of 2017, higher than the 47.7% of the Spanish national average (Consejo de la Juventud de España, 2017). In under-institutionalised regimes, young adults experience such forms of informal and temporary jobs as a way to achieve some independence from the family (Walther, 2006).

In countries in the employment-centred regime category, social security is provided by both family and the

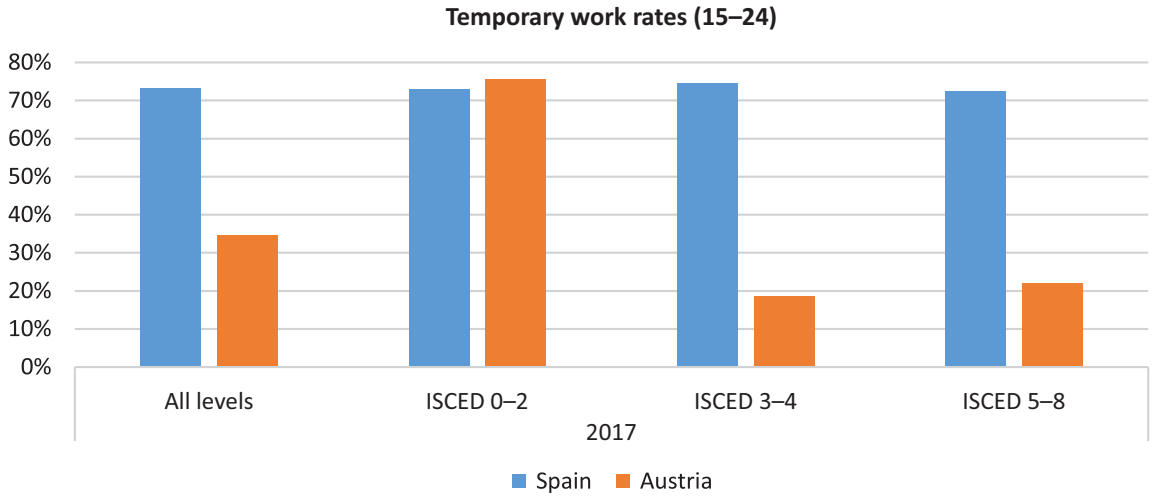

Figure 2. Temporary work rates, age group 15–24 years. Source: developed by the authors with Eurostat (2019) data.

state, although state aid is viewed with ambivalence by young adults. In countries in the under-institutionalised regime, in contrast, family is the centre of social security (Walther, 2006). Family works as a "social shock absorber" because young adults receive no substantial social benefits from the state (Walther & Stauber, 2006). In Spain, family support provides young adults with some security and flexibility during their transitions, and can act as a "waiting hall" (Du Bois-Reymond & López Blasco, 2004). This protracted economic or habitational dependence on families, in combination with labour market characteristics such as high youth unemployment and other structural deficits (e.g., social services), contributes to labelling young adults as disadvantaged (Walther, 2017).

In employment-centred regimes (Walther, 2006), in contrast, opportunities are more dependent on institutions and structures. Young adults are more inclined to believe that the qualifications and educational paths to labour market entry offer better prospects, as reflected in the low rates of unemployment and better labour conditions (i.e., contracts). This power attributed to educational and training-system structures and their paths to a standardised labour market may, however, be associated either with individuals' lower self-responsibility in the case of failure or with processes that stigmatise 'the losers' who follow less-valued pre-vocational pathways (Walther, 2006).

3. Methodology

We performed an in-depth literature review of the concepts and themes relevant to the research question and used these to ground the research design. The data analysis method chosen consists of two research steps. First, by examining the biographies of young adults in Vienna and Malaga and describing their main trajectories in different life domains, such as education, work or family, we describe and analyse their decisions to enrol in one of the available LLL programmes and their transition, taking contextual conditions into account (cf. Eurostat, 2019; Walther, 2006, 2017). Second, we analyse their projections about their imagined futures.

3.1. Sample

Our sample consists of 10 young adults from Vienna and 8 from Malaga who were taking part or had taken part in different programmes in these regions (Table 1). The initial sample from Malaga included 10 young adults, but two were eliminated because the programmes in which they participated belonged to the formal education system and not to the public LLL programmes in the labour sphere included in this article and described below.

In Malaga, the Workshop School Programme (2013 edition) is exclusively for unemployed young adults aged 18–25 and forms part of the wider Vocational Training for Employment subsystem in Andalusia. Due to suspicions about funding control in this subsystem, the new edition of the programme was suspended and did not resume until 2018. Workshop schools give priority to individuals who have a deficit in education/training credentials and/or belong to a specific vulnerable group, such as those considered to be at risk of social exclusion. It is an interesting programme because it provides a comprehensive range of activities. Further, it provides young adults with courses to become athletic instructors and teaches them about various topics, related, for example, to gender equality or environmental education. It also offers them the opportunity to prepare for compulsory secondary education examinations. The programme was structured around a one year training period (one year) and a paid apprenticeship (six months) in the same organisation that implements it.

The Vocational Training Courses (2017 edition) have the same two-part structure but focus on professional training, with apprenticeships in local companies. These courses are not just for young adults, although 50% of

Table 1. Distribution of young adults (with fictitious names) in both regions, by programme in which they are enrolled.

Vienna		Malaga	
Programme	**Young adults**	**Programme**	**Young adults**
Just Integration	Ahmed	*PICE*	Sofía
	Faisal		Pedro
	Jana	*Vocational Training Course*	José
	Ioana		Mario
	Musa		Antonio
Back to the Future	Daniel		Pablo
	Habib	*Workshop School*	Mónica
	Jakob		Cecilia
	Alexander		
	Lena		

the positions are reserved for people aged 18–29. Entry criteria vary depending on the course, starting with no requirement for a compulsory secondary education qualification. The courses include traditional crafts, such as gardening and carpentry. The third LLL programme in Malaga is the Comprehensive Programme for Qualification and Employment (PICE; 2017 edition), framed by the EU Youth Guarantee Scheme and aimed at unemployed young adults aged 16–29. After initial orientation sessions, participants may enrol primarily in a range of attendance-based (185 hours) and online (100–150 hours) training courses on a great variety of topics, including language and technological skills for specific professions.

The young adults in Vienna were enrolled in two different programmes (2017 editions). The Back to the Future programme was oriented specifically to Viennese young adults aged 18–24 who were dependent on needs-oriented subsidies and registered at the employment service but had not yet managed to find a job, despite participating in training and an active job search. Participants were provided with coaching, training and transitional employment for a maximum of two years. The project was conceived for young adults with little work experience and special needs who had encountered obstacles to finding long-term employment. The idea was to encourage participants and improve their pre-existing skills through acquisition of additional competence to prepare them for more highly-qualified tasks.

The second programme was JUST Integration. The target group was young adults from Vienna aged 18–30 who faced difficulties entering the labour market due to overlapping disadvantages. One particular target group of this programme was young refugees who had been granted asylum. The young adults were provided with individual support in the form of short apprenticeships based on previous work experience to foster their reintegration into the labour market for six months and ease their transition into work.

3.2. Data Collection

The interviews were performed within the YOUNG_ADULLLT project. Young adults were contacted through snowball sampling with the help of professionals in charge of the programmes in which they were participating. Sampling criteria were based on (Rambla, Jacovkis, Kovacheva, Walther, & Verlage, 2018):

(1) Identifying relevant regions and programmes in the countries that participated in the project—in this article, Vienna (Austria) and Malaga (Spain);
(2) Selecting different young adults (as well as managers, street professionals and experts) who had participated in the same LLL programmes, to provide different accounts of them;
(3) Ensuring diversity among young adults in terms of age (18–29 years of age), gender, ethnicity and origin.

Semi-structured interviews were conducted and transcribed in 2017 on the basis of a common interview guide circulated among YOUNG_ADULLLT project partners to strengthen comparability. The first question was a narrative open question about young adults' lives to obtain information about their life stories. Further questions were then asked about some of the issues raised during the narratives, such as their imagined life plans.

3.3. Data Analysis

Data analysis was performed following Corbin and Strauss's (1990) Grounded Theory (GT) principles. Informed GT (Thornberg, 2012) recognises that researchers who work with GT principles usually have previous knowledge in the field of their research and that this knowledge is reflected in one way or another in the research and data analysis. The data can thus be explored through the lenses of previous knowledge and pre-existing theories. We used the theoretical framework of *bounded agency* and *projectivity* to explore the empirical data in order to feed and expand existing theory on youth transitions. The data analysis started from this article's research questions. Different codes of analysis were introduced, codes closely related to the literature on life course as well as to the research questions, especially those in relation to their experiences in the LLL programme or their future dreams. Table 2 provides a detailed list of the codes employed.

Table 2. Codes for analysing the young adults' interviews.

Previous trajectories	Projections
Family	
Education	
Health	
Labour market experiences	Future dreams
Reflexivity towards skills	Specific next steps
LLL programme	
Experience in LLL programme	
Other past experiences	

Once the interviews were coded, we ordered the different transitions experienced by each of the young adults in our sample chronologically. Each 'life as narrated' was thus interpreted against the backdrop of its contextual conditions, past transitions and projections about the future, with attention to the speaker's accounts of transitions and decisions, especially the transition into LLL. Later, two comparisons were made, one within the regional sample and another with the samples from both countries, to identify and analyse patterns of similarity and difference based on the codes and research questions explored. Attention was also paid to other sociodemographic issues, such as age, migration background and maximum education credentials (vocational/academic route) obtained.

Comparison in life course studies requires moving both from the macro to the micro and through different dimensions and contexts, such as education or the labour market. Some information is likely to be lost in the process of reducing complexity. We recognise this fact, as well as the risk of being guided considerably by previous theories, as potential limitations of this study.

Nonetheless, the comparative analysis proposed of these two samples of young adults from two quite different countries and regions (different, for instance, in transition regimes and living conditions) can be very useful in depicting the different contextual conditions and how they influence agency. Furthermore, the diversity of our sample can improve understanding of the diversity and complexity that define the social world, and thus the LLL programmes themselves and the biographies of their participants.

4. Results

4.1. The Cases of Pablo and Alexander

We provide in-depth description of two cases: Pablo from Malaga and Alexander from Vienna. These individuals are similar in age, gender and level of educational credentials obtained (Early School Leaving situation). Whereas Early School Leaving is quite common among young adults in both regions, migration is more common among the Viennese young adults. These characteristics of our sample, such as a lack of educational credentials and/or qualification, suggest that the individuals could face difficulties in their later life course. For instance, they could be more prone to disqualified trajectories into the less-protected segments of labour market, with higher risks of unemployment and worse labour conditions.

The narratives of Pablo and Alexander serve as an entry point for exploring the complexity that characterises not only their past trajectories but also their decisions and experiences based on their participation in an LLL programme and their projections for the future. Their narratives reflect the relevance of different characteristics of the transition regimes and broader living conditions, such as the importance of family, the informal economy in Spain and state support in Austria.

4.1.1. The Case of Pablo

Pablo, age 21, grew up in Malaga. He says that he never liked to study and struggled to pass each year of primary and secondary education, although he never had to repeat a year.

The Spanish education system is structured in a comprehensive way and is compulsory until the age of 16. At 16, Pablo decided to enter post-compulsory education, academic track. Pablo was convinced by his parents' expectations and by his own perception that there was less opportunity to enter the labour market than in previous years, when the construction sector was stronger. Pablo dropped out of post-compulsory education after three months, however, and has since undertaken a variety of yo-yo movements. He experienced Not in Education, Employment, and Training (NEET) situations and gained informal and precarious work experience to support his parents, since his father was unemployed. Pablo also attempted to return to formal Vocational Education, but he again dropped out because he felt he was lagging behind his classmates. This decision was triggered not only by finding the theoretical content quite difficult but also by his grandfather's death.

Pablo characterises his daily routine during the NEET situation as monotonous, just "staying at home" and smoking plenty of cannabis. Pablo said he was "willing to do something" to change the situation but was not successful. He had a personal conflict with his mother at the time because "she wanted him to do something" else. He went to live with his grandmother to help his family care for her.

Pablo believes that changes must come from reflecting on your own situation and taking decisions. After reflecting, Pablo felt he "would be going nowhere" if he continued "to live life this way". Because his projections for the future did not appeal to him, he struggled to find a job as soon as possible. He believes that work is necessary to be economically independent.

Pablo's father told him about the Vocational Training Courses. Pablo liked the idea and decided to apply to one. His past work experiences made him realise that he preferred active jobs like the one for which he is now being trained. He portrays himself as happy with his current training. He values his relationship with his classmates and teachers greatly, as they help him to acquire specific skills and practical knowledge close to the professional world.

Pablo is aware of the generalised unemployment in Andalusia and knows that young people with lower educational credentials have fewer job opportunities today than a few years ago (i.e., construction). Because he has already experienced a yo-yo transition and precariousness, he seems to be working harder to avoid repeating such experiences. Pablo believes that this course will allow him to find new work opportunities, but there is no guarantee that he will be able to find a job due to the difficult labour market.

In the future, Pablo wants to work as a gardener, and he is even considering self-employment. If he cannot work as a gardener, he will try to find other jobs. If neither option works, he does not reject the idea of receiving more training or even returning to formal education. As a last option, Pablo has not abandoned his professional dream of joining the army, but he feels discouraged due to the highly competitive application process.

4.1.2. The Case of Alexander

Alexander, 23 years old, was born in Vienna but moved to Burgenland. He portrays himself as a very shy person

who benefits from other people's support to improve his socialisation. He says that he did not receive as much support and personal care as he needed because of the high student-teacher ratio in his class at school. This lack of attention, combined with his self-presentation as a lazy child and with episodes of social anxiety, made it difficult for him to focus on school. His interview narrative explains that the early stages of his educational career were a "difficult period".

After finishing Lower Secondary Level studies at the age of 14, Alexander moved to a College for Higher Vocational Education in the capital city of Burgenland, where he lived with some of his friends. His parents convinced him to make this move towards a "more vocationally-oriented" programme, despite the fact that Alexander wanted to continue to study in the Academic Secondary School, Upper Cycle. He felt he was not talented in manual and technical work, so he dropped out of the course.

Alexander also did an internship in a supermarket, during which he contemplated an apprenticeship, influenced in part by his peers: friends, neighbours and family. He decided to attend a private higher-level vocational school to study social professions and gastronomy. Alexander indicated that his experience in this school was supportive, especially the relationship with his teachers, and that this increased his motivation to learn and enjoy his time there. Alexander's parents' divorce was, however, a critical juncture in his life course, as it led to financial problems in his family. He abandoned these studies in the fourth of five years because he could no longer afford the tuition.

After having to leave school, Alexander was required to take different courses offered by the Austrian Public Employment Service. He is quite critical of these courses, which he perceived as useless and a waste of time. He could not participate in either a course or a form of training that would support him.

A friend who had participated in the LLL programme Back to the Future a year earlier told Alexander about this opportunity. A crucial factor in his decision to apply for the programme was that he could not find a job after doing his civil service and was unemployed for six months. Applicants to Back to the Future have generally registered in the Austrian Public Employment Service, which assigns young adults to the programme. The participants receive financial support from this Employment Service to cover their living costs. Back to the Future seeks labour market integration for young adults who are currently receiving a basic subsidy to improve their employability by means of intensified coaching, training and transitional employment. Alexander portrays himself as happy in the programme, which he finds quite stimulating and which provides him with a structured work routine. Moreover, its timetable allows him to attend evening classes to obtain his general qualification for university entrance (A-Levels).

The Back to the Future programme helped Alexander gain more self-confidence and organise his daily life. In the future, he dreams of being a psychotherapist or working in human resources management. Alexander plans to finish his schooling, study at the university and, most importantly, obtain a stable job.

4.2. Decisions, Experiences and Expectations Concerning the LLL Programmes: Insights from Bounded Agency and Projectivity

Starting from the cases of Pablo and Alexander and introducing other information about the life courses of the rest of the sample, this section will develop in greater depth some of the main themes identified through the analysis. The themes, which relate to some of the richer pieces of information identified, were chosen to expand existing theory on youth transitions and answer the research questions. For reasons of space, other topics, such as "support during transitions" or "standardised or normal life course", are not addressed separately.

4.2.1. Looking for Work, Training and Personal Opportunities

The LLL programmes analysed attempt to ease the transition to the labour market. In Andalusia, they provide training and in some cases apprenticeships or paid work experience. In Austria, they also provide coaching and training to unemployed young adults with difficulty finding a job or entering the labour market.

Despite these differences in their activities and target groups, the young adults in both regions commonly refer to the role these programmes play in their life courses by providing them with new opportunities (see Table 3).

The participants perceive these opportunities differently. First, the opportunities can be a steppingstone or gate keeper to new pathways into the labour market. This is the case of Sofía, a young adult woman with tertiary education who experienced various yo-yo movements, such as migrating abroad, returning to Spain, and combining study and work. Sofía expects to use PICE to diversify her skills to open new job possibilities. Like Sofía, Pablo expects to find a job that suits him after the programme. Ahmed, a Syrian refugee in Austria, expects to obtain new training credentials from enrolling in JUST Integration.

Second, opportunities are related to possibilities of being trained for or gaining working experiences in jobs for which participants could not previously be trained. José is currently enrolled in a Vocational Training Course on gardening. He had previously tried to access formal Vocational Education in this field, in which he has always wanted to work, but was not able to do so. Antonio was also unable to access other earlier formal education he liked because he did not fit the entry criteria (he had not validated his educational credentials from Latin America in Spain). He is finally being trained in carpentry, an area related to his personal and professional interests.

Table 3. Meaning behind the decision to enrol in an LLL programme: Perceived opportunities.

Malaga		
Young adult	*Meaning*	
Sofía	Open opportunities	Open-door strategy: diversify options
Pedro		In the future, find a job to support his brother "who has problems"
José		Finally found a chance to be trained and work in the professions he likes
Antonio		
Mario		Programme as a "safety net" if he does not achieve his professional dream
Pablo		Right choice to escape the NEET situation and change routines/habits
Cecilia		Way to "rebuild her life" and "become something"
Mónica	Personal development	Way to "open up". To be trained in an area she likes
Vienna		
Young adult	*Meaning*	
Ahmed	Open opportunities	Open-door strategy: Diverse options
Ioana		
Musa		
Daniel		
Jakob		
Alexander		
Lena		
Faisal	Consolidate/improve his position in his current job	Professional and personal growth
Habib		
Jana		"Last chance" for a labour market opportunity

Finally, opportunities are related to the participants' personality development. This is the case of Pablo, who used the programme not only to diversify his job opportunities but also to overcome his NEET situation and change his habits. Cecilia reflects on past experiences marked by times of lack of support from her parents, Early School Leaving and troubles entering the labour market or other training courses. She enrolled in the programme in hopes of "rebuilding her life" and "becoming something" and to learn new skills. Mónica suffered from bullying at school. She decided to enrol not only to be trained but also to learn how to "open up".

Faisal and Habib are both refugees from Syria who moved to Austria after the European migrant crisis in 2015. Faisal hopes that participating in the LLL programme JUST Integration will help him not only to grow professionally, but also to develop his language skills, which he finds important to finishing his training and having a good future in Austria. Habib perceives the programme similarly. His involvement in JUST Integration is a steppingstone to a better future in general and to "becoming a better person" in terms of work ethic and eagerness. Lastly, the goal was to get a better job.

4.2.2. Degrees of Clarity in Young Adults' Projections about Their Future

Young adults from both regions share imagination of a normal and standardised life course. They dream of a life that follows a specific plan: having a job (and, therefore, earning enough money to enjoy economic stability), building their own family and home, and being independent.

Young adults from Malaga and Vienna generally differ, however, in the clarity of their projections about their future, especially in their imagined next steps after participation in the LLL programme. This difference is reflected in the different types of transitions and risks they imagine they will face when pursuing their professional and personal objectives. While the Andalusian young adults tend to prepare alternative plans in case they cannot find a job, the Viennese young adults only discuss a few alternative pathways to employment after completing the programme. All seem to be aware that the programmes' functioning is influenced by their wider contextual conditions, such as the higher youth unemployment in Andalusia and the more institutionalised transitions and better job prospects in Austria. They tend to

differ in their degree of confidence in the potential of LLL programmes to contribute to their labour integration.

In this vein, Ioana, a Romanian migrant, and Musa, an Afghan refugee, have obtained secondary education but have experienced more yo-yo movements than Alexander in their previous transitions. Ioana hopes to be hired in the company where she is doing her apprenticeship, and Musa wants to take the final craftsman's examination in his apprenticeship to find a job.

In Malaga, Mónica and Cecilia are interesting cases. They finished their participation in the programme two years ago and expected to find jobs on completion, but they are still unemployed. Both have again experienced yo-yo movements during their transition. They do not discount returning to training or to the formal education system. Like Pablo, they make multiple projections about their future, also preparing alternative plans to achieve labour market integration.

4.2.3. The Restorative Role of LLL Programmes

The restorative role of the LLL programmes is important for some young adults. Positive aspects are teachers' high degree of involvement in participants' learning situation, a supportive relationship with peers, the learning-by-doing approach and the practical character of the programme. All of these aspects are reflected in the cases of Pablo and Alexander.

Other young adults also describe themselves as being happy that they had enrolled in the programme. Mario says, for example, "I am doing what I have never done before, that is…feeling happy when I come here to study". In the interviews, the young adults say they have been pleasantly surprised. Some even talk about the programme as different from their past encounters with school or their attempts to return to the formal education system. Here, their past experiences are significant.

Mónica and Cecilia believe that their self-confidence increased during the programme, where the professionals acted as "significant others". José thinks that he is at the best point in his life, since he finally has the opportunity to be trained as a gardener. Daniel tried twice to obtain his general qualification for university entrance, but he failed. He experienced several rejections in his job search because he had neither educational credentials nor work experience in the formal labour market. He considers his participation in Back to the Future as a major achievement. It is not only providing him with new work opportunities but also is helping him to gain self-confidence.

In contrast to this perception of Back to the Future, many Austrian young adults like Daniel consider the courses proposed by the Austrian Public Employment Service as a waste of time because the activities are not useful. The uselessness seems to be related to their perception that those courses have not helped them, not provided them with tools to foster their transition into the labour market, or not contributed to their personal growth: "That was a real waste of time...in the end, the courses didn't help. It was about daydreaming and really, really weird, very odd things, what they offered unemployed young people".

5. Discussion and Conclusion

The aim of this article was to highlight young adults' perspectives by exploring the biographies of participants in LLL programmes in Vienna and Malaga. Giving voice to young adults is useful for understanding the ways they use and interpret their pathways during transition points (Walther, 2017). By analysing the interviews, we show how contextual conditions and bounded agency not only are interrelated in individuals' actions (Evans & Biasin, 2017) but also shape the young people's projections about their futures, a process where past experiences also become relevant (Emirbayer & Mische, 1998).

We used the cases of Pablo and Alexander as entry points to explore the research questions and disentangle their complexity, as these individuals' experiences reflect different characteristics of their respective life course regimes (Walther, 2006, 2017). Moreover, the biographies were embedded in contextual data (e.g., Eurostat, 2019) about young adults' living conditions in their regions to interpret the biographies in greater depth.

Based on transition regimes typologies, young adults in different contexts experienced different sources of support during their transitions (Walther, 2017; Walther & Stauber, 2006): family is central in the case of Pablo, as are both family and state in the case of Alexander. Social capital and networks, such as family or friends, were also significant in their transition into the LLL programme, for instance, in informing them of its existence.

Labour market characteristics were also relevant (Walther, 2006). Pablo experienced and suffered the consequences of his yo-yo transitions (EGRIS, 2001), marked by a lack educational credentials in a precarious labour market. His past influenced his present actions and future imaginations. Pablo also mentions his negative routines during his NEET situations and the absence of appealing projections of the future had these routines continued. Moreover, he has prepared several alternative plans in case he cannot find a job after the programme, although he expects ultimately to achieve stability.

Alexander, in contrast, can count on public subsidies while he is unemployed or enrolled in his programme. He does not seem to feel either pressure or fear about the possibility of experience a transition into the most precarious periphery of the Austrian labour market (Walther, 2006), since the state provides a variety of benefits to help him. After completing the program, he wants to return to formal education. Alexander seems certain that he will be able to achieve stability and re-standardise his life course, as he has not thought about alternatives in case his plans fail.

In our opinion, projections (Emirbayer & Mische, 1998) about having a standard or normal life course

(Walther, 2017) are related, on the one hand, to the high degree of institutionalisation of transitions in Austria (Walther, 2006). Viennese young adults' projections are influenced by the belief that the state will help them in all events and that following certain education/training patterns, such as going through the VET system, will enable them to achieve better labour positions and a standardised life course. The same projections among the Andalusian young adults could show, however, their desire to escape from forced participation in temporary jobs, which affects all ISCED levels (Eurostat, 2019).

The success of these programmes depends not only on the contexts but also on the people with whom they are working (Pawson, 2006). The diversity of "opportunities" that our research identified drew our attention to the different roles and expected effects of these programmes as perceived by young adults in their life course (Kotthof et al., 2017; Kovacheva et al., 2018). In some cases, young adults expected to create some of these opportunities at the same time in order to find solutions to various challenges they were facing at the moment, such as trying both to find a job and "to grow" personally. After experiencing these programmes, some even talk about the programmes' restorative role in their lives. These effects depend greatly, however, on their past experiences, such as being bullied or being rejected by the labour market, as well as on the programme's resources (i.e., personal support), which must fit their needs. Other young adults, in contrast, perceive other institutions' programme activities as a "waste of time".

More research is clearly needed, especially research that attends more closely to the content and type of skills the LLL courses offer, which could activate different mechanisms to trigger change (Pawson, 2006) or explores differences related to the social class or socioeconomic status of the young adults.

Moreover, it would be interesting to perform this analysis using samples of the same country, both people who chose to take part in an LLL programme and people who did not, in order to explore how different individuals negotiate and exercise their agency in similar contextual conditions.

Nóvoa (2019) recently stated that the purpose of LLL has changed from a "right" to learn on a lifelong basis to a "duty" that supports economic growth and employability. This change has been accompanied by increased responsibility of individuals for their learning processes and success (Alves et al., 2010). Since the goals of LLL policies and programmes have become more normative, it would be interesting to hear from young adults about the significance and different meanings the programmes have to them. By giving these young adults a voice and recognising them as equal actors, we can use their reflections on their experiences to develop more sustainable LLL programmes in line with their personal interests, as well as to understand the broader role of LLL programmes. The young adults reflect not only on their skills acquisition, but also on the degree of support they received, for instance, from teachers and peers. They reflect particularly on how their experiences affected them and increased their self-confidence, and the opportunities that these programmes represent for pursuit of personal and professional projects.

This article should serve to remind policymakers to develop programmes that better fit young adults' interests and chains of reasoning. Our conclusion that programmes can be improved by listening to young adults follows Pawson (2006), who claims that improving these programmes ultimately depends on how their subjects receive the resources and mechanisms introduced. And as we have shown, there is no pattern for a one-size-fits-all programme; everything depends on the context, the complex interrelations of which must be untangled in order to understand the young adults' agency.

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Conflict of Interests

The authors declare no conflict of interests.

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Article

Putting Tasks to the Test: The Case of Germany

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Abstract
The demand for skills has changed throughout recent decades, favouring high-skilled workers that perform abstract, problem-solving tasks. At the same time, research shows that occupation-specific skills are beneficial for labour market success. This article explores (1) how education, workplace characteristics and occupations shape job task requirements, (2) how within-occupation job task content relates to wages, and (3) whether these relationships vary across types of tasks due to their presumably varying degrees of occupational specificity. Using worker-level data from Germany from 2011–2012 the article shows that a large part of task content is determined by occupations, but that task requirements also differ systematically within occupations with workers' educational levels and workplace characteristics. Moreover, differences in task usage within occupations are robust predictors of wage differences between workers. Finally, the results suggest that non-routine manual tasks have a higher occupational specificity than abstract and routine tasks, and that manually skilled workers can generate positive returns on their skills in their specific fields of activity.

Keywords
education; job tasks; occupational specificity; wages; worker-level

Issue
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1. Introduction

The demand for knowledge and skills has changed significantly in Western societies, partly due to technological change. An important research question is therefore which type of skills will be in demand in the future and which educational qualifications are particularly suitable for this. Two strands of literature addressing this question, i.e., the task-approach literature and the literature on occupational specificity are in the foreground in this article.

In the task approach (Autor, Levy, & Murnane, 2003) aggregate demand for skills is linked with the specific skill demands of jobs. This approach draws an explicit distinction between skills, as characteristics of workers, and tasks, as characteristics of job requirements. The key insight of this conceptualisation is that advances in computer technology throughout recent decades have complemented workers in abstract tasks, substituted for workers in routine tasks, and left most non-routine manual tasks unaffected. Studies in numerous countries have demonstrated a subsequent employment polarization along the occupational distribution (e.g., Autor & Dorn, 2013; Goos, Manning, & Salomons, 2014; for Germany see Antonczyk, DeLeire, & Fitzenberger, 2018; Spitz-Oener, 2006).

Studies referring to the international comparative literature on differences between educational systems (Allmendinger, 1989; Shavit & Müller, 1998) or the skill-weights approach (Lazear, 2009) have focused on the question of whether the specificity of skills is associated with labour market advantages. Vocational education, which on average provides more specific skills than academic education, or programs with a high vocational specificity in general are beneficial for labour market success (e.g., de Lange, Gesthuizen, & Wolbers,

2014; Eggenberger, Rinawi, & Backes-Gellner, 2018; Forster & Bol, 2018), although some studies show disadvantages of too specific skills later in one's career (Forster & Bol, 2018; Hanushek, Schwerdt, Woessmann, & Zhang, 2017).

The aim of this article is to put tasks to a test in Germany, and thereby to deepen the occupation-level argumentation in the task-approach literature by linking this approach to the concept of occupational specificity. This article explores (1) how education, workplace characteristics and occupations shape job task requirements, (2) how within-occupation job task content relates to wages, and (3) whether these relationships vary across types of tasks due to their presumably varying degrees of occupational specificity. The German labour market is especially well suited for this as Germany is a country that stresses vocation-specific training and many jobs have occupational credentialing requirements. In addition, Germany is one of the few exceptions for which person-level task data are available.

From a task-approach perspective, an occupation is conceptualised as an indivisible bundle of task demands that are performed simultaneously by each worker in the occupation to produce output (Autor & Handel, 2013, p. 64). This implies that occupations should be an important measurable predictor of job tasks. Alternatively, with regard to their job content, occupations should have a small within-variance and high between-occupation variance. In practice, these assumptions are not tested; almost all analyses treat job tasks as an occupation-level construct (Autor & Handel, 2013, p. 79). However, Autor and Handel (2013) use a sample of 1,333 workers from the 2008 Princeton Data Improvement Initiative survey (PDII) and 6-digit level occupation information to show that abstract, routine and (non-routine) manual tasks also vary within occupations, are significantly related to workers' characteristics and are robustly predictive of wages. A similar study by Cassidy (2017) studied the task variance within (3-digit) occupations using a sample of around 37,000 West German workers from the 1985–1986 and 1991–1992 German Qualification and Career Survey. Unlike Autor and Handel (2013), this analysis was based on evaluations of whether the worker performed a set of occupational tasks (for instance planning, educating, repairing) and not generic tasks (e.g., problem-solving tasks, repetitive tasks or absence of interactive tasks, fixing things by hand). Cassidy (2017) revealed trends in task usage between the two data collections, and whether individual characteristics affect individual and occupation-mean task usage. Also, he studied the relation between individual task use and income. The results confirm the basic findings of Autor and Handel (2013), with Cassidy (2017) emphasising the importance of individual-level task information for income in addition to occupation-mean task usage.

The analysis in this article is similar to these analyses, with three noteworthy differences. First, the data used in this article were collected in 2011–2012 and are thus much more recent than the data used in the study by Cassidy (2017). Second, this is the first study for Germany that also uses generic task information. Third, a factor that has not been discussed in these papers is whether differences in task usage within occupations result from workplace heterogeneity. Autor and Handel's study did not consider any characteristics other than human capital and demographics. Cassidy considered the hierarchical level and controls for industry in the task models. One of the advantages of the more recent German task is that it also contains valuable information on workplace conditions, among them advances in technologies and computer programs in the workplace. In this article, it is explicitly tested whether task variance within occupations systematically relates to workplace differences, over and above individual characteristics. The analyses support this assumption.

The task-approach literature does not discuss whether the crucial task domains, i.e., abstract, routine and (non-routine) manual tasks, differ in the extent to which they are structured by occupations or to what extent differences in tasks are due to education and workplace characteristics. The results for Autor and Handel (2013) and Cassidy (2017) tend to show a higher explanatory contribution of occupations for manual tasks, but do not discuss this further. However, it is an interesting question whether analysing tasks as an occupation-level concept can be differently justified depending on the task domain. As stressed in the literature on occupational specificity, for individuals, it is important whether the skills in which they are particularly productive are only required in certain occupations or whether their career chances depend more on the specific job rather than the occupation. Comparing abstract, routine and non-routine manual tasks concerning their degrees of specificity this article argues that in Germany non-routine manual tasks are more occupation-specific than abstract or routine tasks. From this it is deduced that worker and workplace characteristics should explain less of the variance in non-routine manual tasks as compared to abstract and routine tasks, and that non-routine manually skilled workers can certainly gain advantages from performing non-routine manual tasks in the German labour market, namely if they work in occupations which specialise in this field. Conforming to this argumentation, this article finds that variance in these manual tasks is much more explained by occupation than variance in abstract and routine tasks. Moreover, the results reveal that manually skilled workers earn higher wages for their skills in manual-specific occupations. In contrast, the analyses do not show any additional returns for highly abstract or routine tasks in abstract- or routine-intensive occupations.

This article makes four contribution to the literature. First, it is the first that uses generic task information to apply the Autor and Handel (2013) study to the German case. Second, it uses data that are more current than a similar study in Germany. Third, the article takes into ac-

count workplace heterogeneity, as a factor that has not been systematically discussed and investigated so far. Finally, it considers that the three tasks domains differ systematically with regard to occupational specificity and tests empirical implications that can be derived from this.

The article proceeds as follows: Section 2 introduces the conceptual framework and derives hypotheses. Section 3 describes the data. The analytic strategy is described in Section 4. Section 5 presents results and Section 6 concludes.

2. Conceptual Framework and Hypotheses

The task approach draws an explicit distinction between skills, as characteristics of workers, and tasks, as characteristics of job requirements. One consequence of this distinction between skills and tasks is that the standard human capital model no longer provides a satisfactory approach for explaining returns to skills (Acemoglu & Autor, 2011). Instead, this task-sensitive perspective is more compatible with a Roy model of occupational choice (Roy, 1951). In this model, individuals with different task efficiencies self-select into occupations that offer them the highest wages for their tasks. Occupations differ in the combination of different types of tasks and the extent and level to which these tasks are required and remunerated, or as Autor and Handel (2013, p. 65) put it, "the productive value of tasks differs among occupations". From a task-approach perspective, an occupation is conceptualised as an indivisible bundle of task demands that are performed simultaneously by each worker in the occupation in order to produce output (Autor & Handel, 2013, p. 64). This implies that with regard to their job content, occupations should have a small within-variance and high between-occupation variance, i.e., that a substantial proportion of job task content is determined by occupations (H1).

The task-approach literature does not discuss whether the crucial task domains, i.e., abstract, routine and non-routine manual tasks, differ in the extent to which they are structured by occupations. Research on occupational specificity argues that educational programs and occupations differ in the degree to which they relate to rather specific skills, i.e., skills that are immediately valuable within one occupation, or general skills, which are broad and transferable across occupations (see, e.g., Forster & Bol, 2018). Eggenberger et al. (2018), for instance, define an occupation to be "specific" if the skills bundle of this occupation is very different from other occupations and "general" if it is similar to the skill bundles in many other occupations. A higher degree of specificity of skills is related to positive labour market outcomes, possibly because employers can use specifically-skilled workers directly to increase productivity (or their certificate suggests low training costs; cf. Forster & Bol, 2018). Accordingly, one can also ask whether certain types of tasks are rather concentrated in specific occupations and hardly needed in others, while others occur in a similar way in different occupations. Comparing the three types of tasks typically distinguished in the task-approach literature, the conclusion is relatively easy to reach that non-routine manual tasks have a higher degree of occupational specificity than the other two task domains. Non-routine manual tasks involve manual dexterity, physical strength or physical effort. For example, mechanics, construction workers, carpenters and nurses typically perform these tasks. In Germany, most of these non-routine manual-intensive occupations are linked with highly standardised vocation-specific curricula of training occupations. Characteristic of these occupations is that task requirements are more or less fixed by very specific occupational regulations. Access to these occupations is reserved to those who have the appropriate certificates (for a comprehensive description of the German vocational education and training system see Solga, Protsch, Ebner, & Brzinsky-Fay, 2014). All of these characteristics apply less to abstract, i.e., analytic, problem-solving tasks, or short repetitive, manual and cognitive routine tasks. Both do not relate to specific occupational profiles, and routine-intense occupations often have even no entry requirements, i.e., general or specific education. Altogether, one can deduce that non-routine manual tasks have a higher degree of specificity than abstract and routine tasks. If this assumption holds, the proportion of job task content, which is determined by occupations, should be larger in case of non-routine manual task content than in case of abstract or routine task content (H2).

From a methodological point of view, obviously, the higher the level of aggregation of occupational information, the higher the level of imprecision, and thus the more within-occupational variance in job tasks should be observable. From a substantive position, the Roy model is compatible with systematic differences in task requirements within detailed occupations: exogenous changes in technology or workplace organisation affect workers within the same occupations at different workplaces to a different extent or, at least, at different points in time. Naturally, some workplaces (or firms) are better equipped to implement changes in technology or workplace organisation than others do. For instance, in firms that change their remuneration systems or production technologies, task requirements and thus the returns to tasks should differ from firms that did not already adapt to these exogenous changes. Compatible with this view, several studies have shown that some firms pay higher wages than others do for equally skilled workers (see Card, Heining, & Kline, 2013). Fixed effects for detailed occupations then cannot account for all systematic variance in tasks. It can therefore be expected that variance in tasks within occupations is also systematically related to workplace heterogeneity; an empirical implication is that workplace characteristics are correlated with task content conditional on occupation (H3).

Whereas this assumption should apply to all three task domains, nevertheless, on can assume that because

credential requirements and task content in non-routine manual-intensive occupations are much more fixed than in abstract or routine-intensive occupations, the proportion of job task content, which is determined by occupations, should be larger in case of non-routine manual task content than in case of abstract or routine task content even if the composition of worker and workplace characteristics within occupations is controlled for (H4).

In a situation of (ongoing) self-selection into occupations and jobs within occupations, workers with a higher task efficiency should move to workplaces within occupations that offer higher rewards and adapt their skills to changing task requirements (Autor & Handel, 2013). For example, consider a situation where a firm replaces some manual tasks by robots, and the worker adapts to this change by performing more, better-paid machine-controlling tasks. We then should observe that human capital (most importantly education) should have a double effect in determining job task content, namely allocating workers to occupations and influencing their job tasks within occupations. This is what Autor and Handel (2013) found in their analysis of the US data. Similar sorting processes should take place in the German labour market as well, so the empirical implication will be tested that human capital (education) is correlated with task content unconditional and conditional on occupation (H5).

If substantial variance in job tasks within occupations is observable, this could still be the result of measurement error. As Autor and Handel (2013, pp. 81–82) argue, however, "if self-reported variation in job tasks is a robust predictor of wages, this would provide prima facie evidence that self-reported task variation is likely to be informative about job content even within occupations". Therefore, this article also analyses the association between tasks and wages. More specifically, it will be tested whether within-occupational task differences are robust predictors of wages (H6).

Systematic sorting moreover implies that returns to tasks are higher in occupations that have high occupation-level returns to these tasks (Autor & Handel, 2013, pp. 66–70). I suppose that the argument of sorting into occupations applies in particular to non-routine manual tasks, because of their higher occupational specificity: access to and advancement opportunities in these manual-intensive occupations is reserved to those who have the appropriate certificates, i.e., certificates that reliably indicate the applicants' skills and thus their abilities in performing specific tasks. Also, from Lazear's model of specificity (Lazear, 2009), one can deduce that a higher degree of specificity implies higher productivity and thus wages in those occupations that correspond to these specific skills (cf. Eggenberger et al., 2018, pp. 98–99). Empirically this argument implies that the more an occupation specialises in non-routine manual tasks, the higher should be the return to this task at the worker level. I will test whether there is a wage premium for performing non-routine manual tasks in an occupation that specialises in this task domain, over and above wage differences resulting from individual-level task use and occupation-level task intensity (H7).

3. Data

The data used to test these assumptions come from the 2012 Task Survey collected by the Federal Institute for Vocational Education and Training (BIBB; Alda, Rohrbach-Schmidt, & Tiemann, 2015). This survey contains generic job task information for a nationally representative employee sample of the German working population, excluding workers with further training degree as their highest level attained, with a total sample size of 4,356 employees. These employees also participated in the 2012 Employment Survey (Hall, Siefer, & Tiemann, 2015a, 2015b) carried out by BIBB and the Federal Institute for Occupational Safety and Health (BAuA), so rich information from this survey of employees' human capital, socio-demographics and workplace characteristics can be considered in the analyses as well. The generic job task information relates to workers' current main job at the time of the follow-up interview. Main job information is available as occupational codes at the 5-digit level of the German classification of occupations (occupational types), 2010 edition (KldB2010). In the data at hand, there are 617 distinct 5-digit occupations with at least one employee. In around 5% of all occupation-cases ($n_j = 211$) a 5-digit is represented only by one employee.

For the multivariate analyses, I use a consistent sample of cases with full information on generic tasks, education, occupation, workplace measures and wages (528 cases were dropped). As in Autor and Handel's study, in all analyses I only consider workers with age 18 to 64 (a further 68 cases were dropped). For identification, I restrict the sample to occupations with at least five cases per 5-digit occupational codes (712 cases were dropped). This leaves me with $n_i = 3{,}048$ worker-level observations nested in $n_j = 198$ occupations. The average number of cases within these 198 occupations is 15.5, and the maximum number is 102. The distribution of the number of occupations is right-skewed, and the median number of observations per occupation is 10. Except for a small number of occupations (<10%), they include both cases with VET or a university degree and/or those with no degree. Compared to the total analysis sample, these cases represent 34% of all 5-digit occupations but 81% of all workers. As a robustness check, I inspected whether results differ, if the sample is restricted to at least 20 cases per 5-digit codes. Results with these alternative selections do not substantially differ from those presented below (main regression tables based on this selection are provided in Annex, Tables A1 and A2).

The data include highly similar generic task information as in Autor and Handel (2013). As in Autor and Handel (2013, pp. 70–71), analyses concentrate on three broad dimensions motivated by the conceptual framework in Autor et al. (2003): abstract problem-solving

tasks ("abstract tasks"); routine, codifiable cognitive and manual tasks that follow explicit procedures ("routine tasks"); and non-routine manual job tasks that require physical adaptability ("manual tasks"). As for the US data, respondents were asked how often a series of tasks were required at their job (daily, at least once a week, at least once a month, less frequently than once a month, never). I consider only those items that were included in the Autor and Handel's analysis in the same way or very similarly. Four items are used to identify abstract tasks, i.e., (1) reading texts of 25 pages or longer, (2) using higher mathematics such as integral calculus or inference statistics, (3) the frequency of difficult problem-solving tasks, and (4) analysing. As in Autor and Handel (2013), items are combined into a standardised scale of abstract tasks using the first component of a principal component analysis. The component accounts for 60% of their variation; in Autor and Handel (2013) it was 42%. For identifying jobs with routine tasks the following items are used: (1) performing short, repetitive tasks, and items for low interactive task content, i.e., the reversed items, (2) interacting with people other than colleagues, i.e., customers, clients, patients, schoolchildren or the public, (3) advising other people, and (4) interactions with applicants, candidates. Also, the items are combined into a standardised scale of routine tasks using the first component of a principal component analysis, which accounts for 42% of their variation (56% in Autor & Handel, 2013). For non-routine manual tasks, I use: (1) using physical strength or making great physical effort and (2) using dexterity and manual skill (the first component explaining 68% of their variation; these two single tasks were included in one questionnaire item in Autor & Handel, 2013). In some analyses, the mean occupational task usage of workers within occupations is considered as well.

Table 1 presents summary statistics of the explanatory and dependent variables used in the analyses presented in this article. Some other control variables are introduced in Section 4.

As in the German workforce, most individuals (65.9%) in the sample have, as their highest vocational attainment, apprenticeship training or a full-time school vocational training degree (VET degree), 25.4% have a university degree (this includes degrees from universities of applied sciences) and 8.6% have no qualifying vocational degree. Females form 48.9% of the sample, and 9.8% have an immigrant background (non-German mother language and/or nationality other than German). Mean gross monthly wages (in euro) is 2,896, the mean log hourly wage is 2.74, and individuals in the sample have, on average, 23.9 years of labour market experience. 30.8% have a supervisory position. Substantial shares of employees state that they experienced the introduction of new manufacturing technologies or process technologies (34.6%), or the introduction of new computer programs (46.2%), or an increase in skill requirements (49.2%) in their immediate working environment within the last two years. Average firm size (imputed by taking the midpoint of their firm size category) is 354.

Table 2 presents the means and standard deviations of the composite task scales by major demographic groups, with basic patterns being highly similar in Germany and the US (see Autor & Handel, 2013). The gap between workers without a degree and university graduates is about one standard deviation for abstract tasks and about two-thirds for non-routine manual and routine tasks. Routine tasks are the most important domain for workers without a degree, non-routine manual job tasks for workers with a VET degree and abstract tasks for those with a university degree.

Table 1. Sample summary statistics. Source: BIBB/BAuA Employment Survey 2012 and Supplemental Task Survey to the Employment Survey 2012, weigted by sampling weight.

	Mean	SD
Highest voc. degree attained:		
No voc. degree	0.086	0.281
VET degree	0.659	0.474
University degree	0.254	0.436
Female	0.489	0.500
Immigrant background	0.098	0.297
Gross monthly wage	2896	1886
Log hourly wage	2.74	0.507
Experience in yrs.	23.9	10.8
At workplace:		
Supervisory position	0.308	0.462
New technologies	0.346	0.476
New computer programs	0.462	0.499
Increase in skill requirements	0.492	0.500
Firm size	353.9	526.9
N	3,048	

Table 2. Means and standard deviations (in parentheses) for standardized task scales by major demographic and education groups. Source: BIBB/BAuA Employment Survey 2012 and Supplemental Task Survey to the Employment Survey 2012.

	All	Male	Female	Immigrant Background		No voc. degree	VET degree	University degree
				yes	no			
Abstract	.00	.22	–.17	–.11	.01	–.58	–.21	.60
	(1.00)	(1.01)	(0.96)	(1.11)	(0.99)	(1.14)	(0.94)	(0.82)
Routine	.00	.13	–.10	.15	–.01	.38	.11	–.35
	(1.00)	(1.02)	(0.97)	(0.99)	(1.00)	(0.94)	(1.02)	(0.87)
Non-routine Manual	.00	.06	–.04	.06	–.01	.22	.18	–.46
	(1.00)	(1.01)	(0.99)	(0.97)	(1.00)	(0.93)	(0.97)	(0.95)

Note: N = 3,048.

4. Analytic Strategy

The analyses proceed in two steps. First, variance in tasks and their determinants are analysed. Second, the association between tasks and wages is studied.

4.1. Task Models

The standardised task scales are regressed on demographics, human capital measures, workplace characteristics and occupation dummies, as follows:

$$T_{ij} = \alpha + \beta_1 S_i + \beta_2 X_i + \beta_3 W_i + \gamma_j + \varepsilon_{ij} \quad (1)$$

where T_{ij} is a vector of job tasks demands T (abstract, routine, non-routine manual) of worker i in occupation j. The vector S includes human capital measures, i.e., the highest vocational degree attained and labour market experience in years and its square (mean-centered). X is a vector of socio-demographic characteristics (gender, immigrant background). W is a vector of workplace characteristics, including supervisory position, firm size (divided by 100, mean-centered) and the three measures of the workplace environment as described above, as well as the firms' economic sector (28.3% public, 21.2% industry, 8.2% craft, 12.3% trade and commerce, 23.8% other services, and 6.2% trade unions, interest groups, and others) and whether the firm is located in the western (85.7%) or eastern part of Germany (14.3%) as additional controls.

Each task model is estimated with and without γ, a vector of 198 occupational dummies (one omitted). Because fixed-effects regression controls for unobserved occupational effects but not additional within-occupation correlation, I use cluster-robust standard errors. With these specifications, it is tested whether tasks vary within occupations because of workplace heterogeneity (H3) and whether human capital (education) is correlated with task content unconditional and conditional on occupation (H5).

H1 states that a substantial proportion of job task content is determined by occupations. H2 states that the proportion of job task content determined by occupations should be larger in the case of non-routine manual tasks than in the case of abstract or routine tasks. If these assumptions hold, occupations (vector γ) should be a measurable predictor of job tasks, especially in the case of non-routine manual tasks. To test these hypotheses more directly, the intra-class-correlation (ICC) of an empty random intercept model of tasks (which is a random-effects analysis of variance [ANOVA]) is calculated. The ICC gives the fraction of occupation-level variance in T_{ij} in total variance, by separating the variance in T_{ij} into the variance between occupations and the variance within occupations, as follows:

$$\text{ICC} = \sigma^2_{u0j} / \sigma^2_{u0j} + \sigma^2 \varepsilon_{ij} \quad (2)$$

If it applies that non-routine manual tasks are much more structured by occupations (H2), then we should expect a higher ICC for non-routine manual tasks than for abstract or routine tasks in an empty model specification (see equation 3). H4 states that the proportion of job task content, which is determined by occupations, should be larger in case of non-routine manual task content even if the composition of worker and workplace characteristics within occupations is controlled for. To test this assumption, random intercept models of tasks with vectors S, X, and W are calculated (see equation 4; because effect coefficients are not discussed, only the ICC-values are presented in Section 5).

$$T_{ij} = \gamma_{00} + u_{0j} + \varepsilon_{ij} \quad (3)$$

$$T_{ij} = \gamma_{00} + \gamma_{10} S_{ij} + \gamma_{20} X_{ij} + \gamma_{30} W_{ij} + u_{0j} + \varepsilon_{ij} \quad (4)$$

4.2. Wage Models

In a second step, the wage-related hypotheses are tested. The OLS regression of log hourly wages have the form:

$$W_{ij} = \alpha + \beta_1 T_i + \beta_2 S_i + \beta_3 X_i + \beta_4 W_i + \gamma + \varepsilon_{ij} \quad (5)$$

where W_{ij} are log hourly wages, T_{ij} is a vector of job task demands T (abstract, routine, non-routine manual, mean centred), and the vectors S, X, W and γ are as in the task models (see Section 4.1). Because of self-selection, occupations have to be treated as endogenous in wage equations (Chaparro, 2016, p. 4); as was discussed before, workers non-randomly self-select into occupations based on their task efficiency, leading to a positive correlation between, for example, education and the error term at the occupation level. The FE-approach with oc-

cupation fixed effects can be used to obtain unbiased estimates of the within-occupation wage effects of tasks. Again, to account for within-occupational error correlations, I use standard errors clustered at the occupation level. Using this specification, it is tested whether individual job tasks are robust predictors of wages (H6).

H7 states that there is a wage premium for performing non-routine manual tasks in an occupation that specialises in this task, over and above wage differences resulting from individual-level task use and occupation-level task intensity. In the presence of level-2 endogeneity (a correlation of covariates with the unobserved occupation effect), the random-effects estimation of such interaction effects might be inconsistent. The Hausman-Taylor (HT) estimator instead provides valid standard errors and can handle the problem of occupation-level endogeneity (see Castellano, Rabe-Hesketh, & Skrondal, 2014, for an application using student data nested in schools). The HT estimation takes advantage of the fixed-effects model (i.e., removing the heterogeneity bias) while retaining the ability to identify the parameters of the occupation-level variables. It is based upon an instrumental variable estimator that uses both the between and within variation of the exogenous variables as instruments, as follows:

$$W_{ij} = X1_{ij}\beta_1 + X2_{ij}\beta_2 + Z1_j\, d_1 + Z2_j\, d_2 + Z1_j X_{ij}\beta_3 + u_j + \varepsilon_{ij} \quad (6)$$

where $X1$ are worker-level variables, among them job task demands and workplace variables, and $Z1$ are occupation-level variables assumed to be uncorrelated with $u_j + \varepsilon_{ij}$; and $X2$ are worker-level variables and $Z2$ occupation-level variables possibly correlated with u_j but uncorrelated with ε_{ij}. In the application at hand, $X2$ includes education, gender, and social background using the Erikson-Goldthorpe-Portocarero class scheme (see Erikson & Goldthorpe, 2002) based on parents' occupation and employment status. $Z2$ includes two occupation variables that capture the educational composition in the occupation: the percentage share of workers in the occupation with vocational training and with university education, as their highest education (both grand-mean centred). The term $Z1_j X_{ij}$ interacts each job task demand with the occupation-mean task usage. I tested whether the level-1 variables assumed to be level-2 endogenous have enough within variance to serve as their own instrument. The exogenous level-1 variables (tasks) also correlate sufficiently strongly with the endogenous level-2 variables. A formal test of overidentifying restrictions (orthogonality conditions) reveals that the instruments may be valid, i.e., the Sargan-Hansen test statistic is not statistically significant.

5. Results

5.1. Explaining Differences in Job Tasks: Education, Demographics and Workplace Measures

Table 3 below presents results of the models of abstract, routine and non-routine manual tasks without (see models M1) and with occupation-fixed effects (see models M2). As for the US, unconditional of occupation, there are statistically significant associations between tasks and education (the referent is VET), gender, and immigrant background: compared to VET graduates, unskilled workers perform fewer abstract tasks, but more routine tasks. In contrast, university graduates perform more abstract tasks, but fewer routine and non-routine manual tasks than VET graduates do. On average, females' use of all tasks is below that of males, possibly indicating that they specialise less in all task domains than males, whereas there are no differences across workers with and without an immigrant background. Experience is negatively related to routine and non-routine manual task intensity. In addition, workplace characteristics covary significantly with individual task usage. Workers with a supervisory position perform more abstract and non-routine manual tasks, but fewer routine tasks than workers with no such responsibility. If new technologies have been introduced at their workplace, these workers perform significantly more routine and manual tasks than comparable workers without such changes in their working environment. The introduction of new computer programs and increases in skill requirements instead are positively related to abstract task use but negatively related to routine tasks (as manual tasks with regards to new computer programs). Firm size is positively associated with routine tasks and negatively related to manual tasks.

Are these effects fully mediated by selection into occupations? As models M2 for each task domain show, while the size of coefficients clearly declines, human capital as well as most workplace characteristics remain significant predictors of abstract and non-routine manual job task use even within occupations. As the F-statistic in the lower part of the table shows, both groups of variables are jointly significant. This is a remarkable result if one considers that it is controlled for occupations at the 5-digit level of occupations in Germany: having completed university education instead of VET still is a significant positive correlate for abstract tasks, and negative correlate for non-routine manual tasks. These results show that as in the US, education plays a dual role in determining workers' job tasks, namely allocating them to occupations and influencing their job tasks within occupations (i.e., H5). The results also reveal significant within-occupation effects of workplace measures. The effects on abstract and routine tasks are usually smaller but remain significant in nearly all cases. Concerning non-routine manual tasks, the negative effect of new computer programs at the workplace is fully mediated by occupations, and workers who experience an increase in skill requirements at their workplace perform significantly more non-routine manual tasks. These results support the assumption that workplace characteristics are correlated with task content conditional on occupation (H3), suggesting that some differences in task content within occupations are related to workplace heterogeneity.

The results in Table 3 also reveal that occupation is an important measurable determinant of job task content. Conditioning on occupations, in most cases, strongly attenuates the coefficients and the explanatory power increases substantially. Comparing the predictive power across task domains shows that occupations do a different job in determining job tasks. Occupations account for up to 52% of variance in non-routine manual tasks in the FE-model (M2), but only 44% and 41% for abstract and routine tasks, respectively. Also, the gain compared to models without fixed occupational effects (M1) is significantly higher for non-routine manual tasks (+37%) than for abstract (+16%) and routine tasks (+22%).

To further analyse whether and to what extent variance in tasks results from differences across and within occupations, Table 4 includes the results of the random-effects ANOVA. In the empty model specification, the fraction of variance at the occupation-level (ICC) is 37.9% for abstract tasks, 34.7% for routine tasks and 46.6% for non-routine manual tasks. It is 23.1%, 25.8% and 42%, respectively, if the composition concerning human capital, demographic and workplace-related characteristics are controlled for. Thus, non-routine manual tasks are the domain with the largest amount of variance that results from differences between occupations (and thus the lowest fraction of variance that results from differences within occupations), and this also holds true if compositional effects are considered. As column 4 in table 4 reveals, the reduction of error variance at the occupation-level is much smaller in case of non-routine manual tasks (i.e., −9.9%) than in case of abstract and routine tasks (−39.1% and −25.6%). Taken together, the results show that indeed a substantial proportion of job task content is determined by occupations (H1). Possi-

Table 3. OLS-Regressions of abstract, routine, and non-routine manual tasks without/with occupation fixed effects. Source: BIBB/BAuA Employment Survey 2012 and Supplemental Task Survey to the Employment Survey 2012.

	Abstract		**Routine**		**Non-Routine Manual**	
	M1	M2	M1	M2	M1	M2
Highest voc. educ. (R. VET):						
No voc. degree	−0.26***	−0.06	0.22**	0.05	0.05	−0.01
	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)	(0.07)
University degree	0.64***	0.15***	−0.32***	−0.02	−0.62***	−0.19***
	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)
Female	−0.36***	−0.33***	−0.12***	0.09*	−0.16***	−0.11**
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Immigrant background	−0.09	0.03	0.08	−0.04	0.04	−0.09*
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.04)
Experience	0.00	0.01	−0.02*	−0.01*	−0.01*	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Experience^2	−0.00	−0.00	0.00*	0.00*	0.00$^+$	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
At workplace:						
Supervisory position	0.24***	0.20***	−0.35***	−0.26***	0.15***	0.11**
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
New technologies	−0.02	0.04	0.08*	−0.01	0.23***	0.10**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)
New computer programs	0.27***	0.16***	−0.16***	−0.09*	−0.20***	0.02
	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)	(0.03)
Increase in skill requir.	0.30***	0.20***	−0.22***	−0.12***	0.03	0.07*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Firm size	0.00	0.00	0.01**	0.01***	−0.02***	−0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Constant	−0.07	−0.03	0.35***	0.21*	0.59***	0.23**
	(0.09)	(0.09)	(0.09)	(0.09)	(0.10)	(0.08)
198 occupation dummies	No	Yes	No	Yes	No	Yes
F(Education)	175.19***	5.87**	43.72***	0.43	125.89***	9.68***
F(Workplace variables)	34.60***	12.60***	40.23***	5.12***	20.48***	11.25***
F(Occupation dummies)		4.32***		11.33***		6.37***
R-squared	0.28	0.44	0.19	0.41	0.15	0.52
N	3048	3048	3048	3048	3048	3048

Notes: All models control for firm location and economic sector; + p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 4. ICCs for random intercept models of job tasks. Source: BIBB/BAuA Employment Survey 2012 and Supplemental Task Survey to the Employment Survey 2012.

	ICC M0	ICC M1	Change ICC in %
Abstract	.379	.231	–39,1
Routine	.347	.258	–25,6
Non-Routine Manual	.466	.420	–9.87
$N_{(occupation)}$	198	198	
$N_{i(workers)}$	3048	3048	

Notes: M0 includes no predictor variables. M1 controls for worker and workplace composition, i.e., education, gender, experience, experience squared, immigrant background; and supervisory status, firm size, new manufacturing/process technologies, new computer programs, increases in skill requirements, economic sector, firm location (West/East-Germany).

bly, because of their higher occupational specificity, non-routine manual task content is especially bound to occupations (H2), even if worker and workplace characteristics are controlled for (H4). Yet the results also show that worker and workplace characteristics substantially correlate with job task content over and above occupations.

5.2. Job Tasks and Wages

Table 5 shows the results of the wage models. Model M1 only includes the individual-level task scales. These scales predict substantial wage differences. A one standard deviation increase of the abstract tasks scale is as-

Table 5. OLS and Hausman-Taylor regressions of Log Hourly Wages on Task Scales. Source: BIBB/BAuA Employment Survey 2012 and Suppl. Task Survey to the Employment Survey 2012.

	M1	M2	M3	M4	M5	M6
Abstract (worker level)	0.17***	0.08***	0.03**		0.02**	0.03**
	(0.01)	(0.01)	(0.01)		(0.01)	(0.01)
Routine (worker level)	0.02	–0.01	0.00		0.00	0.01
	(0.01)	(0.01)	(0.01)		(0.01)	(0.01)
Non-Routine Manual (worker level)	–0.12***	–0.08***	–0.04***		–0.04***	–0.04***
	(0.01)	(0.01)	(0.01)		(0.01)	(0.01)
Abstract (occup. level)				0.23***	0.21***	0.17*
				(0.03)	(0.03)	(0.07)
Routine (occup. level)				–0.00	–0.00	0.01
				(0.02)	(0.02)	(0.03)
Non-Routine Manual (occup. level)				–0.08***	–0.04*	–0.04
				(0.02)	(0.02)	(0.03)
Abstract (worker level)						–0.00
* Abstract (occup. level)						(0.01)
Routine (worker level)						0.01
* Routine (occup. level)						(0.01)
Non-Routine Manual (worker level)						0.03*
* Non-Routine Manual (occup. level)						(0.02)
Worker-/workplace controls	No	Yes	Yes	Yes	Yes	Yes
198 occupation dummies	No	No	Yes	No	No	—
Constant	2.75***	2.59***	2.62***	2.59***	2.60***	2.56***
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
F(Task variables)	88.90***	47.81***	10.10***		9.69***	21.24***
F(Occ-lev. Task var)				64.91***	34.26***	8.01*
R-squared	0.18	0.37	0.48	0.40	0.40	—
N	3048	3048	3048	3048	3048	2738

Notes: Worker controls are education, gender, experience, experience squared, immigrant background. Workplace controls are supervisory status, firm size, new manufacturing/process technologies, new computer programs, increases in skill requirements, economic sector, firm location (West/East-Germany). M6 add. includes social background, %share of VET/univ. graduates in the occupation. Robust standard errors in parentheses; + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

sociated with an approximate 17% wage premium, while similar increases in non-routine manual tasks are associated with a 12% wage penalty. Effect sizes thus are highly similar to those found in the US (i.e., +20% and −19%, respectively; see Autor & Handel, 2013, p. 82). In this model, there is no systematic association between routine tasks and wages in Germany (in the US, routine tasks also loose significance in models with controls for human capital or occupational dummies). By themselves, the three generic task scales explain 18% of wage variation. M2 additionally controls for education, experience, gender, immigrant status and the full set of workplace characteristics, and M3 additionally includes occupation-fixed effects. Even though the magnitude of the task coefficients decline, abstract and non-routine manual tasks remain significant correlates of wages in both models. In model M4 only the occupational-level task variables are included. When tasks are measured at the occupation-level again abstract and non-routine manual tasks are significant predictors of wages as well. In model M5 both, individual and occupation-level tasks are included (as well as worker and workplace controls). This model is in line with the finding reported in Cassidy (2017, p. 408) that job tasks at the individual level are informative about wages even if the task content at the occupational level is controlled for. That job tasks have a partial effect on wages is also reflected in the highly significant F-statistics. Altogether, these findings argue strongly that within-occupational task differences are robust predictors of wages (H6).

Model M6 is the Hausman-Taylor specification, which tests whether there is a wage premium for performing non-routine manual tasks in an occupation that specialises in this task domain, over and above wage differences resulting from individual-level task use and occupation-level task intensity. For non-routine manual tasks, the results are compatible with systematic sorting into occupations: remarkably, while the main effects of non-routine manual tasks are (significantly) negative, the interaction term is positive, statistically significant and of substantial size. This effect is stable, even if other interaction terms are included and even conditional on educational attainment and further worker and workplace characteristics. This supports the interpretation that manually skilled workers can generate positive returns on their skills in their specific fields of activity (H7). In contrast, the analyses do not show any additional returns for highly abstract or routine tasks in abstract- or routine-intensive occupations.

6. Conclusions

On the one hand, recent findings have demonstrated that technological changes throughout recent decades have differently influenced the demand for several types of skills with advantages for highly qualified employees in abstract-intensive occupations, i.e., occupations that require large numbers of analytic, problem-solving tasks. On the other hand, recent studies have stressed that occupation-specific skills provide benefits in the labour market, at least for those with a view to early entry into the labour market.

Using worker-level data from Germany in 2011–2012, this article analysed the association between education and generic job task requirements, and between job tasks and wages, while assuming that the three main task domains distinguished in the literature differ in their level of occupational specificity. It was argued that non-routine manual tasks have a higher degree of specificity than abstract and routine tasks.

There are four main findings in this article. First, while in fact a large part of generic job content is determined by occupations, job task requirements also differ systematically within occupations with workers' educational levels and workplace characteristics. Having completed university education instead of VET education is a significant positive correlate for abstract tasks, and a negative correlate for non-routine manual tasks, even within detailed occupational groups. A supervisory position, increases in skill requirements, new manufacturing or process technologies and new computer programs at the workplace are positively related to abstract and non-routine manual task usage. Second, differences in task usage within occupations are robust predictors of wage differences between workers. Conforming to the previous literature, on average, abstract task usage is positively related to wages, whereas non-routine manual task usage is related to lower wages. Third, the results support the view that non-routine manual tasks have a higher occupational specificity than abstract and routine tasks. This conclusion is based on the observation that occupations have a higher predictive power for this type of task, and that compared to abstract and routine tasks a higher share of variance in non-routine manual tasks results from differences across occupations. Analysing tasks as an occupation-level concept, in Germany, might be therefore better justified for non-routine manual than for abstract routine tasks. Fourth, results of a Hausman-Taylor regression model reveal a wage premium for non-routine manual task usage in non-routine manual-intensive occupations, but no such premium in case of abstract and routine tasks. This finding can be well rationalised by the concept of specificity, which implies higher productivity, and thus wages for workers with specific skills in those occupations that correspond to these skills.

Altogether, this article thus underlines the merits of a task-based approach and worker-level task information for understanding the interplay between education, tasks and wages. Second, it seems fruitful to consider the specificity of tasks in addition to the tasks as such. The results suggest that in areas with specialised task requirements, the value of specific skills is high and rewarded accordingly. For Germany, this can be seen in the area of non-routine manual tasks. While non-routine manual tasks, on average, tend to be associated with lower wages than abstract tasks, manu-

ally skilled workers achieve wage gains in non-routine, manual-specific occupations.

Future research might advance these analyses in several respect. First, more differentiated distinctions between task domains, for instance factors of social, technical, creative, cognitive skills, as in Liu and Grusky (2013), could further deepen the occupation-level argumentation presented here. Second, this article, on a descriptive basis, indeed finds substantial within-occupation job tasks variance across workplaces, but the conceptual model did not include factors that determine this variance in a systematic or even causal way (see, e.g., Deming, 2017). Intensifying research on how workplace heterogeneity adds to the understanding of job task content and the returns to tasks seems a valuable direction for future research. Another limitation is that the analyses are based on a comparatively small cross-sectional sample. Future studies should strive to extend testing the model in other contexts and with more highly powered data, and individual panel data to further verify the robustness of the results.

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Conflict of Interests

The author declares no conflict of interests.

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Annex

Table A1. OLS-Regressions of abstract, routine, and non-routine manual tasks without/with occupation fixed effects for occupations with $n_i \geq 20$. Source: BIBB/BAuA Employment Survey 2012 and Supplemental Task Survey to the Employment Survey 2012.

	Abstract		Routine		Non-Routine Manual	
	M1	M2	M1	M2	M1	M2
Highest voc. educ. (R. VET):						
No voc. degree	−0.42***	−0.17^{+}	0.31**	0.08	0.03	−0.04
	(0.10)	(0.09)	(0.10)	(0.10)	(0.10)	(0.11)
University degree	0.56***	0.10*	−0.12*	−0.07	−0.54***	−0.16***
	(0.06)	(0.05)	(0.06)	(0.08)	(0.06)	(0.07)
Female	−0.30***	−0.27***	−0.17**	0.07	−0.14**	−0.11*
	(0.05)	(0.06)	(0.05)	(0.07)	(0.05)	(0.05)
Immigrant background	−0.15^{+}	0.05	0.12	−0.02	0.02	−0.12^{+}
	(0.09)	(0.08)	(0.09)	(0.09)	(0.09)	(0.06)
Experience	−0.00	0.00	−0.01	−0.00	−0.02	−0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Experience^2	−0.00	−0.00	0.00	0.00	0.00	−0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
At workplace:						
Supervisory position	0.23***	0.22***	−0.29***	−0.27***	0.20***	0.07
	(0.05)	(0.06)	(0.06)	(0.05)	(0.06)	(0.05)
New technologies	0.03	0.03	0.02	−0.06	0.24***	0.09^{+}
	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.04)
New computer programs	0.22***	0.17***	−0.14**	−0.08	−0.19***	0.04
	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.03)
Increase in skill requir.	0.31***	0.21***	−0.18***	−0.10*	0.03	0.03
	(0.05)	(0.04)	(0.05)	(0.04)	(0.05)	(0.04)
Firm size	0.00	0.00	0.01^{+}	0.01*	−0.02***	−0.01***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
Constant	0.18	0.14	0.19	0.03	0.69***	0.18
	(0.14)	(0.13)	(0.15)	(0.11)	(0.15)	(0.12)
39 occupation dummies	No	Yes	No	Yes	No	Yes
F(Education)	68.54***	3.02*	7.92***	0.77	40.64***	3.41*
F(Workplace variables)	18.72***	7.66***	17.07***	5.87***	9.97***	3.34***
F(Occupation dummies)		9.58***		12.00***		31.84***
R-squared	0.26	0.41	0.16	0.36	0.13	0.52
N	1525	1525	1525	1525	1525	1525

Notes: All models control for firm location and economic sector; + p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table A2. OLS and Hausman-Taylor regressions of Log Hourly Wages on Task Scales for occupations with $n_j \geq 20$. Source: BIBB/BAuA Employment Survey 2012 and Suppl. Task Survey to the Employment Survey 2012.

	M1	M2	M3	M4	M5	M6
Abstract (worker level)	0.15***	0.08***	0.03**		0.03**	0.03**
	(0.02)	(0.01)	(0.01)		(0.01)	(0.01)
Routine (worker level)	0.02	−0.01	0.00		0.00	0.01
	(0.01)	(0.01)	(0.01)		(0.01)	(0.01)
Non-Routine Manual (worker level)	−0.12***	−0.09***	−0.05***		−0.05***	−0.04***
	(0.02)	(0.01)	(0.01)		(0.01)	(0.01)
Abstract (occup. level)				0.28***	0.26***	0.19**
				(0.03)	(0.03)	(0.06)
Routine (occup. level)				0.01	−0.00	0.03
				(0.03)	(0.04)	(0.04)
Non-Routine Manual (occup. level)				−0.09***	−0.04	−0.06+
				(0.02)	(0.02)	(0.03)
Abstract (worker level)* Abstract (occup. level)						−0.02
						(0.02)
Routine (worker level)* Routine (occup. level)						0.02
						(0.02)
Non-Routine Manual (worker level)						0.04*
* Non-r. Manual (occup. level)						(0.02)
Worker-/workplace controls	No	Yes	Yes	Yes	Yes	Yes
39 occupation dummies	No	No	Yes	No	No	—
Constant	2.73***	2.63***	2.65***	2.62***	2.63***	2.58***
	(0.03)	(0.03)	(0.05)	(0.05)	(0.05)	(0.04)
F(Task variables)	30.78***	26.50***	8.56***		8.01***	11.86**
F(Occ-lev. Task var)				70.09***	33.17***	15.87**
R-squared	0.19	0.37	0.45	0.41	0.42	—
N	1525	1525	1525	1525	1525	1365

Notes: Worker controls are education, gender, experience, experience squared, immigrant background. Workplace controls are supervisory status, firm size, new manufacturing/process technologies, new computer programs, increases in skill requirements, economic sector, firm location (West/East-Germany). M6 add. includes social background, %share of VET/univ. graduates in the occupation. Robust standard errors in parentheses; + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

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Article

Medium and Long-Term Returns to Professional Education in Switzerland: Explaining Differences between Occupational Fields

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Abstract
In Switzerland, initial vocational education and training graduates may enter a track of the tertiary system called professional education. Professional education represents about one-third of the tertiary system, includes numerous vocational training courses, and prepares for managerial or expert positions. Despite its prevalence, the long-term returns to professional education have rarely been investigated due to lacking data. In order to fill this gap, we will estimate the long-term returns to professional education based on a novel methodological design. Secondly, we aim to explain the differences in the returns to professional education between occupational fields by making use of the task-based approach of Autor, Levy and Murnane (2003). Analyses are based on the Swiss Labour Force Survey from 1991–2016. Based on a quasi-panel with cohort fixed effects and on linear regression models, our results reveal average short-term returns to professional education of 7% and long-term returns of 11%. However, we find considerable differences in the returns between training fields, which can partly be attributed to differences in the change of task composition after completion of professional education between occupations.

Keywords
initial vocational education and training; professional education; returns to education; work tasks

Issue
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1. Introduction

In Switzerland, one-third of all tertiary-level students complete a vocationally oriented track of higher education, called professional education. It is the main avenue to higher education from initial vocational education and training (IVET), which is the dominant form of upper-secondary education in Switzerland and chosen by about two-thirds of a birth cohort. Professional education reflects the strong occupational segmentation of the Swiss labour market and offers about 840 different occupation-specific training courses. They are accessible without a general university admissions certificate, also called baccalaureate, but usually require the previous completion of an upper-secondary degree and some work experience. The curricula are designed in collaboration with professional organisations and incorporate the skill requirements of specific occupations. Consequently, professional education provides in-depth vocational knowledge and also prepares for managerial positions. Depending on the professional education track, graduates receive diplomas called “College of Higher Education Diploma” or (Advanced) “Federal Diploma of Higher Education”, which can be earned after full or part-time studies (Cattaneo & Wolter, 2011; SBFI, 2018).

Despite the prevalence of professional education, little is known about the specific returns to this type of education. This holds for Switzerland as well as for

other countries with comparable types of vocationally oriented higher education. The handful of existing studies shows a fairly large variation in returns between countries. A comparative descriptive analysis calculated an OECD average of 22% higher relative earnings compared with upper secondary or post-secondary non-tertiary education (OECD, 2011). Other studies report short-term returns of up to 25% for the US (Celeste & Sanford, 2018; Jepsen, Troske, & Coomes, 2012; and 33% for Finland (Böckerman, Haapanen, & Jepsen, 2018), compared to the wage before graduation. For Germany, Stüber (2016) estimates that lifetime incomes with professional education are 40% higher than with IVET but 15% lower compared to a university degree. The latter finding corresponds with the results of Brunello and Rocco (2015), who calculate 18% lower relative earnings in OECD countries for professional education holders compared to academic higher education.

For Switzerland, recent evidence shows that 60% of professional education diploma holders report positive wage effects one year after the exam (BFS, 2019). Descriptive figures reveal that, on average, workers with an IVET diploma earn about 27% less than workers with professional education (Baumeler, Kriesi, & Barabasch, 2017). However, previous studies calculating short-term returns of professional education compared to IVET report varying figures, ranging between 19% and 37% (Sheldon, 1992; Weber, 1998; Wolter, 1994; Wolter & Weber, 1999). A more recent study of Cattaneo (2011) estimates short-term returns of about 7%, using five-year panel data. Based on the same data, and assuming stable economic and individual wage development, the study estimates prospective lifetime returns to professional education between −4% and +29%, depending on the cost scenario.

In sum, the findings from previous national and international research are fairly heterogeneous and difficult to generalise because returns to education always depend on the national labour market structure and the educational composition of a country's working population. Furthermore, the findings are based either on the inconsistent use of international classification codes for education or refer to different points in time and/or different birth cohorts. Other shortcomings are that the existing studies report either causal estimates of short-term returns or non-causal estimates of long-term returns. However, economic downturns or changing values of certain skill sets are likely to influence educational long-term effects. The previous findings might therefore not be reliable (Bassanini, Booth, Brunello, De Paola, & Leuven, 2007). Previous research does also not take into account that professional education is occupation-specific and thus very heterogeneous regarding the taught skill sets. Considering that skills are related to wage levels (Lemieux, 2015; Parent, 2000; Sullivan, 2010; Weeden, 2002; Williams, 2017), wage gains may differ between occupations after completion of professional education.

Against this background, our article estimates the average long-term returns to professional education compared to the time before graduation, when workers held an upper-secondary vocational training certificate only. We propose a novel methodological approach, which combines a quasi-experimental design with a quasi-panel, using a fixed effects estimator. Furthermore, we investigate differences in the returns to professional education between occupational groups and analyse the role of occupation-specific working tasks in explaining these differences. Put differently, we ask three related research questions: 1) how high are the average long-term wage gains after completing professional education compared to the time before graduation? 2) Do the wage gains differ between occupation-specific types of professional education? 3) To what extent can earning differences be explained by a change in the task sets after completion of professional education? In the next section, we will outline our theoretical assumptions, which are based on human capital theory (Becker, 1962), and the task approach of Autor, Levy and Murnane (2003). The third section describes the methods and data. The results are presented in Section 4 and discussed in section 5.

2. Socio-Economic Perspectives of Returns to Professional Education

Individual long-term returns to education are defined as the income benefits of continuing education minus its lifetime costs (Oreopoulos, 1972). Returns have been conceptualised either by comparing the income of people with and without a specific course of education or as the individual difference in income before and after completing extra education. While the first concept allows insights into return differences between different types of education, the second concept focuses on the wage gains of individuals after investing in more education. In this article, we focus on the second concept.

The economic and sociological wage literature assumes that returns to education depend on the interplay of supply and demand factors (Autor & Handel, 2013; Oreopoulos, 1972). Whereas the supply depends on the skills of employees (Becker, 1962), demand factors may be related, for example, to company structure (Baron & Bielby, 1980), employment relations (Goldthorpe, 2000), workplace authority (Wright, 2000), occupational gender-compositions (Murphy & Oesch, 2016) or occupation-specific skill requirements (Tåhlin, 2007), and a changing economic structure (Autor et al., 2003).

Explanations of how individual skills determine long-term returns mainly stem from human capital theory (Becker, 1962). The approach argues that every extra year of education results in an increase in knowledge and skills, which lead to higher productivity and, therefore, higher wages. The empirical literature confirms this assumed relationship between wages and years of schooling. For Switzerland, a number of studies show that each additional year of schooling/education is associated with

an increase in wages (Cattaneo & Wolter, 2018; Tuor & Backes-Gellner, 2010; Weber & Wolter, 1999; Wolter & Weber, 2005).

However, the human capital theory falls short in explaining wage differences between people with similar years of education but different occupation-specific skills. The reason is that the relative value of skills and thus their returns depend on their demand by employers (Autor et al., 2003). In order to conceptualise employers' demand and formulate assumptions regarding its impact on individual returns, we make use of the task-based approach by Autor et al. (2003). It argues that the demand for some working tasks has decreased within the last decades due to computerisation and automation. As a result, jobs with large shares of these tasks offer lower wages (Goos, Manning, & Salomons, 2010; Liu & Grusky, 2013; Oesch, 2013; Rohrbach-Schmid & Tiemann, 2013).

2.1. Determinants of Long-Term Returns to Professional Education

From a supply-side perspective and based on human capital theory, an increasing level of education increases the level of individual productivity, which is remunerated by employers (Becker, 1962). Becker argues that the productivity of a person is a function of investment in knowledge and skills, which determine the expected lifetime income. An investment in human capital is profitable as long as the costs of every further unit of education or training do not exceed their expected utility (Becker, 2011). Consequently, workers' productivity and thus their earnings should increase continuously after completion of formal education, because workers accumulate experience throughout their working life. This increase in both productivity and wages should be observable in the early and middle career but may diminish thereafter because skills depreciate over time (Mincer, 1974). Based on human capital theory, and taking into account that professional education teaches competencies for demanding technical or management positions (SBFI, 2018), we therefore assume that professional education increases the average wage of workers over time compared to their average wage before graduation and that these returns become constant or even decrease in the later career.

2.2. Determinants of Occupation-Specific Returns

From a demand perspective, two aspects are important. Firstly, the demand for skills has undergone profound changes within the last decades (Autor et al., 2003; Firpo, Fortin & Lemieux, 2011; Liu & Grusky, 2013). Secondly, professional education is occupation-specific. Consequently, the demand for skills is likely to differ between occupations and affects the returns to education. In order to conceptualise potential differences between occupation-specific types of professional education, we make use of the task-based approach of Autor et al. (2003), also called the "skill-biased technological change" approach (SBTC). It connects job tasks with skills by classifying jobs regarding their core task and identifying the skills necessary to carry out these activities. With regard to work tasks, the SBTC approach distinguishes between two main dimensions: routine/non-routine tasks and manual/non-manual tasks. The combination of these dimensions results in four different tasks: routine cognitive tasks, routine manual tasks, non-routine manual tasks, and non-routine non-manual tasks. The latter task type is often further divided into non-routine analytical and interactive tasks (Spitz-Oener, 2006; Williams & Bol, 2018).

Autor et al. (2003) assume that routine tasks require fewer skills than non-routine tasks. Whereas routine tasks require little analytical effort, non-routine tasks are more heterogeneous and variable and require more cognitive effort and abilities. Furthermore, routine tasks can, compared to non-routine tasks, be fully specified as a series of instructions to be executed by a machine. Manual tasks represent physical tasks and require a lot of physical effort. Routine cognitive tasks represent general cognitive occupational skill requirements, such as calculating, correcting texts/data, or measuring tasks, which require less (and more repetitive) cognitive effort than non-routine tasks. Analytical tasks require problem-solving, evaluating and planning skills, or skills for working out and interpreting rules. Interactive tasks subsume, for example, negotiating, teaching, entertaining, caring, or presenting skills (Spitz-Oener, 2006).

The task-based approach argues that due to technological and economic change within the last decades, namely computerisation and a shift from a production to a service economy, the demand for the five types of tasks has profoundly changed. Routine tasks—and in particular manual routine tasks—have decreased, although they have not disappeared altogether. Non-routine tasks and high-skilled work have risen in importance (Acemoglu & Autor, 2011; Autor et al., 2003; Buera & Kaboski, 2012; Drucker, 1954). This has led to an increasing demand for highly skilled workers who are able to complete non-routine work tasks (Autor et al., 2003). Their ensuing higher bargaining power results in higher wages (Pissarides, 2000).

More precisely, the literature shows that the growth of the service sector, as well as technological change, has led to an increase in the demand for non-manual tasks. The demand for manual skills has decreased, and they are mainly sought after in medium- and low-wage occupations (Autor & Handel, 2013; Firpo et al., 2011). Furthermore, and due to automation, routine cognitive and routine manual tasks have been replaced by computers. This has led to a decrease in their relative market value (Autor et al., 2003; Spitz-Oener, 2006).

The shifts in the demand for (non-)routine and (non-)manual tasks over the last decades have been observed in most Western countries (Autor et al., 2003; Jerbashian, in press). This also holds for Switzerland, where the picture is similar. The service sector has

grown in size whereas agriculture and production have shrunk (Sheldon, 2005). Furthermore, the demand for high-skilled workers—particularly for workers with tertiary-level education—has risen, while the demand for unskilled work has decreased (Sacchi, Salvisberg, & Buchmann, 2005). This process was accompanied by an expansion of the tertiary education system in Switzerland (Buchmann, Sacchi, Lamprecht, & Stamm, 2007). Regarding work tasks, Oesch and Rodriguez Menes (2011) and Aepli et al. (2017) confirm that the importance of analytical and interactive non-routine tasks has risen, whereas manual routine tasks have decreased (Aepli et al., 2017; Oesch & Rodriguez, 2011). In addition, and rather surprisingly, Aepli et al. (2017) also find a slight increase in manual non-routine tasks since 1990.

The distinction between the five task types is ideal-typical. Fernández-Macías and Hurley (2016) show, for example, that the significance of routine tasks may differ by work context. Whereas the dominant concept of routine tasks refers to tasks characterised by the methodical repetition of a procedure, which correlates negatively with cognitive effort, routine tasks may also serve to optimise performance, as is the case with musicians, for example. In the latter case, routine tasks are associated with high cognitive requirements. However, despite this element of blurring between the categories, the SBTC task concept has been useful in previous studies in order to explain differences in wage returns.

For the US, the results showed that wages of (high) skilled workers have increased more over time since the 1970s compared to wages of low skilled workers (Acemoglu & Autor, 2011). Furthermore, analytical skills, such as problem-solving, managing, or supervising, have correlated with higher wages in recent times compared to the 1980s (Autor & Handel, 2013; Liu & Grusky, 2013). For Germany, Spitz-Oener (2006) and Dustmann, Ludsteck and Schoenberg (2009) find a similar, albeit slightly postponed development. Their results show that wages of high skilled workers have increased more significantly compared to the wages of low skilled workers. The available evidence for Switzerland is in line with these findings. Between the years 1990 and 2008, employment and earnings increased most at the top of the occupational structure (Oesch & Rodriguez, 2011). Furthermore, Aepli et al. (2017) observed the highest wage increases within the last decade for analytical and interactive non-routine tasks.

In summary, these findings imply that changes in the demand for certain tasks are related to changes in their market price. Consequently, we expect that these changes in task demand, which have been on-going for several decades, affect the returns to education in general and to professional education in particular. Although professional education should generally lead to a larger share of non-routine tasks, the extent of this change is likely to differ considerably between occupational fields. Whereas in some fields, routine manual and/or cognitive tasks may almost disappear for workers with professional education, these tasks may remain sizeable in others.

Based on the SBTC approach, our basic assumption is that the returns to professional education are related to the task changes induced by professional education. Firstly, we assume that the increasing demand for analytical and interactive non-routine tasks should lead to a higher monetary value of these tasks. Therefore, we posit that returns to professional education will be higher in occupational fields where professional education leads to jobs characterised by a strong increase in interactive and analytical tasks compared to the jobs of workers with IVET only.

Secondly, with regard to manual non-routine tasks, two opposing trends may be at work. On the one hand, the demand for manual tasks has decreased or stagnated due to the shrinking industrial sector. This is likely to have had a detrimental effect on returns. On the other hand, non-routine tasks are difficult to automate and may not be replaced. This may have had a positive effect on wages. If the first tendency prevails, we would expect limited returns to professional education in occupational fields where professional education leads to an increase in manual non-routine tasks. Based on the second tendency, we would expect to find increasing returns due to professional education in occupational fields where professional education leads to jobs with higher shares of manual non-routine tasks.

Thirdly, the prediction regarding cognitive routine tasks is also not entirely straightforward. Based on the classical SBTC assumption that the demand for, and consequently the monetary value of, cognitive routine tasks has been decreasing due to automation, we would expect that professional education which leads to jobs with an increasing share of manual routine tasks correlates with low returns. However, as described above, the demand for manual non-routine tasks is still surprisingly high in the Swiss labour market. Whether it has been sufficiently high to positively affect returns to professional education is an empirical question. Fourthly, the decreasing demand for routine manual tasks due to computerisation should have led to a lower monetary value of routine manual tasks. We expect lower returns in occupational fields where a professional education program leads to an increasing share of manual routine tasks.

Finally, average occupation-specific wages may be related to the coverage of collective agreements, i.e., binding industry—or occupation-specific conventions for minimum wages of workers with certain skills. Collective agreements result from successful wage negotiations between employee associations, such as labour unions and employer associations. In Switzerland, collective wage agreements, also called “GAV”, cover about 40% to 50% of all employees during our observation time (BFS, 2018; Lampart & Kopp, 2013; Oesch, 2011).

The findings regarding the relationship between wages and collective agreements are inconsistent. For the US, Canada, and the UK, Card, Lemieux and Riddell

(2004) find, for example, that collective wage agreements negotiated by unions tend to reduce wage inequality between workers. However, the results also show that the higher wages in industries with union coverage are due to the higher skill level of the respective workers. For Switzerland, Visser and Checchi (2009) find no significant correlation between union coverage and returns to education. However, union coverage and collective wage agreements are not fully congruent. Consequently, it remains an open question of whether collective wage agreements affect returns to professional education in Switzerland.[1]

3. Data and Methods

3.1. Data and Sample

We use the Swiss Labour Force Survey (SLFS) of the Federal Statistical Office from 1991–2016. The Dataset is designed as a rotating panel and provides information on the structure of the labour force and employment patterns in Switzerland. The SLFS is based on a random sample stratified by cantons. Until 2009, respondents were interviewed once a year for a maximum of 5 consecutive years. From 2010 onwards, interviewees remained in the sample for a maximum of 2 years (BFS, 2017). We limit our sample to individuals born between 1951 and 1971 who hold a vocational education diploma and are aged between 20 and 65 in the observed years from 1991 to 2016. We thus use the regular retirement age for men as an upper limit. The lower limit is set at 20 years as the youngest possible age to enter professional education (BFS, 2007). This basic sample of 69543 individuals thus covers the complete working life. 10189 individuals of this sample have also earned a professional education certificate. In order to estimate the average returns to professional education by occupational group, we select a subsample of individuals for whom we have information on income before and/or after completion of professional education. Including the control group without professional education, this sample includes 28565 individuals, which we observe between two and five consecutive years.

3.2. Methods

3.2.1. Estimation Strategy

The estimation of long-term returns to education poses two problems: longitudinal data covering a long timespan are needed, and self-selection into higher education due to unobserved characteristics ("unobserved heterogeneity") has to be controlled. The available data for Switzerland—including the SLFS—do not provide sufficiently large samples or observation spans. Furthermore, the available data do not include information on ability or motivation, and estimation results could, therefore, be biased. Deaton (1985) proposes a solution to both problems. In order to optimise the estimation of average population values, he suggests creating a "quasi-panel" by grouping individuals of cross sections by fixed characteristics. Deaton demonstrates that with a high number of observations per created cohort and cross-section, the sample cohort and population cohort means at each point in time are comparable. This method allows for the estimation of cohort fixed effects as well, because demeaning of the variables over time and cohort becomes possible. The creation of such a quasi-panel allows for the use of cross-sectional or short panel data to investigate long-term developments with data "repeatedly collected from random samples drawn from the same time-stable cohort of individuals rather than repeatedly from the same specific individuals" (Russell & Fraas, 2005, p. 2). The problem of unobserved heterogeneity is tackled by the use of a fixed effects estimator isolating the so-called "within variation". To create a quasi-panel, we first define a treatment and a control group. While the latter includes all individuals holding a VET diploma only and are therefore eligible to enter professional education, the treatment group includes all individuals who first completed upper-secondary vocational education and training and earned a professional education diploma later. The average treatment effect (of the treated) is the average individual wage difference before and after professional education, based on all individuals of the treatment group.

Second, we sort and aggregate the individuals of the treatment group by their year of graduation from professional education between 1991 and 2014.[2] After data cleaning, this procedure yields a sample of 22 graduation cohorts and one control group, which we observe over a maximum of 25 years.[3] Because our sample size differs within cohorts over time, the precision of the cell means differs. Following Russell and Fraas (2005), we correct our results for possible heteroscedasticity by using cell sizes as weights.[4] To sum up, the creation of a quasi-panel allows us to investigate the long-term returns to professional education by estimating the "average treatment effect of the treated (ATET)", which is the average difference of individuals in the treatment group before and af-

[1] Due to lacking data, we are not able to answer this question in the present study.

[2] Since exact exam dates are unknown, we count the exam-year as a pre-treatment time point.

[3] Some individuals of the control group may enter professional education at an unobserved later date. These potential "high achievers" could bias our estimates by increasing the observed average yearly gross income of the control group without professional education. In order to control for this potential bias, individuals remain in the control group without professional education until the year in which they earn their degree.

[4] After controlling for autocorrelation with the stata procedure "xtserial" we find some weak indication for autocorrelation (Brüderl & Ludwig, 2015; Cameron & Miller, 2015). We also test for heteroscedasticity by including cluster-robust standard errors. We find the expected upward changes in the values of standard errors. However, because the differences are minimal and do not change the p-values of any of our estimates, we do not apply standard error correction.

ter the treatment (Brüderl & Ludwig, 2015). In our case, the average treatment effect is implemented as a "distributed fixed effect", measuring the development of the returns to professional education more precisely than the usual dichotomous fixed effects estimator, because it compares the average of all time points before with each point in time after the treatment (Dougherty, 2005).

In order to explore differences in the income development between occupational groups, we would ideally use the described quasi-panel design and estimate the effects by occupation using a fixed effects estimator. However, the large number of cases needed per cohort and year (see Verbeek & Nijman, 1992) is not available. Alternatively, we use our sample on the individual data level and follow a three-step procedure. First, we estimate the average short-term returns to professional education by occupational group (3-digit SBN 2000 level) using a fixed effects estimator at the individual level. Second, we aggregate the data by occupational group. This procedure yields average values for 39 groups of occupations. Third, we use an OLS regression to explain the relationship between tasks and average return differences to professional education between 39 occupational fields (model II). Again, using a fixed effects estimation strategy allows us to wipe out the "contaminated" between-variation (Allison, 2009, p. 3).[5]

3.2.2. Variables

Our estimation of the returns to professional education (model I) is based on the cohort average of the natural logarithm of individual gross yearly income. We calculate full-time equivalents based on 42 weekly working hours. The income data are adjusted for inflation.[6] We measure the long-term returns to professional education by using a variable which compares the average income before professional education with each time point after completing professional education. This so-called distributed fixed effect captures the wage development over time. Furthermore, we control the average age within each graduation cohort at each point in time (age effect) and include a categorical time variable (period effect) into model I. The latter measures the average wage development over time and controls the economic cycle. Finally, the variable ratio of the labour market demand for IVET and professional education diploma holders captures the yearly occupation-specific ratio of labour demand for IVET and professional education diploma holders. The indicator is measured at the two-digit level of the Swiss standard classification of occupations (SBN2000, 39 occupational fields) and based on Swiss Job Monitor data (Sacchi, 2014). It captures the annual occupation-specific job openings for workers with an IVET diploma or with a professional education degree, weighted by the access probability of the opening with a given credential (for details see Kriesi, Buchmann, & Sacchi, 2010; Sacchi, Kriesi, & Buchmann, 2016). Representative data of the advertised open positions in Switzerland, the Swiss Job Monitor Data (Sacchi, 2014), were used to measure the demand side. The calculation of the mobility weights, capturing the degree to which open positions in one occupation are accessible for individuals with another occupational background, is based on the Swiss Census 2010. The index thus represents individual occupation-specific job opportunities at the time of entering employment in the current workplace. Higher numbers on the index are associated with better opportunities for IVET diploma holders.

The dependent variable of our second model (model II), which estimates the average occupation-specific determinants of returns to professional education, is the average yearly income difference before and after professional education for 39 occupational groups, measured at the 3-digit level of the SBN 2000 (see Table A1 in the Appendix). The construction of this variable is based on 39 auxiliary fixed effects regressions with the inflation-adjusted logarithmic yearly gross income as a dependent variable, a dummy measuring the mentioned income change and a time variable capturing the survey wave. The results of the auxiliary regression for the occupational group specific returns are shown in Figure 1.

Regarding the task operationalisation, we make use of Spitz-Oener's (2006) categorisation, which distinguishes between (1) cognitive routine tasks, (2) manual routine tasks, (3) analytic tasks, (4) interactive tasks, and (5) manual non-routine tasks. We calculate five indicators, which measure the difference in the work tasks before and after completing professional education. The indicators capture the average difference in the share of task X in occupation Y between workers holding IVET and professional education diplomas. The measures are based on the *German BIBB/BAuA Employer Survey* (Hall, Siefer, & Tiemann, 2018; Hall & Tiemann, 2009; Jansen & Dostal, 2015). In order to cover all of our observation years, we used the waves of 1999, 2006, and 2012. We make use of German data because no Swiss task data is available. However, due to the strong similarity of the German and Swiss occupational systems, we consider this approach feasible.[7]

[5] Tests for temporal homogeneity (Brüderl & Ludwig, 2015) and Hausman tests (Hausman, 1978) confirm that fixed effects models are an appropriate strategy of analysis due to a correlation between our explanatory variables and the unobserved person- or group-specific characteristics (the so-called "person or cohort-specific error terms").

[6] For individuals with several wage observations before the transition to professional education, we calculate the average across the observed years. Based on a Kruskal-Wallis rank sum test we find no statistically significant differences in the average income of respondents with 1,2,3 or 4 observations before completing professional education (Chi-Square value of 2.179; $p = 0.5362$). Respondents are nearly equally distributed over the 4 different points in time. Furthermore, men and women still follow different working time regimes in Switzerland. Because men in our data work full-time about twice as often as women, we use full-time equivalents.

[7] In order to test the validity of using German data, we systematically compared the task description of some training occupations based on the information issued by SERI (2019) and IAB/Berufenet (2019). Using carpenters as an example, the results show that the described tasks of this training occupation are almost identical in Germany and Switzerland (see Appendix, Table A4).

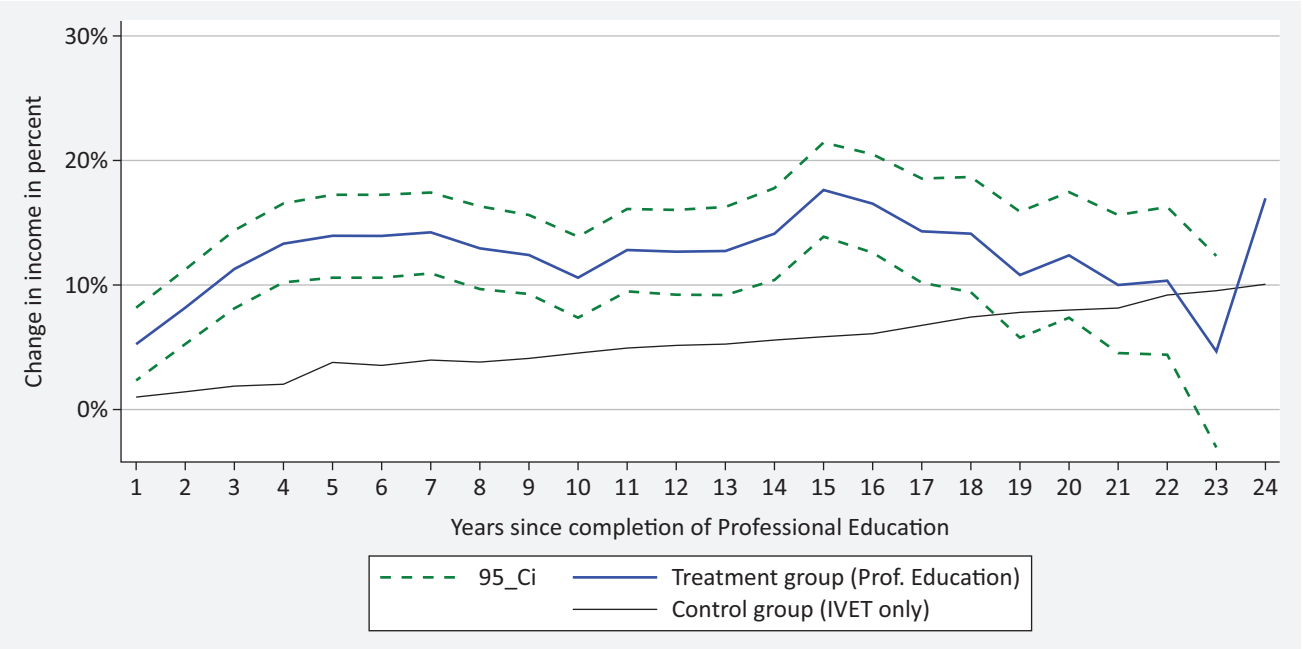

Figure 1. Income change due to professional education (impact function).

Regarding our control variables, we estimate the ratio of professional education graduates to IVET diploma holders per occupational field based on the SLFS data. The reason is that the transition probability into professional education may be influenced by the average returns within an occupational field, leading to a selection bias. In other words, the probability to complete professional education may be higher in occupational fields offering higher returns for professional education diploma holders compared to fields with lower returns. We also include workers' wages before completing their professional education, averaged by occupational group, in order to control for disproportional wage increases between occupational fields. Furthermore, we include the average age of workers because we assume lower returns with increasing age[8] and the occupation-specific change in the share of female workers. The reason is that female-dominated occupations often go along with lower returns. Possible reasons are a devaluation of female-typed tasks or lower investment of women in well-paid specific human capital (Becker, 1971; Leuze & Strauß, 2016). Finally, we control for company size. Large companies have more financial resources, which might lead to higher returns in large companies (Oi & Idson, 1999). Tables 1 and 2 provide an overview of all variables.[9]

4. Results

We will begin by presenting our results for the average long-term returns of professional education. In the second section, we describe the differences between occupational fields regarding wages and changes in task shares before discussing the relationship between tasks and returns in the third section.

4.1. Long-term Returns to Professional Education

Our results regarding the long-term returns to professional education are shown in Table A2 in the Appendix and illustrated in Figures 1 and 2. The coefficients for the years in Table A2 show the distributed fixed effects up to 24 years after graduation. They represent the annual wage increase after completing professional education compared to the average wage before graduation. Figure 1 shows that, although the trend of the impact variable is not entirely linear—partly due to a varying number of observations per year—the general trend is clear-cut. It shows increasing returns to professional education over time from on average 7% right after graduation to almost 18% in the 15th year after earning the degree. Afterward, returns diminish slightly over time and even out about 20 years after graduation at an average value of approximately 10%. This downward trend may partly be due to a low number of observations for the last years and should be regarded with caution. The development of the control group with IVET also only shows an upward trend but on a considerably lower level.

In order to calculate the average wage increase across the entire observation span, we estimated a model with a dummy variable instead of the distributed fixed effects variable. It captures the average wage change across all graduation cohorts (see Table A3 in the Appendix). It reveals the average long-term returns

[8] No differences in the age effect were found using a median age.
[9] Due to a lack of data, we do not control for union coverage.

Table 1. Descriptive overview of variables for model I.

Variable	Mean	Std. Dev.	Min	Max
Overall average gross yearly income	99943.96	11701.09	64111.44	129976.1
Logarithm of overall average gross yearly income	11.45	.11	11.04	11.67
Distributed fixed effect (number of years after graduation)	7.37	6.15	0	24
Average age per cohort and year	43.11.	5.98.	29	53
Ratio labour demand for professional education/IVET	16	6.82	2	44
Year	2006	6.07	1991	2015
N_total (Total sample size)	69543			
N total_cohort (Cohort sample size (quasi-panel))	443	1400	3	8172
Number of cohorts	23			

Table 2. Descriptive overview of variables for model II.

Variable	Mean	Std. Dev.	Min	Max
Average short term returns to professional education (%)	3.77	8.13	23	23
Average relative task change between workers with professional education and iVET :				
Relative change of analytic non-routine tasks	9.64	20.85	−55	50
Relative change of interactive non-routine tasks	14.79	27.65	−62	93
Relative change of manual non-routine tasks	−3.79	31.95	−47	125
Relative change of cognitive routine tasks	−.872	10.49	−26	26
Relative change of manual routine tasks	−2.13	25.72	−37	75
Average wage before professional education (in 1000 CHF)	80.87	14.95	58	127
Average age	38.79	4.98	30	51
Change of share of women (%)	25.23	34.56	0	100
Average company size (ref = medium and large companies)				
Small	.51	.50	0	1
Medium & large	.10	.31	0	1
Ratio of professional education graduates (%)	3.41	2.75	0	13
Sample size (No occupational fields)	39			

of approximately 11%. Regarding the short-term returns, our results confirm Cattaneo's (2011) estimate of approximately 7% higher earnings right after completion of professional education. However, our long-term estimations based on the quasi-panel method refer, with an average of 11%, to the first third of Cattaneo's long-term calculations, which range from −4% to 29%, depending on the cost scenario. Consequently, most of her cost scenarios are considerably higher than our estimates.

To test the robustness of our results, we re-estimated our model by a) reducing the observation span to 15 years after graduation, b) reducing the graduation cohorts to those observable for a maximum of 15 years (graduation cohorts from 2001 to 2014), and by c) reducing the graduation cohorts to those observable for the entire time-span of 24 years (graduation cohort of 1991–2000). All estimates result in similar average return values between 10% and 12% (see Table A3 in the Appendix). We therefore conclude that our estimates of the long-term returns are robust and not affected by the observed downward trend in returns approximately 15 years after graduation.

The year dummies in our model control for time trends (period effects). They include the wage development of the control group with IVET only and of workers with professional education. The development is illustrated in Figure 2. Compared to the reference year of 1991, almost all coefficients show positive values. This indicates a general upward trend in wages for IVET and professional education certificate holders. The average age of the respondents has no significant effect on wage development. Consequently, the wage increase over the career is not related to the average cohort age at graduation. Finally, the variable measuring the ratio of the demand for workers with professional education and workers with initial VET is positive and statistically significant. This implies that the returns to professional education increase if the demand for workers with professional education is higher than the demand for workers with initial VET only. If the ratio increases by 10%, the average wages for people with professional education increase by 5%.

4.2. Wage Differences between Occupational Fields

In order to examine wage differences between occupational fields, we have run auxiliary regressions, which estimate the average short-term returns for 39 occupational fields. The results are illustrated in Figure 3. They show that the returns to professional education—albeit

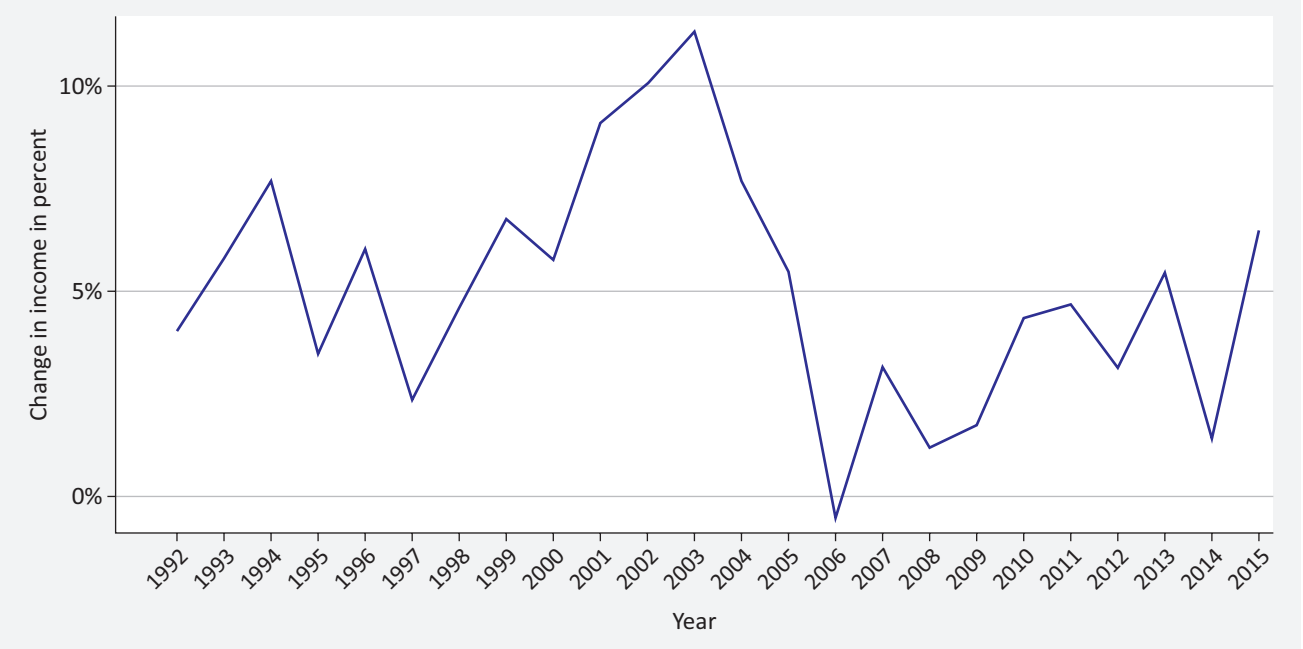

Figure 2. Average relative wage development of professional education and IVET only certificate holders (compared to the year 1991).

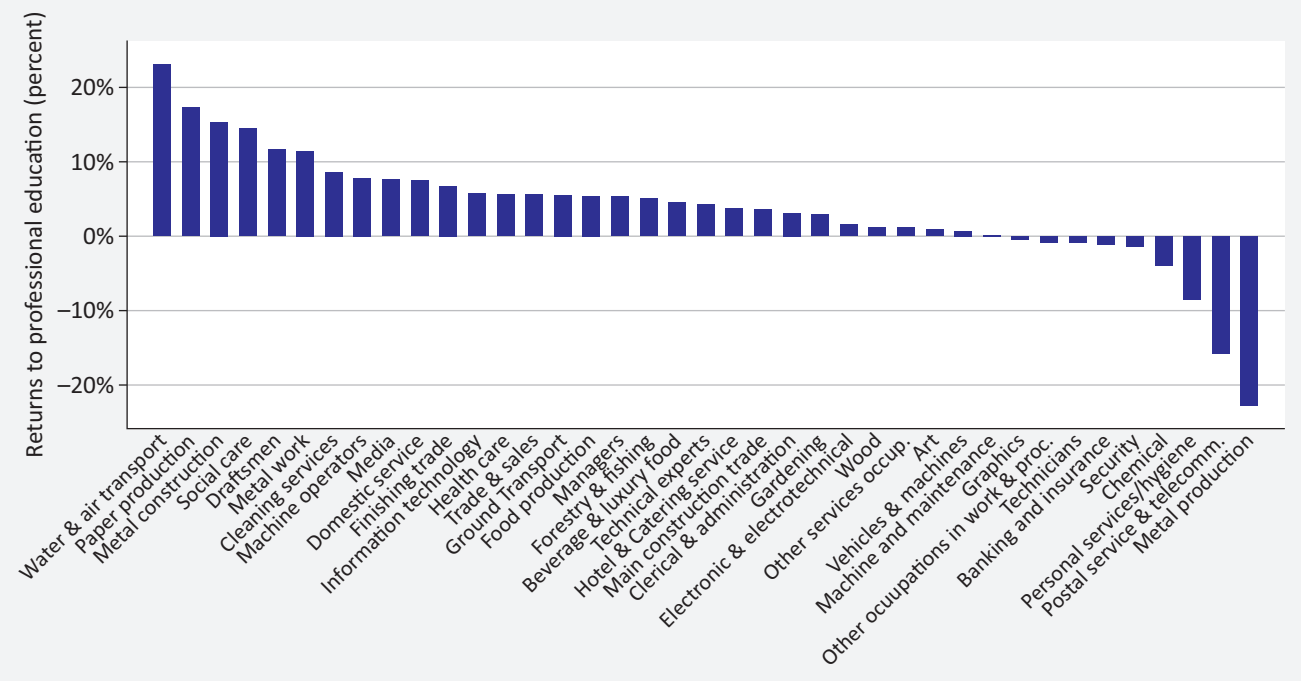

Figure 3. Mean return (%) to professional education by occupational field.

mostly positive—do indeed vary considerably between the occupational fields. They range from average values of 23% in occupational fields like water & air transport or paper production to negative values of −23% for metal production or personal service/hygiene.

Figure 4 illustrates the average relative task difference between workers with an IVET and a professional education diploma within an occupational field. In most occupational fields, completing professional education leads to an increase in analytic and interactive non-routine tasks. The differences regarding cognitive routine tasks are small in most occupational fields. With a few notable exceptions, professional education is associated with lower shares of routine and non-routine manual tasks. Outliers regarding routine manual tasks are social care or personal services/hygiene. In these occupational fields, manual routine tasks are an integral part of skilled work. These findings thus support the assumption

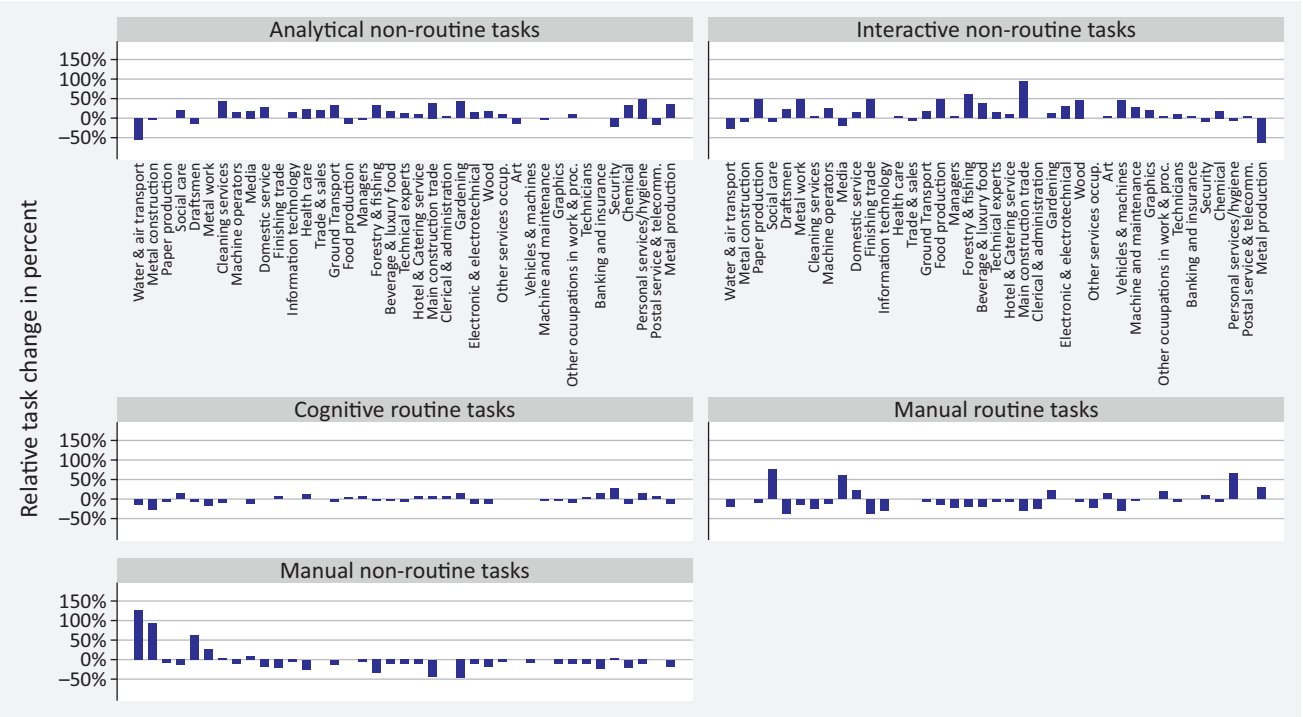

Figure 4. Relative change of task shares after professional education by occupational field, sorted from left to right by return size.

that some types of routine manual tasks go along with qualified work (see Fernández-Macías & Hurley, 2016). Outliers for non-routine manual tasks are paper production or water and air occupations. In these fields, routine tasks dominate, and professional education leads to a shift from routine to manual non-routine tasks.

Figure 5 illustrates the bivariate correlation between the occupation-specific returns to professional education and the relative change of all three types of non-routine tasks taken together. The pattern supports our hypothesis that an increase in non-routine tasks due to professional education goes along with higher returns.

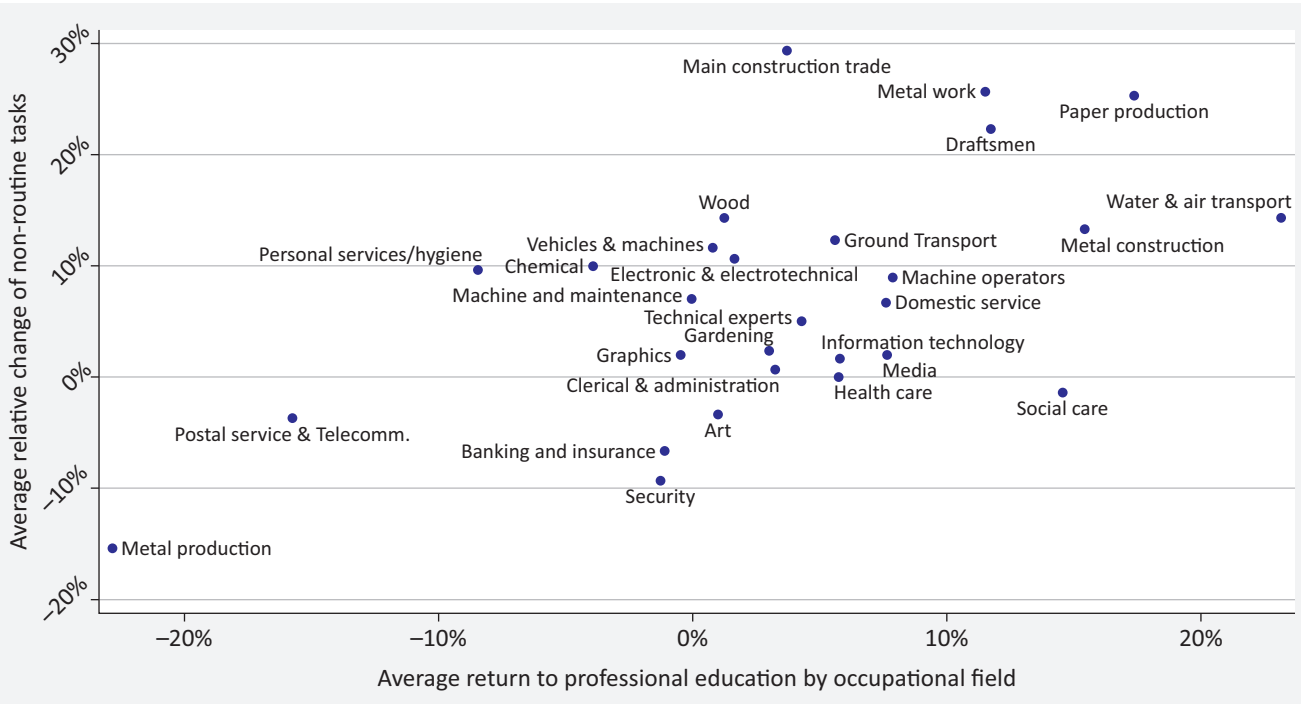

Figure 5. Correlation between the relative change of analytical and interactive non-routine tasks and returns to professional education by occupational field.

4.3. Determinants of Occupation-Specific Returns

The relationship between a change in the share of work tasks and occupation-specific returns to professional education is illustrated in Table 3. As expected, we find a significant positive impact of analytical and interactive non-routine tasks. A 10% relative increase in the share of these two tasks goes along with higher average returns of around 2%. Interestingly, manual non-routine tasks are associated with the strongest increase in returns. In occupational fields where professional education leads to a relative increase in manual non-routine tasks, returns increase strongest. A 10% relative increase in manual non-routine tasks leads to 3% higher returns. The comparatively high returns of manual non-routine tasks in Switzerland may, on the one hand, be due to the still fairly high prestige of craftsmanship. The prevalence and high quality of Swiss vocational education and training have helped to maintain the traditionally strong position of craft occupations. On the other hand, high returns may be explained by collective agreement coverage, which is higher in the secondary sector than in the tertiary sector in Switzerland (Lampart & Kopp, 2013).

The relative change in the share of routine tasks—manual or cognitive—is not significantly related to returns to professional education. This is in line with the SBTC approach and may be explained with the diminishing importance and the decreasing demand for routine tasks in modern economies. The finding also shows that, although cognitive routine tasks are still prevalent in the Swiss labour market (Aepli et al., 2017), their monetary value is limited.

Regarding our control variables, neither the average wage before professional education nor average age nor the change of the share of women before and after professional education nor the company size nor the ratio of professional education graduates are significantly related to the occupation-specific returns to professional education.

5. Discussion and Conclusions

In Switzerland, initial VET diploma holders may continue their education at the tertiary level by earning a professional education degree. About one-third of all IVET diploma holders choose this option, usually after gaining some work experience (BFS, 2019). In order to investigate how much an investment in professional education pays in the long run in comparison with holding an IVET diploma only, we make use of a novel design which combines a quasi-panel cohort design with an experimental framework. The procedure yields short-term returns of approximately 7% and long-term returns of 11%. The former figure is in line with results presented by Cattaneo (2011). However, her figures for long-term returns, which are based on projections of different cost scenarios, are in most cases higher than ours, and her highest value exceeds our results by as much as 18%. This suggests that the long-term returns of professional education have hitherto been overestimated. Likely reasons are that changes in the demand for skills due to fluctuating business cycles or technological development cannot be taken into account with short-term data only. This disadvantage is greatly attenuated by our proposed method. It allows for a reliable simulation of longitudinal data with long observation spans which enable more precise and robust estimates of long-term returns.

In the second step, we analysed whether the returns differ between occupation-specific types of professional education and whether such differences are related to changes in the task composition associated with the transition from IVET to professional education. We found

Table 3. Model II—Results of (weighted) OLS regression.

Returns to professional education	Coef.	Std. Err.
Relative change of analytical non-routine tasks (in 10%)	1.85**	(0.86)
Relative change of interactive non-routine tasks (in 10%)	2.09***	(0.61)
Relative change of manual non-routine tasks (in 10%)	2.94***	(0.62)
Relative change of cognitive routine tasks (in 10%)	1.71	(1.45)
Relative change of manual routine tasks (in 10%)	0.69	(0.56)
Average wage before professional education (in 10000 CHF)	0.10	(0.09)
Average age	−0.28	(0.29)
Change of share of women (in 10%)	−0.66	(2.52)
Average company size (ref = micro companies)		
Small	3.17	(2.77)
Middle & large	−4.46	(5.81)
Ratio of professional education graduates	0.58	(0.49)
Constant	−0.38	(11.64)
F-Test	3.33*** (11,27)	
Observations	39	
Adj. R-squared	0.40	

Notes: Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

that within most of the occupational fields, professional education has positive wage effects. However, the magnitude of the wage gains varies considerably due to varying occupation-specific differences in the task composition of IVET and professional education diploma holders. Wage gains increase significantly in occupational fields where professional education leads to an increasing share of non-routine tasks. This is in line with our assumptions, based on the task-based approach, and can be explained by the growing importance of non-routine tasks in the labour market.

This being said, it is important to note that these findings pertain to short-term returns only. We were not able to estimate long-term differences between occupational fields due to insufficient sample sizes. A drawback of the proposed quasi-panel method is the requirement of a very large number of observations per cohort and time points. This severely limits subgroup comparisons, for example by occupation, age, or gender. Furthermore, the available data sets for Switzerland lack information on individual characteristics, such as ability, school leaving certificates, or social background, as well as on workplace characteristics, which are potentially relevant for individual returns to education.

Despite these limitations, our article makes some important contributions to the existing literature. Firstly, our study demonstrates that the use of a quasi-panel cohort design compensates the lack of individual life-course data, which frequently hampers reliable estimates of returns to education. It enables us to observe long-term developments even if individual-level longitudinal data is unavailable. Secondly, the chosen method based on an experimental design combined with a fixed effects estimator allows for causal estimations at a cohort level and for controlling unobserved heterogeneity. We consider this approach to be a useful alternative to the sole estimation of short-term returns or of long-term returns, which are potentially biased by self-selection or unobserved heterogeneity. The reliable long-term estimation of returns to professional education is particularly important for Switzerland, where a large part of the workforce enters vocational education and makes use of this type of education to optimise their income prospects. A third contribution is a confirmation that the returns to professional education are very heterogeneous and partly determined by the occupation-specific changes in the task composition after completion of professional education. Whereas professional education pays off well in some occupational fields, the financial benefits, compared to IVET, are very small in others. Within the Swiss system, where the accessible programs of professional education strongly depend on the IVET training program, this implies that the prospects for an individuals' lifetime earnings are partly determined at the early age of 15, when young people enter IVET.

In sum, our article contributes to the hitherto scarce research on Swiss professional education. However, many questions remain unanswered. Further research should, for example, aim at comparing the long-term returns to professional education with those for university or university of applied sciences education. It would also be important to gain more insights into differences in long-term returns between men and women, who still follow different working time regimes in Switzerland. Whether and to what extent part-time work has an influence on the returns to professional education, to our knowledge, has never been investigated. Last but not least, it would be desirable if the relative significance of work tasks, individual characteristics, and firm characteristics for returns could be investigated further.

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Conflict of Interests

The authors declare no conflict of interests.

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Appendix

Table A1. Occupational groups based on SBN2000.

114 Gardening	115 Forestry & fishing	211 Food production
212 Beverage & luxury food	241 Metal production	242 Metalwork
243 Metal construction	244 Machine and maintenance	251 Electronic & Electrotechnical
253 Vehicles & machines	261 Wood	263 Paper production
271 Graphics	281 Chemical	291 Other occupations in work & processing
311 Engineering	321 Technicians	331 Draftsmen
341 Technical experts	351 Machine operators	361 Information technology
411 Main construction trade	412 Finishing trade	511 Trade & sales
523 Other services occup.	531 Ground Transport	533 Water & air transport
541 Postal service & telecomm.	611 Hotel & Catering service	612 Domestic service
621 Cleaning services	623 Personal services/hygiene	711 Managers
721 Clerical & administration	731 Banking and insurance	741 Security
751 Legal occupations	811 Media	813 Art
831 Social care	832 Welfare	865 Health care

Table A2. Model I—Results of (weighted) quasi-panel fixed effects regression.

Effect of professional education (%)	**Coef.**	**Std. Err.**
Distributed fixed effect (number of years after graduation)		
Year 1	0.053***	(0.015)
Year 2	0.083***	(0.015)
Year 3	0.114***	(0.016)
Year 4	0.134***	(0.016)
Year 5	0.140***	(0.017)
Year 6	0.139***	(0.017)
Year 7	0.143***	(0.016)
Year 8	0.130***	(0.017)
Year 9	0.125***	(0.016)
Year 10	0.106***	(0.017)
Year 11	0.128***	(0.016)
Year 12	0.127***	(0.017)
Year 13	0.128***	(0.017)
Year 14	0.142***	(0.018)
Year 15	0.177***	(0.019)
Year 16	0.165***	(0.020)
Year 17	0.144***	(0.021)
Year 18	0.141***	(0.023)
Year 19	0.108***	(0.025)
Year 20	0.125***	(0.026)
Year 21	0.101***	(0.028)
Year 22	0.104***	(0.030)
Year 23	0.047	(0.039)
Year 24	0.170***	(0.059)

Table A2. (Cont.) Model I—Results of (weighted) quasi-panel fixed effects regression.

Effect of professional education (%)	Coef.	Std. Err.
Calendar year (ref = 1991)		
1992	0.041***	(0.012)
1993	0.058***	(0.013)
1994	0.077***	(0.015)
1995	0.035*	(0.019)
1996	0.060***	(0.019)
1997	0.023	(0.025)
1998	0.047*	(0.025)
1999	0.068**	(0.027)
2000	0.058*	(0.032)
2001	0.091***	(0.032)
2002	0.101***	(0.035)
2003	0.113***	(0.037)
2004	0.077*	(0.041)
2005	0.055	(0.045)
2006	−0.005	(0.056)
2007	0.032	(0.054)
2008	0.012	(0.058)
2009	0.018	(0.062)
2010	0.043	(0.064)
2011	0.047	(0.066)
2012	0.031	(0.073)
2013	0.055	(0.073)
2014	0.014	(0.079)
2015	0.065	(0.078)
Ratio labour demand (PE/VET)	0.005***	(0.001)
Average age	0.005	(0.003)
Constant	10.99***	(0.096)
F-Test	140 (72,241)	
Observations	314	
cohorts	23	

Notes: Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; Average panel length: 14 years, fixed effects panel regression weighted by the number of individuals per graduation cohort; R^2 is not shown in the table, because in a quasi-panel design it is not a reliable estimate.

Table A3. Results of (weighted) quasi-panel fixed effects regression.

Effect of professional education (%)	Coef.	Std. Err.
Average effect (all cohorts)	0.107***	(0.014)
Average effect until year15 after graduation (all cohorts)	0.108***	(0.014)
Average effect for those observable for max. 15 years after graduation (graduation cohorts 2001–2014)	0.099***	(0.017)
Average effect for cohorts observable for 24 years (graduation cohorts 1991–2000)	0.114***	(0.022)

Notes: Standard errors in parentheses; *** $p < .01$, ** $p < .05$, * $p < 0.1$; All models include the same controls as in Model in Table A2.

Table A4. Example of the similarity of Swiss and German occupations: Carpenter.

Tasks of Swiss Carpenters (SERI, 2019)	**Tasks of German Carpenters** (IAB/Berufenet, 2019)
Advising customers Selling products	Advising customers Selling products
Preparation, manufacturing/production, repair of wood and wooden materials like: • cabinets • tables • kitchens, wall and ceiling coverings, wood implements for household • carcasses • doors • windows • sports equipment	Preparation, processing/production, or repair of wood and wooden materials like: • cabinets • tables • interior fittings • seating • doors • windows

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Article

The Signal and the Noise: The Impact of the Bologna Process on Swiss Graduates' Monetary Returns to Higher Education

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Abstract
Using longitudinal data on university leaver cohorts in the period from 2006 to 2016, we investigate the impact of the Bologna reform on Swiss graduates' returns to higher education. Drawing on the job market signaling model, we expect lower returns for graduates who enter the labor market with a bachelor's degree. Moreover, we expect that the initial wage difference between bachelor and master graduates will become less volatile over time, since employers constantly update their beliefs about graduates' employability. Controlling for selection into employment and a number of different signals sent by the graduates, we find a persistent advantage of a master's over a bachelor's degree. The new degrees, and especially a bachelor's degree, did indeed serve as a noisy signal about graduates' productivity in the first years of the Bologna process.

Keywords
Bologna reform; earnings; employment; higher education; labor market; signaling theory; Switzerland; university graduates

Issue
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1. Introduction

The restructuring of the higher education system in the Bologna process presents an ideal setting in which to study the formation of monetary returns to different degrees of higher education. In this regard, Switzerland is an especially interesting case since there was no equivalent degree to a bachelor's before the reform was implemented (Glauser, Zangger, & Becker, 2019). Prior to Bologna, the Swiss higher education system provided two degrees, a licentiate (diploma) and the doctorate, the latter being offered only at the 12 research-orientated universities. In the course of the Bologna process, this two-tier system has been extended to a three-tier system in which master's degrees have replaced the former licentiate. From an international perspective, both master's and bachelor's degrees were introduced rather quickly. A first cohort of graduates left Swiss universities with a bachelor's degree as early as of 2004 (State Secretariat for Education, Research and Innovation [SERI], 2019). From 2010, all new entrants to a research-orientated university have pursued a degree within the Bologna model. The development of master's (MA) and bachelor's degrees (BA) is depicted in Figure A1 in the Appendix (for better readability the abbreviations BA, for bachelor's degree, and MA, for master's degree, are used hereafter, whereby the abbreviations refer only to the academic level but not to a specific field of study).

Universities of applied sciences, providing a more practically orientated education with a pronounced degree of vocational specificity, subsequently followed this development with a first cohort of BA graduates in 2008. Unlike graduates with other upper-secondary or tertiary level degrees, graduates from research-orientated universities with a BA degree can thus be regarded as the vanguard that entered the Swiss labor market with a degree previously unknown to employers.

Although there are studies that look at particular aspects of returns to higher education in Switzerland (e.g., examining the role of informal job-search channels; Franzen & Hangartner, 2006), there is a lack of studies that fully examine monetary returns after the Bologna reform. Against this background, we ask how the introduction of new degrees constitutes a previously unknown signal for employers regarding graduates' productivity, and how this in turn shapes the income disparities among holders of different university degrees. Since improving the employability of graduates was one of the key goals of the Bologna process (Schomburg & Teichler, 2011), this article also presents an assessment of the success of the reform. In this regard, we evaluate whether one of the reform's initial promises—namely the so-called "employability" of graduates with the new BA qualification—is fulfilled.

Using panel data on graduates from Swiss universities in the period from 2006 to 2016, we examine how the returns to BA and MA degrees differ with graduates' characteristics (e.g., gender, field of study, type of university, further training, etc.) within the first five years after graduation from university. While this institutional change occurred in the period of the international financial crisis, it has to be noticed that this exogenous shock of the global financial crisis likely had only a minor effect upon graduates' wages since Switzerland was only marginally affected by this event. Unemployment as well as differences in returns in terms of status attainment across university degrees, for example, remained at a stable and very low level (Zangger, Glauser, & Becker, 2018).

The remainder of this article is organized as follows. In the next section, we outline our theoretical framework with a particular focus on job market signaling and briefly summarize existing research. The third section outlines the data and methodological approach. This is followed by the empirical results in the fourth section. We conclude with a brief discussion in the fifth section.

2. Background

The introduction of new, formerly unknown degrees into the Swiss higher education system as a consequence of the Bologna process is an ideal setting in which to test the theoretical assumptions of the job market signaling model (Weiss, 1995). In contrast to traditional human capital theory (Becker, 1964; Mincer, 1974), signaling theory suggests that the returns to different degrees of higher education do not reflect skills acquired throughout the time spent in the education system, but are mere indicators of ex-ante abilities and productivity (Arrow, 1973; Spence, 1973; Stiglitz, 1975). The argument proceeds as follows. In most labor markets, employers lack accurate information about potential employees' productivity. It is for this reason that they use—based on their experience and beliefs—observed characteristics of job applicants as signals (alterable) and indices (fixed) to infer workers' productivity and abilities (Spence, 1973, p. 357). The wage offered is then a function of these signals and indices. However, the relationship between signals and offered wage is a mutual one, since employers constantly update their own beliefs about the conditional probability distribution of workers' productivity (i.e., they adjust their interpretation of signals and indices based on the newly hired employees' observed productivity; Arrow, 1973). Moreover, since signals are alterable, workers also select different signals based on anticipated earnings (Spence, 1973). In this regard, acquiring a signal is costly and depends on an individual's ability: Successfully completing an MA, for example, comes along with less effort for high-ability individuals and is more demanding for low-ability individuals. For the latter, continuing education is also associated with a higher uncertainty because they face a higher risk of not successfully completing the desired degree. Educational certificates are the main signal on which employers base their employment decisions and offered wages. However, they also resort to other signals and unalterable indices, such as a potential employee's work history, age, or gender. Most importantly, however, the probabilistic nature of signals and their dynamic, mutual relation to the offered wage also implies that returns to education vary with time, and, especially, with the amount of uncertainty associated with an educational certificate.

As long as there is no institutional change of certificates in higher education, the degrees serve as a fairly secure screening device (Stiglitz, 1975), and employers can rely on the university system as a "filter" when recruiting applicants (Arrow, 1973). However, if new certificates are introduced into the educational system, as was the case in the course of the implementation of the Bologna reform, employers' uncertainty about the productivity of applicants attaining the previously unknown university degrees is expected to be high. This uncertainty might therefore have an effect on the earnings offered by the employers to graduates with formerly unknown degrees. In the present case, the Bologna process introduced two noisy signals, a BA and an MA degree, which were previously unknown in the Swiss education system.

On the one hand, these signals are also accompanied by a detailed record of attended courses and grades obtained, thus enabling a more direct ex-ante assessment of a potential employee's productivity. On the other hand, the different duration of the two degrees might also be an inherent signal to employers. In this regard, both signaling as well as human capital approaches would suggest higher earnings for MA than for

BA degrees due to both the quantity and the quality of graduates' investment in skills (Lörz & Leuze, 2019; Neugebauer & Weiss, 2018). However, while a human capital perspective would predict only more heterogeneous responses of employers during a transition period due to the additional uncertainty of the two new signals, signaling processes also suggest competing hypotheses about the reform's effects on graduates' returns.

Compared to persons who left university with a BA, graduates with an MA might signal higher ex-ante productivity and ability since they were able to complete a more demanding degree and were willing to forgo earnings for a longer period of time (Neugebauer & Weiss, 2018). However, since there are no admission restrictions on MA degrees in Switzerland (Glauser et al., 2019), the first argument does not necessarily follow. The opposite could even be true: rather than a positively selected group (Trennt, 2019), some graduates with an MA degree might have opted to stay in education for a longer period of time to compensate for the negative signal of a below-average BA degree with the positive signal of an MA and to reduce the risk of unemployment after graduation (Cappellari & Lucifora, 2009; Glauser et al., 2019). Likewise, the uncertainty about the returns to the new degrees, and especially regarding the new BA, was also factual for graduates. This might have presented individuals with an incentive to continue studying at master level, independent of their ability. In the same vein, replacing one existing signal (licentiate) with two new ones (BA and MA) could also have sent a more direct message to employers. Since one of the communicated goals of the Bologna process was to enhance graduates' employability, with a BA degree as the intended norm for entering the labor market (Schomburg & Teichler, 2011), employers might regard graduates with a BA as especially motivated and suitable candidates in the labor market. However, they could also presume that holders of a BA degree are not smart enough to complete a more demanding educational career, and thus take a BA as a signal of a reduced productivity. This also follows from the argument made above that the selection of different signals by individuals is associated with higher risk and costs for low-ability individuals. Both lines of argument highlight the importance of controlling for additional measures of ability and productivity when estimating the returns to different degrees—namely, grades or exit examination scores (Altonji & Pierret, 2001; MacLeod, Riehl, Saavedra, & Urquiola, 2017).

With the introduction of BA and MA degrees, employers had thus to weight different sources of uncertainty against each other. This is especially true in the case of a BA degree. Given the counteracting considerations elaborated above and the fact that a detailed track record with grades is available as a consequence of the Bologna reform, it seems fair to assume that employers extrapolated their assessment of the productivity of graduates with a licentiate to the first cohorts of graduates with an MA degree. However, the grades of BA graduates did not allow an assessment of their productivity compared to that of holders of other degrees. Instead, the BA graduates' grades could only be used in the screening among different applicants with this degree. Given the mentioned discourse about the employability of BA graduates, employers consequently might have overestimated graduates' productivity in the beginning, offering them salaries close to those of graduates with an MA degree. On the other hand, assuming that employers try to maximize their utility (and minimize their risk), it also seems plausible that a BA degree would be associated with lower pay for the first cohorts of graduates in order to avoid losses due to an erroneous overestimation of BA graduates' productivity. Consequently, the difference in returns to graduates with an MA degree should become less pronounced for subsequent cohorts of graduates, as employers acquire information about the productivity of BA graduates. Given the contradictory reasoning, however, we expect only that the initial wage difference between BA and MA graduates will become less volatile across cohorts of graduates. Furthermore, we expect that the differences in returns to various university degrees become less pronounced with increasing time spent in the labor market. Against the background of the importance of further education and training for graduates with general education certificates such as those obtained from studying at a university (Hanushek, Schwerdt, Woessmann, & Zhang, 2017), the effect of the initial signal is subsequently replaced by new signals and information about workers productivity. Since this holds true for both graduates with a BA as well as those with an MA degree, it can thus be expected that the initial wage differential between the two groups should become less pronounced.

With regard to empirical evidence, studies draw a mixed picture, supporting both the idea of human capital theory as well as the assumptions of the signaling models (e.g., Alesi, Schomburg, & Teichler, 2010; Arcidiacono, Bayer, & Hizmo, 2010; Heckman, Lochner, & Todd, 2003; Hout, 2012; Neugebauer & Weiss, 2018). Recent (experimental) evidence, for example, indicates that employers indeed take educational degrees as signals for workers' ex-ante productivity (Deming, Yuchtman, Abulafi, Goldin, & Katz, 2016). However, contrary to the assumption of signaling theory, the advantage of higher degrees does not automatically decrease with increasing labor force experience—at least when considering college reputation as a signal (MacLeod et al., 2017). In line with this finding, a vast literature reports higher returns for higher degrees over the life course (for a compact summary, see Posselt & Grodsky, 2017), although the patterns differ considerably with the institutional context, namely the development of the vocational system (Breen, 2005; Hanushek et al., 2017).

Meanwhile, there is also evidence that points to alternative explanations for different returns to BA and MA degrees. Altonji, Kahn and Speer (2016), for example, demonstrate how labor market conditions affect

graduates of various fields of study and backgrounds differently, highlighting that such external conditions might also explain the varying development of returns to BA and MA degrees. Similarly, in line with the above-outlined mechanism of diminishing returns to an MA degree due to a negative selection of students who try, for example, to avoid a bad start in the labor market (Carneiro, Heckman, & Vytlacil, 2011; Trennt, 2019), Cappellari and Lucifora (2009) show that regional labor market conditions and opportunity costs do indeed shape the selection into an MA program. However, since labor market prospects changed little even during the financial crisis of 2008 in Switzerland, we expect that such macro-processes play only a minor part in the explanation of different returns to BA and MA degrees in the present case.

3. Data and Methods

To analyze income differences between BA and MA graduates, panel data of the Swiss Graduate Survey (SGS; for details, see the SGS fact sheet at the Federal Statistical Office online page: www.bfs.admin.ch/bfs/en/home/statistics/education-science/surveys/ashs.html) has been employed. Our sample of this biennial census survey conducted by the Swiss Federal Statistical Office is limited to graduates from Swiss universities holding a BA or an MA degree. Graduates of universities of applied sciences and universities of teacher education are not included in our analyses. The SGS data are collected both one and five years after graduation. Given our focus on the development of income differentials in the course of the Bologna process, we consider only recent cohorts that graduated between the years 2006 and 2016 from all Swiss universities. Due to the small number of cases, graduates of the 2004 cohort are excluded, while data for the 2018 cohort were not yet available.

The main dependent variable in the analyses is the gross monthly income one and five years after graduation. In this regard, we consider respondents' income from main and secondary employment as well as paid overtime and fringe benefits (bonuses, commissions), deflated with May 2000 serving as the basis. Due to the skewed distribution, the monthly income is logarithmized. In addition to analyses related to the income distribution, we use the relative income change in terms of the ratio of wages between the first and fifth year after graduation. To this end, we divide the deflated income five years after graduation by the corresponding value one year after graduation. Thus, values bigger than 1 refer to a growth in personal income over four years while values smaller than 1 correspond to a decline in income. We further restrict our sample to graduates who are employed or economically inactive at the time of the survey, with non-missing information on income for the employed. Moreover, to qualify as gainfully employed, graduates must have a monthly income of at least 1000 CHF and work at least eight hours a week. Likewise, the self-employed are excluded from our analyses. To reduce age-related heterogeneity, the maximum age in the analysis sample is 35 years.

The analyses related to the *monthly income one year after graduation* are based on 13,149 men and 13,102 women of the university leaver cohorts from 2006 to 2016. In addition to the attained university degree (BA, MA) we control for the field of study (Social Sciences & Humanities, Economics, Law, Science, Medicine & Pharmacy, and Technical Sciences), the type of university (cantonal university vs. one of the two prestigious universities—ETH and EPFL) and final grades (a 4 corresponds to the minimum pass mark and a 6 to the highest mark). Additionally, completed and ongoing further training are considered. We differentiate between graduates who have completed further tertiary training at the same level (e.g., a second BA) or a higher level (e.g., PhD after MA or MA after BA), and those who have not completed any additional training at tertiary level. Besides, we take into account whether individuals have completed further training that does not lead to an MA or a PhD, but which has a minimum duration of six months. In addition, we control for whether individuals are in training at the time of the survey. In this respect, only training courses lasting six months or longer are considered. Finally, the weekly working hours and the region in which persons are employed (German-, French-, or Italian-speaking Switzerland, or working abroad) has been considered. The variables described above are used in the same way in relation to the analyses of the *monthly income five years after graduation* that are based on 4,737 men and 4,465 women from the university leaver cohorts of 2006 to 2012. Regarding the *relative income growth* between the first and fifth year after graduation, we can consider only individuals with non-missing data on income in both survey time points. Therefore, the sample sizes for men (4,127) and women (3,922) are lower compared to those we use in the income analyses five years after graduation. The same control variables as outlined above are taken into account, but additionally the income in the first year after graduation is included in our analyses. Descriptive statistics of the dependent and independent variables are provided in the Appendix (see Tables A1 and A2).

We run all our analyses separately for men and women, since selection into employment, employment patterns, and income distributions differ by gender (Schömann & Becker, 2002; Wise & Zangger, 2017). To account for possible selection into employment, we use the Heckman selection model (Heckman, 1979), because the estimators of simple ordinary least squares (OLS) are biased if selection into employment is present. However, the application of the Heckman selection model assumes that there is a sufficiently large sample, that the errors are distributed normally and homoscedastically, that the number of censored cases is not too high, and that the correlation ρ of the error terms between the selection and estimation equations is sufficiently large (Breen,

1996; Cameron & Trivedi, 2010; Windzio, 2013). In the samples we analyze, we find no selectivity into employment for men but for women. Additionally, diagnostic tests of normality and homoscedasticity in the case of women show that the assumptions are violated. Nevertheless, results of the Heckman models are reported for both sexes for improved comparability, while we additionally provide the results of the OLS regressions in the Appendix (see Tables A7 and A8). The results and the interpretation of their meanings do not differ substantially between the different models. In the selection equation, we use all controls of the main models and additionally account for marital status and parenthood. Further, we use survey weights provided in the data to account for selectivity with regard to participation in the SGS. All estimated models are based on the Full-Maximum-Likelihood method (see Cameron & Trivedi, 2010, or Wooldridge, 2002) since weights are not permitted in the common Heckman model. In order to reduce bias that could occur due to implausible combinations of income and person-specific characteristics, we exclude a small number of cases based on the most extreme values obtained in regression diagnostics regarding the leverage, cooks' D, dffits, and dfbetas (Meuleman, Loosveldt, & Emonds, 2015). Additional sensitivity analyses, which are available upon request from the authors, show that a more restrictive exclusion of cases does not alter our results.

In our statistical models (see Tables 1 and 2), the focus is mainly on the main effect of the university degree on income and the relative income change. Additionally, and in order to describe changes concerning our dependent variables over university degree and cohorts more intuitively, we present the results of the interaction terms for degree and cohort graphically, while the corresponding tables are shown in the Appendix (see Tables A5 and A6).

4. Empirical Results

One year after graduation, about 86% of men and 85% of women of our sample are gainfully employed. On average, the mean income of women (M = 4,865, SD = 2,006) is lower compared to men (M = 5,553, SD = 2,262, see Table A1 in Appendix). In contrast to the findings for men (see Table A3 in Appendix), we observe selectivity into employment for women (see Table A4 in Appendix). Women are more likely to be in the observed sample of employed graduates if they have attained an MA degree, those with better final grades as well as the childless and unmarried. It is therefore appropriate, at least for our analyses of women's income differentials, to control for selectivity into employment. Since the parameters to estimate possible sample selection (inverse of the hyperbolic tangent of ρ, athrho in Tables 1 and 2) are insignificant in the case of men, we do not interpret the findings of the selection equation (see Table A3 in Appendix).

Turning our attention to the main effects of an MA degree on the log monthly income, we observe significant differences in the returns for both men and women (see Tables 1 and 2). In line with assumptions of human capital and signaling theory, entering the labor market with an MA rather than a BA degree leads to 4 log points higher earnings for women and 14 log points higher earnings for men one year after graduation. Thus, one year after graduation, men with an MA degree show higher income advantages than women. Moreover, there are also striking differences in the returns according to the field of study, the institutional type of the university, and final grades. Graduates from one of the two prestigious technical universities (ETH/EPFL) earn up to 8% more than graduates from other universities, independent of their degree, field of study, and further controls such as additional qualifications obtained or the region of employment. Likewise, returns differ considerably between fields of study, with economics yielding the highest, and law the lowest, one year after graduation. It should be noted that these differences between fields are even more pronounced when not controlling for the weekly working hours, indicating that part-time employment varies considerably among graduates from different fields (results not reported). Further, but only for the sample of women, the first cohort of graduates earned significantly less one year after graduation than their more recent counterparts.

In a next step, we examine the earning differentials five years after graduation. The descriptive findings show the following picture. About 91% of men are employed, while the proportion of women is somewhat lower (89%). As in the first year, men (M = 7,378, SD = 2,802), on average, have considerably higher incomes than women (M = 6,294, SD = 2,219, see Table A2 in Appendix). The results of the multivariate analyses (see Tables 1 and 2) do not indicate that the advantage of an MA degree compared to a BA degree is decreasing five years after graduation. The difference has slightly decreased for men but strongly increased for women for whom an advantage of 13 log points is observed. As before, graduating from a prestigious university (ETH/EPFL) is still associated with higher returns, although the effect is reduced to about 9% higher earnings—at least for men, while the effect for women is insignificant. However, and as already mentioned with regard to income differentials at the beginning of employment, the income five years after graduation is most strongly influenced by the field of study. While all graduates earn less than those graduating with a degree in economics, the income disadvantages have declined remarkably for graduates with a degree in law while the changes for graduates of other disciplines are comparatively small. Finally, the differences by graduation cohorts are negative but insignificant. Thus, we do not observe that earnings have declined over graduation cohorts.

However, it is important to note that the results reported above on income one and five years after graduation are based on different samples. In the previously presented results, it is thus not considered how the income

Table 1. Men's monthly income (log.) in the first and fifth year after graduation and their relative income growth.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.143***	(0.016)	0.124***	(0.016)	0.052	(0.133)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.280***	(0.013)	−0.223***	(0.018)	−0.339**	(0.115)
Law	−0.479***	(0.016)	−0.147***	(0.017)	−0.167	(0.160)
Science	−0.327***	(0.012)	−0.284***	(0.017)	−0.636***	(0.134)
Medicine/Pharmacy	−0.139***	(0.013)	−0.175***	(0.023)	−0.247**	(0.081)
Technical Sciences	−0.262***	(0.016)	−0.281***	(0.022)	−0.576***	(0.119)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.124***	(0.013)	0.086***	(0.018)	0.181*	(0.073)
Final grade	0.039***	(0.010)	0.058***	(0.014)	0.084	(0.071)
Age	0.022***	(0.002)	0.014***	(0.002)	0.027**	(0.010)
Cohort (*Ref.: 2006*)						
2008	−0.001	(0.017)	0.016	(0.015)	−0.094	(0.157)
2010	0.002	(0.016)	−0.005	(0.015)	−0.194	(0.139)
2012	−0.018	(0.015)	−0.025	(0.014)	−0.226	(0.149)
2014	−0.003	(0.015)				
2016	−0.010	(0.015)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	−0.031	(0.029)	−0.019	(0.021)	−0.167	(0.230)
Higher qualification	−0.077*	(0.031)	−0.072***	(0.016)	−0.234	(0.126)
Other training completed (*Reference: no*)						
Yes	0.066***	(0.018)	0.075***	(0.012)	0.154	(0.097)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.233***	(0.008)	−0.256***	(0.012)	−0.648***	(0.092)
Weekly working hours	0.015***	(0.001)	0.024***	(0.001)	0.043***	(0.005)
Language region of employer (*Ref.: German-speaking*)						
French- /Italian-speaking	−0.089***	(0.008)	−0.133***	(0.010)	−0.172***	(0.046)
Italian-speaking	−0.261***	(0.021)				
Abroad	−0.352***	(0.016)	−0.298***	(0.023)	−0.507***	(0.075)
Log. monthly income 1st year					−2.587***	(0.373)
Constant	7.338***	(0.080)	7.321***	(0.112)	21.368***	(3.318)
athrho	0.001	(0.011)	−0.017	(0.045)	−0.011	(0.010)
lnsigma	−1.048***	(0.009)	−1.267***	(0.014)	0.304	(0.185)
Observations	13'149		4'737		4'127	
N (selected/censored)	11'303/1'846		4'306/431		3'696/431	
Wald chi^2/DF	5782.671/22		3001.256/19		578.535/20	

Data: SGS, own calculations. Notes: Log gross monthly income (deflated to base May 2000); estimations based on Full-Maximum-Likelihood method using survey weights. Standard errors in parentheses, significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. For results of the selection equation, see Table A3 in Appendix.

changes within the first five years and how this relates to the differential between holders of a BA or MA degree. In the following, we thus examine the income dynamics after entering the labor market in more detail. In this respect, the earnings growth rate is calculated by dividing the log earnings five years after graduation by the log earnings one year after graduation. In the case of men (see the last two columns of Table 1), the results do not indicate that the average earnings growth rate differs between the degrees. This contrasts with the findings for women (see Table 2). For the latter, it is evident that an MA degree is associated with significant advantages in terms of income growth. For women with an MA, for example, the growth rate over four years is about 123% of that of women with a BA degree ($e^{0.209} \approx 1.232$). Extrapolating from this rather short observation window of four years, we would thus conclude that the differences in earnings by university degree do not become smaller with increasing time spent in the labor market. At least with regard to women, this finding then contradicts our hypothesis that the original signal of the diploma itself is subsequently replaced by new information about employees' productivity, and that on-the-job training is of special importance for graduates from higher education (Hanushek et al., 2017).

Finally, we expected that earning differentials should be more volatile for the first cohorts of BA and MA graduates since it takes time for employers to update their

Table 2. Women's monthly income (log.) in the first and fifth year after graduation and their relative income growth.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.041**	(0.015)	0.131***	(0.015)	0.209**	(0.068)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.226***	(0.012)	−0.173***	(0.016)	−0.320***	(0.052)
Law	−0.422***	(0.015)	−0.080***	(0.017)	−0.067	(0.065)
Science	−0.254***	(0.015)	−0.215***	(0.019)	−0.440***	(0.064)
Medicine/Pharmacy	−0.111***	(0.014)	−0.151***	(0.019)	−0.200***	(0.057)
Technical Sciences	−0.215***	(0.022)	−0.212***	(0.028)	−0.363***	(0.075)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.080***	(0.017)	0.035	(0.019)	0.049	(0.046)
Final grade	0.012	(0.012)	0.019	(0.013)	−0.045	(0.055)
Age	0.018***	(0.002)	0.003	(0.002)	0.004	(0.008)
Cohort (*Ref.: 2006*)						
2008	0.054*	(0.026)	−0.003	(0.017)	−0.108	(0.088)
2010	0.050*	(0.024)	0.001	(0.016)	−0.123	(0.075)
2012	0.049*	(0.023)	−0.007	(0.015)	−0.126	(0.074)
2014	0.076***	(0.023)				
2016	0.061**	(0.023)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	0.051	(0.027)	0.001	(0.018)	0.055	(0.081)
Higher qualification	−0.035	(0.054)	−0.037*	(0.019)	−0.252***	(0.047)
Other training completed (*Ref.: no*)						
Yes	0.040	(0.021)	0.066***	(0.011)	0.204***	(0.044)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.200***	(0.009)	−0.125***	(0.012)	−0.310***	(0.038)
Weekly working hours	0.014***	(0.001)	0.024***	(0.001)	0.033***	(0.002)
Language region of employer (*Ref.: German-speaking*)						
French- /Italian-speaking	−0.052***	(0.008)	−0.095***	(0.010)	−0.172***	(0.041)
Italian-speaking	−0.220***	(0.022)				
Abroad	−0.321***	(0.019)	−0.440***	(0.025)	−0.680***	(0.074)
Log. monthly income 1st year					−2.083***	(0.124)
Constant	7.641***	(0.086)	7.736***	(0.106)	18.289***	(1.294)
athrho	−1.183***	(0.050)	−0.176*	(0.089)	−0.012	(0.032)
lnsigma	−0.828***	(0.010)	−1.297***	(0.015)	−0.151	(0.135)
Observations	13'102		4'465		3'922	
N (selected/censored)	11'211/1'891		3'992 /473		3'449/473	
Wald chi^2/DF	3265.465/22		2440.174/19		1413.777/20	

Data: SGS, own calculations. Notes: Log gross monthly income (deflated to base May 2000); estimations based on Full-Maximum-Likelihood method using survey weights. Standard errors in parentheses, significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. For results of the selection equation, see Table A4 in Appendix.

beliefs about graduates' productivity, especially in the case of those entering the labor market with a BA degree. In this regard, the estimated log monthly income for the interaction effects between degree and cohort are illustrated in Figures 2 and 3. First, it is obvious that the income advantages with an MA degree one year after graduation are more pronounced for men, as already outlined above. However, due to the U-shaped pattern in the case of men, the time interval covered by the data in our view is too short to conclude that the income disadvantages with a BA degree have remained constant across cohorts. Of course, the benefits for the MA degree are obvious, but they could weaken further if the trend since the 2012 cohort continues. These results stand in stark contrast to those for women. What is noticeable is the fact that one year after graduation, the income differentials between holders of a BA and MA degree of all but the cohort of 2014 are unexpectedly small and insignificant. In contrast, the results for income differentials five years after graduation show a different picture. For both men and women, a more or less parallel trend is observed for the income earned with an MA degree. While the differences compared to the BA degree are comparatively constant for women, the results for men tend to point to an increase in income differences for the youngest cohorts. In case of the relative income growth, a similar pattern is observed for both men and women. The noise that can be observed in the first cohorts also

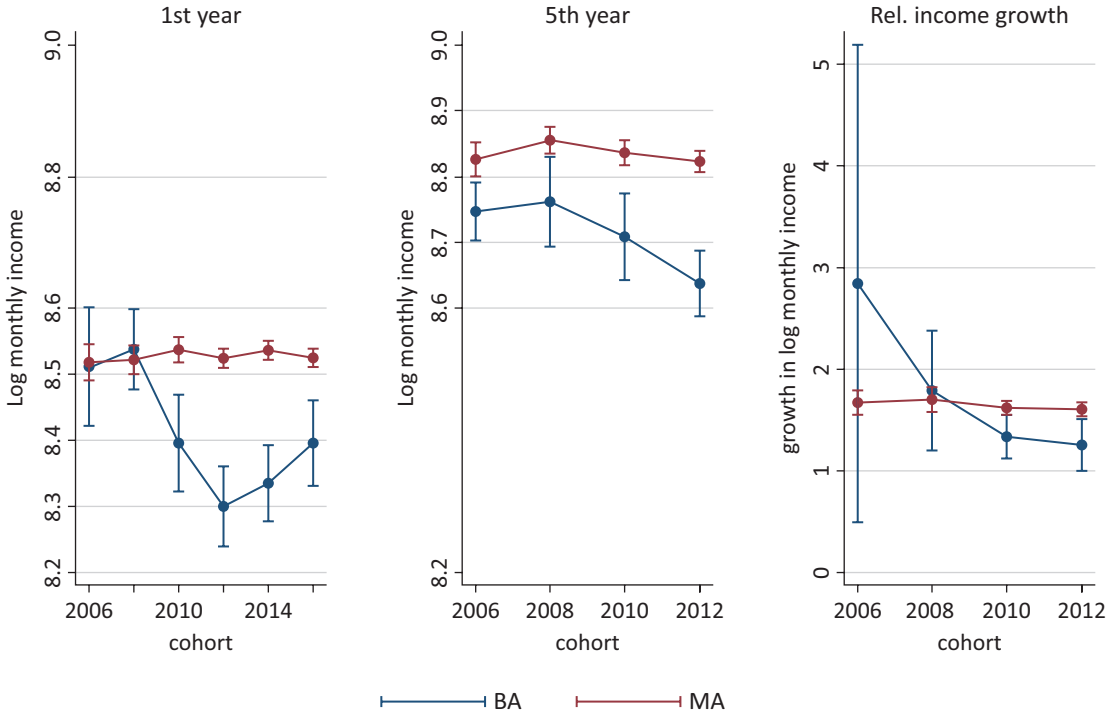

Figure 1. Linear predictions of interactions of university degree and cohort on gross monthly income (log) for men in the first and fifth year after graduation and their relative income growth. Data: SGS, own calculations. Note: See Table A5 in Appendix for further details.

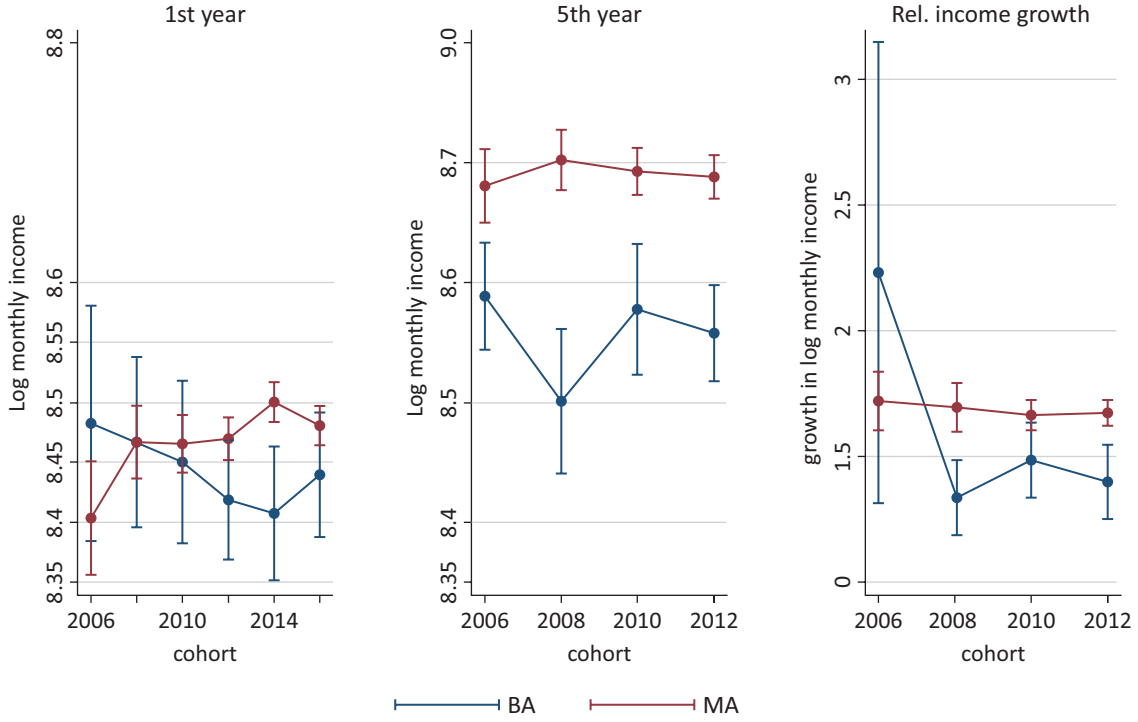

Figure 2. Linear predictions of interactions of university degree and cohort on gross monthly income (log) for women in the first and fifth year after graduation and their relative income growth. Data: SGS, own calculations. Note: See Table A6 in Appendix for further details.

develops in such a way in terms of income growth, at least for the younger cohorts, that there are advantages for holders of an MA degree. Together, these findings then indicate that employers did indeed need time to get to know the productivity of graduates with a BA degree. However, we do not observe that employers tried to reduce their risk, and therefore paid substantially less to the first cohorts of graduates. It is rather the case that

employers adjusted the starting salaries of individuals with a BA degree downwards during the observation period. Nonetheless, these additional results highlight the argument made in the theoretical section relating to less ambiguity about the productivity of graduates with an MA degree, indicated by fairly constant earnings and income growth for such graduates over successive cohorts while the returns to a BA degree are more volatile.

5. Discussion and Conclusions

Against the background of the implementation of the Bologna reform in Switzerland, the aim of this study was to compare monetary returns at the start of BA and MA graduates' working lives. Based on longitudinal data on university leaver cohorts from 2006 to 2016 of the SGS, we analyzed how the returns on the newly introduced degrees (BA, MA) differ in terms of earnings one and five years after graduation. Moreover, we examined the relative income growth indicated by the ratio of the wages within this time span. Referring to signaling theory, we emphasized that the two new degrees introduced two previously unknown signals for employers regarding graduates' productivity. In this regard, the introduction of the BA was considered an especially noisy signal for employers when trying to assess graduates' productivity since there was no equivalent degree prior to the Bologna process. Since MA degrees replaced the former licentiate, we expected this type of degree to be a less uncertain signal for employers.

Our results show that one year after graduation, men show a significantly higher income differential (MA vs. BA) than women. Although this result is in line with earlier studies on differentials in the income growth of men and women (Engelhardt & Jann, 2004), it is nevertheless surprising given that women now constitute the majority at Swiss universities. Indicated by the striking differences for men and women in the selection equation of our models, persistent gendered division of labor might add their share to explain this pattern ("modernized traditionalism"; Becker & Jann, 2017). Nevertheless, a more thorough examination is needed. Moreover, there are remarkable differences in the returns according to the field of study, the institutional type of the university, and final grades. Five years after graduation, the disparities of income among the different types of degree remain persistent across graduation cohorts, while the impact of field of study as another signal has increased in the course of graduates' career trajectories. The same holds true for the influence of further education and training after graduation, highlighting that on-the-job training is indeed of special importance for graduates from higher education (Hanushek et al., 2017). Likewise, the initial signal of graduating from a prestigious university is also found to decline over the course of graduates' careers. The influence of the main signal of a higher degree, however, declines only marginally over the first five years for men and becomes even more important in the case of women. As expected, the returns to an MA are stable over successive cohorts of graduates, while the earnings of those entering the labor market with a BA are much more volatile, indicating a marginal overestimation of their productivity by employers in the case of the first cohorts of graduates.

While the (persistent) advantage of an MA over a BA can be explained by both human capital as well as job market signaling theory, there are some particularities which indicate that, at least for the first cohorts in the Bologna process, the new degrees, and especially the BA, did indeed serve as a noisy signal about graduates' productivity to employers (Arrow, 1973; Spence, 1973). In this regard, other signals of ex-ante productivity decline in the short period of four years in the labor market (such as graduating from a prestigious university). More importantly, however, the big initial volatility and the subsequent decline in the earnings of graduates with a BA over cohorts, contrasted by constant and precisely estimated earnings for graduates with an MA, indicate that employers were uncertain and initially overestimated BA graduates' productivity. Consequently, this suggests that the returns to a university degree not only reflect the skills acquired in the education system but are also an assessment of a graduate's ex-ante productivity.

Meanwhile, there are also alternative explanations for our results. Because job-, firm-, and labor market-specific information is lacking in our data, it is also possible that BA and MA graduates work in different segments of the labor market, which would provide another explanation for the observed earnings differentials (Baron & Bielby, 1980). This then also highlights the importance of considering such characteristics in future research.

Lastly, as another limitation on our study, it should be emphasized that the "observation window" in terms of historical period and individuals' labor force experience covered in the data is too short to describe a long-term trend and cohort patterns of income differentials between holders of a BA and MA degree (see Schömann & Becker, 2002). On the other hand, there are indications that employers become increasingly familiar with the new degrees institutionalized in the course of the Bologna reform. On the other hand, it would be interesting to investigate the lifetime income for BA and MA graduates. From the perspective of human capital theory, the disparities of starting wages might be persistent across the working life. However, based on the data at hand, we are unable to follow this topic further. Moreover, future research might also investigate whether the disparities and their development among graduates of different degrees could also be explained by a varying likelihood of mobility between jobs, firms, and industries (e.g., Becker & Blossfeld, 2017).

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Conflict of Interests

The authors declare no conflict of interests.

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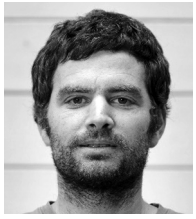
About the Authors



David Glauser, born 1978 in Bern (Switzerland), studied educational science, sociology and political science in Bern. PhD in Bern and, since 2015, scientific associate at the department of sociology of education at the University of Bern. Research interests include school to work transitions, educational inequality, methods of empirical social research.

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Rolf Becker studied sociology and political science in Mannheim. PhD in Berlin and Habilitation in Dresden and, since 2004, Director and Full Professor for sociology of education at the University of Bern. Research interests include life course research, social stratification and mobility, sociology of education, methods of empirical social research, electoral analysis.

Annex

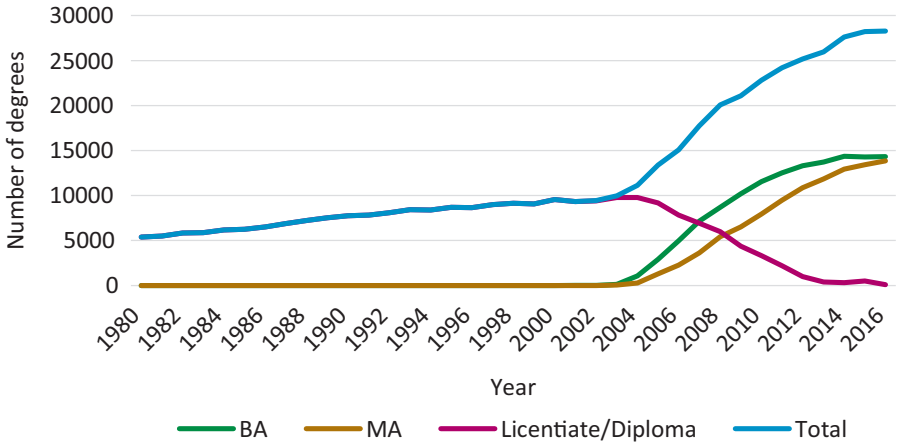

Figure A1. Development of degrees in Switzerland from 1980 to 2016 (absolute figures, men and women). Data: FSO (2017); own representation.

Table A1. Descriptive statistics: First year after graduation.

	Women		**Men**	
	Proportion Mean/SD	*95%- CI Min./Max.*	*Proportion Mean/SD*	*95%- CI Min./Max.*
Gross monthly income	4'865/2006	904; 21555	5553/2262	904; 20843
Degree				
BA	0.1169	0.1112,0.1226	0.0826	0.0777,0.0875
MA	0.8831	0.8774,0.8888	0.9174	0.9125,0.9223
Field of study				
Social Sciences, Humanities	0.3758	0.3668,0.3849	0.1396	0.1332,0.1461
Economics	0.1595	0.1523,0.1667	0.2726	0.2640,0.2812
Law	0.1659	0.1589,0.1730	0.1063	0.1005,0.1121
Science	0.1479	0.1414,0.1544	0.2253	0.2177,0.2329
Medicine/Pharmacy	0.0768	0.0719,0.0817	0.0395	0.0359,0.0431
Technical Sciences	0.0740	0.0691,0.0789	0.2167	0.2090,0.2243
Type of university				
Cantonal university	0.8659	0.8597,0.8722	0.6693	0.6606,0.6780
ETH/EPFL	0.1341	0.1278,0.1403	0.3307	0.3220,0.3394
Final grade	5.20/0.38	4.00; 6.00	5.23/0.38	4.00; 6.00
Age	26.97/2.17	22.00; 35.00	27.34/2.19	21.00; 35.00
Cohort				
2006	0.0324	0.0292,0.0357	0.0552	0.0510,0.0593
2008	0.1014	0.0954,0.1074	0.1210	0.1147,0.1274
2010	0.1421	0.1355,0.1487	0.1467	0.1400,0.1534
2012	0.2165	0.2090,0.2241	0.2003	0.1930,0.2075
2014	0.2386	0.2307,0.2466	0.2301	0.2222,0.2379
2016	0.2689	0.2606,0.2772	0.2468	0.2387,0.2549
Completed additional training at university				
No training completed	0.9693	0.9661,0.9726	0.9782	0.9755,0.9810
At same level	0.0290	0.0259,0.0322	0.0199	0.0173,0.0225
Higher qualification	0.0016	0.0009,0.0024	0.0019	0.0011,0.0027
Other training completed				
No	0.9552	0.9513,0.9591	0.9681	0.9648,0.9714
Yes	0.0448	0.0409,0.0487	0.0319	0.0286,0.0352
In training at the time of the survey				
Not in training	0.7033	0.6948,0.7119	0.6856	0.6770,0.6943
In training	0.2967	0.2881,0.3052	0.3144	0.3057,0.3230
Weekly working hours	37.09/9.22	8.00; 80.00	39.12/7.81	8.00; 80.00
Language region of employer				
German-speaking	0.5717	0.5624,0.5811	0.6100	0.6008,0.6192
French-speaking	0.3119	0.3031,0.3207	0.2589	0.2506,0.2671
Italian-speaking	0.0344	0.0310,0.0379	0.0294	0.0262,0.0325
Abroad	0.0820	0.0765,0.0874	0.1018	0.0958,0.1078
Marital status				
Single	0.9005	0.8947,0.9063	0.9189	0.9137,0.9242
Married, in partnership	0.0957	0.0900,0.1014	0.0800	0.0748,0.0852
Divorced, widowed	0.0038	0.0026,0.0050	0.0011	0.0005,0.0017
Children				
Without children	0.9730	0.9699,0.9760	0.9649	0.9615,0.9684
Children	0.0270	0.0240,0.0301	0.0351	0.0316,0.0385
Observations	11'211		11'303	

Data: SGS, own calculations.

Table A2. Descriptive statistics: Fifth year after graduation.

	Women		**Men**	
	Proportion Mean/SD	*95%- CI Min./Max.*	*Proportion Mean/SD*	*95%- CI Min./Max.*
Gross monthly income	6'294/2219	926; 18'952	7378/2802	1001; 30'635
Degree				
BA	0.1604	0.1490,0.1718	0.1378	0.1274,0.1482
MA	0.8396	0.8282,0.8510	0.8622	0.8518,0.8726
Field of study				
Social Sciences, Humanities	0.3500	0.3349,0.3650	0.1260	0.1158,0.1362
Economics	0.1685	0.1557,0.1812	0.2742	0.2600,0.2884
Law	0.1898	0.1771,0.2025	0.1169	0.1069,0.1269
Science	0.1669	0.1553,0.1785	0.2383	0.2255,0.2511
Medicine/Pharmacy	0.0507	0.0436,0.0578	0.0197	0.0153,0.0241
Technical Sciences	0.0742	0.0659,0.0826	0.2249	0.2123,0.2375
Type of university				
Cantonal university	0.8578	0.8469,0.8686	0.6569	0.6425,0.6713
ETH/EPFL	0.1422	0.1314,0.1531	0.3431	0.3287,0.3575
Final grade	5.17/0.38	4.00; 6.00	5.19/0.39	4.00; 6.00
Age	30.65/2.14	26.00; 39.00	31.01/2.22	25.00; 39.00
Cohort				
2006	0.1077	0.0979,0.1176	0.1468	0.1361,0.1574
2008	0.1938	0.1808,0.2068	0.2249	0.2117,0.2381
2010	0.2791	0.2648,0.2934	0.2693	0.2556,0.2829
2012	0.4194	0.4036,0.4351	0.3591	0.3443,0.3738
Completed additional training at university				
No training completed	0.8401	0.8284,0.8518	0.8272	0.8155,0.8388
At same level	0.0915	0.0822,0.1007	0.0686	0.0607,0.0765
Higher qualification	0.0685	0.0605,0.0764	0.1042	0.0949,0.1136
Other training completed				
No	0.7795	0.7664,0.7927	0.8391	0.8278,0.8503
Yes	0.2205	0.2073,0.2336	0.1609	0.1497,0.1722
In training at the time of the survey				
Not in training	0.7605	0.7468,0.7742	0.7636	0.7505,0.7766
In training	0.2395	0.2258,0.2532	0.2364	0.2234,0.2495
Weekly working hours	36.94/8.19	8.00; 80.00	39.61/6.4	8.00; 75.00
Language region of employer				
German-speaking	0.5594	0.5433,0.5755	0.5950	0.5796,0.6104
French-/Italian-speaking	0.3556	0.3400,0.3713	0.3058	0.2913,0.3204
Abroad	0.0849	0.0752,0.0947	0.0992	0.0893,0.1091
Marital status				
Single	0.7209	0.7062,0.7356	0.7481	0.7345,0.7617
Married, in partnership	0.2650	0.2505,0.2795	0.2465	0.2330,0.2600
Divorced, widowed	0.0141	0.0098,0.0183	0.0054	0.0028,0.0079
Children				0.8441,0.8660
Without children	0.8435	0.8317,0.8554	0.8550	0.1340,0.1559
Children	0.1565	0.1446,0.1683	0.1450	0.8441,0.8660
Observations	3'992		4'306	

Data: SGS, own calculations.

Table A3. Men's monthly income (log.) in the first and fifth year after graduation and relative income growth, results of selection equations for Table 1.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.536***	(0.045)	0.321***	(0.089)	0.539***	(0.096)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.425***	(0.047)	−0.417***	(0.101)	−0.468***	(0.106)
Law	−0.364***	(0.053)	−0.508***	(0.105)	−0.579***	(0.111)
Science	−0.466***	(0.050)	−0.472***	(0.094)	−0.597***	(0.100)
Medicine/Pharmacy	0.014	(0.086)	−0.089	(0.196)	−0.149	(0.206)
Technical Sciences	−0.203**	(0.070)	−0.118	(0.134)	−0.218	(0.140)
Type of university (*Ref. cantonal university*)						
ETH/EPFL	0.128*	(0.053)	0.153	(0.093)	0.188	(0.096)
Final grade	0.394***	(0.042)	0.293***	(0.083)	0.360***	(0.087)
Age	0.030***	(0.008)	−0.009	(0.014)	−0.008	(0.015)
Cohort (*Ref.: 2006*)						
2008	−0.103	(0.078)	−0.306**	(0.100)	−0.078	(0.100)
2010	−0.133	(0.075)	−0.234*	(0.099)	0.022	(0.099)
2012	−0.139	(0.072)	−0.278**	(0.096)	−0.035	(0.096)
2014	−0.213**	(0.071)				
2016	−0.214**	(0.071)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	−0.412***	(0.087)	−0.227*	(0.097)	−0.311**	(0.107)
Higher qualification	−0.463	(0.319)	−0.536***	(0.083)	−0.525***	(0.085)
Other training completed (*Ref: no*)						
Yes	−0.165*	(0.076)	0.306**	(0.104)	0.292**	(0.108)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.121***	(0.032)	−0.525***	(0.060)	−0.554***	(0.063)
Marital status (*Reference: married/in a partnership*)						
Single/divorced/widowed	0.027	(0.063)	−0.176*	(0.085)	−0.170	(0.090)
Divorced/widowed	−0.793*	(0.313)				
No children (*Ref.: children*)	−0.070	(0.091)	−0.153	(0.112)	−0.169	(0.115)
Constant	−1.755***	(0.328)	0.804	(0.639)	0.006	(0.671)
athrho	0.001	(0.011)	−0.017	(0.045)	−0.011	(0.010)
lnsigma	−1.048***	(0.009)	−1.267***	(0.014)	0.304	(0.185)
N (selected/censored)	11'303/1'846		4'306/431		3'696/431	
Wald chi^2/ DF	5782.671/22		3001.256/19		578.535/20	

Note: See Table 1.

Table A4. Women's monthly income (log.) in the first and fifth year after graduation and relative income growth, results of selection equations for Table 2.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.275***	(0.041)	0.386***	(0.079)	0.557***	(0.083)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.020	(0.043)	−0.078	(0.095)	−0.088	(0.099)
Law	0.130*	(0.054)	−0.185	(0.109)	−0.249*	(0.113)
Science	−0.219***	(0.054)	−0.335**	(0.109)	−0.407***	(0.114)
Medicine/Pharmacy	0.112	(0.062)	0.187	(0.164)	0.168	(0.168)
Technical Sciences	−0.217*	(0.086)	−0.309	(0.174)	−0.385*	(0.177)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.139*	(0.064)	0.254*	(0.117)	0.297*	(0.119)
Final grade	0.185***	(0.038)	0.045	(0.081)	0.099	(0.086)
Age	0.014*	(0.007)	−0.040**	(0.013)	−0.037**	(0.013)
Cohort (*Ref.: 2006*)						
2008	0.161	(0.082)	−0.092	(0.110)	0.170	(0.116)
2010	0.186*	(0.078)	−0.185	(0.102)	0.090	(0.106)
2012	0.119	(0.074)	−0.150	(0.099)	0.111	(0.103)
2014	0.010	(0.073)				
2016	0.077	(0.073)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	−0.093	(0.083)	−0.237*	(0.092)	−0.325**	(0.099)
Higher qualification	−0.226	(0.278)	−0.615***	(0.096)	−0.614***	(0.098)
Other training completed (*Ref.: no*)						
Yes	−0.106	(0.062)	0.241**	(0.082)	0.252**	(0.085)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.028	(0.030)	−0.358***	(0.061)	−0.390***	(0.063)
Marital status (*Ref.: married/in a partnership*)						
Single/divorced/widowed	0.151***	(0.040)	0.083	(0.071)	0.102	(0.071)
Divorced/widowed	0.393	(0.226)				
No children (*Ref.: children*)	0.520***	(0.060)	0.427***	(0.084)	0.415***	(0.080)
Constant	−1.219***	(0.290)	1.927***	(0.567)	1.120	(0.603)
athrho	−1.183***	(0.050)	−0.176*	(0.089)	−0.012	(0.032)
lnsigma	−0.828***	(0.010)	−1.297***	(0.015)	−0.151	(0.135)
N (selected/censored)	11'211/1'891		3'992 /473		3'449/473	
Wald chi^2/ DF	3265.465/22		2440.174/19		1413.777/20	

Note: See Table 2.

Table A5. Men's monthly income (log.) in the first and fifth year after graduation and their relative income growth; models with interaction terms—shown in Figure 1.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.006	(0.048)	0.079**	(0.025)	−1.172	(1.199)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.280***	(0.013)	−0.222***	(0.017)	−0.316*	(0.124)
Law	−0.478***	(0.016)	−0.149***	(0.017)	−0.155	(0.149)
Science	−0.326***	(0.012)	−0.287***	(0.017)	−0.623***	(0.130)
Medicine/Pharmacy	−0.140***	(0.013)	−0.176***	(0.023)	−0.232**	(0.083)
Technical Sciences	−0.260***	(0.016)	−0.281***	(0.022)	−0.551***	(0.111)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.125***	(0.013)	0.087***	(0.018)	0.187*	(0.074)
Final grade	0.039***	(0.010)	0.059***	(0.014)	0.082	(0.072)
Age	0.022***	(0.002)	0.014***	(0.002)	0.030***	(0.009)
Cohort (*Ref.: 2006*)						
2008	0.025	(0.055)	0.015	(0.040)	−1.061	(1.273)
2010	−0.117*	(0.059)	−0.039	(0.039)	−1.509	(1.241)
2012	−0.213***	(0.055)	−0.109***	(0.033)	−1.582	(1.278)
2014	−0.177***	(0.054)				
2016	−0.116*	(0.056)				
Degree · Cohort (*Ref.: BA · 2006*)						
MA · 2008	−0.021	(0.057)	0.014	(0.043)	1.090	(1.275)
MA · 2010	0.136*	(0.061)	0.049	(0.042)	1.469	(1.252)
MA · 2012	0.219***	(0.057)	0.105**	(0.036)	1.513	(1.282)
MA · 2014	0.196***	(0.056)				
MA · 2016	0.123*	(0.058)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	−0.026	(0.029)	−0.011	(0.021)	−0.129	(0.200)
Higher qualification	−0.077*	(0.031)	−0.072***	(0.016)	−0.230	(0.121)
Other training completed (*Ref.: no*)						
Yes	0.067***	(0.018)	0.076***	(0.012)	0.161	(0.093)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.234***	(0.008)	−0.257***	(0.012)	−0.643***	(0.089)
Weekly working hours	0.015***	(0.001)	0.024***	(0.001)	0.043***	(0.005)
Language region of employer (*Ref.: German-speaking*)						
French-/Italian-speaking	−0.090***	(0.008)	−0.133***	(0.010)	−0.176***	(0.046)
Italian-speaking	−0.266***	(0.021)				
Abroad	−0.353***	(0.016)	−0.298***	(0.023)	−0.506***	(0.074)
Log. monthly income 0' year					−2.591***	(0.365)
Constant	7.461***	(0.091)	7.337***	(0.112)	22.398***	(3.999)
Selection equation						
Degree: MA (*Ref.: BA*)	0.267	(0.169)	0.214	(0.159)	1.164***	(0.194)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.423***	(0.047)	−0.418***	(0.101)	−0.487***	(0.108)
Law	−0.361***	(0.053)	−0.515***	(0.105)	−0.571***	(0.112)
Science	−0.465***	(0.050)	−0.478***	(0.094)	−0.606***	(0.101)
Medicine/Pharmacy	0.018	(0.086)	−0.091	(0.196)	−0.154	(0.204)
Technical Sciences	−0.199**	(0.070)	−0.127	(0.134)	−0.237	(0.140)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.129*	(0.053)	0.157	(0.093)	0.186	(0.096)
Final grade	0.394***	(0.042)	0.295***	(0.083)	0.361***	(0.088)
Age	0.030***	(0.008)	−0.009	(0.014)	−0.007	(0.015)

Table A5. (Cont.) Men's monthly income (log.) in the first and fifth year after graduation and their relative income growth; models with interaction terms—shown in Figure 1.

	1st year		5th year		relative income growth	
Cohort (*Ref.: 2006*)						
2008	−0.316	(0.188)	−0.355	(0.192)	0.382	(0.231)
2010	−0.375*	(0.176)	−0.421*	(0.182)	0.562*	(0.218)
2012	−0.436**	(0.169)	−0.314	(0.170)	0.589**	(0.207)
2014	−0.461**	(0.169)				
2016	−0.378*	(0.171)				
Degree · Cohort (*Ref.: BA · 2006*)						
MA · 2008	0.257	(0.206)	0.096	(0.225)	−0.629*	(0.260)
MA · 2010	0.292	(0.194)	0.259	(0.214)	−0.720**	(0.247)
MA · 2012	0.359	(0.186)	0.078	(0.202)	−0.820***	(0.235)
MA · 2014	0.298	(0.186)				
MA · 2016	0.201	(0.187)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	−0.405***	(0.087)	−0.211*	(0.099)	−0.359***	(0.108)
Higher qualification	−0.466	(0.319)	−0.534***	(0.083)	−0.536***	(0.085)
Other training completed (*Ref.: no*)						
Yes	−0.165*	(0.076)	0.308**	(0.104)	0.285**	(0.108)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.122***	(0.032)	−0.526***	(0.060)	−0.559***	(0.063)
Marital status (*Ref.: married/in a partnership*)						
Single/divorced/widowed	0.027	(0.063)	−0.173*	(0.086)	−0.178*	(0.091)
Divorced/widowed	−0.789*	(0.313)				
No children (*Ref.: children*)	−0.073	(0.091)	−0.152	(0.112)	−0.160	(0.115)
Constant	−1.532***	(0.356)	0.845	(0.645)	−0.448	(0.684)
athrho	0.005	(0.011)	−0.004	(0.047)	−0.004	(0.011)
lnsigma	−1.050***	(0.009)	−1.268***	(0.014)	0.298	(0.182)
N (selected/censored)	11'303/1'846		4'306/431		3'696/431	
Wald chi^2/ DF	5841.234/27		3013.691/22		591.737	

Data: SGS, own calculations. Notes: log. gross monthly income (deflated to base May 2000); estimations based on Full-Maximum-Likelihood method using survey weights. Standard errors in parentheses, significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A6. Women's monthly income (log.) in the first and fifth year after graduation and their relative income growth; models with interaction terms—shown in Figure 2.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	−0.079	(0.055)	0.092***	(0.026)	−0.510	(0.473)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.226***	(0.012)	−0.171***	(0.016)	−0.302***	(0.049)
Law	−0.422***	(0.015)	−0.082***	(0.017)	−0.057	(0.062)
Science	−0.254***	(0.015)	−0.216***	(0.019)	−0.425***	(0.062)
Medicine/Pharmacy	−0.112***	(0.014)	−0.151***	(0.019)	−0.188***	(0.056)
Technical Sciences	−0.215***	(0.022)	−0.213***	(0.027)	−0.348***	(0.073)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.080***	(0.017)	0.036	(0.019)	0.050	(0.046)
Final grade	0.011	(0.012)	0.019	(0.013)	−0.049	(0.055)
Age	0.017***	(0.002)	0.003	(0.002)	0.002	(0.008)
Cohort (*Ref.: 2006*)						
2008	−0.016	(0.061)	−0.087*	(0.037)	−0.894	(0.474)
2010	−0.032	(0.060)	−0.011	(0.034)	−0.748	(0.476)
2012	−0.064	(0.055)	−0.031	(0.029)	−0.834	(0.476)
2014	−0.075	(0.057)				
2016	−0.043	(0.056)				
Degree · Cohort (*Ref.: BA · 2006*)						
MA · 2008	0.080	(0.067)	0.109**	(0.042)	0.872	(0.482)
MA · 2010	0.094	(0.065)	0.024	(0.038)	0.689	(0.481)
MA · 2012	0.130*	(0.061)	0.038	(0.033)	0.784	(0.481)
MA · 2014	0.172**	(0.062)				
MA · 2016	0.119	(0.061)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	0.052	(0.027)	0.002	(0.018)	0.060	(0.081)
Higher qualification	−0.034	(0.054)	−0.039*	(0.019)	−0.255***	(0.049)
Other training completed (*Ref.: no*)						
Yes	0.041	(0.021)	0.066***	(0.011)	0.203***	(0.043)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.199***	(0.009)	−0.127***	(0.012)	−0.312***	(0.039)
Weekly working hours	0.014***	(0.001)	0.024***	(0.001)	0.033***	(0.002)
Language region of employer (*Ref.: German-speaking*)						
French-/Italian-speaking	−0.053***	(0.008)	−0.095***	(0.010)	−0.176***	(0.041)
Italian-speaking	−0.220***	(0.022)				
Abroad	−0.322***	(0.019)	−0.439***	(0.024)	−0.683***	(0.075)
Log. monthly income 1st year					−2.083***	(0.124)
Constant	7.756***	(0.098)	7.763***	(0.107)	19.025***	(1.439)
Selection equation						
Degree: MA (*Ref.: BA*)	0.377*	(0.173)	0.538**	(0.173)	1.633***	(0.228)
Field of study (*Reference: Economics*)						
Social Sciences, Humanities	−0.024	(0.043)	−0.087	(0.095)	−0.127	(0.101)
Law	0.125*	(0.055)	−0.179	(0.109)	−0.239*	(0.115)
Science	−0.221***	(0.054)	−0.337**	(0.109)	−0.435***	(0.116)
Medicine/Pharmacy	0.108	(0.062)	0.194	(0.165)	0.151	(0.169)
Technical Sciences	−0.219*	(0.086)	−0.310	(0.174)	−0.408*	(0.179)
Type of university (*Reference: cantonal university*)						
ETH/EPFL	0.139*	(0.064)	0.251*	(0.118)	0.293*	(0.120)
Age	0.014*	(0.007)	−0.040**	(0.013)	−0.034*	(0.014)

Table A6. (Cont.) Women's monthly income (log.) in the first and fifth year after graduation and their relative income growth; models with interaction terms—shown in Figure 2.

	1st year		5th year		relative income growth	
Cohort (*Ref.: 2006*)						
2008	0.326	(0.185)	0.179	(0.200)	1.154***	(0.253)
2010	0.286	(0.179)	−0.215	(0.166)	0.868***	(0.221)
2012	0.228	(0.168)	−0.001	(0.160)	1.072***	(0.217)
2014	0.056	(0.169)				
2016	0.184	(0.169)				
Degree · Cohort (*Ref.: BA · 2006*)						
MA · 2008	−0.195	(0.206)	−0.382	(0.244)	−1.331***	(0.292)
MA · 2010	−0.113	(0.198)	−0.017	(0.209)	−1.085***	(0.258)
MA · 2012	−0.120	(0.187)	−0.235	(0.202)	−1.302***	(0.252)
MA · 2014	−0.040	(0.187)				
MA · 2016	−0.118	(0.187)				
Completed additional training at university (*Reference: no add. training completed*)						
At same level	−0.089	(0.083)	−0.242**	(0.093)	−0.352***	(0.099)
Higher qualification	−0.218	(0.285)	−0.614***	(0.096)	−0.614***	(0.098)
Other training completed (*Ref.: no*)						
Yes	−0.105	(0.062)	0.239**	(0.082)	0.244**	(0.085)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.028	(0.030)	−0.351***	(0.061)	−0.382***	(0.063)
Marital status (*Ref.: married/in a partnership*)						
Single/divorced/widowed	0.151***	(0.040)	0.085	(0.071)	0.098	(0.071)
Divorced/widowed	0.389	(0.227)				
No children (*Ref.: children*)	0.523***	(0.061)	0.424***	(0.084)	0.411***	(0.081)
Constant	−1.317***	(0.323)	1.840**	(0.568)	0.218	(0.624)
athrho	−1.173***	(0.051)	−0.163	(0.088)	−0.003	(0.070)
lnsigma	−0.830***	(0.011)	−1.298***	(0.015)	−0.154	(0.135)
N (selected/censored)	11'211/1'891		3'992/473		3'449/473	
Wald chi^2/ DF	3279.190/27		2486.239/22		1491.904/23	

Data: SGS, own calculations. Notes: Log. gross monthly income (deflated to base May 2000); estimations based on Full-Maximum-Likelihood method using survey weights. Standard errors in parentheses, significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A7. Men's monthly income (log.) in the first and fifth year after graduation and relative income growth; OLS-models.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.143***	(0.016)	0.124***	(0.017)	0.055	(0.133)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.280***	(0.013)	−0.223***	(0.018)	−0.341**	(0.115)
Law	−0.479***	(0.016)	−0.148***	(0.017)	−0.169	(0.162)
Science	−0.327***	(0.012)	−0.285***	(0.017)	−0.638***	(0.135)
Medicine/Pharmacy	−0.139***	(0.013)	−0.175***	(0.023)	−0.247**	(0.081)
Technical Sciences	−0.262***	(0.016)	−0.281***	(0.022)	−0.577***	(0.119)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.124***	(0.013)	0.086***	(0.018)	0.181*	(0.073)
Final grade	0.039***	(0.010)	0.058***	(0.014)	0.086	(0.072)
Age	0.022***	(0.002)	0.014***	(0.002)	0.027**	(0.010)
Cohort (*Ref.: 2006*)						
2008	−0.001	(0.017)	0.016	(0.015)	−0.094	(0.158)
2010	0.002	(0.016)	−0.005	(0.015)	−0.194	(0.139)
2012	−0.018	(0.016)	−0.026	(0.014)	−0.227	(0.149)
2014	−0.003	(0.015)				
2016	−0.010	(0.015)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	−0.031	(0.029)	−0.019	(0.021)	−0.169	(0.231)
Higher qualification	−0.077*	(0.031)	−0.073***	(0.016)	−0.237	(0.127)
Other training completed (*Ref.: no*)						
Yes	0.066***	(0.018)	0.075***	(0.012)	0.155	(0.097)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.233***	(0.008)	−0.257***	(0.012)	−0.650***	(0.093)
Weekly working hours	0.015***	(0.001)	0.024***	(0.001)	0.043***	(0.005)
Language region of employer (*Ref.: German-speaking*)						
French-/Italian-speaking	−0.089***	(0.008)	−0.133***	(0.010)	−0.172***	(0.046)
Italian-speaking	−0.261***	(0.021)				
Abroad	−0.352***	(0.016)	−0.298***	(0.023)	−0.507***	(0.075)
Log. monthly income 1st year					−2.587***	(0.374)
Constant	7.339***	(0.080)	7.319***	(0.112)	21.356***	(3.324)
Observations	11'303		4'306		3'696	
R^2	0.386		0.493		0.459	
F(df1, df2)	(22, 11280) = 262.94		(19, 4306) = 162.64		(20, 3675) = 28.75	

Data: SGS, own calculations. Notes: Log. gross monthly income (deflated to base May 2000); estimations based on OLS regression using survey weights. Standard errors in parentheses, significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A8. Women's monthly income (log.) in the 1st and 5th year after graduation and relative income growth; OLS-models.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.100***	(0.014)	0.136***	(0.014)	0.211**	(0.070)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.252***	(0.011)	−0.174***	(0.016)	−0.320***	(0.052)
Law	−0.457***	(0.014)	−0.082***	(0.017)	−0.068	(0.065)
Science	−0.309***	(0.014)	−0.219***	(0.019)	−0.441***	(0.063)
Medicine/Pharmacy	−0.110***	(0.012)	−0.149***	(0.019)	−0.200***	(0.058)
Technical Sciences	−0.254***	(0.019)	−0.215***	(0.027)	−0.364***	(0.074)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.108***	(0.015)	0.038*	(0.018)	0.050	(0.045)
Final grade	0.046***	(0.010)	0.020	(0.013)	−0.044	(0.056)
Age	0.018***	(0.002)	0.002	(0.002)	0.004	(0.009)
Cohort (*Ref.: 2006*)						
2008	0.076***	(0.023)	−0.004	(0.017)	−0.108	(0.088)
2010	0.071**	(0.022)	−0.002	(0.016)	−0.123	(0.076)
2012	0.068**	(0.021)	−0.008	(0.015)	−0.125	(0.075)
2014	0.083***	(0.021)				
2016	0.072***	(0.020)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	0.024	(0.024)	−0.002	(0.018)	0.054	(0.081)
Higher qualification	−0.026	(0.034)	−0.047**	(0.018)	−0.254***	(0.047)
Other training completed (*Ref.: no*)						
Yes	0.019	(0.019)	0.069***	(0.011)	0.205***	(0.044)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.208***	(0.009)	−0.130***	(0.012)	−0.311***	(0.038)
Weekly working hours	0.015***	(0.001)	0.024***	(0.001)	0.033***	(0.002)
Language region of employer (*Ref.: German-speaking*)						
French-/Italian-speaking	−0.056***	(0.008)	−0.096***	(0.010)	−0.173***	(0.042)
Italian-speaking	−0.245***	(0.022)				
Abroad	−0.375***	(0.018)	−0.440***	(0.025)	−0.680***	(0.074)
Log. monthly income 1st year					−2.083***	(0.125)
Constant	7.281***	(0.078)	7.748***	(0.107)	18.290***	(1.298)
Observations	11'211		3'992		3'449	
R^2	0.326		0.502		0.629	
F(df1, df2)	(22, 11188) = 238.16		(19, 3972) = 146.53		(20, 3428) = 70.26	

Data: SGS, own calculations. Notes: Log. gross monthly income (deflated to base May 2000); estimations based on OLS regression using survey weights. Standard errors in parentheses, significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

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Article

‘Virtuous’ and ‘Vicious’ Circles? Adults’ Participation in Different Types of Training in the UK and Its Association with Wages

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Abstract
The relationship between education, skills and labour market outcomes is becoming an increasingly pressing issue in many countries. In the UK, recent changes in education and skills funding structures and the ongoing consequences of the 2008 recession may have affected participation in training. ‘Virtuous’ and ‘vicious’ circles of learning may exist, whereby access to training is associated with social advantage, and training begets more training. We explore workers’ participation in different types of training and how this is associated with wages using the UK Household Longitudinal Study. Our exploratory findings suggest that those working in lower-level occupations may not only be less likely to undertake training in general, but also less likely to have done types of training associated with wage increases (e.g., to meet occupational standards), and more likely to have done training associated with no or negative changes in wages (e.g., health and safety) compared to those working in higher-level occupations. We suggest that further research is needed to unpack the ‘black box’ of training and its impacts upon different groups of people. We discuss the implications of our findings to help break the ‘vicious’ circles.

Keywords
adult skills; learning; social class; types of training; wages

Issue
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1. Introduction

The relationship between education, skills and labour market outcomes is becoming an increasingly pressing issue in many countries, in the context of changes in the occupational structure, skills demand and education provision. In the UK, recent changes in the education and skills funding structures and the broader consequences of the 2008 recession may have affected participation in training. In particular, some concern has been raised about the volume of training provided (Green, Felstead, Gallie, Inanc, & Jewson, 2016; Jewson, Felstead, & Green, 2015) and whether at-risk or socially disadvantaged groups’ access to training has changed (Felstead, Green, & Jewson, 2013; Lindsay, Canduela, & Raeside, 2013). In this article, we explore who participates in different types of training and how this is associated with wages, focusing on individuals from different socioeconomic backgrounds using data from the UK Household Longitudinal Study (UKHLS).

The contribution of this article is threefold. First, it focuses the analysis on adults aged 25–64, who tend to display different patterns of participation in training compared to younger adults. Second, it adds further evidence to existing findings that people working in lower-level occupations are less likely to undertake training in general compared to those working in higher-level occupations, by showing that they may also be less likely to have done types of training associated with wage in-

creases and more likely to have done types of training associated with no or negative changes in wages, highlighting the need for further research in this area. Third, it shows the importance of disaggregating the type of training accessed where possible, and suggests that better data about the type of and quality of training be collected to help improve such analyses. We make specific policy recommendations to help address the gap in adults' participation in training in the UK.

2. Background

2.1. The Situation of Training in the UK

The UK has been long-described as being stuck in a 'low-skill low-quality' equilibrium (Finegold & Soskice, 1988), a situation wherein a substantial proportion of the economy comprises low-quality jobs with low incentives for facilitating staff training and learning. It appears that the low-skill equilibrium problems are still ongoing (Green, 2016; Wilson & Hogarth, 2003). The UK also performs poorly in an international context. Public expenditure on training in Great Britain as a proportion of GDP was among the lowest of the G7 countries between 2004–2011, with only Japan at comparably low levels (Organisation for Economic Co-operation and Development [OECD], 2019). More recently, in 2015, the proportion of employees accessing training was lower in the UK than in the EU (30% versus 41%), and UK spend per training participant was just two thirds of the EU average (Eurostat, 2019). These measures do not explicitly capture the quality of training, however.

2.2. Who Participates in Training?

The wide-ranging literature on training suggests that, generally, younger people are more likely to undertake training than older people, although the proportion of younger adults accessing training may have decreased over time (Chen, Raeside, Egdell, & Graham, 2015). It is also well-established that better-qualified people tend to access more training than those with lower or no qualifications (e.g., Blanden, Buscha, Sturgis, & Urwin, 2008; Hoque, 2008; Johnson et al., 2009; Keep & James, 2010; Lindsay et al., 2013), that higher-wage workers are more likely to access training than lower-wage workers (Cheung & McKay, 2010), and that workers whose wages are likely to grow more quickly are more likely to undertake training than workers with slower wage growth (Pischke, 2001). There is some indication that working in professional and associate professional occupations is associated with higher participation in training than working in lower-level NS-SEC occupations (Felstead et al., 2013). Working part-time compared to full-time and working in the private sector compared to the public sector tends to be associated with lower participation in training (Arulampalam & Booth, 1998). The influence of individuals' social origins on participation in training may be mediated by educational attainment and occupation. Findings from the UK National Adult Skills Survey suggested that almost one in two people from the lowest social grades had not undertaken any learning since leaving school and were much less likely to participate in any training than those from more advantaged social grades (National Institute of Adult Continuing Education, 2015).

Although it is well-established that people with higher qualifications are more likely to access training than those with lower qualifications, explanations for this finding are unclear and are beyond the scope of this article. However, we note that these findings suggest that the existence of 'vicious' and 'virtuous' circles of participation in training is underpinned by social disadvantage. Individuals from lower socioeconomic backgrounds are less likely to obtain higher levels of qualifications and are also less likely to undertake training. In contrast, individuals from higher socioeconomic backgrounds are more likely to gain higher qualifications and to undertake training. It is also well-established that training leads to more training (e.g., "learning begets learning" and "skill begets skill" (Heckman, 2000, p. 50). In this article, we make use of the types of training variables available in the UKHLS data to disaggregate patterns of participation in different types of training and explore the association between different types of training and wages.

2.3. The Effect of Training on Wages

Classic human capital theory (Becker, 1962) distinguishes between general and specific training. General training is easily transferable, and all its benefits accrue to the worker. Specific training cannot be easily transferred to another firm, so the firm providing the training will reap all the returns. From this theoretical perspective, firms would finance specific (but not general) training and the wage gains to the worker would be greater from general training than from specific training (precisely because the worker reaps all the benefits to general training; see Arulampalam, Booth, & Elias, 1997). However, empirical findings do not tend to support the implications of the pure human capital view, as the majority of training provided by firms is general or has a general component (Loewenstein & Spletzer, 1999). More recent 'non-competitive' theories have argued that, in the presence of labour market imperfections, employers may be able to recoup costs of investing in general training (Acemoglu & Pischke, 1999; Bassanini, Booth, Brunello, De Paola, & Leuven, 2005). It is therefore complex to define which training is specific and which—general, although it has been argued that on-the-job training (e.g., induction, health and safety training) tends to be more specific than off-the-job training (e.g., Barron, Berger, & Black, 1999; Lynch, 1991, 1992).

The extensive empirical research on the effects of training on wages suggests that there is a broadly positive relationship, although the estimates vary depending on the type of modelling approach used and on the

type of population under study. For example, estimates range from 11% for men and 18% for women (Booth, 1991) to around 3.6% for men, and no significant effect for women (Blundell, Dearden, & Meghir, 1996; similar estimates of 4–5% for men in Vignoles, Galindo-Rueda, & Feinstein, 2004) and to negligible effects under a fixed-effects approach (Leuven & Oosterbeek, 2008). There may also be lags before the effects of training manifest on wages (Blanden, Buscha, Sturgis, & Urwin, 2012; Cheung & McKay, 2010).

Wage returns to training also vary by the type of training (e.g., Fialho, Quintini, & Vandeweyer, 2019). However, less information is available about the effects of different types of training on wages compared to the literature on the returns to training in general. Furthermore, not all sources of data permit analysis disaggregated by different types of training. Where such analysis has been possible, the results have been mixed. For example, accredited training (usually off-the-job) tends to be associated with wage gains while non-accredited training may not be (Booth & Bryan, 2002). Health and safety training could be associated with a decrease in pay (Cai & Waddoups, 2012), and induction and health and safety training may be provided for statutory reasons (Jones, Jones, Latreille, & Sloane, 2009). Gains from training tend to accrue to training courses at higher levels than at lower levels, and to academic over vocational qualifications at the same level (Blanden et al., 2008; Evans, Schoon, & Weale, 2013; McIntosh & Morris, 2016).

2.4. The Selection Problem

One of the central problems of empirical research on the effect of training on wages is the selection problem that makes it is difficult to recover true causal estimates. The selection problem arises because individuals' typically unobservable characteristics, such as innate ability or motivation, may influence undertaking both training and wages. In the absence of any corrections for the selection problem, estimated coefficients of the effect of training on wages are likely to be biased.

Several approaches are typically used to tackle the selection problem if a randomised experimental setup is not possible. For example, instrumental variables or selection models may be used to address selection bias (e.g., Fialho et al., 2019), but valid instruments may not be available in the data. If panel data are available, fixed-effects estimation can be used to account for typically unobserved measures by using the individuals as their own controls (e.g., Blanden et al., 2012, 2008), assuming that unobservables are time-invariant and have time-invariant effects on the outcome (Angrist & Pischke, 2008). However, fixed effects models may be problematic if there is relatively little variation within individuals over time, leading to excessively large standard errors (Dearden, Reed, & Van Reenen, 2006). Furthermore, as fixed-effects models tend to amplify measurement errors in variables, this may cause downward bias in the training variable, leading to smaller estimates compared to random-effects models (Angrist & Pischke, 2008). Another approach, also subject to data availability, uses a specially constructed comparison group that identifies those who wanted to undertake training but, for some reason, did not do so (Görlitz, 2011; Leuven & Oosterbeek, 2008). However, this approach tends to reduce the sample size and decrease the power of the analysis. In this article, we exploit the panel nature of the UKHLS and adopt a loose form of the Leuven and Oosterbeek (2008) approach to model the association between training and wages.

2.5. Research Questions

Our research questions are motivated by the relative gap in the literature on the participation in and wage returns to different types of training compared to training more broadly defined, and what implications this might have for different groups of people, in particular those who are typically less likely to undertake training. We are also keen to compare estimates from different model specifications. Our main questions are: What is the association between different types of training and wages? How does this relate to the different patterns of participation in these types of training?

3. Data and Methods

3.1. Data

We use data from the UKHLS, a survey which follows a sample of the UK population since 2009 and incorporates the British Household Panel Study (BHPS, a smaller longitudinal study that started in 1991). The UKHLS contains over 40,000 households, with around 50,000 individual interviews with adults aged 16+. The UKHLS waves 1–7 used in this study roughly correspond to the period 2009–2016. Among a wealth of information, the UKHLS contains data on participation in training, including type of training, measures of social class, wages, and other personal and job-related characteristics.

Analysis is conducted on adults aged 25–64; we exclude younger adults because they are more likely to engage in full-time education, while older and retired people are less likely to engage in training and their socioeconomic background is harder to capture (socioeconomic background is typically underpinned by occupations). We also restrict the sample to adults in employment (excluding self-employed) in wave 1 who were not unemployed in any other wave, following Blanden et al. (2008), partly because job-related training questions apply to respondents who are in work, and partly to exclude any mandatory training programs that people claiming unemployment benefit may have to undertake. We do not have information about who financed the training, but we restrict our analysis to look at training provided by an employer only, and not at training pro-

vided by the government, educational establishment, or other provider. There were almost 12,900 cases fitting this restriction at wave 2, with the number decreasing in each wave until around 8,000 observations at wave 7. Apprentices were treated as employed, but in any case, their number was very small (see Table A2 in the Annex for summary statistics).

3.2. Definitions

3.2.1. Training

We define training as whether individuals have undertaken any employer-provided job-related training or education in the last twelve months, as asked by the question:

> Since we last interviewed you on [last interview date], have you done any [other] training schemes or courses, even if they are not finished yet? Please include any part-time or evening courses, training provided by an employer, day release schemes, and government training schemes. (trainany, asked in wave 2 onwards)

That our sample of analysis is limited to 25–64-year-old adults in employment suggests that most responses to this question will likely involve training rather than education. A small number of people in part-time education may still be included in our sample.

The UKHLS also collects information on the three longest training schemes that the respondent has done since the last survey wave. For each of the three training periods, the UKHLS asks respondents to give the reason(s) why they did this training: to get started in the job (induction), to develop skills in the current job, to maintain professional status/meet occupational standards, to prepare for a job one might do in the future, to help get a promotion, health and safety training, and training for hobbies or leisure. For the purposes of this article, we treat responses to these questions as accurate, but responses could contain measurement error (for a short discussion, see Booth & Bryan, 2002, p. 7). We discuss the implications of possible measurement error for our analysis later in the article. We created indicator variables to capture the reasons for doing training for all training periods. In this article, we focus on training period 1 only.

3.2.2. Wages

We use the gross monthly income in respondents' main job (paygu_dv) to generate log hourly earnings, following the standard approaches in the literature (see Table A1 in the Annex). We do not deflate the earnings to account for inflation, although we do include year dummies to pick up the time effect, which would include inflation.

3.2.3. Socioeconomic Background

We use two measures of respondents' socioeconomic background based on the National Statistics Socio-Economic Classification (NS-SEC). The NS-SEC categorises people into social classes based on their occupation and labour relations (Office for National Statistics, 2010). In this article, we use the three-group NS-SEC for (1) whether respondents work in the managerial and professional occupations, intermediate occupations, or routine and manual occupations, and (2) for respondents' parents' occupations at respondent age 14.

3.3. Modelling and Measurement

We undertook analysis in three stages. First, we created simple descriptive statistics for an overview of the data. Second, we modelled what characteristics affected the decisions to undertake employer-provided training, broadly following the approach in Blanden et al. (2008) for the BHPS. Third, we conducted an exploratory analysis of whether undertaking employer-provided training was associated with wages and whether this varied by type of training, restricting the sample to those who wanted to undertake training only, loosely based on the Leuven and Oosterbeek (2008) approach. We do not have information about why participants could not undertake training, only whether they wanted to do so. Around half of the respondents in our unrestricted sample wanted to undertake training, and around 30% of respondents participated in at least some employer-provided training in the last 12 months. When the sample was restricted only to those who wanted to undertake training, around 40% participated in training (see Table A3 in the Annex).

Throughout the analysis, we paid special attention to socioeconomic background. We ran the regressions for men and women separately. We used cluster-robust standard errors to allow for individual responses to be correlated across time (Longhi & Nandi, 2015). As we use data from a range of waves, all our analyses were conducted on unweighted data. For the implications of using unweighted data in analysis, see the UKHLS user guide (Knies, 2017, p. 74). All analysis was conducted using Stata 15 SE software. We do not attempt to model women's decision to work in this article (see Section 5.1 for a discussion of the limitations).

3.3.1. Who is Likely to Invest in Training?

To see what characteristics affected whether people did any job-related employer-provided training, the following models were set up, broadly following the specifications used in other literature (Blanden et al., 2008; Gloster et al., 2015). These models were not restricted to those who wanted to do training.

$$\text{Train}_{it} = \alpha + \boldsymbol{SES_{it}\beta_1} + \boldsymbol{X_{it}\beta_2} + \beta_3\text{Year}_{it} + \varepsilon_{it} \quad (1)$$

The subscript *it* refers to an observation belonging to individual *i* in year *t*. *Train* is whether a respondent did any training, or whether they did training of a particular type. ***SES*** is a vector of socioeconomic background, including respondents' current NS-SEC and parental NS-SEC group at respondent age 14 (both measured using 3-group NS-SEC). ***X*** is a vector of individual and job-related characteristics, including sex, age, age squared, non-white ethnic group, poor health, married, own home (mortgage or outright), household income, number of dependent children under 16, country of residence, highest qualification at wave 1, permanent job, part-time job, private sector, high job satisfaction, and small workplace. The *Year* variable is the UKHLS survey wave (note that in UKHLS interviews in a wave are carried out over two years, meaning that the first wave took place over 2009–2011, and waves do not directly correspond with calendar years). The error term is denoted by ε. Models were run under pooled probit specifications and we report the marginal effects. We also ran pooled linear probability (ordinary least squares, OLS) and panel probit random effects models to test robustness.

3.3.2. What Associations Are There between Training and Wages?

To explore whether participation in employer-provided training was associated with wages, we set up the following general regression models using naïve pooled OLS, random-effects (RE) and fixed-effects (FE) specifications, restricted to those who wanted to do training. We included RE approaches partly to compare with FE results, and partly to look at the association of time-invariant variables with the outcome. However, our RE specifications will likely be biased because of omitted variables in our model (see Section 5.1). While a decrease in effect sizes from RE to FE may suggest that RE selection bias is high, if the small FE effect remains significant, it could still be because FE was not able to remove all bias from the estimation. Furthermore, the issues around FE attenuation bias and measurement error discussed earlier may complicate the interpretation of results.

We run models for doing any training and for the reasons for doing training. A priori, we expect training overall to be positively associated with wages, and for the effects to be smaller under fixed-effects specifications compared to random effects and pooled OLS. We also expect undertaking training for more general skill development reasons (e.g., to maintain professional status/meet occupational standards and to help get a promotion) to be positively associated with wages. In contrast, we expect statutory, more specific, on-the-job types of training (health and safety, induction, developing skills in current job) to have smaller or no effect on wages. However, it is unclear a priori whether training to maintain professional status/meet occupational standards or to develop skills in the current job are more specific or general types of training.

The wage equation for all specifications is in the form below, following the standard Mincerian approach:

$$\begin{aligned} \text{LnHrEarn}_{it} = \; & \alpha + \gamma \text{Train}_{it} + \boldsymbol{SES_{it}\beta_1} + \boldsymbol{X_{it}\beta_2} \\ & + \beta_3 \text{Year}_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

The vectors ***SES*** and ***X*** are defined as above, although we drop time-invariant controls (parental NS-SEC, highest qualification at wave 1 and ethnicity) from the fixed effects specification. We also test model sensitivity by including and excluding controls potentially co-determined with the decision to undertake training, such as part-time job and public sector job.

We looked into setting up a Heckman model to attempt to account for selection into training, following reviewer suggestions. However, it was not possible to find a suitable selection exclusion criterion in the data that would be associated with the decision to train but not with wages, and we do not present our Heckman results here.

3.4. Descriptive Statistics

Around one third of adults in the analysis sample participated in employer-provided training in the last 12 months across waves 2–7. Adults, especially women, who were working in higher NS-SEC occupations were more likely to participate in training than those working in routine and manual NS-SEC occupations (Figure 1), consistent with other findings in the literature (women's training may be driven by the higher proportion of women than men working in the public sector, which also tends to provide more training than the private sector; see, e.g., Sousounis, 2009).

Respondents' most frequently mentioned reason for doing training was to improve skills in their current job (mentioned by two thirds of respondents; see Table A2 in the Annex). Around one in four respondents did health and safety training, and the proportion was higher for those working in routine and manual NS-SEC compared to respondents from other NS-SEC categories. For all other types of training except induction, a lower proportion of respondents working in routine and manual NS-SEC occupations undertook the training compared to those working in higher NS-SEC occupations.

4. Results

4.1. Who Participates in Employer-Provided Training?

Table 1 shows how working in intermediate and routine NS-SEC occupations affects the probability of participating in employer-provided training (overall and in different types) compared to working in the professional NS-SEC occupations, for women and men separately. The full results (Table A4 in the Annex) show the different associations between other job-related characteristics and reasons for training. The pooled probit model results

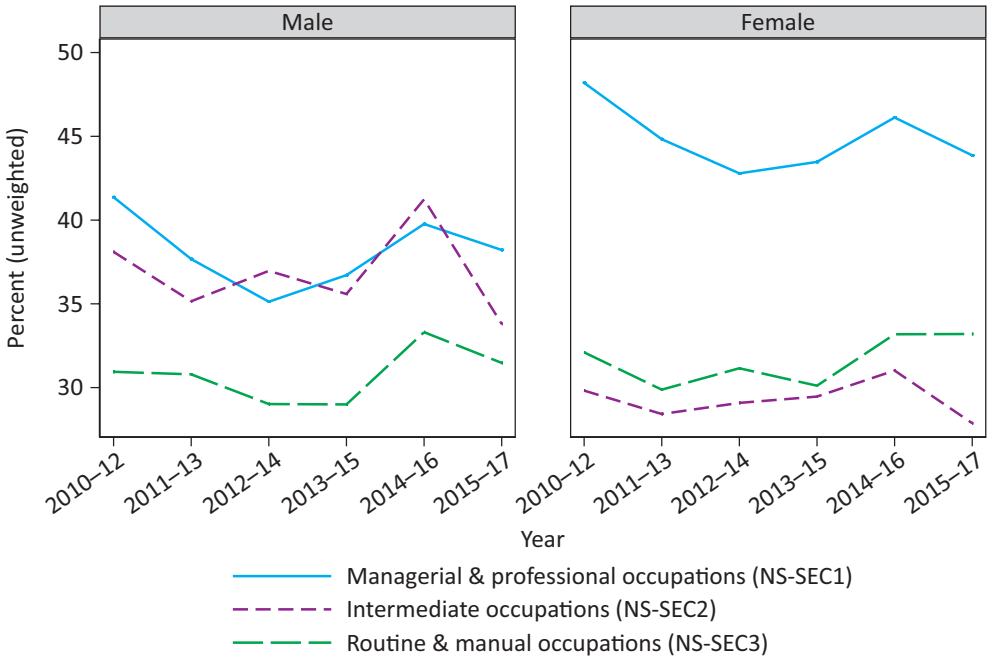

Figure 1. Participation in employer-provided training in last 12 months, by sex and own NS-SEC. Source: UKHLS waves 2–7, unweighted.

were broadly similar to those of the panel probit and pooled linear probability models.

Women working in intermediate NS-SEC occupations were less likely to have done employer-provided training in the last 12 months compared to women working in the professional occupations. However, there was no significant effect of current NS-SEC on the probability of doing employer-provided training for men.

Heterogeneous patterns emerged when we looked at the probability of undertaking different types of training (also Table 1). Women and men working in routine NS-SEC occupations were more likely to have done health and safety training than those working in managerial and professional occupations, keeping all other variables constant. Men in routine occupations were less likely to undertake training to improve skills in their current job compared to men working in the professional occupations, but there was no significant difference for women. Furthermore, women from intermediate and routine NS-SEC occupations were less likely to engage in training to maintain professional status or to meet occupational standards compared to those working in managerial and professional NS-SEC occupations, but there was no significant difference for men. Women from intermediate and routine NS-SEC and men from routine NS-SEC occupations were also less likely to do training for promotion-related reasons compared to those working in professional NS-SEC occupations.

These findings are broadly consistent with those reported in the literature. Overall, the findings suggest that men and women working in intermediate and routine NS-SEC occupations are less likely to undertake training that leads to generic skill development, and more likely to undertake training provided for statutory reasons, notably health and safety training, than those who work in professional NS-SEC occupations.

4.2. What Is the Association between Training and Wages?

We now turn to the key question of whether different types of training had different associations with wages. We attempt to address the selection problem by restricting our sample to those who wanted to undertake training. Selected results are presented here, see Table A5 in the Annex for the full RE results.

Table 2 shows how participation in employer-provided training (overall) was associated with wages, for those who wanted to do work-related training only. The results are shown for men and women separately, and compare OLS, RE and FE approaches. Participation in training in the last 12 months was associated with a moderate increase in men's wages across all three approaches, under no lags. As anticipated, the OLS model gave the highest coefficient (2.5% increase), and the FE model—the lowest (1% increase). There was also some indication of a positive effect on men's wages when the training variable was lagged by 1 period (OLS, RE), and by 3 periods (OLS only). However, there was only limited support for an association between training and women's wages, with a significant positive effect in lag 3 (OLS) or in lag 2 (RE). There were no significant effects of participation in training on wages in the FE model for women.

In Table 3, we show how participation in different types of employer-provided training was associated with wages. For space considerations, we only present the fixed- and random-effects models (including lags), although we also looked at pooled OLS. The results were

Table 1. Association between personal characteristics and doing training in the last 12 months (overall and by main reason for training).

	Training in last 12 months	Help you get started in your job	Improve skills in current job	Maintain prof status/meet occ standards	Prepare for job might do in future	Help get promotion	Health and safety training	Hobbies/leisure
	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)
Women								
Higher managerial and professional (ref.)								
Intermediate	−0.094***	0.011	0.006	−0.113***	0.003	−0.031***	0.020	0.010
	(0.010)	(0.007)	(0.016)	(0.019)	(0.013)	(0.009)	(0.016)	(0.006)
Routine	−0.018	0.009	0.026	−0.067***	−0.007	−0.024**	0.090***	0.000
	(0.011)	(0.006)	(0.014)	(0.017)	(0.013)	(0.009)	(0.016)	(0.005)
Other personal characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other job-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	**26,342**	8,647	8,647	8,648	8,647	8,647	8,647	8,461
Men								
Higher managerial and professional (ref.)								
Intermediate	0.005	0.009	−0.009	−0.015	0.042*	−0.018	0.027	−0.003
	(0.014)	(0.009)	(0.020)	(0.023)	(0.021)	(0.013)	(0.022)	(0.007)
Routine	0.004	0.009	−0.096***	0.028	−0.016	−0.023*	0.118***	−0.008
	(0.011)	(0.007)	(0.017)	(0.019)	(0.015)	(0.010)	(0.018)	(0.006)
Other personal characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other job-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	**20,893**	6,710	6,710	6,711	6,710	6,710	6,712	6,710

Note: Average marginal effects, based on pooled probit model specifications. Standard errors in parentheses. See Table A4 in the Annex for full model results.

Table 2. Association between doing training in the last 12 months and wages, various lags.

	Women					Men				
	No lags	**L1**	**L2**	**L3**	**L4**	**No lags**	**L1**	**L2**	**L3**	**L4**
OLS Had employer-provided training in last 12 months										
Coefficient	0.006	0.003	0.011	0.025*	0.018	0.025***	0.030***	0.017	0.025*	0.015
SE	(0.007)	(0.008)	(0.009)	(0.011)	(0.014)	(0.007)	(0.008)	(0.010)	(0.011)	(0.014)
N	13,080	9,567	6,875	4,750	2,828	10,650	7,707	5,545	3,847	2,298
Random Effects Had employer-provided training in last 12 months										
AME	0.006	0.001	0.012*	0.007	0.001	0.012*	0.019***	0.000	0.006	0.014
SE	(0.005)	(0.005)	(0.006)	(0.008)	(0.011)	(0.005)	(0.005)	(0.006)	(0.008)	(0.011)
N	13,080	9,567	6,875	4,750	2,828	10,650	7,707	5,545	3,847	2,298
Fixed effects Had employer-provided training in last 12 months										
AME	0.007	−0.004	0.009	−0.006	−0.016	0.010*	0.009	−0.009	−0.011	−0.005
SE	(0.005)	(0.005)	(0.006)	(0.009)	(0.013)	(0.005)	(0.005)	(0.007)	(0.009)	(0.012)
N	15,021	10,821	7,957	5,596	3,422	12,375	8,826	6,461	4,555	2,774
Other personal characteristics controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other job-related controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Selected results, UKHLS waves 2–7, unweighted. Pooled OLS and panel linear regressions, random- and fixed-effects specifications, training lagged by 0, 1, 2, 3 and 4 years. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3. Association between doing training in the last 12 months by reason for doing training and wages.

	Women					Men				
	No lags	**L1**	**L2**	**L3**	**L4**	**No lags**	**L1**	**L2**	**L3**	**L4**
Help you get started in your job (RE)	0.010	−0.014	−0.060*	−0.031	0.005	−0.015	−0.032	0.048	0.008	−0.061
	(0.017)	(0.021)	(0.029)	(0.033)	(0.037)	(0.017)	(0.024)	(0.032)	(0.034)	(0.057)
Improve skills in current job (RE)	0.003	0.004	0.010	−0.016	0.038	0.005	0.002	0.014	−0.017	0.012
	(0.008)	(0.014)	(0.015)	(0.018)	(0.026)	(0.009)	(0.013)	(0.018)	(0.023)	(0.029)
Maintain prof status/meet occ standards (RE)	0.004	0.014	0.011	0.041**	0.054*	0.005	0.006	0.004	0.004	0.004
	(0.007)	(0.011)	(0.012)	(0.015)	(0.024)	(0.008)	(0.011)	(0.014)	(0.016)	(0.027)
Prepare for job might do in future (RE)	−0.001	0.004	0.016	0.001	0.015	0.004	−0.020	−0.019	0.004	−0.048
	(0.008)	(0.012)	(0.014)	(0.022)	(0.028)	(0.009)	(0.013)	(0.015)	(0.018)	(0.029)
Help you get a promotion (RE)	−0.002	−0.030	0.001	0.012	0.021	−0.011	−0.029	−0.004	−0.020	0.026
	(0.011)	(0.016)	(0.017)	(0.025)	(0.031)	(0.012)	(0.018)	(0.016)	(0.023)	(0.032)
Health and safety training (RE)	−0.018*	−0.049***	−0.033*	−0.024	−0.038	−0.020*	−0.020	0.019	−0.031	0.011
	(0.008)	(0.011)	(0.015)	(0.018)	(0.027)	(0.009)	(0.012)	(0.015)	(0.018)	(0.028)
For hobbies or leisure (RE)	−0.000	−0.001	0.002	0.000	0.035	0.037	0.012	0.025	0.032	−0.071
	(0.021)	(0.023)	(0.026)	(0.051)	(0.048)	(0.023)	(0.029)	(0.027)	(0.031)	(0.071)
N (RE)	5,488	2,612	1,759	1,199	744	4,342	1,947	1,245	864	511
Help you get started in your job (FE)	0.015	0.007	−0.024	0.032	0.058	−0.009	−0.027	0.061	0.010	−0.164**
	(0.017)	(0.021)	(0.030)	(0.039)	(0.057)	(0.017)	(0.025)	(0.039)	(0.035)	(0.055)
Improve skills in current job (FE)	0.004	−0.010	0.008	−0.050*	0.038	0.002	0.012	0.012	−0.045	0.007
	(0.008)	(0.015)	(0.016)	(0.023)	(0.031)	(0.009)	(0.014)	(0.021)	(0.030)	(0.045)
Maintain prof status/meet occ standards (FE)	−0.012	−0.018	−0.015	0.020	−0.035	0.010	0.006	0.008	0.009	−0.041
	(0.008)	(0.013)	(0.014)	(0.020)	(0.032)	(0.008)	(0.012)	(0.017)	(0.018)	(0.036)
Prepare for job might do in future (FE)	−0.014	0.003	0.026	−0.006	0.006	0.006	−0.016	−0.022	0.029	0.030
	(0.009)	(0.013)	(0.016)	(0.031)	(0.039)	(0.010)	(0.014)	(0.016)	(0.019)	(0.042)
Help you get a promotion (FE)	0.009	−0.005	0.004	−0.008	0.032	−0.003	−0.015	0.010	−0.013	−0.022
	(0.011)	(0.017)	(0.020)	(0.031)	(0.047)	(0.012)	(0.020)	(0.015)	(0.026)	(0.038)
Health and safety training (FE)	−0.002	−0.017	0.003	−0.017	0.002	−0.019*	−0.003	0.011	−0.025	0.014
	(0.008)	(0.012)	(0.016)	(0.022)	(0.044)	(0.009)	(0.013)	(0.018)	(0.019)	(0.039)
For hobbies or leisure (FE)	−0.010	0.012	0.009	0.051	0.076	0.013	0.000	0.004	0.050	0.196**
	(0.023)	(0.023)	(0.031)	(0.069)	(0.062)	(0.025)	(0.033)	(0.039)	(0.041)	(0.070)
N (FE)	6,252	2,955	2,033	1,399	864	4,964	2,220	1,420	998	599

Notes: Selected results, UKHLS waves 2–7, unweighted. Random- and fixed-effects, lagged by 0, 1, 2, 3 and 4 years. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

almost entirely not significant with a few exceptions. Participation in health and safety training was negatively and significantly associated with women's wages under RE with 0, 1 and 2 lags only, and not significant for RE lags 3 and 4, and not at all under FE. Participation in health and safety training was also negatively and significantly associated with men's wages under no lags in the RE and FE models and was not significant otherwise. Participation in induction training was negatively and significantly associated with women's wages under RE in lag 2, and for men's wages under FE in lag 4 only. Last, participation in training to maintain professional status/meet occupational standards was positively and significantly associated with women's wages under RE in lags 3 and 4. Unexpectedly, under FE in lag 3, there was a negative association between this kind of training and women's wages. Participation in this type of training was not significant under either RE or FE for men's wages.

In general, the FE models gave the smallest coefficients and the least significant results, as expected. This difference in significance may be due to the overly large standard errors in the FE models, as discussed earlier. It may also be the case that restricting the sample to those who wanted to undertake training only also considerably restricted the sample size and the power of the analysis. In particular, the rather large coefficients on induction training lagged by 4 years for men should be interpreted with caution, as they may be affected by the smaller number of available observations and by the relatively low incidence of induction-related training. Furthermore, FE and RE models do not tend to agree on which coefficients are significant, so we cannot use the combination of models to provide additional support for the strength of association between the variables.

To test the robustness of the models, we compared these results with those of the unrestricted sample (i.e., those who undertook employer-provided training irrespective of whether they wanted to do work-related training), but do not present these results here. The results were not affected in a substantial way. Participation in health and safety training was still associated with a decrease in wages for women under RE (in lags 0, 1 and 2) and for men (but in lag 3 instead of lag 0 under both FE and RE). However, participation in training to maintain professional status/meet occupational standards was no longer significant for women. Participation in induction training was also no longer significantly associated with wages for women under RE in lag 2. The unexpected negative association between participation in training to maintain professional status or occupational standards and women's wages under FE in lag 3 was also no longer significant in the unrestricted sample.

5. Conclusions

In this article, we explored workers' participation in different types of employer-provided training and its association with wages, using the UKHLS. We found that the probability of participating in training varied by respondents' own NS-SEC, highest qualifications, and other personal and job-related characteristics. Working in intermediate or manual occupations was negatively associated with the probability of undertaking some types of training, such as for maintaining professional status or meeting occupational standards (for women) or improving skills in current job (for men), but was positively associated with undertaking other kinds of training, such as induction and health and safety training. These exploratory findings support the arguments in the literature about the persistent inequalities in work-related training (Hoque, 2008; Lindsay et al., 2013). While we found little evidence of a direct social origin (parental background) effect on participation in training, there may be indirect channels through which social origins can affect this (e.g., Causa & Johansson, 2010) that are beyond the scope of this article and remain an issue for further research.

Looking at the association between employer-provided training in general and wages, and restricting the analysis to those who wanted to undertake training, we found mixed evidence for a small, positive effect for men and to a lesser extent for women, depending on the specifications and lags used. For men, the association between training and wages was either not significant, or small (e.g., 1.0% increase under FE, no lags; 1.2%–1.9% increase under RE, lags 0 and 1; and 2.5%–3.0% increase under OLS, lags 0, 1 and 3). For women, there were far fewer significant effects, with only a 1.2% increase under RE lag 2, and a 2.5% increase under OLS lag 3, the remaining associations were not significant.

We found tentative evidence of different associations between different types of training and wages, especially when lagged by several years, supporting insight from other work suggesting that the gains to training may take time to materialise (Blanden et al., 2012). When the sample was restricted to those who wanted to do training, we found that participation in training to maintain professional status or occupational standards was positively associated with women's wages under RE in lags 3 and 4 (and, oddly, negatively associated with wages under FE lag 3). However, participation in this type of training was no longer significant for the unrestricted sample. Assuming that training to maintain professional status or occupational standards is more general than specific, our findings are in line with the expectation that general training should raise wages by more than specific training.

We also found evidence of a negative association between health and safety training and wages for women, and to a lesser extent for men. For women, the findings held under RE lags 0, 1 and 2, and for men—under RE and FE, no lags. The RE results were similar in the unrestricted sample as well (for men, RE lag 3 became significant rather than lag 0). Cai and Waddoups (2012) also found a negative association between health and safety training and wages. It could be the case that health and safety training is unrelated to skill development and tends to be provided for statutory reasons (Jones et al., 2009). It may

also be the case that such training tends to be prevalent in low-paid types of jobs, which may explain the negative association between this type of training and wages—this remains an issue for further research.

Our findings seem to tentatively support the view that general skills training (e.g. to maintain occupational standards) is associated with higher wage returns than is specific skills training (health and safety, induction training; see, e.g., Arulampalam et al., 1997; Jones, Kalmi, & Kauhanen, 2011). However, a large part of our associations between different types of wages and training, especially under FE, were not significant. Overall, we consider that there is tentative evidence pointing towards a slight and positive association between wages and training, and skill-related training in particular, and that adults working in routine and manual occupations are less likely to participate in such training activities.

5.1. Limitations and Future Research

We emphasise that the relationships between training and wages reported here are only associations, and that we do not fully isolate the 'true' causal effect of training on wages. There are several issues that complicate our results and make it difficult to isolate the causal effect, and we remain cautious about these findings for the reasons discussed below.

First, although we made partial attempts to account for selection into training by restricting our sample to those who wanted to undertake training, we have not fully addressed the selection problem. We have not modelled women's selection into work, so our estimates for women's wages may be biased. Future research could jointly model selection into work and into training, and extending this to panel data. Furthermore, we have not addressed other concerns, such as potential reverse causality (that higher wages may lead to a higher propensity to take up training) or omitted variable bias (e.g., who financed the training), which remain issues for further research.

Second, some of our control variables may be excessive, potentially co-determined with the training decision. We tested the sensitivity of our results and exclude permanent job and part-time job controls, individually and then jointly from the regression specification. However, there were no substantial differences to either the magnitude, direction or significance of estimates of key regressors. We decided to leave the job-related controls in, following similar regression specifications in the exploratory literature (e.g., Sousounis, 2009), as the analysis in this article focuses on the different associations in the data, rather than on the estimation of 'true' causal effects.

5.2. Contributions

The aim of this article was to explore how undertaking different types of training in the UK was associated with wages for adults aged 25–64. The article makes three main contributions to the literature. First, by focusing on adults aged 25–64, this study looks at the training patterns of people who are in work, in contrast to other research that includes younger adults who tend to have a higher incidence of training. Second, our exploratory analysis highlights that aggregated measures of training can hide important variation in the data. People working in lower-level occupations may not only be less likely to access training in general, but also less likely to undertake training associated with higher wages (e.g., training to maintain occupational standards) and more likely to undertake training associated with lower wages (e.g., health and safety and induction training). Our analysis makes a case for further research on the disaggregated effects of training for specific subgroups. Third, we suggest that more detailed statistics are needed to investigate these issues further, e.g., by introducing questions about different types of training in large-scale national surveys.

That adults in lower-quality jobs and with lower qualifications, who may have more to gain from training or learning, tend to miss out on training relative to their more advantaged peers in better jobs has been widely discussed in other research. Our findings suggest that adults working in lower-level NS-SEC occupations who do access training may face further obstacles, by being more likely to participate in statutory types of training that appear to be negatively associated with wages, and less likely to participate in skill-developing types of training that may have a more positive association with wages. Why this is the case remains a question for further research. It may be that routine and manual NS-SEC occupations are less likely to offer training opportunities other than statutory training compared to intermediate and professional occupations. Ongoing inequalities in access to beneficial training can further perpetuate virtuous circles of learning for more advantaged people and vicious circles for more disadvantaged people. Firms should consider how they could provide better training opportunities targeting workers in lower-level occupations and encourage them to take up that training. To help address this, policymakers could encourage firms to adopt employability skills frameworks, e.g., following the Taylor Review suggestions (Taylor, Marsh, Nicol, & Broadbent, 2017). Firms could also aim to collect better data to monitor whether groups of employees systematically lack training and development opportunities and help ensure that access to beneficial training is available to those who need it most.

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Conflict of Interests

The authors declare no conflict of interests.

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Annex

Table A1. Key variables for analysis.

Variable	Information and notes
wanttrain_du (derived from jblkchb)	Whether wanted to undertake work-related training. This variable was created by taking the **jblkchb** variable (present in waves b, d, and f of UKHLS), recoding it to 1 (if respondent wanted to undertake work-related training) and 0 if not, and using the data from the previous wave to fill in missing observations for waves c, e and g.
Emptrain_du (derived from trainany and trwho1)	Whether did any training in the last 12 months that was provided by an employer. Yes = 1, No (including training by other providers and no training) = 0. The UKHLS asked all respondents in the main adult survey who were interviewed at a prior wave, if they have done 'any training schemes or courses', including schemes still in progress, and including 'part-time or evening courses, training provided by an employer, day release schemes, and government training schemes' (**trainany**). It also asked who provided the training in spells 1–3 (we use spell 1 only, **trwho1**).
trainpurp11–trainpurp73	Variables asking for reason for undertaking training in training spells 1–3. Reasons include: Help you get started in your job, Improve skills in current job, Maintain professional status/meet occupational standards, Prepare for job might do in future, Help you get a promotion, Health and safety training, For hobbies or leisure. We created variables **trpurp1–7** that take the value 1 when that purpose for training was mentioned by the respondent for any training spell, and 0 otherwise. In our analysis we use the purpose for training for training period 1 (longest period of training in last 12 months).
lnhrpay (derived from paygu_dv)	Gross monthly income in main job (derived). This variable was trimmed at the top and bottom 1% of the distribution to minimise outliers, and recoded into an hourly wage. This was done by dividing the trimmed **paygu_dv** by the number of weeks in a month (4.35), and dividing again by a variable for number of hours typically worked in a week, itself created from usual hours (**jbhrs**) plus overtime (**jbot)**. This variable was trimmed as well, to drop all observations above 100 hours a week, and all observations below 7 hours a week. The log of the hourly wage was used as the variable of interest in the regression analysis, **lnhrpay**.

Table A2. UKHLS waves 1–7 summary statistics.

	Overall			Women			Men		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Whether had any employer-provided training in last 12 months	61,074	0.301	0.459	34,663	0.300	0.458	26,411	0.303	0.459
Help you get started in your job	22,405	0.051	0.219	12,946	0.052	0.222	9,459	0.049	0.216
Improve skills in current job	22,409	0.673	0.469	12,947	0.680	0.467	9,462	0.663	0.473
Maintain prof status/meet occ standards	22,409	0.516	0.500	12,948	0.521	0.500	9,461	0.509	0.500
Prepare for job might do in future	22,405	0.232	0.422	12,946	0.224	0.417	9,459	0.243	0.429
Help you get a promotion	22,405	0.097	0.296	12,946	0.092	0.289	9,459	0.103	0.304
Health and safety training	22,408	0.256	0.437	12,946	0.242	0.428	9,462	0.275	0.447
For hobbies or leisure	22,407	0.074	0.262	12,947	0.079	0.270	9,460	0.067	0.250
Log of usual gross pay per hour: current job	76,574	2.421	0.474	42,633	2.335	0.455	33,941	2.529	0.475
Higher managerial occupations	84,094	0.488	0.500	45,427	0.473	0.499	38,667	0.507	0.500
Intermediate occupations	84,094	0.158	0.365	45,427	0.201	0.401	38,667	0.109	0.311
Routine and manual occupations	84,094	0.353	0.478	45,427	0.326	0.469	38,667	0.385	0.487
Age	89,614	45.046	9.997	49,133	45.214	9.952	40,481	44.842	10.048
Whether married	89,531	0.770	0.421	49,074	0.728	0.445	40,457	0.820	0.384
Long-standing illness or impairment	89,527	0.265	0.441	49,087	0.276	0.447	40,440	0.251	0.434
England	89,592	0.842	0.365	49,122	0.837	0.369	40,470	0.847	0.360
Wales	89,592	0.043	0.203	49,122	0.046	0.209	40,470	0.040	0.196
Scotland	89,592	0.074	0.262	49,122	0.074	0.262	40,470	0.075	0.263
Northern Ireland	89,592	0.041	0.198	49,122	0.043	0.203	40,470	0.038	0.192
Number of own children in household	89,614	0.706	0.986	49,133	0.657	0.934	40,481	0.765	1.043
Own house outright/with mortgage	89,232	0.773	0.419	48,924	0.768	0.422	40,308	0.778	0.416
Gross household income in month before interview	89,614	4397.931	2619.325	49,133	4279.149	2631.894	40,481	4542.099	2596.733
Current job is permanent	84,679	0.958	0.200	45,684	0.953	0.211	38,995	0.964	0.186
Work in private sector company	79,280	0.595	0.491	44,170	0.498	0.500	35,110	0.717	0.451
Work part-time	79,699	0.226	0.418	44,337	0.352	0.478	35,362	0.069	0.254
Satisfied with current job	80,106	0.771	0.420	44,563	0.785	0.411	35,543	0.754	0.431
Fewer than 50 employees	79,511	0.432	0.495	43,866	0.465	0.499	35,645	0.392	0.488
Whether want work-rel training (filled in)	63,774	0.518	0.500	35,841	0.510	0.500	27,933	0.528	0.499
Female	89,614	0.548	0.498	49,133	1.000	0.000	40,481	0.000	0.000
Non-white ethnic group	87,938	0.162	0.369	48,799	0.151	0.358	39,139	0.176	0.381
Degree/above as highest qualification at W1	89,521	0.323	0.468	49,099	0.315	0.465	40,422	0.333	0.471
Other higher qualification	89,521	0.142	0.349	49,099	0.161	0.368	40,422	0.118	0.322
A level etc	89,521	0.189	0.391	49,099	0.176	0.380	40,422	0.205	0.404

Table A2. (Cont.) UKHLS waves 1–7 summary statistics.

	Overall			Women			Men		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
GCSE etc	89,521	0.205	0.403	49,099	0.219	0.413	40,422	0.188	0.390
Other qualifications	89,521	0.079	0.270	49,099	0.071	0.256	40,422	0.090	0.286
No qualifications	89,521	0.062	0.242	49,099	0.059	0.235	40,422	0.067	0.250
Parent—Higher managerial occupations	76,071	0.373	0.484	42,465	0.366	0.482	33,606	0.381	0.486
Parent—Intermediate occupations	76,071	0.262	0.440	42,465	0.265	0.441	33,606	0.257	0.437
Parent—Routine and manual occupations	76,071	0.366	0.482	42,465	0.368	0.482	33,606	0.362	0.481
Wave 1	89,614	0.230	0.421	49,133	0.221	0.415	40,481	0.240	0.427
Wave 2	89,614	0.167	0.373	49,133	0.167	0.373	40,481	0.167	0.373
Wave 3	89,614	0.145	0.352	49,133	0.147	0.354	40,481	0.142	0.349
Wave 4	89,614	0.133	0.339	49,133	0.134	0.341	40,481	0.131	0.337
Wave 5	89,614	0.122	0.327	49,133	0.123	0.329	40,481	0.120	0.325
Wave 6	89,614	0.106	0.307	49,133	0.107	0.310	40,481	0.103	0.304
Wave 7	89,614	0.099	0.299	49,133	0.101	0.301	40,481	0.097	0.296

Note: Data are unweighted and pooled across UKHLS waves 1–7, and are not limited to employer-provided training in this table.

Table A3. Individual characteristics by participation in employer-provided training, unrestricted and restricted samples.

	Unrestricted						Restricted to those who wanted to train only					
	No employer-provided training			Employer-provided training			No employer-provided training			Employer-provided training		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Log of usual gross pay per hour: current job	36,752	2.410	0.477	17,672	2.511	0.447	16,539	2.430	0.458	11,499	2.511	0.438
Higher managerial occupations	38,386	0.456	0.498	18,183	0.568	0.495	17,064	0.492	0.500	11,776	0.579	0.494
Intermediate occupations	38,386	0.171	0.376	18,183	0.133	0.340	17,064	0.171	0.376	11,776	0.131	0.337
Routine and manual occupations	38,386	0.373	0.484	18,183	0.299	0.458	17,064	0.338	0.473	11,776	0.290	0.454
Age	42,674	46.237	9.969	18,400	45.217	9.214	17,919	43.211	8.990	11,884	43.754	8.824
Whether married	42,628	0.767	0.423	18,376	0.780	0.415	17,895	0.760	0.427	11,867	0.770	0.421
Long-standing health problems	42,650	0.270	0.444	18,390	0.270	0.444	17,906	0.252	0.434	11,876	0.261	0.439
England	42,662	0.829	0.376	18,392	0.857	0.350	17,913	0.845	0.362	11,877	0.859	0.348
Wales	42,662	0.046	0.209	18,392	0.040	0.196	17,913	0.046	0.210	11,877	0.041	0.199
Scotland	42,662	0.078	0.268	18,392	0.070	0.255	17,913	0.070	0.256	11,877	0.070	0.255
Northern Ireland	42,662	0.047	0.212	18,392	0.033	0.179	17,913	0.038	0.192	11,877	0.030	0.170
No. of dep. children under 16 (continuous)	42,674	0.686	0.980	18,400	0.714	0.968	17,919	0.833	1.026	11,884	0.783	0.984
Own house outright/with mortgage	42,474	0.777	0.416	18,323	0.795	0.404	17,833	0.751	0.433	11,834	0.776	0.417
Gross household income in month before interview	42,674	4,292.190	2,647.983	18,400	4,793.988	2,554.871	17,919	4,375.620	2,478.720	11,884	4,771.945	2,469.201
Current job is permanent	38,618	0.962	0.190	18,261	0.967	0.180	17,153	0.960	0.196	11,828	0.966	0.181
Work in private sector company	38,155	0.649	0.477	18,119	0.487	0.500	16,990	0.612	0.487	11,749	0.480	0.500
Work part-time	38,359	0.247	0.431	18,146	0.171	0.376	17,060	0.199	0.399	11,765	0.155	0.362
Satisfied with current job	38,587	0.765	0.424	18,264	0.790	0.407	17,138	0.763	0.426	11,832	0.806	0.395
Fewer than 50 employees	37,834	0.440	0.496	17,940	0.389	0.488	16,873	0.404	0.491	11,625	0.380	0.485
Whether wanted work-related training	40,333	0.444	0.497	18,062	0.658	0.474						
Female	42,674	0.568	0.495	18,400	0.565	0.496	17,919	0.551	0.497	11,884	0.558	0.497
Non-white ethnic group	42,645	0.154	0.361	18,379	0.143	0.350	17,907	0.207	0.405	11,873	0.170	0.376
Degree/above as highest qualification at W1	42,645	0.300	0.458	18,384	0.365	0.481	17,912	0.348	0.476	11,874	0.386	0.487
Other higher qualification	42,645	0.128	0.334	18,384	0.181	0.385	17,912	0.147	0.354	11,874	0.184	0.388
A level etc	42,645	0.190	0.392	18,384	0.195	0.396	17,912	0.195	0.396	11,874	0.197	0.398
GCSE etc	42,645	0.222	0.416	18,384	0.175	0.380	17,912	0.205	0.404	11,874	0.162	0.369
Other qual	42,645	0.087	0.282	18,384	0.057	0.232	17,912	0.072	0.258	11,874	0.050	0.217
No qual	42,645	0.072	0.259	18,384	0.028	0.164	17,912	0.034	0.181	11,874	0.020	0.142

Table A3. (Cont.) Individual characteristics by participation in employer-provided training, unrestricted and restricted samples.

	Unrestricted						Restricted to those who wanted to train only					
	No employer-provided training			Employer-provided training			No employer-provided training			Employer-provided training		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Parent—Higher managerial occupations	36,472	0.362	0.480	15,988	0.393	0.488	15,320	0.396	0.489	10,405	0.404	0.491
Parent—Intermediate occupations	36,472	0.262	0.440	15,988	0.257	0.437	15,320	0.267	0.442	10,405	0.256	0.437
Parent—Routine and manual occupations	36,472	0.376	0.484	15,988	0.350	0.477	15,320	0.337	0.473	10,405	0.340	0.474
Wave 1	42,674	0.000	0.000	18,400	0.000	0.000	17,919	0.000	0.000	11,884	0.000	0.000
Wave 2	42,674	0.205	0.403	18,400	0.226	0.419	17,919	0.209	0.407	11,884	0.231	0.421
Wave 3	42,674	0.188	0.391	18,400	0.184	0.388	17,919	0.188	0.390	11,884	0.175	0.380
Wave 4	42,674	0.176	0.381	18,400	0.163	0.369	17,919	0.173	0.378	11,884	0.167	0.373
Wave 5	42,674	0.162	0.368	18,400	0.153	0.360	17,919	0.163	0.370	11,884	0.154	0.361
Wave 6	42,674	0.136	0.343	18,400	0.145	0.352	17,919	0.132	0.339	11,884	0.144	0.351
Wave 7	42,674	0.133	0.339	18,400	0.129	0.335	17,919	0.135	0.341	11,884	0.129	0.335

Note: Data are unweighted and pooled across UKHLS waves 1–7.

Table A4. Regression results, probability of participation in training in last 12 months, overall and by reason for training, men and women, pooled logit.

	Women	**Women—reasons for training**					**Men**	**Men—reasons for training**				
	Training in last 12 months	Help get started in job	Improve skills in current job	Maintain prof status/ meet occ stds	Help get a promotion	Health and safety training	Training in last 12 months	Help get started in job	Improve skills in current job	Maintain prof status/ meet occ stds	Help get a promotion	Health and safety training
	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)
Higher managerial and professional (ref.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
Intermediate	−0.094*** (0.010)	0.011 (0.007)	0.006 (0.016)	−0.113*** (0.019)	−0.031*** (0.009)	0.020 (0.016)	0.005 (0.014)	0.009 (0.009)	−0.009 (0.020)	−0.015 (0.023)	−0.018 (0.013)	0.027 (0.022)
Routine	−0.018 (0.011)	0.009 (0.006)	0.026 (0.014)	−0.067*** (0.017)	−0.024** (0.009)	0.090*** (0.016)	0.004 (0.011)	0.009 (0.007)	−0.096*** (0.017)	0.028 (0.019)	−0.023* (0.010)	0.118*** (0.018)
Age (continuous)	0.000 (0.000)	−0.001*** (0.000)	−0.003*** (0.001)	0.004*** (0.001)	−0.003*** (0.000)	0.004*** (0.001)	−0.002*** (0.001)	−0.002*** (0.000)	−0.004*** (0.001)	0.004*** (0.001)	−0.006*** (0.001)	0.003*** (0.001)
Married/civil partnership/ cohabiting	−0.007 (0.010)	−0.002 (0.006)	−0.014 (0.013)	−0.025 (0.015)	0.006 (0.009)	0.021 (0.014)	0.043*** (0.012)	−0.001 (0.007)	−0.031 (0.019)	−0.021 (0.022)	−0.015 (0.013)	0.005 (0.021)
Longstanding health problems	0.021** (0.008)	0.010 (0.005)	0.005 (0.011)	0.038** (0.013)	−0.003 (0.007)	0.033** (0.012)	0.014 (0.009)	0.001 (0.006)	0.039** (0.014)	−0.002 (0.016)	0.000 (0.009)	0.031* (0.015)
England (ref.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
Wales	−0.052** (0.018)	−0.010 (0.011)	0.010 (0.026)	−0.008 (0.031)	0.011 (0.018)	−0.069** (0.027)	−0.003 (0.022)	−0.028*** (0.008)	−0.024 (0.033)	0.007 (0.035)	0.033 (0.021)	−0.013 (0.032)
Scotland	−0.066*** (0.015)	−0.017* (0.008)	−0.006 (0.022)	0.001 (0.026)	−0.010 (0.014)	−0.036 (0.021)	−0.014 (0.017)	−0.003 (0.009)	0.016 (0.023)	0.005 (0.028)	0.008 (0.017)	0.010 (0.025)
Northern Ireland	−0.104*** (0.016)	−0.034*** (0.008)	−0.053 (0.032)	−0.034 (0.034)	−0.014 (0.016)	−0.046 (0.028)	−0.080*** (0.021)	−0.016 (0.013)	0.027 (0.032)	−0.005 (0.038)	0.020 (0.025)	0.069 (0.036)
No. of dep. children under 16 (continuous)	−0.001 (0.005)	−0.001 (0.003)	−0.002 (0.007)	−0.003 (0.008)	0.009* (0.004)	0.003 (0.007)	0.002 (0.005)	−0.005* (0.003)	0.002 (0.007)	0.006 (0.008)	−0.001 (0.005)	−0.002 (0.007)
Own house	−0.031** (0.010)	−0.002 (0.006)	0.011 (0.014)	−0.022 (0.016)	−0.021* (0.010)	−0.044** (0.015)	0.016 (0.012)	−0.018* (0.008)	0.005 (0.018)	−0.010 (0.019)	−0.004 (0.011)	−0.002 (0.018)
Household income (continuous)	0.000* (0.000)	−0.000** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	−0.000** (0.000)	0.000 (0.000)	−0.000 (0.000)	−0.000 (0.000)	0.000 (0.000)	−0.000 (0.000)	−0.000*** (0.000)
Permanent	0.037* (0.016)	−0.062*** (0.017)	−0.015 (0.025)	0.054 (0.029)	−0.014 (0.017)	0.010 (0.026)	0.037 (0.021)	−0.049* (0.022)	0.011 (0.037)	0.076 (0.042)	0.059*** (0.018)	0.005 (0.037)

Table A4. (Cont.) Regression results, probability of participation in training in last 12 months, overall and by reason for training, men and women, pooled logit.

	Women	**Women—reasons for training**					**Men**	**Men—reasons for training**				
	Training in last 12 months	Help get started in job	Improve skills in current job	Maintain prof status/ meet occ stds	Help get a promotion	Health and safety training	Training in last 12 months	Help get started in job	Improve skills in current job	Maintain prof status/ meet occ stds	Help get a promotion	Health and safety training
	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)
Job is in private sector	−0.155*** (0.008)	0.016** (0.005)	−0.032** (0.011)	−0.059*** (0.013)	0.001 (0.007)	−0.020 (0.011)	−0.105*** (0.010)	−0.002 (0.006)	0.003 (0.014)	−0.099*** (0.016)	−0.019* (0.009)	0.018 (0.014)
Job is part-time	−0.074*** (0.008)	0.002 (0.006)	−0.020 (0.013)	0.024 (0.015)	−0.061*** (0.007)	0.035** (0.013)	−0.100*** (0.017)	0.003 (0.014)	0.006 (0.034)	0.030 (0.037)	−0.004 (0.023)	−0.045 (0.032)
Satisfied with job	0.028*** (0.008)	0.015** (0.005)	0.040** (0.013)	0.005 (0.014)	0.024*** (0.007)	0.016 (0.012)	0.039*** (0.008)	0.005 (0.006)	0.029* (0.014)	0.010 (0.016)	0.012 (0.009)	0.005 (0.014)
Workplace has < 50 employees	0.012 (0.008)	−0.009 (0.005)	0.005 (0.011)	0.010 (0.013)	−0.019** (0.007)	0.031** (0.011)	−0.038*** (0.009)	0.002 (0.005)	−0.034* (0.014)	0.044** (0.015)	−0.043*** (0.008)	0.023 (0.014)
Non-white ethnic group	−0.016 (0.012)	0.013 (0.007)	−0.000 (0.016)	0.002 (0.017)	−0.002 (0.010)	0.009 (0.017)	−0.041** (0.013)	0.023* (0.009)	0.003 (0.020)	−0.012 (0.022)	0.029* (0.013)	0.020 (0.021)
Highest qualification: Degree or equivalent (ref.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
Other higher qualification	0.062*** (0.013)	0.012 (0.006)	−0.006 (0.015)	0.030 (0.018)	0.011 (0.010)	0.049** (0.016)	0.033* (0.016)	0.006 (0.008)	−0.013 (0.021)	0.012 (0.024)	−0.015 (0.012)	0.104*** (0.023)
A level etc	−0.003 (0.012)	0.007 (0.007)	0.002 (0.017)	−0.061** (0.020)	0.019 (0.011)	0.047** (0.018)	0.008 (0.014)	0.022** (0.008)	−0.030 (0.019)	0.007 (0.022)	−0.002 (0.012)	0.058** (0.020)
GCSE etc	−0.039** (0.013)	0.006 (0.007)	0.006 (0.018)	−0.082*** (0.021)	0.005 (0.011)	0.055** (0.019)	−0.045** (0.014)	−0.005 (0.008)	−0.023 (0.022)	−0.052* (0.025)	−0.001 (0.014)	0.047* (0.022)
Other qual	−0.101*** (0.018)	0.028* (0.014)	−0.008 (0.028)	−0.101** (0.034)	0.015 (0.018)	0.051 (0.029)	−0.041* (0.019)	−0.006 (0.010)	−0.026 (0.029)	−0.063 (0.033)	−0.008 (0.020)	0.119*** (0.032)
No qual	−0.170*** (0.018)	0.000 (0.015)	−0.053 (0.039)	−0.203*** (0.041)	−0.012 (0.024)	0.092* (0.042)	−0.135*** (0.022)	0.022 (0.021)	0.006 (0.040)	−0.099 (0.051)	−0.015 (0.030)	0.063 (0.044)
Parent—Higher managerial and professional (ref.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
Parent—Intermediate occupations	0.005 (0.010)	−0.004 (0.006)	−0.004 (0.014)	0.012 (0.016)	−0.005 (0.009)	−0.003 (0.014)	0.002 (0.011)	0.011 (0.007)	−0.003 (0.017)	0.005 (0.019)	−0.004 (0.010)	−0.000 (0.018)
Parent—Routine and manual occupations	0.009 (0.010)	−0.009 (0.006)	−0.018 (0.013)	0.015 (0.015)	−0.004 (0.009)	0.008 (0.014)	0.020 (0.011)	0.004 (0.006)	−0.012 (0.016)	0.026 (0.018)	0.008 (0.010)	0.030 (0.017)

Table A4. (Cont.) Regression results, probability of participation in training in last 12 months, overall and by reason for training, men and women, pooled probit.

	Women	**Women—reasons for training**					**Men**	**Men—reasons for training**				
	Training in last 12 months	Help get started in job	Improve skills in current job	Maintain prof status/ meet occ stds	Help get a promotion	Health and safety training	Training in last 12 months	Help get started in job	Improve skills in current job	Maintain prof status/ meet occ stds	Help get a promotion	Health and safety training
	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)
2010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
2011	−0.023**	−0.010	0.013	0.041**	0.013	0.022	−0.026**	0.006	0.047**	0.026	0.011	0.009
	(0.007)	(0.006)	(0.014)	(0.015)	(0.009)	(0.013)	(0.008)	(0.007)	(0.016)	(0.017)	(0.010)	(0.015)
2012	−0.033***	−0.007	−0.002	0.033*	−0.007	0.025	−0.043***	−0.003	0.009	0.038*	0.012	0.011
	(0.008)	(0.007)	(0.014)	(0.016)	(0.009)	(0.014)	(0.009)	(0.007)	(0.017)	(0.019)	(0.011)	(0.016)
2013	−0.034***	−0.008	0.003	0.044*	−0.002	0.031*	−0.028**	0.006	0.014	0.031	0.004	0.021
	(0.008)	(0.007)	(0.015)	(0.017)	(0.010)	(0.015)	(0.010)	(0.008)	(0.018)	(0.019)	(0.011)	(0.017)
2014	−0.009	0.007	−0.030	0.040*	−0.002	0.036*	−0.000	0.003	0.033	−0.008	0.013	0.018
	(0.009)	(0.008)	(0.016)	(0.018)	(0.010)	(0.016)	(0.011)	(0.008)	(0.018)	(0.020)	(0.012)	(0.018)
2015	−0.019*	0.003	−0.033	0.023	0.001	0.026	−0.009	0.004	−0.012	0.031	0.002	0.001
	(0.010)	(0.008)	(0.017)	(0.019)	(0.010)	(0.017)	(0.011)	(0.009)	(0.020)	(0.021)	(0.012)	(0.019)
N	26,342	8647	8647	8648	8647	8647	20893	6710	6710	6711	6710	6712

Notes: Full results, UKHLS waves 2–7, unweighted pooled probit regression, average marginal effects (dy/dx(*)), standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Year is the first year of the fieldwork carried out in that UKHLS wave. Training done to prepare for a job one might do in the future and training for hobbies and leisure not shown owing to space considerations.

Table A5. Regression results, association between different reasons for participation in training and wages (log of hourly earnings), random effects.

	Women					Men				
	No lags	**L1**	**L2**	**L3**	**L4**	**No lags**	**L1**	**L2**	**L3**	**L4**
Help you get started in your job	0.010	−0.014	−0.060*	−0.031	0.005	−0.015	−0.032	0.048	0.008	−0.061
	(0.017)	(0.021)	(0.029)	(0.033)	(0.037)	(0.017)	(0.024)	(0.032)	(0.034)	(0.057)
Improve skills in current job	0.003	0.004	0.010	−0.016	0.038	0.005	0.002	0.014	−0.017	0.012
	(0.008)	(0.014)	(0.015)	(0.018)	(0.026)	(0.009)	(0.013)	(0.018)	(0.023)	(0.029)
Maintain prof status/meet occ standards	0.004	0.014	0.011	0.041**	0.054*	0.005	0.006	0.004	0.004	0.004
	(0.007)	(0.011)	(0.012)	(0.015)	(0.024)	(0.008)	(0.011)	(0.014)	(0.016)	(0.027)
Prepare for job might do in future	−0.001	0.004	0.016	0.001	0.015	0.004	−0.020	−0.019	0.004	−0.048
	(0.008)	(0.012)	(0.014)	(0.022)	(0.028)	(0.009)	(0.013)	(0.015)	(0.018)	(0.029)
Help you get a promotion	−0.002	−0.030	0.001	0.012	0.021	−0.011	−0.029	−0.004	−0.020	0.026
	(0.011)	(0.016)	(0.017)	(0.025)	(0.031)	(0.012)	(0.018)	(0.016)	(0.023)	(0.032)
Health and safety training	−0.018*	−0.049***	−0.033*	−0.024	−0.038	−0.020*	−0.020	0.019	−0.031	0.011
	(0.008)	(0.011)	(0.015)	(0.018)	(0.027)	(0.009)	(0.012)	(0.015)	(0.018)	(0.028)
For hobbies or leisure	−0.000	−0.001	0.002	0.000	0.035	0.037	0.012	0.025	0.032	−0.071
	(0.021)	(0.023)	(0.026)	(0.051)	(0.048)	(0.023)	(0.029)	(0.027)	(0.031)	(0.071)
Higher managerial and professional (ref.)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Intermediate	−0.160***	−0.167***	−0.183***	−0.181***	−0.179***	−0.037	−0.023	−0.002	0.031	−0.064
	(0.016)	(0.022)	(0.026)	(0.032)	(0.042)	(0.019)	(0.031)	(0.037)	(0.042)	(0.054)
Routine	−0.288***	−0.304***	−0.328***	−0.330***	−0.259***	−0.177***	−0.191***	−0.175***	−0.154***	−0.168***
	(0.016)	(0.022)	(0.025)	(0.029)	(0.039)	(0.017)	(0.023)	(0.025)	(0.031)	(0.041)
Age (continuous)	0.028***	0.026**	0.023*	0.007	−0.006	0.031***	0.030***	0.044***	0.038*	0.031
	(0.006)	(0.009)	(0.011)	(0.011)	(0.016)	(0.006)	(0.009)	(0.013)	(0.015)	(0.020)
Age squared	−0.000***	−0.000**	−0.000*	−0.000	0.000	−0.000***	−0.000**	−0.000**	−0.000*	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Married/civil partnership/cohabiting	−0.072***	−0.082***	−0.094***	−0.110***	−0.098**	−0.115***	−0.139***	−0.153***	−0.128***	−0.211***
	(0.014)	(0.019)	(0.022)	(0.026)	(0.033)	(0.019)	(0.025)	(0.031)	(0.035)	(0.047)
Longstanding health problems	0.001	0.006	0.044**	0.056**	0.068**	−0.006	−0.011	−0.023	0.003	−0.002
	(0.009)	(0.012)	(0.015)	(0.020)	(0.024)	(0.011)	(0.016)	(0.018)	(0.023)	(0.031)
England (ref.)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Wales	0.000	−0.010	0.034	−0.013	0.017	−0.099***	−0.098*	−0.094*	−0.101	−0.081
	(0.031)	(0.039)	(0.039)	(0.053)	(0.066)	(0.030)	(0.042)	(0.047)	(0.066)	(0.062)
Scotland	0.013	0.053	0.041	0.048	0.106	−0.049*	−0.036	−0.014	0.021	−0.036
	(0.019)	(0.028)	(0.033)	(0.036)	(0.056)	(0.024)	(0.034)	(0.045)	(0.046)	(0.056)

Table A5. (Cont.) Regression results, association between different reasons for participation in training and wages (log of hourly earnings), random effects.

	Women					Men				
	No lags	**L1**	**L2**	**L3**	**L4**	**No lags**	**L1**	**L2**	**L3**	**L4**
Northern Ireland	0.043	0.011	0.099*	0.020	0.134	−0.079*	−0.091*	−0.108*	−0.032	0.018
	(0.027)	(0.042)	(0.050)	(0.081)	(0.087)	(0.035)	(0.042)	(0.050)	(0.060)	(0.130)
No. of dep. children under 16 (continuous)	−0.006	−0.010	−0.006	0.015	0.031	0.030***	0.042***	0.043***	0.030**	0.055**
	(0.006)	(0.010)	(0.012)	(0.013)	(0.018)	(0.006)	(0.009)	(0.011)	(0.011)	(0.018)
Own house	0.047***	0.040	0.036	0.036	0.057	0.086***	0.067**	0.078*	0.037	0.037
	(0.014)	(0.020)	(0.022)	(0.029)	(0.041)	(0.017)	(0.024)	(0.031)	(0.030)	(0.038)
Household income (continuous)	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Permanent	0.063*	0.084	0.109*	0.056	0.100	0.054	0.065	0.070	0.101	0.077
	(0.028)	(0.043)	(0.049)	(0.087)	(0.116)	(0.031)	(0.047)	(0.057)	(0.075)	(0.078)
Job is in private sector	−0.049***	−0.044**	−0.034*	−0.010	−0.027	0.024	0.040*	0.067***	0.039	0.056
	(0.011)	(0.015)	(0.017)	(0.021)	(0.027)	(0.012)	(0.016)	(0.019)	(0.024)	(0.031)
Job is part-time	0.052***	0.043*	0.059*	0.030	0.026	0.074	0.081	0.009	0.023	−0.076
	(0.014)	(0.021)	(0.026)	(0.031)	(0.047)	(0.052)	(0.064)	(0.066)	(0.092)	(0.093)
Satisfied with job	0.009	−0.004	0.006	0.010	0.028	0.011	0.033*	0.039*	0.024	0.003
	(0.009)	(0.013)	(0.018)	(0.023)	(0.037)	(0.009)	(0.015)	(0.017)	(0.018)	(0.033)
Workplace has < 50 employees	−0.072***	−0.070***	−0.083***	−0.079***	−0.074**	−0.074***	−0.057**	−0.078***	−0.110***	−0.094*
	(0.012)	(0.017)	(0.019)	(0.021)	(0.028)	(0.014)	(0.020)	(0.024)	(0.028)	(0.037)
Non-white ethnic group	0.027	0.048*	−0.006	−0.002	0.021	−0.100***	−0.121***	−0.132***	−0.096*	−0.114**
	(0.017)	(0.024)	(0.026)	(0.027)	(0.035)	(0.019)	(0.027)	(0.033)	(0.038)	(0.043)
Highest qualification: Degree or equivalent (ref.)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Other higher qualification	−0.134***	−0.111***	−0.096***	−0.092***	−0.111**	−0.086***	−0.072*	−0.099**	−0.056	−0.101*
	(0.016)	(0.021)	(0.025)	(0.027)	(0.035)	(0.021)	(0.028)	(0.033)	(0.041)	(0.048)
A level etc	−0.211***	−0.180***	−0.181***	−0.152***	−0.193***	−0.144***	−0.125***	−0.160***	−0.110**	−0.129**
	(0.017)	(0.023)	(0.026)	(0.030)	(0.041)	(0.020)	(0.027)	(0.032)	(0.035)	(0.046)
GCSE etc	−0.271***	−0.224***	−0.221***	−0.156***	−0.192***	−0.180***	−0.143***	−0.220***	−0.183***	−0.199**
	(0.019)	(0.027)	(0.032)	(0.036)	(0.049)	(0.023)	(0.031)	(0.043)	(0.051)	(0.064)
Other qual	−0.278***	−0.230***	−0.188***	−0.123**	−0.190***	−0.226***	−0.219***	−0.245***	−0.230***	−0.258***
	(0.029)	(0.043)	(0.041)	(0.047)	(0.051)	(0.028)	(0.038)	(0.045)	(0.063)	(0.066)
No qual	−0.272***	−0.201**	−0.206**	−0.067	−0.225*	−0.225***	−0.151	−0.159	−0.109	−0.187
	(0.042)	(0.062)	(0.063)	(0.101)	(0.106)	(0.050)	(0.081)	(0.120)	(0.118)	(0.156)
Parent—Higher managerial and professional (ref.)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)

Table A5. (Cont.) Regression results, association between different reasons for participation in training and wages (log of hourly earnings), random effects.

	Women					Men				
	No lags	**L1**	**L2**	**L3**	**L4**	**No lags**	**L1**	**L2**	**L3**	**L4**
Parent—Intermediate occupations	−0.006	0.010	−0.022	−0.018	−0.036	−0.010	−0.011	−0.020	−0.021	−0.020
	(0.014)	(0.020)	(0.023)	(0.026)	(0.032)	(0.016)	(0.022)	(0.027)	(0.031)	(0.039)
Parent—Routine and manual occupations	−0.024	−0.020	−0.043*	−0.037	−0.023	−0.046**	−0.053*	−0.030	−0.035	−0.006
	(0.014)	(0.019)	(0.021)	(0.023)	(0.031)	(0.016)	(0.022)	(0.027)	(0.031)	(0.038)
2010	0.000					0.000				
	(.)					(.)				
2011	0.023**	0.000				0.002	0.000			
	(0.009)	(.)				(0.008)	(.)			
2012	0.019*	−0.018	0.000			0.007	0.016	0.000		
	(0.009)	(0.012)	(.)			(0.010)	(0.013)	(.)		
2013	0.043***	0.008	0.036**	0.000		0.010	0.017	−0.002	0.000	
	(0.010)	(0.014)	(0.013)	(.)		(0.011)	(0.015)	(0.014)	(.)	
2014	0.055***	0.018	0.053***	0.007	0.000	0.031**	0.040*	0.019	0.015	0.000
	(0.011)	(0.015)	(0.013)	(0.016)	(.)	(0.012)	(0.016)	(0.016)	(0.016)	(.)
2015	0.091***	0.064***	0.088***	0.070***	0.046*	0.055***	0.060***	0.039*	0.055***	0.043*
	(0.012)	(0.017)	(0.016)	(0.017)	(0.018)	(0.012)	(0.016)	(0.017)	(0.015)	(0.019)
Constant	1.781***	1.847***	1.885***	2.250***	2.397***	1.647***	1.646***	1.323***	1.488***	1.677***
	(0.129)	(0.210)	(0.255)	(0.272)	(0.372)	(0.134)	(0.199)	(0.279)	(0.336)	(0.436)
N	5,488	2,612	1,759	1,199	744	4,342	1,947	1,245	864	511

Notes: Full results, UKHLS waves 2–7, unweighted panel linear regression, random effects only, lagged by 0, 1, 2, 3 and 4 years. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Article

Does Vocational Education Give a Labour Market Advantage over the Whole Career? A Comparison of the United Kingdom and Switzerland

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Abstract
Research suggests that vocational education and training (VET) tends to reduce youth unemployment by providing them with specific skills, thus smoothing the transition from education to work. However, we still know relatively little about whether vocational education provides higher employment rate and wages over the entire working trajectory than holders of lower education; after several years of experience, both groups may indeed have similar skills and thus similar situations in the labour market. We compare the situation in the United Kingdom and Switzerland, two countries that share a tradition of vocational education but differ in the specificity and standardisation of their VET system. Creating a pseudo-cohort with repeated rounds of the United Kingdom and Swiss labour force surveys, we use regression models and compare the employment rate and hourly wage of our two groups of interest: individuals with vocational education at the upper secondary level and individuals with no more than compulsory education. We find that VET graduates fare better in terms of both employment and wages over the whole career. This advantage is larger for women than men and, contrary to our hypothesis, larger in the United Kingdom than in Switzerland with respect to employment prospects.

Keywords
apprenticeship; earnings; employment; life course; Switzerland; United Kingdom; vocational education and training

Issue
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1. Introduction

Vocational education and training (VET) has several advantages, both at the individual and country level. By providing vocational skills that are immediately useful in a company, entry into the labour market is eased and thus helps to reduce youth unemployment (OECD, 2010). Furthermore, practice as an important part of the learning process helps to increase motivation, which makes VET an interesting solution to provide education until the upper-secondary level to youth who have less interest or ability for academic education (Wolter & Ryan, 2011). VET is thus seen as a solution against both educational drop-out and youth unemployment.

In scientific literature, VET is often compared with general education to address the question of advantages and disadvantages of the former. In this article, we propose a different approach and compare holders of an upper-secondary VET degree with holders of lower levels of education—i.e., compulsory education or lower. While the comparison of VET with general education is conceptually interesting, it is questionable whether having followed the academic track is the realistic counterfactual of having obtained a VET degree. If VET is chosen due to low school abilities or interest, as argued in the "safety-net" concept (Arum & Shavit, 1995; Shavit & Müller, 2000a), it seems plausible that the alternative would be the absence of upper secondary education and not the academic track.

The comparison of VET graduates with holders of lower education is especially interesting taking the life-course dimension into account. While we can expect a

smooth entry into the labour market for VET graduates (OECD, 2010; Shavit & Müller, 1998) and a more difficult one for holders of lower education, it is an open question whether the expected advantage of VET graduates in the labour market persists over the career, and whether it decreases or increases. To address this question, we use a pseudo-cohort design by pooling labour force survey data from more than twenty years. This enables us to follow a group of people born during a similar period (1954–1968) from the age of 25 to the age of 60. Contrary to other articles using only one wave of cross-sectional data to study whole careers (Forster, Bol, & van de Werfhorst, 2016; Hanushek, Schwerdt, Woessmann, & Zhang, 2017), we thus do not need to make the assumption that the situation of older individuals is a good proxy for the situation of younger people's futures.

Finally, we are interested in the possibility that the labour market returns to VET may vary depending on the context. Indeed, labour market prospects may depend on the country and especially the level of standardisation of the VET system. A more standardised VET system may increase the transferability of competences between employers and thus the capability for holders of a VET certificate to reach better positions (Bol & Van de Werfhorst, 2013). On the contrary, a less standardised VET system may provide VET graduates with a set of skills that is similar to work experience in a firm, resulting in smaller differences between holders of a VET degree and people with a lower level of education. We address these questions by comparing the labour market outcomes between a country with a large and nationally standardised VET system—Switzerland—and a country with a less widespread and less standardised vocational system—the United Kingdom—using the UK Labour Force Survey 1993–2014 and the Swiss Labour Force Survey 1991–2014.

2. Theoretical Framework and Hypotheses

2.1. Vocational Education versus Lower Education

In order to address the question of whether VET provides positive labour market outcomes over the entire career, we need to determine the comparison group, or counterfactual. In the existing literature, VET is often compared to general education at a similar level (Brunello & Rocco, 2015; Cörvers, Heijke, Kriechel, & Pfeifer, 2011; Forster et al., 2016; Hanushek et al., 2017). However, holders of VET tend to perform worse, on average, at compulsory school than holders of general diplomas, even in countries, such as Switzerland, where VET is well recognised (Wolter et al., 2014, p. 119). This explains why VET is often considered as a good solution to provide upper-secondary education to youth who are less motivated or less able to follow an academic track after compulsory school (Wolter & Ryan, 2011). VET then serves as a "safety-net" against school drop-out (Arum & Shavit, 1995; Shavit & Müller, 2000a). As a consequence, individuals with no more than one year of education after compulsory education (described thereafter as "lower education") may provide a relevant counterfactual for a VET diploma. This comparison group also presents the advantage of being highly comparable among countries.

2.2. Vocational Education versus Work Experience

Several studies have shown that vocational education facilitates entry into the labour market (e.g., Breen, 2005; Müller & Gangl, 2003; Shavit & Müller, 1998). One reason for the successful transition from education to work is that the content of the training is designed in close cooperation with employers. VET programmes tend to teach skills that are directly applicable, and thus correspond well to labour market demand. After the end of their training, workers are seen as immediately productive and, for this reason, can expect to find a job (almost) as easily as more experienced workers (Shavit & Müller, 2000a, p. 36). VET aims to bring practical skills to students by providing them an occupation or trade. It has the advantage of giving youth the opportunity to acquire skills that are useful for the labour market in real situations. This is especially the case in dual (work-based) programmes, also called apprenticeships, where young workers not only learn technical skills, such as cutting someone's hair or installing a heating system, but also learn how to interact with customers, colleagues, and supervisors. Indeed, apprentices spend part (or most) of the time working for a firm or organisation that trains him or her.

However, education is not the only way of acquiring skills. As argued in the literature about workplace learning, workers extend their capabilities through their work (Boud & Garrick, 1999). Work experience should indeed provide employees with opportunities to learn new aspects of the job and to master them better over time. This idea is in line with the human capital theory (Becker, 1962), which presents work experience as an integral part of human capital. Since both VET and experience provide work-related skills, it is an open question whether, after several years of work experience, vocational education still provides an advantage over workers without post-obligatory education in terms of labour market outcomes such as employment and wages. While VET tends to ease labour market entry and reduce the risk of unemployment at the beginning of the career (e.g., Breen, 2005; Ryan, 2001), the advantage of obtaining a better-paid position after several years of experience is not evident. Shavit and Müller (2000b, p. 437) thus argue that [vocational education at the upper-secondary level] "teaches skills that can easily be acquired on the job rather than through schooling".

2.3. Transferability of Skills and Signalling

If an employee stays in the company where he or she has been trained, in a VET programme or through work expe-

rience, the chances of remaining employed as well as the wage obtained may be similar for holders of a VET degree and for those having only work experience. However, the situation is different when an employee wants or has to move from one firm to another. In such a situation, the new employer has to estimate the potential employee's productivity in order to determine whether he or she hires the employee, and for which wage. The level of skills required for the position has to be evaluated on the basis of education and work experience. In this case, VET may be seen differently from work experience, because VET includes learning not only firm-specific skills (how to fulfil tasks in the specific context of a firm), but also occupation-specific ones (how to fulfil tasks in different contexts; Müller & Schweri, 2015). When learning an occupation—and not only gaining experience in a specific position—students following the VET track have the opportunity to acquire skills that are more easily transferable to similar positions in other firms compared to skills gained during years of work experience. VET hence aims at preparing youth to practice an occupation not only in one specific firm, but also in other ones.

If employers have good reason to think a worker is able to immediately apply his or her occupational skills to a new environment, without a long period of adaptation, they are more likely to hire him or her and to pay a higher wage. Therefore, the certificate delivered at the end of VET may open the door to better-paid positions. This last point is explained by the job market signalling theory developed by Spence (1973), who argues that a certificate is a way one party (employers) can access information about another (employees).

2.4. Differences over the Life-Course

If dual vocational education is seen as the "gold standard" to enter the labour market and reduce youth unemployment (Hoffman & Schwartz, 2015), the long-term benefit of this type of education is less clear. Thanks to the work-specific skills learned, vocationally-trained workers are likely to access qualified jobs at a young age, with higher salaries than in non-qualified jobs. However, the potential wage growth of holders of a VET degree may be limited, with small margins for improvement. If at the end of the VET the young workers master the occupation they have learned, the potential of future improvement within the occupation may be modest. This argument is in line with the results of Hanushek et al. (2017) who show that, after the age of 30, workers with vocational education earn less than workers with general education.

Workers with a lower level of education may have more difficulty entering the labour market because of a (initial) lack of (recognised) skills. However, if they succeed in securing a position and have the opportunity to learn on the job, they may possibly reach a similar skill level as workers with a vocational education certificate. If their productivity is comparable, they are just as likely to get hired and to receive a comparable wage.

This leads us to formulate a first hypothesis:

> H1a: Workers with a VET certificate have an advantage in terms of employment and wages over workers with a lower level of education at the entry to the labour market, which decreases over the career as work experience increases.

On the contrary, it is also possible that workers with a VET certificate hold an advantage throughout their entire career. Indeed, research on the life-course has shown that careers often follow a trend of accumulation of advantages and disadvantages (DiPrete & Eirich, 2006), which would lead us to expect more successful careers after a good start than after a more difficult one. Being more likely to find a good position, workers with a vocational education certificate may succeed in keeping their position or moving to another one, because their good start sends a positive signal to employers. Conversely, workers without an upper-secondary degree are more likely to experience spells of unemployment at the beginning of their career, which may lead to a higher risk of unemployment throughout their entire career—leaving a scarring effect (Gangl, 2006). Furthermore, the signal of having achieved an upper-secondary degree may be rewarded by employers not only at the beginning of the career, but also later on in one's career.

This argument leads us to the opposite hypothesis:

> H1b: Workers with a VET certificate benefit from a better start in their career and have a steadily increasing advantage in terms of employment and wages over workers with a lower level of education during their career.

2.5. Institutional Differences of VET: Specificity and Standardisation

Up to now, our discussion of education and the labour market was presented as if VET systems were homogeneous across national contexts. This is not the case. Several aspects have been highlighted in the literature to describe the institutional differences of the VET systems, notably the level of specificity or institutional linkage, the standardisation of the content and final exams as well as the degree of stratification or differentiation (Bol & Van de Werfhorst, 2013; Breen, 2005; Grønning, Kriesi, & Sacchi, 2018; Levels, van der Velden, & Di Stasio, 2014; Wolbers, 2003). We focus in this article on two dimensions: specificity and standardisation.

Schematically, vocational education can be organised in two different ways: in the firm-based dual system (apprenticeship) and in vocational schools. The dual system, where students share their time between the workplace and school, is well-established in a group of countries including Austria, Denmark, Germany, the Netherlands, and Switzerland (Wolter & Ryan, 2011) and is based on the principle of occupation-specific skills (Müller &

Schweri, 2015). Working in a firm as part of the training gives a specific orientation to young workers, while vocational programmes spent at school tend to focus on a wider range of occupational skills (Bol & Van de Werfhorst, 2013, p. 5). In a firm, apprentices solve "real tasks", providing them not only with specific but also work-relevant skills (Breen, 2005). Vocational specificity of the educational system of a given country has thus been measured by the prevalence of the dual system in that country (Bol & Van de Werfhorst, 2013, p. 13). Recent findings suggest that the level of specificity impacts the situation on the labour market of VET graduates: Similar to Wolbers (2007), De Lange, Gesthuizen and Wolbers (2014) find that VET graduates in more vocationally-specific educational systems benefit from easier integration into the labour market.

Another important difference between the dual system and school-based vocational programmes concerns the role, in the former, of the employer who hires the apprentice and follows his or her progress during the apprenticeship. Due to a first experience with an employer, the signalling of an apprenticeship is positive in terms of an employee's skills (OECD, 2010, p. 105). It provides other employers with a better signal about workers' skill levels and potential productivity (Breen, 2005, p. 126). As a consequence, the signal of a VET degree may be strongest in a country with a highly specific VET system.

The role of employers is not restricted to hiring and supervising apprentices, but also involves defining the content of the apprenticeship and the competences required to obtain a given certificate. Employers' involvement is crucial in connecting apprenticeships, and vocational education more generally, to the needs of the labour market (OECD, 2010, p. 139). Defining skills that have to be learned by every apprentice to earn a VET diploma is the process of standardisation defined as "the degree to which the quality of education meets the same standards nationwide" (Allmendinger, 1989, p. 233).

A standardised system not only benefits workers, who are able to leave the firm where they undertook the apprenticeship without expecting a strong reduction of their productivity and thus their wage, but is also advantageous to firms at the moment of hiring (Allmendinger, 1989, p. 239). Thanks to a standardised system, employers can hire young workers knowing they have a basic level of occupational skills in their field, as well as a certain professionalism and capacity to learn.

In a system where every firm has to teach a set of abilities that are useful not only to the firm itself but to all the firms of the sector, workers are ready to move to a different firm at the end of their training (OECD, 2010, p. 22). To increase the signalling of a given skill set, a national diploma or certificate is given at the end of the vocational education to workers able to demonstrate all the required skills. A nationally standardised vocational degree recognised by employers helps in particular for labour market entry (Müller & Gangl, 2003). Consequently, the more firms recognise the diploma or certificate, the more useful the diploma is for workers.

2.6. Comparison of Two National Contexts

We analyse the evolution of wages and employment over the life-course for two countries with different VET systems: the United Kingdom and Switzerland. These two countries share a tradition of vocational education, and of apprenticeships more precisely (Cörvers et al., 2011), and a sizeable part of their population holds such a diploma; in the United Kingdom, 21% of adults between 25 and 64 had vocational education at the upper-secondary level as their highest level of education compared to 39% in Switzerland in 2014 (OECD, 2015, p. 45). While the share of holders of a VET degree is larger in Switzerland, this aspect is not the only difference between the two countries. We focus on two aspects: the prevalence of the dual programmes and the standardisation of the VET programmes.

After the end of compulsory school, students in both countries can follow different options within the vocational track. In Switzerland, a large majority of the vocational programmes are taught in the dual form (90% for the year 2005, own calculation from OECD, 2007, p. 277). Those programmes combine school- and work-based education and are also called apprenticeships. While the current rate of youth enrolled in an apprenticeship is low today in the United Kingdom (Bol & Van de Werfhorst, 2013; Brunello & Rocco, 2015; Cörvers et al., 2011), it was larger in the seventies and eighties, the period of observation for this article, with around half of holders of a vocational upper-secondary level being an apprenticeship (own calculation; see Section 3, on data, for more details).

A second important institutional difference between the two countries lies in the level of standardisation, or unification, of the VET system. On the one hand, Switzerland benefits from a nationally harmonised system, with national certificates that give official recognition to VET skills acquired at the upper-secondary level for over 250 occupations (OECD, 2009). Standardised final exams need to be passed in order to obtain the Federal VET Diplomas. In contrast, there is no unified structure of VET in the United Kingdom (Cörvers et al., 2011) and the system is described as "opaque" even by experts (Ryan, 2001). For the period observed in our analysis, the main VET programmes are trade apprenticeships, National Vocational Qualification at level 3 (NVQ3), Business and Technology Education Council (BTEC), and City and Guilds advanced craft (Jenkins, Greenwood, & Vignoles, 2007).

The signalling of VET as well as the transferability of skills for VET graduates are hypothesised to be stronger in contexts of high standardisation of VET diplomas, in comparison with holders of lower education (Bol & Van de Werfhorst, 2013). In less standardised systems, it is more difficult for employers to assess the skills poten-

tial employees possess given their diploma, and the signalling of the diploma is thus weaker. Similarly, skills transfer more easily in a more standardised context, because the skills learned during the training meet the expectation of the new employer.

We expect employability and wages to be higher if the signal of a diploma is stronger (standardisation), as well as if the connection between the vocational programmes and the labour-market needs is tighter (specificity). Hence, given the institutional differences between the United Kingdom and Switzerland, we formulate a second hypothesis:

> H2: The employment and earnings advantage of workers with vocational education over workers with a lower level of education is larger in Switzerland than in the United Kingdom, thanks to the higher specificity and standardisation of Switzerland's VET system.

3. Data and Method

3.1. Data

Our analyses are based on the UK Labour Force Survey 1993–2014 and the Swiss Labour Force Survey 1991–2014, pooling the available rounds. This allows us to work on large datasets considering a period of more than twenty years. To restrict our analysis to a more homogeneous group, we focus on one cohort. To be able to observe workers from 25 to 60, we follow the cohort 1954–1968 over the 22 (UK Labour Force Survey) and 24 (Swiss Labour Force Survey) rounds. Because the same individual is not observed several times (we do not take the mini-panel structure of the Swiss Labour Force Survey into account), we use a pseudo-cohort design. This means that we pool information from different individuals born in a similar period to "compose" an average career of our groups of interest from the age of 25 to the age of 60. According to Deaton (1985), pseudo-panels—and pseudo-cohorts—have some advantages over "real" panels: a lower attrition rate, better representativeness (due to a larger number of observed individuals for a given number of observations) and a lower impact of measurement errors. After selecting the two educational groups of interest for this article (upper-secondary vocational education and compulsory education and lower born between 1954 and 1968), the sample sizes are 214,826 for the United Kingdom and 72,945 for Switzerland.

The structure of the population in terms of educational level is not exactly the same in Switzerland and the United Kingdom, as presented in Table 1. The main difference between the United Kingdom and Switzerland is the importance of the upper- and intermediate secondary education categories (upper-secondary: 20% UK vs 49% CH; intermediate secondary 22% UK vs 4% CH; for more details about educational levels in the two countries see Table A1 in the Appendix). If we do not distinguish between upper-secondary and intermediate secondary, the rate of secondary education is not too different in the two countries (42% in the United Kingdom and 53% in Switzerland), but the share of vocational education is more than two times lower in the United Kingdom (44% against 17%). However, the general structure is similar, with around 30% of the population being highly educated (tertiary level of education) and around 15 to 20% having lower education (compulsory or lower).

This article focuses on vocational education at the upper-secondary level, the main category for vocational education in the two countries. In the United Kingdom, the category "vocational education at the upper-secondary level" is split into several programmes: trade apprenticeships represent slightly more than half the category (55%), the NVQ3 represents 15%, the BTEC and similar represent 14%, and the City and Guilds advanced craft represents 14%. In Switzerland, the firm-based apprenticeship is dominant with 86% of the category. The remaining 14% have attended a full-time

Table 1. Distribution of the population aged 25 to 60 across education in the United Kingdom and in Switzerland, cohort born 1954–1968.

	United Kingdom		Switzerland	
Tertiary	27%		31%	
Upper-secondary	20%		49%	
general		*7%*		*7%*
vocational		*13%*		*42%*
Intermediate secondary	22%		4%	
general		*19%*		*2%*
vocational		*4%*		*2%*
Compulsory or lower	22%		15%	
Other/missing	8%		1%	
Total	*100%*		*100%*	

Source: UK Labour Force Survey 1993–2014 (N = 614,293) and Swiss Labour Force Survey 1991–2014 (N = 126,859), own calculation.
Notes: Unweighted results. After verification, the proportion of each group is similar to the weighted ones. Details of each category in Table A1 in the Appendix.

school vocational programme, which leads to the same certificate as the apprenticeship (Federal VET Diplomas).

The group of comparison for this article is holders of compulsory school level or lower education (called *lower*). It includes persons with compulsory school as the highest level of education, those who have not completed school, and those who have followed short programmes giving no access to the intermediate secondary level of education. In the United Kingdom, 87% of this group have attended compulsory school or less, and 13% have completed a short training, such as city and guilds part 1, which is lower than secondary education. In Switzerland, the share of persons having attended only compulsory school or lower is 94%, and only 6% have completed a short training with a lower level of education.

3.2. Dependent, Independent and Control Variables

The two dependent variables are employment and wages. Employment is calculated with a binary variable taking the value of 1 if the person works at least 8 hours per week, and 0 if the person works less than 8 hours per week or not at all (this last category includes housework, education, retirement, illness, etc.; additional results considering people working at least 20 hours per week are shown in the Appendix). Income is measured as the hourly wage, calculated by dividing the gross annual work income by the number of hours worked (number per week multiplied by 52; additional results for annual work income are shown in the Appendix). The gross annual work income corresponds to the wages of employees, without self-employed workers and employers who are not available in the UK Labour Force Survey and excluded in the Swiss Labour Force Survey. It is corrected for inflation with December 2010 as the reference. We exclude the top and bottom 1% of the wage distribution as well as wages of workers working less than 8 hours per week from our models.

The number of observations is lower for wages than for employment. Firstly, the questions about wages are not asked in each wave of the UK Labour Force Survey, and secondly, the wage variables contain a higher rate of missing data, due to the sensitivity of the questions. For this reason, annual wages are available for 34,044 individuals in the UK Labour Force Survey and 49,293 in the Swiss Labour Force Survey.[1]

The two key independent variables are education (vocational education versus lower education) and age (from 25 to 60). As control variables, we use the region (split into 20 regions for the United Kingdom and into the 26 cantons for Switzerland[2]) and nationality. All results are presented separately for men and women, since labour market trajectories differ between the two groups.

3.3. Regression Model and Multivariate Results

We calculate linear regression models to predict employment and wages by education for men and women. The equation is the same for the two dependent variables and is given as:

$$y_i = \beta_1 + \beta_2 educ_i + B_3 age_i + \beta_4 age_i^2 + \beta_5 age_i^3 + \beta_6 age_i^4 + \beta_7 educ_i \times age_i + \beta_8 educ_i \times age_i^2 + \beta_9 educ_i \times age_i^3 + \beta_{10} educ_i \times age_i^4 + \beta_{11} W_i + \varepsilon_i$$

Where y_i is first a binary variable (0/1) measuring if the person works or not and secondly the natural logarithm of hourly wage for an individual at a given moment, W_i is a vector of controls composed of the region and nationality, and ε_i is the error term. The two key independent variables are *educ* and *age*. The binary variable *educ* indicates whether the person has an upper-secondary vocational level of education, or a lower level of education. The variable *age* indicates the age of the respondent and is developed into four forms: *age*, *age squared*, *age cubed* and *age to the power of four*. These variables enable us to account for the non-linear effect of age on the life-cycle curves in employment and wages, in particular for women. We chose to use the term age up to the 4-degrees of polynomials because the coefficient for age^4 is significant in some of the models shown and the distribution of the predicted values closely mirrors the shape observed in the descriptive results. Each of the forms is then interacted with *educ*, since we expect a different age curve of the dependent variables depending on the education. We present our results graphically due to the large number of interaction terms.

4. Employment Trajectories in the United Kingdom and in Switzerland

The four graphs of Figure 1 present descriptive evidence for the employment rate over the life-course in the United Kingdom (left) and in Switzerland (right) for the two groups of interest: holders of an upper-secondary vocational level of education (vocational) and holders of a compulsory school level or lower (lower), for men and women. We present the results for wages in the appendix.

We observe three important aspects about employment: (1) In Switzerland and the United Kingdom, for both men and women, the employment rate of holders of vocational education is higher than the employment rate of holders of lower education; (2) this difference is greater in the United Kingdom than in Switzerland; (3) this difference seems stable during the career in the United Kingdom, but tends to increase across the career for Swiss men, and women after the age of 35.

[1] Due to the availability of this information in the Swiss Labour Force Survey, we have imputed part of the missing wage data with a regression model containing age, year, canton, type of municipality, residential permit and nationality, occupation studied, hours worked, sector of activity, current occupation, and employment status. This allows us to reduce the number of missing earnings from 12,661 (12.9% of the workers) to 670 (less than 0.1%). We find similar outcomes with listwise deletion of missing data (results available on request from the author).

[2] Regional disparities in the employment structure and job opportunities may impact holders of vocational and lower education differently.

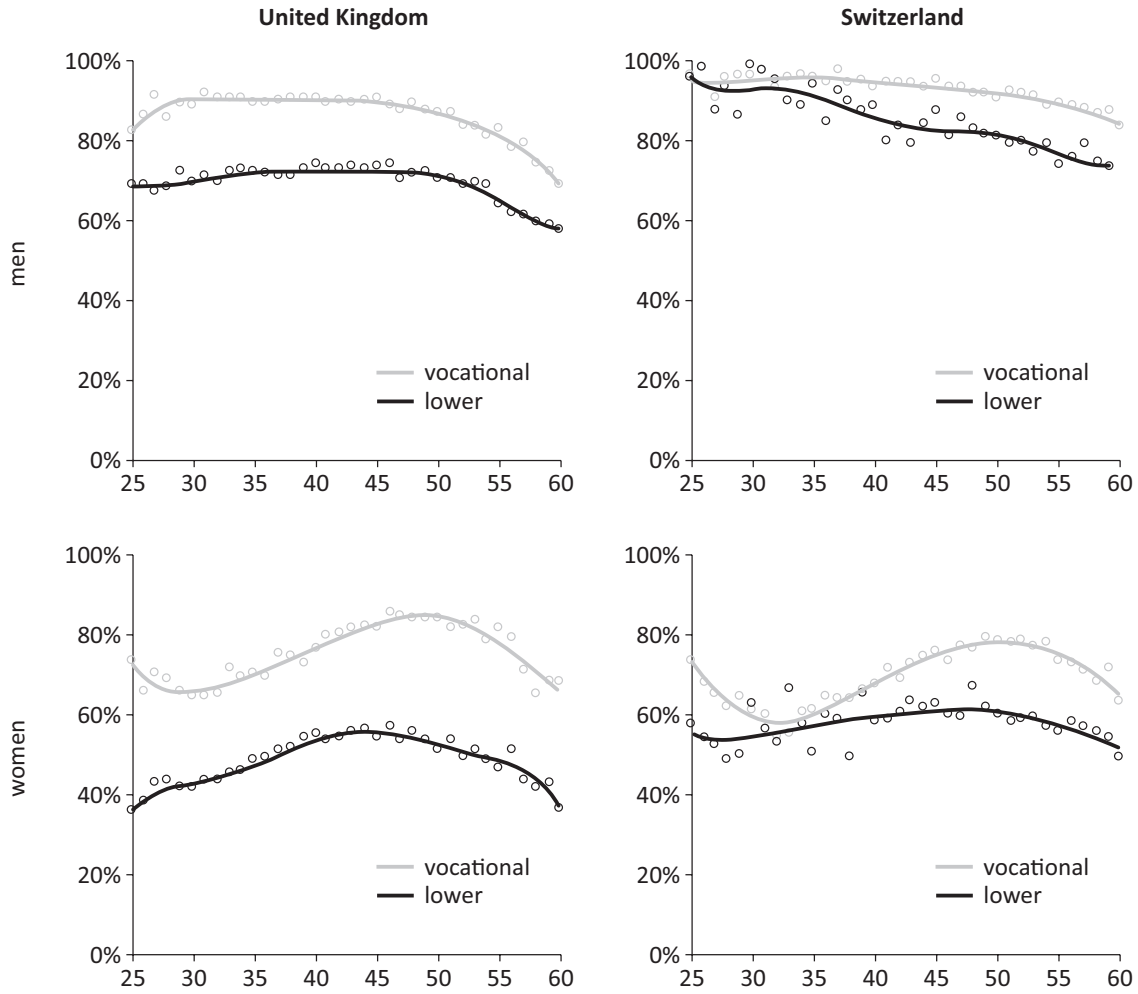

Figure 1. Employment rate (minimum 8 hours per week) for men and women by level of education and age: upper-secondary vocational education (*vocational*) and compulsory school or lower (*lower*). Source: UK Labour Force Survey 1993–2014 and Swiss Labour Force Survey 1991–2014, cohort 1954–1968. Note: Black and grey lines represent the polynomial trend line for the respective groups.

In the United Kingdom, the employment rate of holders of vocational education remains high during the entire career, at around 90% until the age of 50 for men, and between 65 and 85% for women. In comparison, the employment rate of holders of lower education follows a similar trend but lies 17 (men) to 27 (women) percentage points lower.

In Switzerland, the employment rate is comparable for the two groups of men until the age of 35 (95%, on average, between 25 and 35 for holders of vocational education and 93% for holders of lower education). After this period, the employment rate of holders of lower education gradually decreases to 70% at the age of 60, while that of holders of vocational education remains almost constant until the age of 60. This decrease seems to be primarily due to an increasing rate of withdrawal from the labour market (6% between 40 and 49 and 12% between 50 and 60), while unemployment does not increase (7% between 40 and 49 and 5% between 50 and 60). However, these situations are self-reported and the number of observations per age for each category is limited.

Women in Switzerland with vocational education have a similar employment rate as women with lower education during the first part of their career (around 60% between 30 and 40 years old). After this period, the employment rate of women with vocational education increases (to almost 80% around the age of 50), while that of women with lower education remains basically flat at 60%. The curve of the "lower" groups—both for men and women—is less stable, especially during the first part of the career. This is partly due to a smaller number of observations in the "lower" group than in the "vocational" one (men: 7,726 vs 25,227; women: 11,533 vs 27,981).

In the Appendix, we present two robustness checks: first, in Figure A1, the employment rate for those working at least 20 hours per week (contrary to the minimum of 8 hours presented above) previously; second, in Figures A2 to A5, the employment rate by type of vocational track.[3]

[3] UK: apprenticeship, city and guilds advanced, BTEC and NVQ3; CH: apprenticeship and vocational school. We present these results for the entire available population (and not only the cohort 1954–1968) to obtain a sufficient number of observations.

We provide a more stringent test of our hypotheses by resorting to a multivariate design. We estimate the employment rate and hourly wage of each group at each age, based on linear regression models. We present the coefficients in the Appendix (Table A2 and Table A3). Figure 2 shows the advantage of vocational education, in comparison with lower education, based on these regressions (average marginal effect). Overall, the employment advantage of vocational education is larger in the United Kingdom than in Switzerland, and larger for women than for men in the two countries. More specifically, for men, we can observe an opposite trend in the two countries. The advantage of holders of vocational education is high at the beginning of the career in the United Kingdom (17 percentage points) and decreases slightly during the career to 13 points. In Switzerland, there is no significant advantage of vocational education on employment at the beginning of the career for men. However, the advantage of VET increases during the career and men with vocational education have, on average, an employment rate that is 17 percentage points higher at the age of 60.

For women, the trend over the career is similar in the two countries with the employment rate difference between the two educational groups taking the shape of a horizontal "S": the advantage is particularly high at the age of 25, lower at 35, high again at 55, and decreases again during the last 5 years observed. However, the level of vocational advantage for women is higher in the United Kingdom—where it fluctuates between 20 and 30%—than in Switzerland—where the evolution is between 5 and 20%.

5. Wage Trajectories in the United Kingdom and in Switzerland

Figure 3 presents descriptive results for the hourly wage over the life-course for holders of an upper-secondary vocational level of education and holders of a compulsory school level or lower. Each point represents the median hourly wage for a specific age and the line shows the general trend.

As with the employment rate, the hourly wages of holders of vocational education are higher than those of holders of lower education among men and women, in the United Kingdom and in Switzerland. In the United Kingdom, the mean difference in the hourly wage between holders of lower education and those with upper-secondary vocational education is around 20% for both men and women. In Switzerland, this difference is slightly

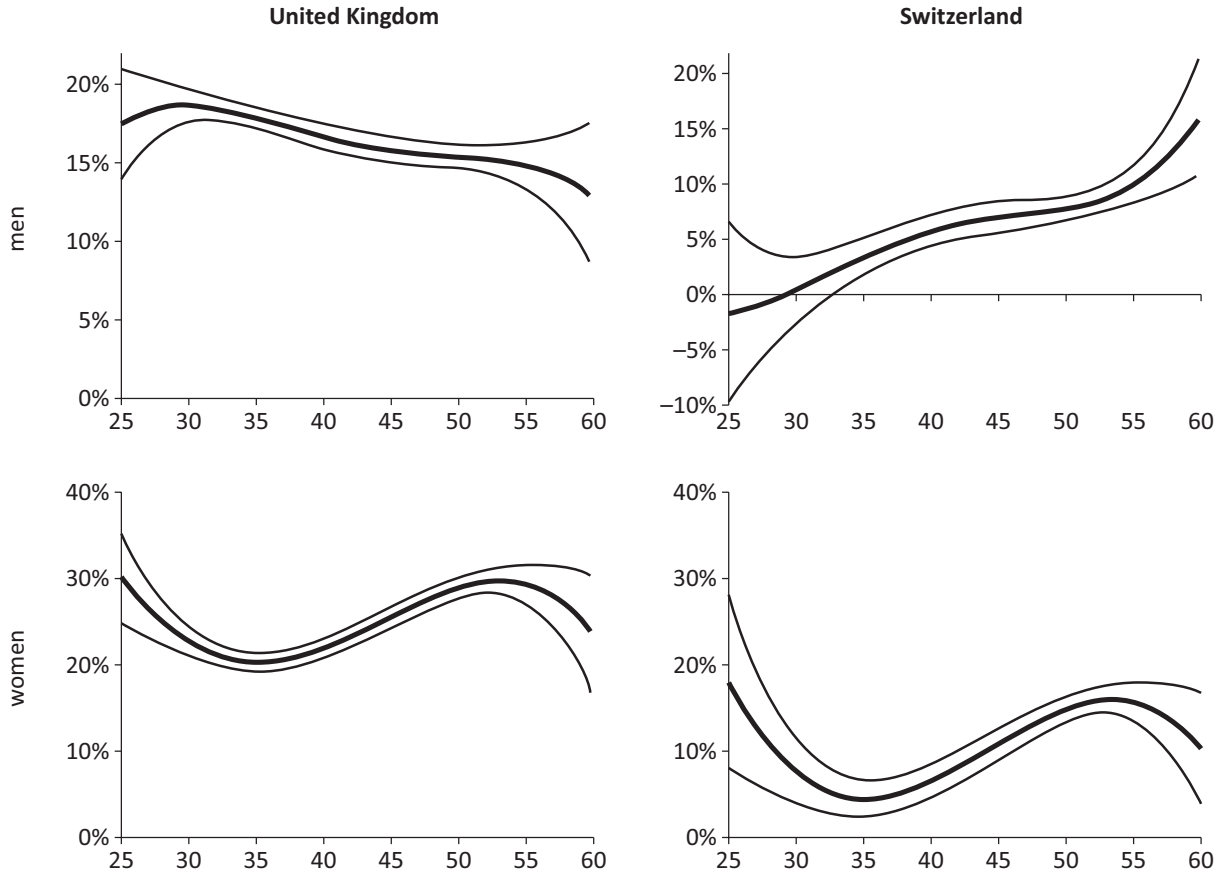

Figure 2. Difference in employment by age for upper-secondary vocational education relative to lower education (average marginal effects). Source: UK Labour Force Survey 1993–2014 and Swiss Labour Force Survey 1991–2014, cohort 1954–1968. Note: Main line stands for average marginal effect; thinner lines stand for 95% confidence intervals.

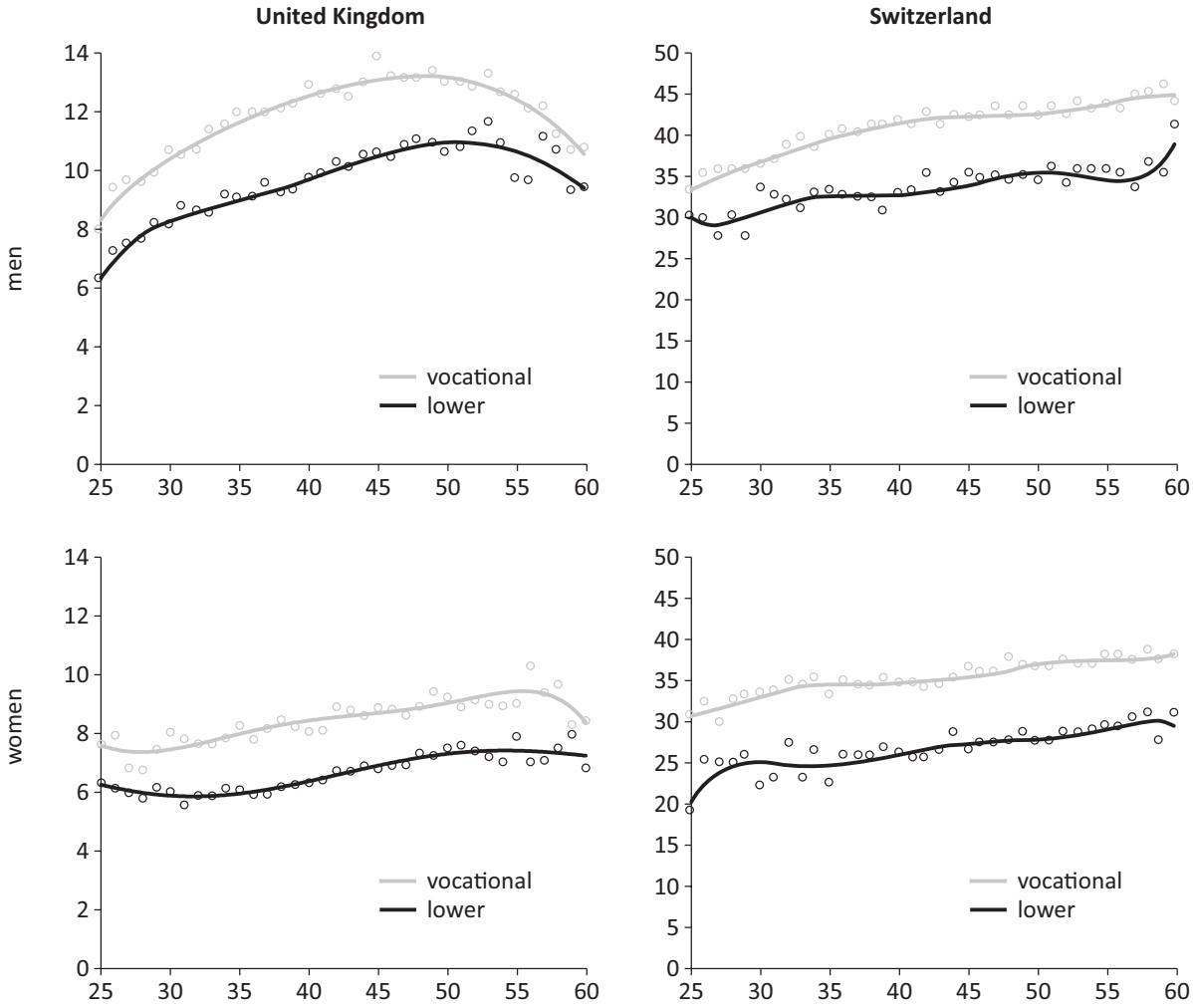

Figure 3. Median hourly wage (£/hour for UK, CHF/hour for Switzerland) for men and women by level of education: upper-secondary vocational education (vocational) and compulsory school level or lower (lower). Source: UK Labour Force Survey 1993–2014 and Swiss Labour Force Survey 1991–2014, cohort 1954–1968. Notes: Black and grey lines represent the polynomial trend line for the respective groups. Median hourly wage for the cohort 1954–1968: UK £13, CH CHF48.

smaller for men than in the United Kingdom (18%) but larger for women (25%). Regarding the evolution of the difference over the career, the difference between holders of vocational education and holders of lower education remains rather stable for men in the United Kingdom, but tends to be smaller at the end of the career. The hourly wage increases more during the career for men than for women in both countries.[4]

We replicate this analysis with annual median wages (see Figure A6 in the Appendix). This second measure does not take the number of working hours into account. It is then less suitable to measure the "hourly price" (and therefore productivity) but informs us about the money wages available to the respondents. While these two indicators present very similar trends for men, the situation is slightly different for women. Annual median wages by type of vocational track are also presented in the Appendix (see Figures A7 to A10) to take the heterogeneity of the vocational track into account.

We turn again to our multivariate model and show in Figure 4 the predicted advantage of vocational education in hourly wages on lower levels of education, based on linear regression models. On average over the entire career, the wage advantage of vocational education is similar in the two countries: 18% for men and women in the United Kingdom as well as for women in Switzerland, and 15% for Swiss men. However, the evolution during the career differs between the two countries.

In the United Kingdom, the advantage of VET increases between 25 and 35, and decreases afterwards. The initial increase is more pronounced for women than for men (respectively from 7% to 24% and from 15% to

[4] The decrease of the hourly wage observed for men in the United Kingdom after the age of 50 may be the result of decreasing productivity due to a difficulty to adapt to new technologies for example but may also be due to a measurement effect. There is indeed a "mechanic" tendency of wages to decrease for older workers when observing more than one birth year cohort (here: fifteen). Because of wage growth across time, the salary at a given age of a person born several years later is on average higher than that of a person born earlier (for more details on this effect see Baudelot, 1982).

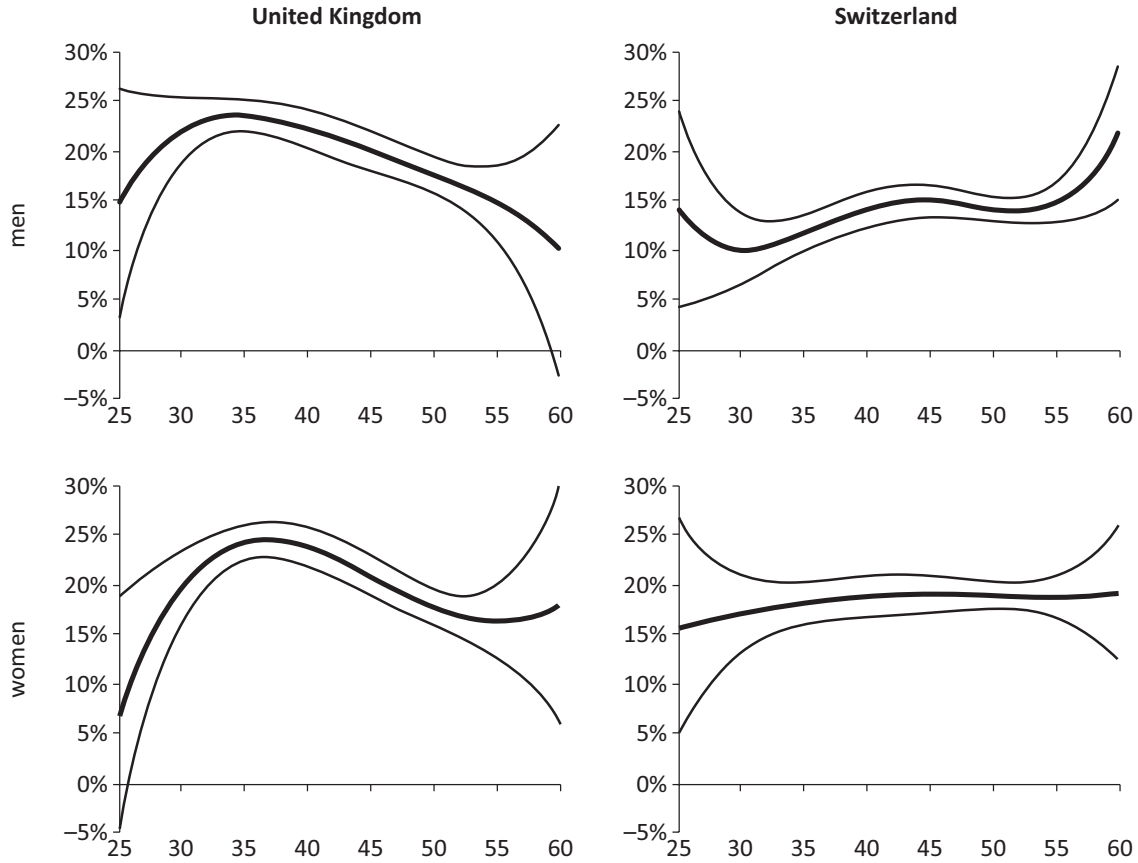

Figure 4. Difference in hourly wage by age for upper-secondary vocational education relative to lower education (average marginal effects). Source: UK Labour Force Survey 1993–2014 and Swiss Labour Force Survey 1991–2014, cohort 1954–1968. Note: Main line stands for average marginal effect, thinner lines stand for 95% confidence intervals.

24%). Afterwards, the advantage decreases for men and women to about 15% at the age of 55.

In Switzerland, the wage advantage of vocational education is more stable during the career. It is almost constant for women, going from 16% at the age of 25 to 19% at 60. This small increase is not statistically significant since the confidence intervals around the value at the age of 25 and the one at the age of 60 overlap. For men, the increase between the ages of 30 (10%) and 60 (23%) is statistically significant.

The advantage of vocational education on annual wages is presented in the Appendix (Figure A11). While the observation of this measure leads us to similar conclusions as the observation of the hourly wage, we can observe one interesting difference. Men and women with lower education seem to not only receive a lower hourly wage in both countries, but also tend to work fewer hours per week. Therefore, the advantage of vocationally-trained men becomes larger when we look at hourly compared to annual wages.

6. Discussion

The analyses of employment rates and wages over the career in the United Kingdom and Switzerland for holders of vocational education in comparison to holders of lower education show us three main results: (1) a constant advantage of holders of vocational education over those with lower education in the two countries, for both men and women, and during the entire career—with rare exceptions where the difference is not statistically significant; (1) for employment, a larger advantage of VET in the United Kingdom than in Switzerland and for women than for men; (3) for hourly wage, a similar advantage over the career for men and women in the two countries.

We do not have a simple answer to our first hypothesis. Results for men and women in the United Kingdom tend to confirm hypothesis H1a, which expected a decreasing advantage of vocational education over the career. However, this is only valid after the age of 35. Afterwards, holders of lower education may have acquired some work experience, which helps them to catch up with VET graduates, which is in line with expectations derived from the human capital theory. On the contrary, results for Swiss men confirm hypothesis H1b, showing an increase in the vocational advantage over the career, a finding that instead corresponds to the cumulative (dis-)advantages theory (DiPrete & Eirich, 2006). For women in Switzerland, we find none of the predicted trend, but have a stable effect on wages and a horizontal "S" curve for employment. This shows the importance of account-

ing for the involvement of a large share of women in household tasks and family life in predicting the evolution of labour market careers.

Contrary to hypothesis H2, which expected a larger advantage of vocational education in Switzerland than in the United Kingdom, we observe the opposite, a larger advantage in the United Kingdom, especially in terms of employment. The larger difference in employment rates in the United Kingdom may be due to a stronger selection process at the upper-secondary vocational education level in the United Kingdom than in Switzerland. The proportion of the population with this level of education is indeed substantially larger in Switzerland than in the United Kingdom. However, because the difference in terms of wage is similar in the two countries, we could also interpret this result as showing an overall stronger labour demand in Switzerland for workers, even without qualification. In a context of almost full employment, as is the case in Switzerland, many employers may have no other choice than to appoint unqualified workers. During the observed period (1991–2014), the unemployment rate is indeed higher in the United Kingdom (between 5 and 10%) than in Switzerland (between 2 and 5%).

The difference in trends over the career for workers in the United Kingdom and in Switzerland (mostly men in the latter case) suggests that different mechanisms are at work in the two countries. This may be linked to the difference in terms of specificity and standardisation of the VET system: In a highly standardised and specific VET system, such as Switzerland, the possibility for holders of lower education to catch up with holders of VET may be more limited than in the United Kingdom, as our results suggest. However, since we do not know the respondents' amount of work experience, we can only use age as a proxy. Hence, these results have to be interpreted cautiously. Furthermore, we observe those trends for men, but not for women. For the latter, the advantage of VET on employment rate takes a horizontal "S" shape, which may be more closely linked to family tasks than to demand on the labour market.

7. Conclusion

Our results clearly highlight the better position on the labour market for holders of vocational education than holders of lower education, in terms of employment prospects and wages over the entire career. Vocational education appears not only key to enter the labour market, but also to shield against non-employment and very low wages. If women's careers are more affected by family events than men's, we nevertheless observe an advantage of vocational education for both men and women.

The effort of strengthening vocational tracks in the educational system appears as clearly relevant, to not only avoid educational drop-outs but also to offer better opportunities in the labour market to youth less interested in, or having more difficulties with, general education. This conclusion can be drawn for both a nationally standardised and very specific system, such as Switzerland, as well as a less standardised and less specific context, such as the United Kingdom.

However, it is important to keep in mind the limitations of this article. First of all, our results do not derive from a causal design, which means this article is unable to prove that the difference between the two groups comes from the level of education. It has indeed been shown in the literature that (self-)selection in educational tracks not only depends on ability, but also on other factors such as social origin (Erikson & Rudolphi, 2009; Goldthorpe, 1996). The population association presented in this article does not take this selection bias into account, due to the lack of relevant information in the datasets. Presenting a detailed, and career-long, description of the labour market situation of the two groups appears nevertheless interesting to us.

Finally, it is also important to remember that we present respondents who entered the labour market 30 to 45 years ago. In a context of globalisation and digitalisation, it is difficult to predict how the careers of youth entering the labour market nowadays will evolve. However, the high employment rates of our study's cohort today—who are now in their fifties and early sixties—strongly suggest that the demand for vocationally-trained workers will not only persist, but also continue to exceed that for non-qualified workers. The challenge for governments may then be the constant modernisation of vocational systems in order to face the increasing importance of information technology in most vocational domains.

Acknowledgments

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Conflict of Interests

The authors declare no conflict of interests.

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About the Author

Maïlys Korber holds a PhD in Social Sciences from the University of Lausanne, in the field of labour market sociology. This article is part of her dissertation *The Labour Market Returns to Vocational Education over the Life Course* (available online), which she defended in February 2019. She is an associate member of the Life Course and Inequality Research Centre and the Swiss National Centre of Competence in Research LIVES.

Appendix

Figures

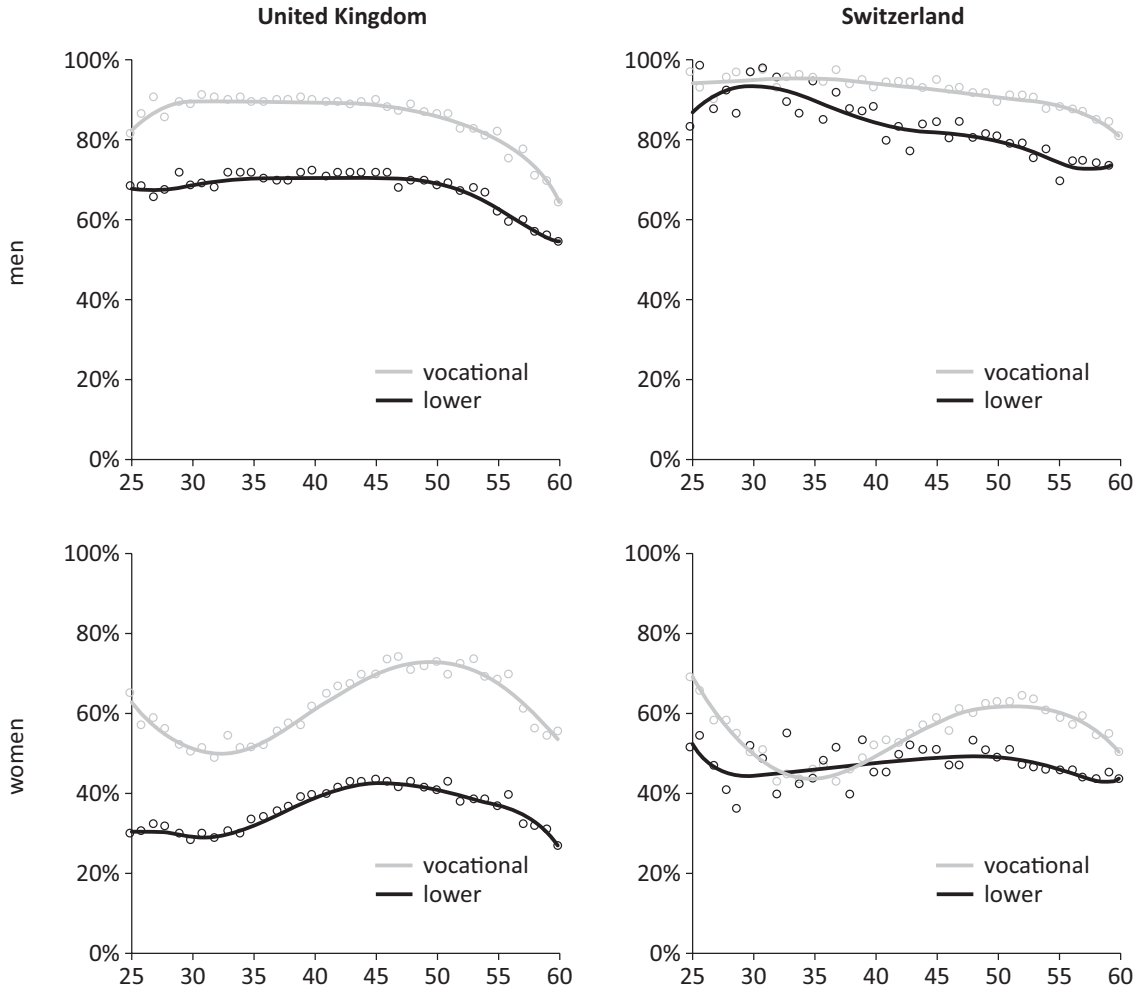

Figure A1. Employment rate (minimum 20 hours per week) for men and women by level of education: upper-secondary vocational education (*vocational*) and compulsory school level or lower (*lower*). Source: UK Labour Force Survey 1993–2014 and Swiss Labour Force Survey 1991–2014, cohort 1954–1968.

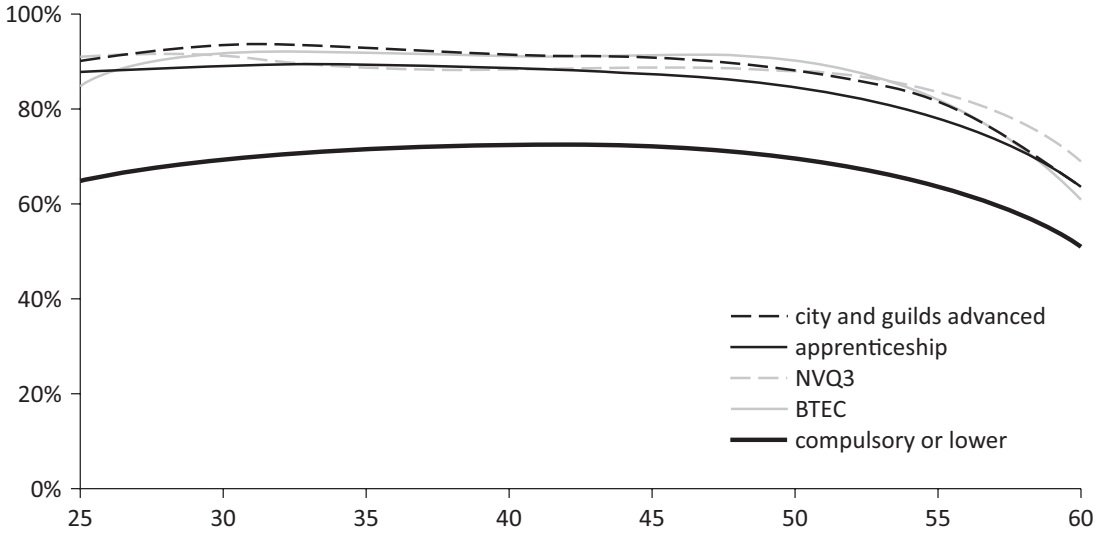

Figure A2. Employment rate (minimun 8 hours per week) by type of upper-secondary vocational education. Men—United Kingdom. Source: UK Labour Force Survey 1993–2014.

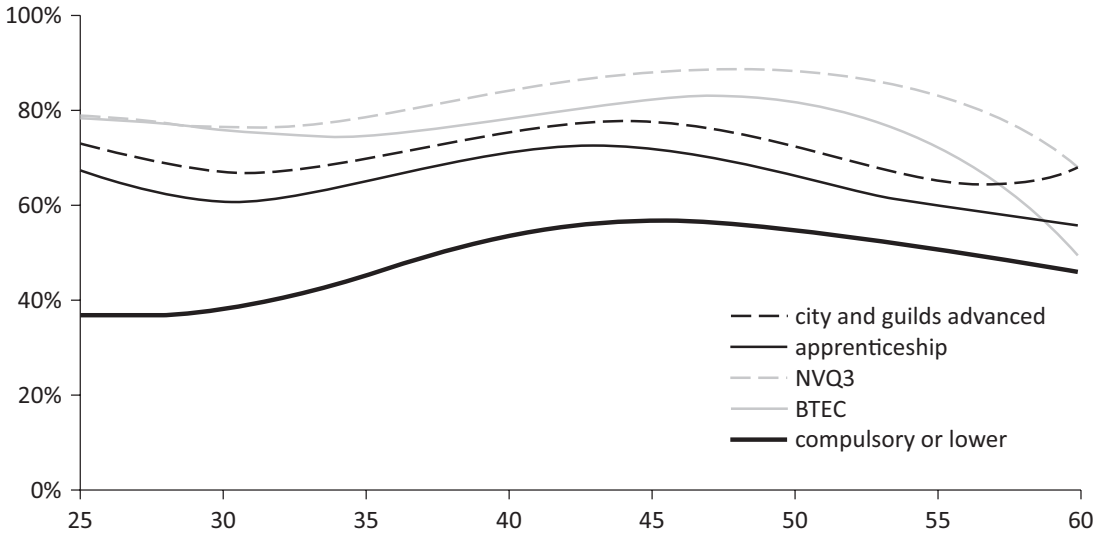

Figure A3. Employment rate (minimun 8 hours per week) by type of upper-secondary vocational education. Women—United Kingdom. Source: UK Labour Force Survey 1993–2014.

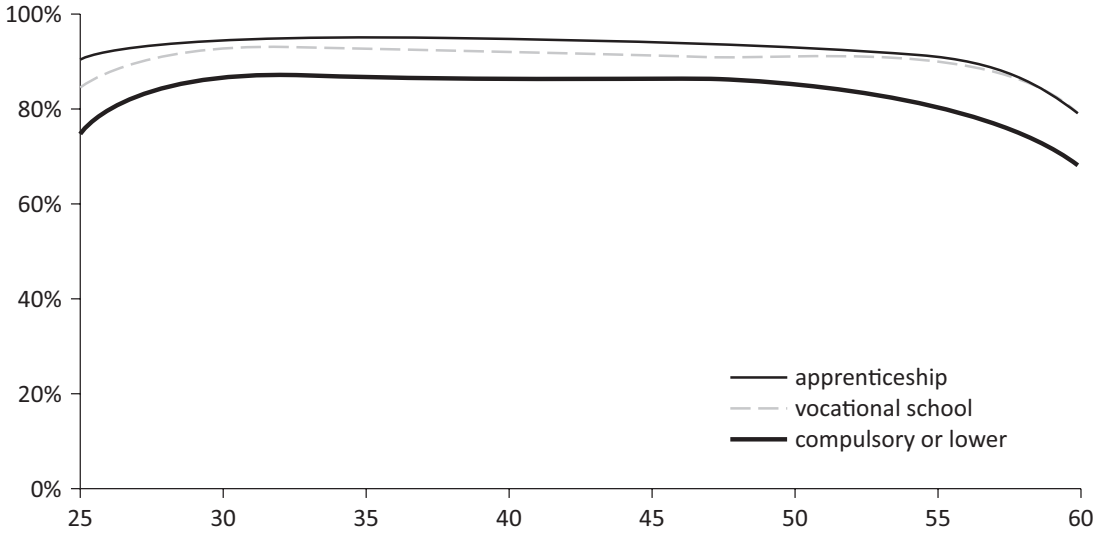

Figure A4. Employment rate (minimun 8 hours per week) by type of upper-secondary vocational education. Men—Switzerland. Source: Swiss Labour Force Survey 1991–2014.

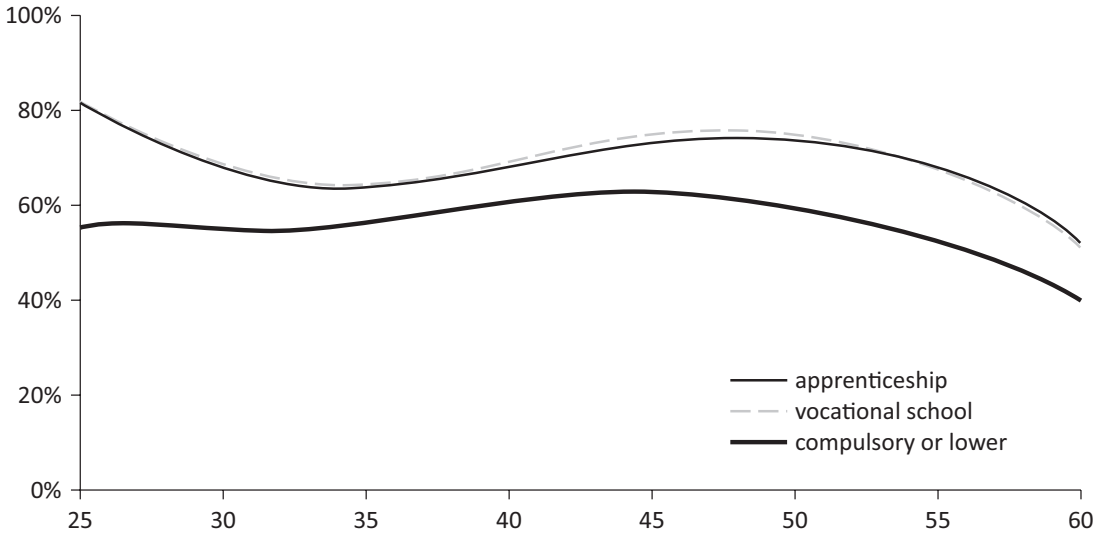

Figure A5. Employment rate (minimun 8 hours per week) by type of upper-secondary vocational education. Women—Switzerland. Source: Swiss Labour Force Survey 1991–2014.

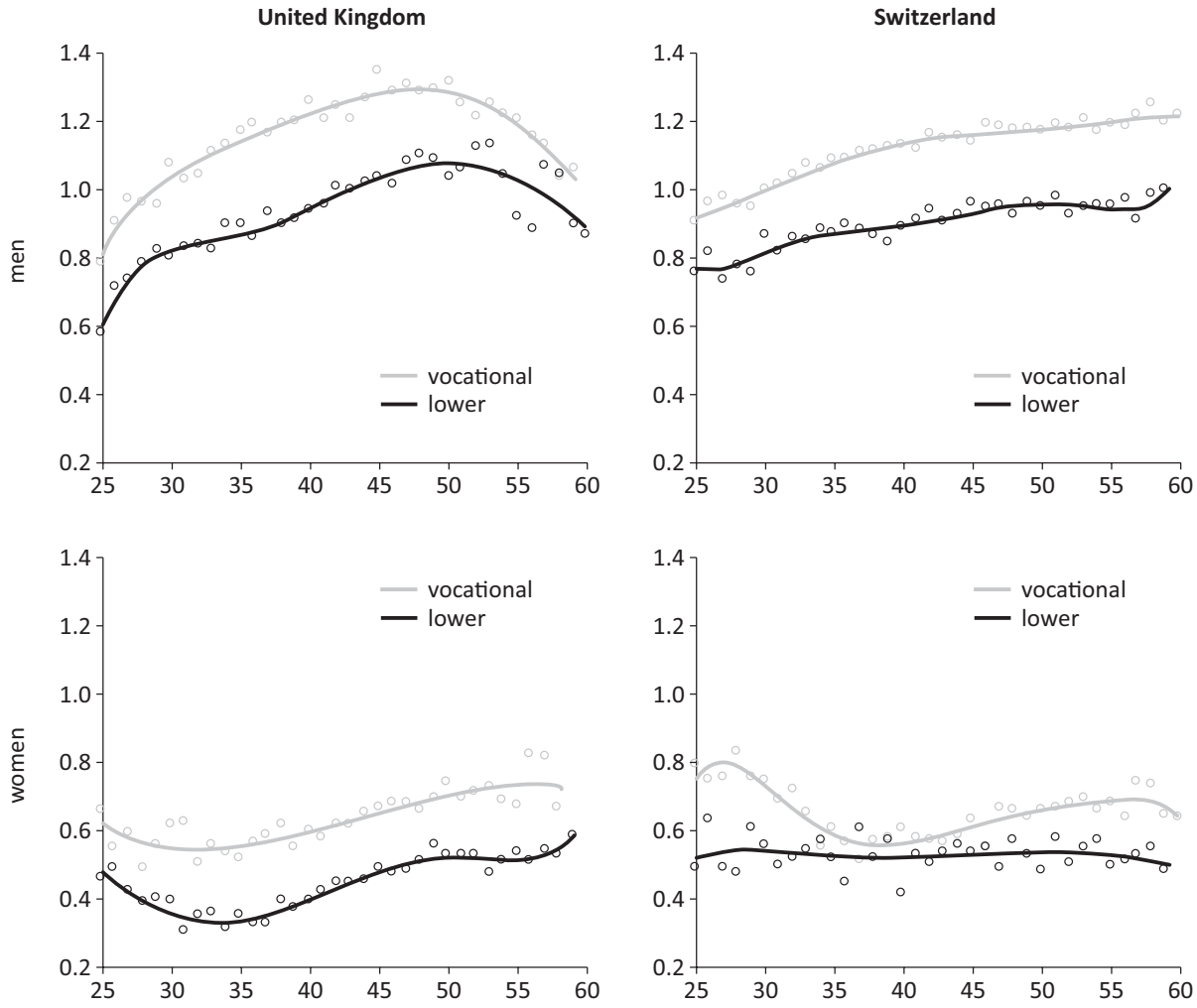

Figure A6. Median annual work income for men and women by level of education: upper-secondary vocational education (*vocational*) and compulsory school level or lower (*lower*). Source: UK Labour Force Survey 1993–2014 and Swiss Labour Force Survey 1991–2014, cohort 1954–1968. It is of little interest to compare absolute wages between the United Kingdom and Switzerland, since the purchasing power and tax systems are different. For this reason, we do not present wages in real pounds or Swiss francs, but the wages relative to the national median wage in each country. The median annual wage for the cohort 1954–1968 corrected for inflation (expressed in 2010 values) is £21,025 in the United Kingdom for the period 1993–2014, and CHF72,300 in Switzerland for 1991–2014. These amounts represent the benchmarks in each country (e.g., value of one).

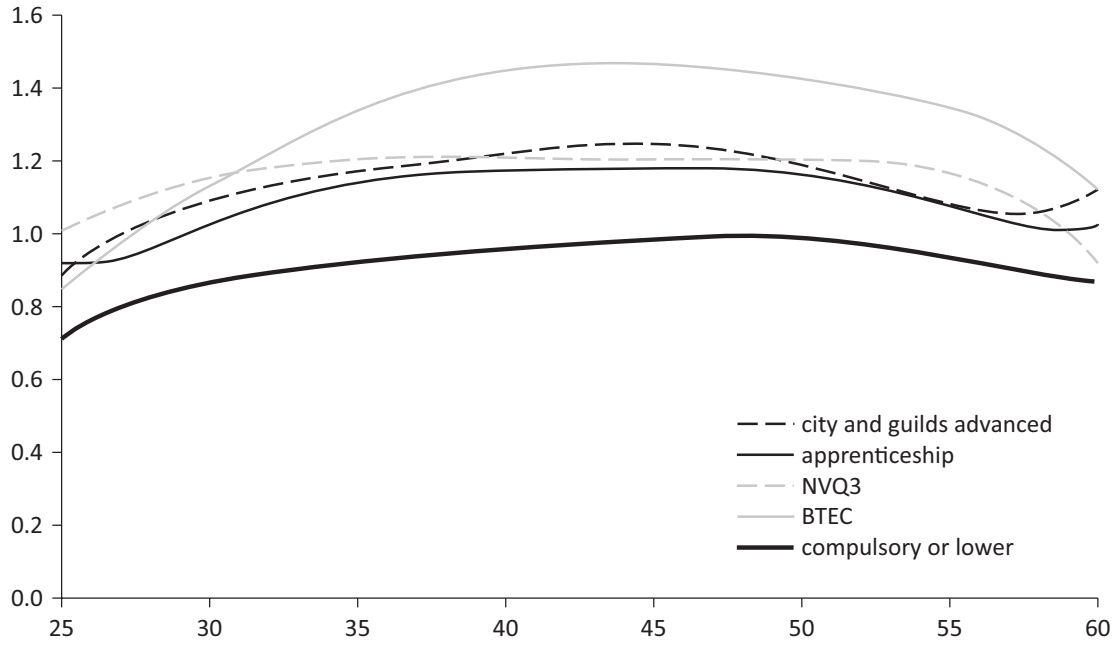

Figure A7. Median annual work income by type of upper-secondary vocational education. Men—United Kingdom. Source: UK Labour Force Survey 1993–2014. Note: 1 = Median annual income for UK (£21,025).

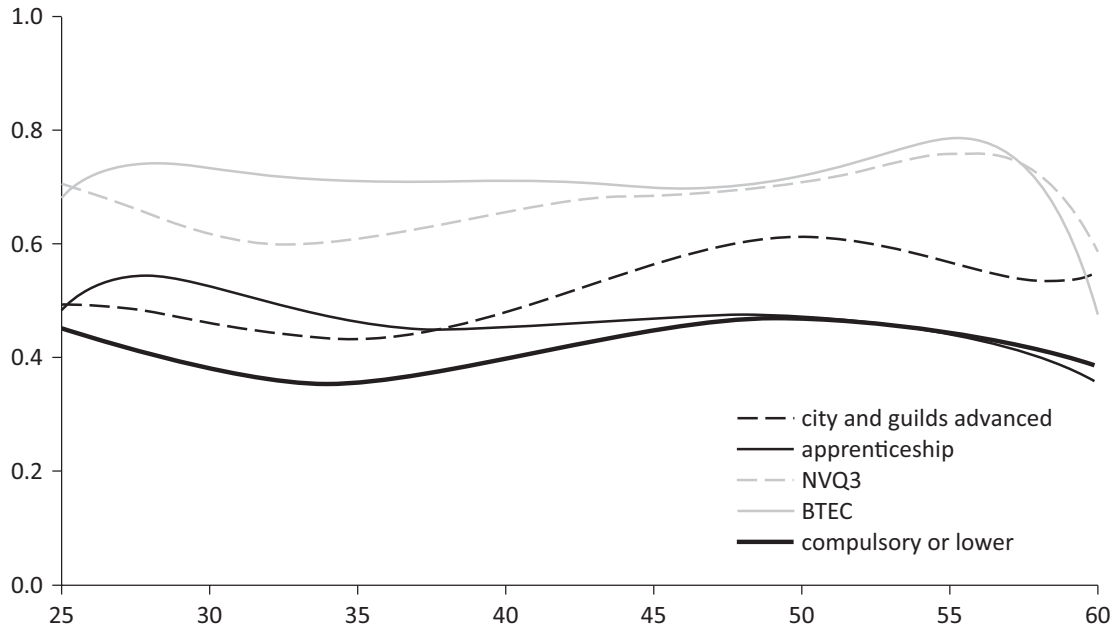

Figure A8. Median annual work income by type of upper-secondary vocational education. Women—United Kingdom. Source: UK Labour Force Survey 1993–2014. Note: 1 = Median annual income for UK (£21,025).

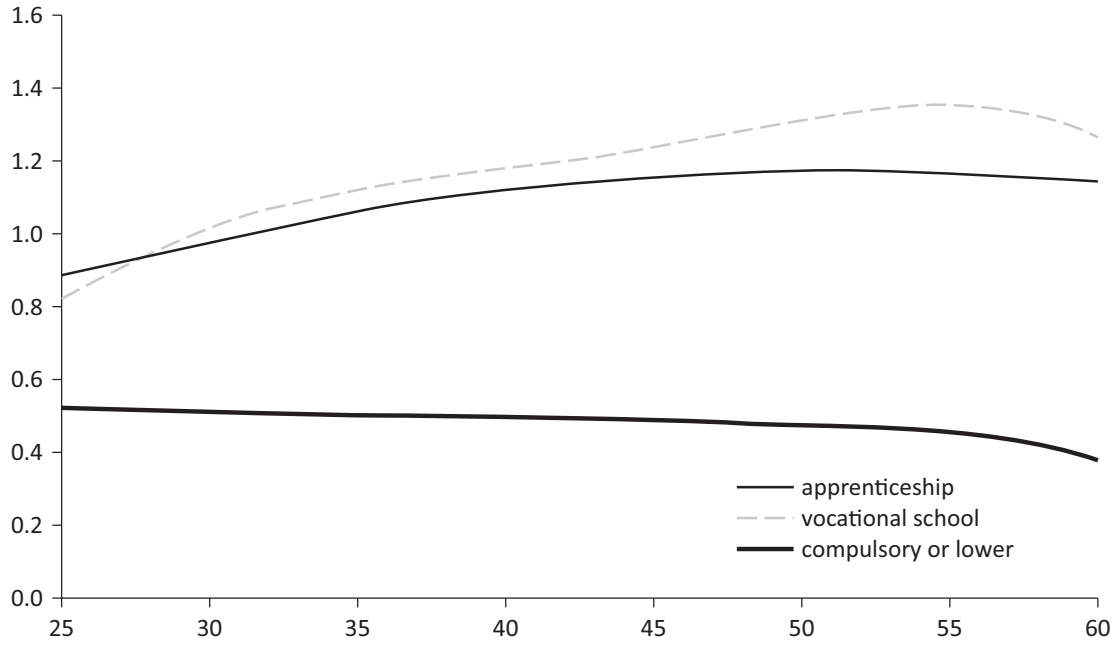

Figure A9. Median annual work income by type of upper-secondary vocational education. Men—Switzerland. Source: Swiss Labour Force Survey 1991–2014. Note: 1 = Median annual work income for CH (CHF72,300).

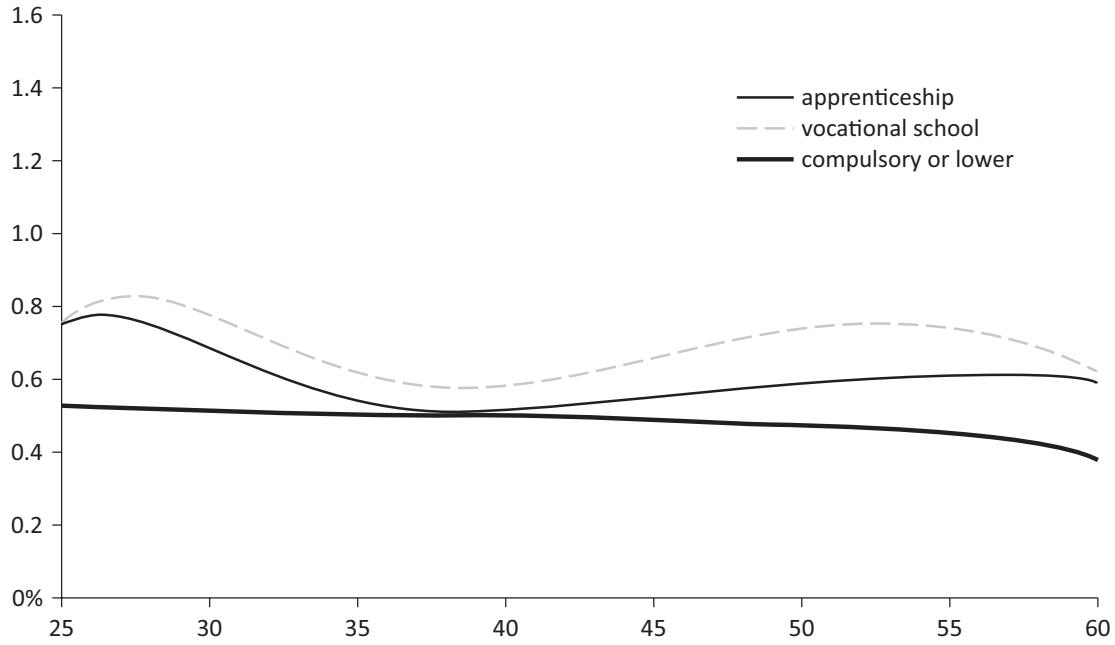

Figure A10. Median annual work income by type of upper-secondary vocational education. Women—Switzerland. Source: Swiss Labour Force Survey 1991–2014. Note: 1 = Median annual work income for CH (CHF72,300).

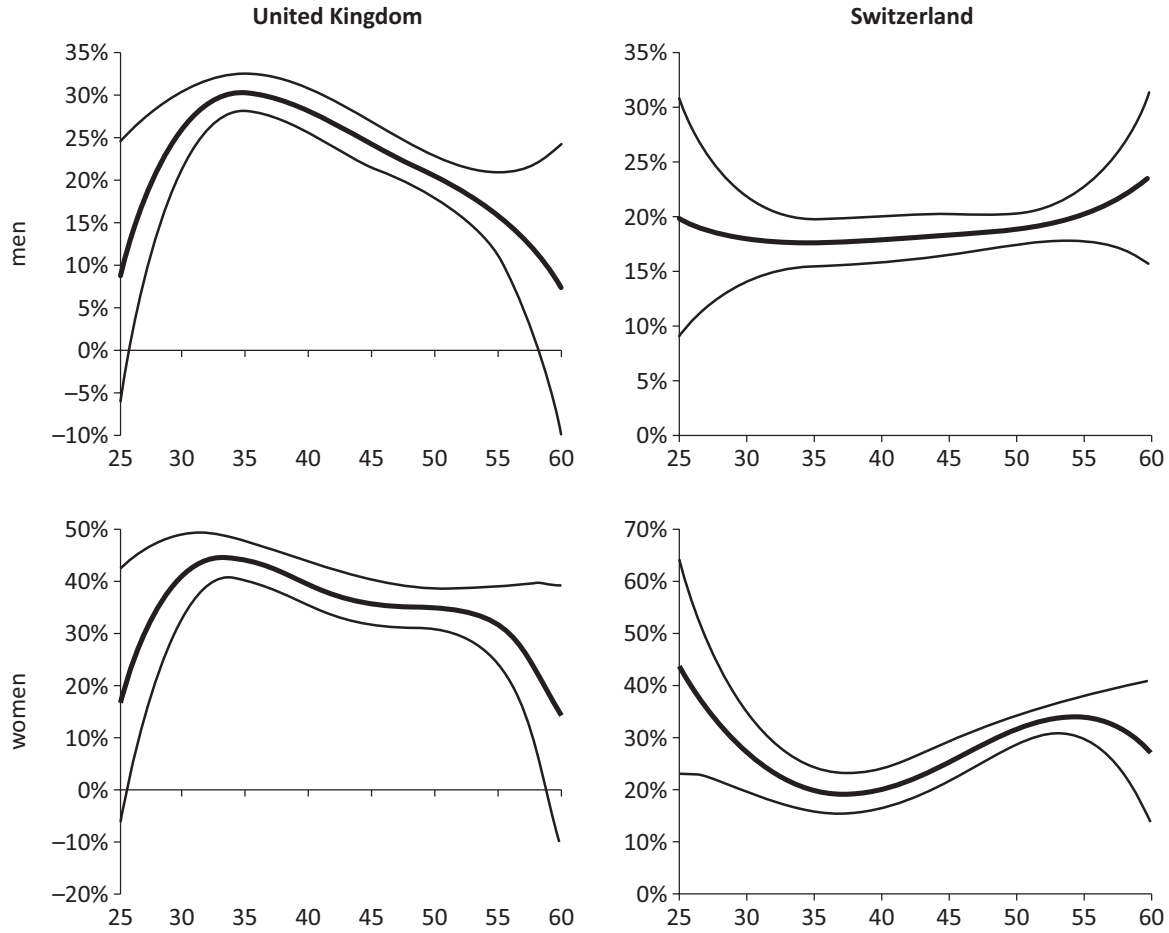

Figure A11. Difference in annual wages by age for upper-secondary vocational relative to lower education (average marginal effects). Source: UK Labour Force Survey 1993–2014 and Swiss Labour Force Survey 1991–2014, cohort 1954–1968. Note: Main line stands for average marginal effect; thinner lines stands for 95% confidence intervals.

Tables

Table A1. Definition of educational categories, United Kingdom and Switzerland.

	United Kingdom	Switzerland
Tertiary	higher education below degree, degree or higher	university, technical college and tertiary vocational education
Upper-secondary	A level or equivalent, apprenticeship above foundation level, city and guilds advanced craft and similar	apprenticeship and baccalaureate
Intermediate secondary	GCSE A-C or equivalent, apprenticeship foundation level, city and guilds craft part 2 and similar	one or two years of internship or commercial school
Compulsory or lower	primary/compulsory school, unfinished school and no qualifications	

Table A2. OLS regression coefficients for being in employment (minimum 8 hours per week). Source: UK Labour Force Survey 1993–2014 and Swiss Labour Force Survey 1991–2014, cohort 1954–1968.

		men		women	
		estimate	std. e	estimate	std. e
UK Labour Force Survey	age	0.919	0.817	**−3.751**	0.917
	age^2	−0.364	0.301	**1.418**	0.338
	age^3	0.068	0.048	**−0.221**	0.054
	age^4	−0.005	0.003	**0.012**	0.003
	educ: voc	−1.126	1.197	1.582	1.820
	age*educ: voc	1.327	1.200	−0.765	1.827
	age^2* educ: voc	−0.487	0.443	0.061	0.674
	age^3* educ: voc	0.077	0.071	0.024	0.109
	age^4* educ: voc	−0.004	0.004	−0.003	0.006
	constant	−0.371	0.816	**3.745**	0.915
	Adjusted R^2	0.077		0.077	
	N	114,198		98,969	
Swiss Labour Force Survey	age	1.708	2.041	−4.690	2.468
	age^2	−0.684	0.731	1.726	0.886
	age^3	0.116	0.114	−0.268	0.139
	age^4	−0.007	0.007	0.015	0.008
	educ: voc	1.377	2.280	2.531	2.858
	age*educ: voc	−1.645	2.229	−1.712	2.804
	age^2* educ: voc	0.688	0.802	0.354	1.011
	age^3* educ: voc	−0.120	0.126	−0.015	0.159
	age^4* educ: voc	0.008	0.007	−0.001	0.009
	constant	−0.551	2.095	**5.150**	2.527
	Adjusted R^2	0.057		0.041	
	N	32,869		38,858	

Notes: Controls include region and nationality. Age variables have been divided by 10 (i.e., age 25 is expressed as 2.5, age 45 as 4.5). Coefficients in bold are significant at $p < 0.05$.

Table A3. OLS regression coefficients for log hourly wage. Source: UK Labour Force Survey 1993–2014 and Swiss Labour Force Survey 1991–2014, cohort 1954–1968.

		men		women	
		estimate	std. e	estimate	std. e
UK Labour Force Survey	age	**6.065**	2.476	0.628	2.157
	age^2	**−2.239**	0.903	−0.480	0.786
	age^3	**0.375**	0.144	0.121	0.125
	age^4	**−0.023**	0.008	−0.010	0.007
	educ: voc	−2.850	3.504	−3.204	3.627
	age*educ: voc	2.767	3.473	2.644	3.585
	age^2* educ: voc	−0.911	1.269	−0.709	1.306
	age^3* educ: voc	0.131	0.203	0.077	0.208
	age^4* educ: voc	−0.007	0.012	−0.003	0.012
	constant	−4.262	2.501	1.720	2.183
	Adjusted R^2	0.125		0.157	
	N	18,542		14,042	
Swiss Labour Force Survey	age 4.300	2.480	1.432	2.680	
	age^2	−1.403	0.891	−0.448	0.959
	age^3	0.206	0.140	0.065	0.150
	age^4	−0.011	0.008	−0.004	0.009
	educ: voc	4.817	2.739	0.193	3.043
	age*educ: voc	−4.850	2.684	−0.123	2.972
	age^2* educ: voc	1.820	0.968	0.075	1.068
	age^3* educ: voc	−0.295	0.152	−0.015	0.167
	age^4* educ: voc	0.018	0.009	0.001	0.010
	constant	−1.339	2.540	1.623	2.756
	Adjusted R^2	0.191		0.146	
	N	21,452		21,249	

Notes: Controls include region and nationality. Age variables have been divided by 10 (i.e., age 25 is expressed as 2.5, age 45 as 4.5). Coefficients in bold are significant at $p < 0.05$.

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Article

Vocational Education and Employment: Explaining Cohort Variations in Life Course Patterns

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Abstract
A stylized finding on returns to vocational education is that vocational compared to general education generates a differential life course pattern of employability: while vocational education guarantees smooth transitions into the labour market and thus generates initial advantages, these erode with increasing age, leading to late-life reversals in employment chances. We contribute to this research by assessing cohort variations in life-cycle patterns and distinguishing two explanations for late-life reversals in employment chances. The adaptability argument states that this phenomenon is due to the lower adaptability and occupational flexibility of those with vocational education. In contrast, the health argument states that vocational education leads to physically more demanding occupations, faster health deterioration, and, thus, lower employability in later life. Using data from the German Socio-Economic Panel, we employ non-parametric state probability analysis to assess cohort variations in employment patterns, and mediation analysis to assess how much of the late-life reversal of employment patterns is due to a faster health deterioration among the vocationally educated. Results show that the early life advantage of vocational education increases across cohorts. Furthermore, those with vocational education exhibit faster health deterioration, and a small part of the late-life employment disadvantage of this group works through lower levels of health after midlife.

Keywords
employment; Germany; life course methods; multi-cohort panel data; vocational education

Issue
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1. Introduction

From a human capital perspective, different educational programmes and fields of study provide not only a particular level of proficiency (vertical education dimension), but also a unique mix of general, field, occupational, and firm-specific skills (horizontal education dimension). Focusing on such horizontal differences, a study by Hanushek, Schwerdt, Woessmann and Zhang (2017) has recently triggered an intense debate on the lifetime returns to general versus vocational education. The authors assume that vocational education generates a differential life course pattern of employability compared to general education. Their results indicate that vocational education provides smooth transitions into the labour market. However, as individuals grow older, this initial advantage erodes and even leads to a disadvantage at older ages. Several replication studies drawing

on internationally comparative cross-sectional data support the general pattern of a trade-off in returns over the life course, although their conclusions regarding country differences are mixed (Forster, Bol, & van de Werfhorst, 2016; Hampf & Woessmann, 2017; Lavrijsen & Nicaise, 2017). Studies devoted to only one country find large initial employment benefits of vocational education that later morph into marginal disadvantages before retirement in the Netherlands (Forster & Bol, 2018), no trade-off with regard to employment prospects in Switzerland (Korber & Oesch, 2019), or only for the lesser-educated in the UK (Brunello & Rocco, 2017).

While several of the above-mentioned studies assess differences in life cycle patterns from an international perspective, differences within countries, in particular across cohorts, are barely understood. This lack of research is surprising, as the assessment of cohort variations of inequality-generating mechanisms lies at the very heart of sociological research (Ryder, 1965). As with country-specific differences, cohort-specific differences may well result in different life course employment patterns. Cohort-specific structural effects provide the boundary conditions under which life-cycle employment patterns are generated. Consequently, the assessment of cohort variations in life cycle patterns emerges as an important research field in the social sciences (see, e.g., Leopold & Leopold, 2018; Manzoni, Härkönen, & Mayer, 2014). Thus, as a first important contribution to the literature, this study dedicates itself to a systematic assessment of cohort variations in life cycle employment patterns between those with general and vocational education.

In addition to the assessment of cohort variations, this study aims to contribute to the literature by distinguishing theoretical explanations that may account for the trade-off in returns over the life course. The literature presents two conflicting explanations (Hanushek et al., 2017): the adaptability argument and the health argument, whereas the former is clearly the most prominent explanation. According to this argument, vocational education provides mainly occupation-specific skills, thus fostering smooth transitions into the labour market. However, as workers age, this advantage erodes as specific skills lead to lower adaptability and occupational flexibility, particularly in labour markets characterized by technological change. In contrast, the health argument states that vocational education leads to physically more demanding occupations that lead to a faster health decline, explaining lower employability at older ages.

On the one hand, the assessment of such health differences between vocationally and generally educated over the life course constitutes a very instructive research question in its own right. Health differences, the most important predictor of subjective well-being, constitute an important dimension of social inequality. On the other hand, such increasing health differences over the life course may well be an intervening mediating mechanism that explains the late-life employment disadvantage of those with vocational education. Therefore, this study aims to make two further important contributions to the literature. First, we deliver a systematic assessment of how the health of both groups evolves over the life course. Second, we scrutinize health differences as an intervening mediating mechanism that explains the late-life employment disadvantage of vocational education.

To assess cohort variations in life cycle patterns as well as the mediating role of health differences, long-running multi-cohort panel data from a country in which vocational education plays a prominent role is necessary. Fortunately, the German Socio Economic Panel (GSOEP) delivers data meeting these requirements. As Hanushek et al. (2017) argue, Germany is one of the most instructive countries for the assessment of returns to vocational education as it is the largest nation with a dominantly company-based vocational training system. The authors posit that in such countries, the late-life trade-off in employment patterns should be most pronounced. In short, this study uses long-running multi-cohort panel data from the most populous country with a dual training system to assess (1) cohort variations in life cycle patterns between those with general and vocationally education (2) health differences between these two groups, and (3) the mediating role of health differences in explaining late-life employment differences.

2. Literature Review

As part of a literature review, we found ten studies that consider the relation between vocational and general education on employment outcomes. Those that do not focus on employment probabilities but rather on other outcomes (e.g., Cörvers, Heijke, Kriechel, & Pfeifer, 2011; Golsteyn & Stenberg, 2017; Verhaest, Lavrijsen, van Trier, Nicaise, & Omey, 2018) have been excluded. Cörvers et al. (2011) focus on hourly wages, Golsteyn and Stenberg (2017) on annual labour earnings, while Verhaest et al. (2018) assess educational and skill mismatch. As vocational education typically assures job security and smooth transitions into the labour market but is generally related to less prestigious jobs with relatively low earnings (Shavit & Müller, 2000; Lavrijsen & Nicaise, 2017), educational gradients in different outcomes (e.g., employment opportunities, skill mismatch, wages) stem from different mechanisms. Therefore, we focus only on studies that consider employment probabilities as outcome. Table 1 lists the remaining seven studies.

Of the seven currently available studies assessing the impact of vocational versus general education on employment chances, five rely on cross-sectional data. Brunello and Rocco (2017) and Korber and Oesch (2019) are the only studies that implement analyses of panel data. While the former focus on two cohorts (birth cohorts 1958 and 1970), Korber and Oesch (2019) use two multi-cohort panel studies from Switzerland.

Studies relying on cross-sectional data observe current employment chances of different cohorts at differ-

Table 1. State of research, data, and method.

Study	Data set	Years	Method	Classification
Brunello and Rocco (2017)	National Child Development Survey (NCDS), British Cohort Survey (BCS)	1981, 2000	Simulations (based on age dummies)	Two cohorts (born 1958 and 1970) panel study
Forster and Bol (2018)	Dutch Labor Force Survey (EBB)	2010–2012	Linear probability model (age + age^2 + age^3 + age^4)	Cross-sectional study
Forster et al. (2016)	Programme for the International Assessment of Adult Competencies (PIAAC)	2012	Logistic regression, (age + age^2)	International cross-sectional study
Hampf and Woessmann (2017)	PIAAC	2012	Linear probability model (age + age^2)	International cross-sectional study
Hanushek et al. (2017)	International Adult Literacy Survey (IALS), German Microcensus (MZ), Australian Administrative Data	1994–1998	Linear probability model + propensity score matching	International cross-sectional study + German and Austrian register data
Korber and Oesch (2019)	Swiss Labor Force Survey (SLFS), Swiss Household Panel (SHP)	1991–2014, 1999–2013	Linear probability model (age + age^2 + age^3 + age^4)	Multi-cohort panel study
Lavrijsen and Nicaise (2017)	PIAAC	2012	Logistic regression (experience + experience^2)	International cross-sectional study

ent ages in order to construct artificial lifetime employment patterns. As individuals from a given birth year (cohort) are observed at one time point (period) and one age, scholars cannot separate age from cohort or period effects. Thus, such analyses must assume that there are no cohort effects (i.e., no cohort properties that relate to the ratio of general versus vocational education and employment opportunities) as well as no period effects (i.e., no business cycle effects in the observation year that affect the employment chances of general versus vocational education differently).

Studies relying on single cohort panel data observe current employment chances of one cohort at different ages and different observational time points. As individuals from one cohort grow older over the observational period, scholars cannot separate age from period effects, and must therefore assume that there is no significant bias due to business cycles.

Even when using multi-cohort panel data, researchers aiming to estimate life cycle employment patterns face the challenge of disentangling age effects and cohort effects, as well as period effects: age, period, and cohort (APC) are linearly dependent (age = period—cohort). As a result, estimating age effects and simultaneously controlling for cohort and period effects is not possible without identifying restrictions. Recent studies drawing on simulation exercises (Bell & Jones, 2014a, 2014b, 2015; Luo, 2013) and mathematical proofs (Luo, Hodges, Winship, & Powers, 2016; Pelzer, te Grotenhuis, Eisinga, & Schmidt-Catran, 2015) demonstrate that purely statistical solutions to the APC problem fail because the confounding lies in the very nature of the linear dependency between APC. Therefore, several scholars agree that instead of trying to solve the APC problem by purely statistical constraints, scholars must employ solid theory and external information to choose an identification restriction (Bell & Jones, 2015; Chauvel & Schröder, 2015; Fienberg, 2013; Glenn, 2005; Heckman & Robb, 1985; Rodgers, 1982).

If theoretical reasoning helps to identify explicitly measured macro variables that bring about period or cohort effects, scholars can include these variables in the model, thereby capturing either period or cohort effects (Heckman & Robb, 1985). This identification restriction rests on the assumption that theory-guided variables can approximate period or cohort effects (Smith, Mason, & Fienberg, 1982). While labour market research provides both theory and empirical evidence for macro-level variables that may bring about period effects impacting labour market returns over the entire employment career (unemployment rates, wage rates and GDP growth), rich empirical evidence for potential variables that may form cohort effects is missing. Using multi-cohort panel data while employing a theory-guided restriction for period effects (i.e., capturing period effects by explicitly measured macro variables) and controlling for cohort effects with dummy variables appears to be the most convenient way to avoid the age-period-cohort conundrum (Kratz & Brüderl, 2017).

Cohort effects not only constitute a potential threat to valid conclusions about age effects, but cohorts also form the boundary conditions under which social processes function (Mannheim, 1928; Ryder, 1965). Thus, even an approach that accounts for cohort effects can-

not rule out cohort variations in life cycle patterns. For this reason, scholars must assess such cohort variations in a further step, as it is only sensible to make inferences about life cycle patterns in the absence of cohort variations. If any are present, life courses should be assessed with respect to a specific cohort. If effects are simply averaged over cohorts, they mask important information about the social processes and mechanisms that bring about differences in life cycle patterns. Therefore, the estimation of cohort variations in life cycle patterns is not merely a methodological objective but is essential to uncovering the explanandum researchers aim to explain. Therefore, assessing cohort variations in life cycle patterns serves not only to investigate whether cohort interactions may be omitted, but may also provide grounds for theorizing under which temporal circumstances which social processes can be expected.

3. Research Gap and Research Plan

To advance the current state of research, the present study delivers an in-depth, multi-variable description of how to uncover changes in life cycle patterns across cohorts. In doing so, this study uses a theory-guided restriction to capture period effects when estimating cohort variations in life cycle patterns. In addition, we estimate the age effect non-parametrically, thereby not predetermining our results by assuming a particular age trajectory. As a result, this approach, compared to the current state of research, provides a better approximation of the complexity of human life courses. We are able to illustrate that a non-parametric approach is particularly important when investigating gender differences in employment patterns.

Furthermore, the late-life reversal of employment patterns between the generally and the vocationally educated may be due to different mechanisms. The main argument provided in previous literature is that the advantage of vocational education erodes with increasing age as specific skills lead to a reduction in adaptability and occupational flexibility in labour markets characterized by technological change. An alternative explanation for this phenomenon may be a faster health deterioration among those with a vocational background that leads to a faster decrease in employability (Hanushek et al., 2017). From this perspective, vocational education leads to physically more demanding jobs, especially among men. This higher physical burden, in turn, leads to a faster health deterioration, which results in a higher probability of labour force dropout.

To distinguish between these explanations, we employ mediation analysis (VanderWeele, 2015), which allows us to define and test total, direct, as well as indirect effects. As health measures are available in the GSOEP data, we are able to test whether there are significant indirect effects of general versus vocational education on employability that work through health. As neither education-specific measures of adaptability nor occupational flexibility are available, the remaining direct effect must be interpreted as a result of these mechanisms. If there is no indirect effect of vocational education on late-life employment through health, this pattern may arise either because vocational education does not affect health, or because health does not affect employment. Therefore, to further understand the mediating role of health, we also provide evidence on the impact of vocational education on health over the life course. This mediation approach allows us to test and potentially rule out health as an alternative explanation for the late-life reversal of employability patterns.

4. Data and Methods

4.1. Sample

Our analyses rely on data from all available subsamples of the German Socio-Economic Panel (GSOEP) version 32 from 1984 to 2015 (for more details on the data see Goebel et al., 2019; Haisken-DeNew & Frick, 2005). We exclude respondents who did not complete lower secondary education, as well as those who immigrated to Germany at or after age 14. We further restrict the life courses under observation from 18–65 and exclude person-years when respondents are in education as well as before acquiring a final educational degree.

In sum, the sample for the analysis of gender and cohort variations in life cycle patterns (sample 1) contains 44,502 persons born between 1919 and 1998 with a total of 332,537 person-years (see notes of Figure 4 and Figure 5 for cohort-specific numbers). In order to test health as a mediating mechanism, we further restrict the sample as important health indicators are not available for the years 1990 and 1993 (sample 2). This restriction results in 43,106 persons and 309,769 person-years (for distribution of variables, see Table A1 in the Appendix).

4.2. Variables

4.2.1. Vocational versus General Education

From a human capital perspective, different educational programmes and fields of study provide not only a unique mix of general, field, occupation, and firm-specific skills (horizontal dimension), but also a particular level of proficiency (vertical dimension). Accordingly, a higher skill level should generate higher productivity, which corresponds to better employment chances. Testing the hypothesis of differential life-course returns to specific versus general skills therefore requires a contrast of these two types of skills at comparable skill levels.

In multi-country comparisons (e.g., Forster et al., 2016; Hanushek et al., 2017) researchers had to rely on rough international classifications such as ISCED levels and fields of study, which often do not adequately take country-specific peculiarities into account. As a result, these studies were only able to distinguish broad educa-

tional levels (secondary versus tertiary) and formal programme type.

In Germany, vocational education and training is the prominent form of post-school education for students from lower and mid-level secondary schools (*Hauptschulen* and *Realschulen*), while graduates from upper secondary schools (*Gymnasien*) normally continue their studies in institutions of higher education, which are usually regarded as providers of general skills. Therefore, at each school level functional equivalents for vocational and general education are rare. To overcome potential singularities a detailed distinction of vocational and general education at each specific skill level is necessary.

The educational indicators defined here account for this institutional peculiarity and go beyond previous research in two respects. First, we build a more fine-grained education variable with four values: lower secondary, upper secondary, post-secondary/lower tertiary, and higher tertiary education. Second, we distinguish between general and vocational programmes by using detailed information on the formal programme type in the German educational system, as well as considering double qualifications, particularly in the form of vocational education with higher education. As dealing with such double qualifications is not straightforward, we conduct several auxiliary analyses. These show that the lion's share of individuals with both qualifications first attained a vocational degree and later a general degree. We therefore consider the later educational attainment endogenous to the first (vocational education + further education that resulted in a general degree), resulting in double qualifications classified as vocational (for a more detailed overview and distribution of categories, see Tables A2 and A3 in the Appendix). To shed further light on the patterns of those with double qualifications, we compare this group with both the vocationally and generally educated in the robustness section.

4.2.2. Control Variables

In each analytical step, we include a vector X_{it} to capture both time-constant and time-variant individual-specific control variables (i.e., gender, nationality, an indicator for living in West Germany, an indicator for at least one parent with a university degree, highest educational level obtained). Further, to account for period effects, every model includes a vector P_t comprising time-variant period measures (i.e., unemployment rate, GDP growth, wage rate, crisis dummy, year of Hartz reforms, i.e., cuttings of unemployment benefits). To account for cohort fluctuations, we include the vector C_i, which represents cohort dummies.

4.2.3. Mediators

To investigate a potential indirect effect explaining employment differences between vocationally and generally educated at later life course stages, we operationalise health with nights spent in hospital in one (the last) survey wave, doctor visits in one (the last) survey wave, disability status, and health satisfaction.

4.3. Methods

The empirical analysis proceeds in several steps. First, we estimate gender-specific non-parametric state probability models with interactions of education type by age to allow for age variations in the effect of vocational versus general education on employment probabilities. Employing a non-parametric approach is important because such an estimator allows capturing the complexity of individuals' employment trajectories (Brüderl, Kratz, & Bauer, 2018). Second, we estimate different health trajectories by vocational versus general education. Third, we estimate age-specific decomposition models. We specify the following models:

$$\begin{aligned} Emp_{it} = {} & \alpha + \beta Voc_i + \gamma_n \sum_{n=2}^{47} Age_{n,it} \\ & + \delta_n \left(Voc_i \times \sum_{n=2}^{47} Age_{n,it} \right) + \lambda' X_{it} + \pi' P_t \\ & + \tau_i C_i + \varepsilon_{it} \end{aligned} \tag{1}$$

$$\begin{aligned} Health_{it} = {} & \alpha + \beta Voc_i + \gamma_n \sum_{n=2}^{47} Age_{n,it} \\ & + \delta_n \left(Voc_i \times \sum_{n=2}^{47} Age_{n,it} \right) + \lambda' X_{it} + \pi' P_t \\ & + \tau_i C_i + \varepsilon_{it} \end{aligned} \tag{2}$$

In model 1, Emp_{it} represents the probability of being employed for individual i at time t. In model 2, we use health satisfaction as a compound measure to capture both physical and mental dimensions of health. In both models, $\sum_{n=2}^{47} Age_{n,it}$ is a set of 46 dummy variables capturing age-related employment probabilities (model 1) and health differences (model 2) from age 18 to 65 (reference: age 18). Voc_i is a binary variable, which is 1 for vocational education and 0 for general education. To allow for age variations in the effect of vocational education, we interact Voc_i with age. The gender-specific models adjust for individual confounders (X_i), period (P_t), and cohort effects (C_i). The cohort-specific models also use the same set of individual confounders and period measures.

We assess the mediating role of health in explaining lower employment probabilities of those with vocational education at older ages. For this assessment, we restrict the sample to individuals older than 54 and younger than 66 and run 11 age-specific KHB decomposition models. This type of model is a convenient mediation/decomposition method for binary dependent variables (Karlson & Holm, 2011; Karlson, Holm, & Breen, 2012; Kohler, Karlson, & Holm, 2011). In such mod-

els with non-linear dependent variables, researchers must distinguish the indirect effect—the percentage mediated—from a change in the explanatory variable of interest resulting from rescaling. In distinguishing mediation from rescaling, the KHB method solves this rescaling problem and performs as least as good as other methods when the dependent variable is binary (Linden & Karlson, 2013). We compare the age-specific coefficient of vocational education of a full model β_F that includes health estimates:

$$Emp_{it} = \alpha + \beta_F Voc_i + \gamma' Health_i + \lambda' X_i + \pi' P_t + \tau_i C_i + \varepsilon_{it} \quad \text{if age } i \in [55, 65] \tag{3}$$

with the age-specific coefficient of vocational education of a reduced model β_R that does not include such health estimates:

$$Emp_{it} = \alpha + \beta_R Voc_i + \lambda' X_i + \pi' P_t + \tau_i C_i + \varepsilon_{it} \quad \text{if age } i \in [55, 65] \tag{4}$$

We estimate 11 age-specific full and reduced models starting from 55 and ending with 65 years of age. To test the significance of this indirect effect, the KHB method employs the delta method (Kohler et al., 2011, p. 424; Sobel, 1982). Figure 1 shows the un-confounding assumptions of our empirical analyses. The total effect of vocational education on employment probabilities is identified if there are no unmeasured confounders between vocational education and the probability of being employed (Confounder 1). The total effect of vocational education on health (Path a) is identified if there are no unmeasured confounders between vocational education and health (Confounder 3). The direct effect of vocational education on employment, net of health (Path c), and the indirect effect of vocational education through health, are identified if there are no unmeasured confounders between vocational education and employment (Confounder 1), no unmeasured confounders between health and employment (Confounder 2) and no unmeasured confounders between vocational education and health (Confounder 3, see also VanderWeele, 2015).

5. Results

5.1. Gender Variations in Life Cycle Patterns

In this section, we assess gender variations in cohort averaged life cycle employment patterns between those with vocational and general education. To elaborate on the importance of cohort and period effects for averaged life cycle trajectories we replicate the most common research strategy from previous research and assess the robustness of the results when we introduce period and cohort measures. First, we model employment trajectories using both linear and quadratic polynomials without controlling for cohort and period effects (see in the Appendix Figures A2a for women, A2b for men). Second, we control explicitly measured macro-variables to capture period effects (Figure A2c for women, Figure A2d for men) and cohort dummies (Figure A2e for women, Figure A2f for men), and a combination of period effects and cohort dummies (Figure A2g for women, Figure A2h for men). The results remain fairly robust, regardless of which effect (period or cohort) is controlled. Thus, if we simply consider period and cohort effects as a form of bias, averaged life cycle trajectories are only marginally affected.

Using a completely flexible approach as described in Equation (1), we estimate non-parametric state probability models and present them as conditional profile and conditional effect plots. The conditional profile plot delivers a predicted unemployment probability curve for the vocationally versus the generally educated, plotted in Figures 2a and 2c for women and men, respectively. The conditional effect plots in Figures 2b and 2d show the employment probability differential of vocationally educated over generally educated women and men, respectively.

Figure 2a and Figure 2b illustrate that the most common research strategy characterized by computing linear and quadratic polynomials leads to erroneous conclusions for women. As such functional forms are over-simplistic, they do not reflect the complexity of

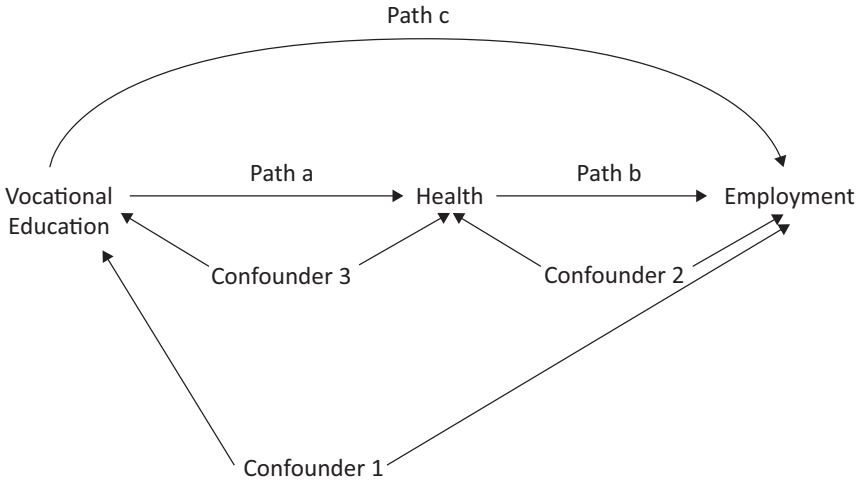

Figure 1. Paths from vocational education to employment and un-confounding assumptions.

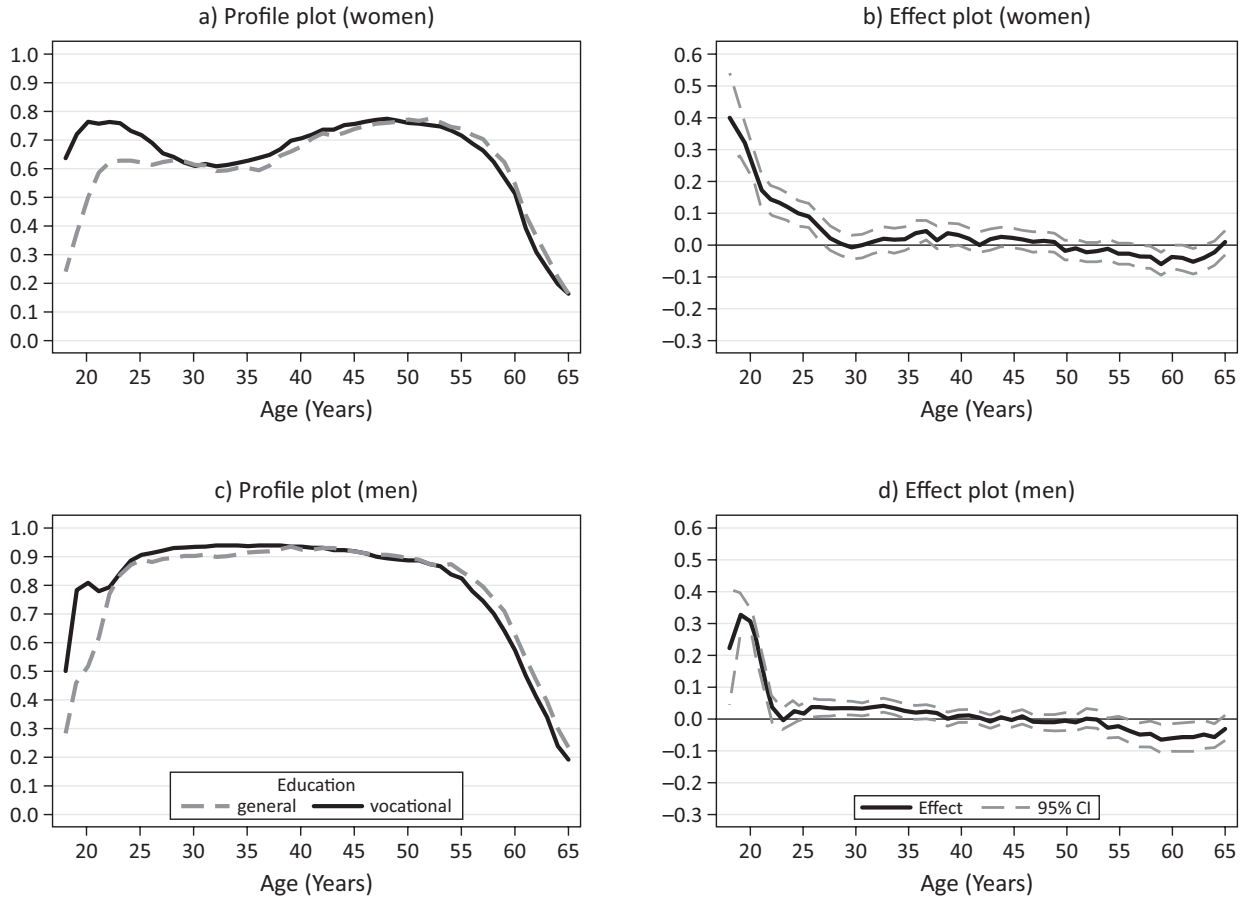

Figure 2. Employment opportunity over the life course: General versus vocational education by gender. Notes: Conditional profile plots (left) and conditional effect plots (right) estimated by gender-specific non-parametric state probability models of vocational and general education on employment probabilities. Control variables include period effects, cohort effects, German nationality, parental educational background, residence in West Germany, and educational level. N persons = 44,502; N person-years = 332,537. See Table A4 in the Appendix for detailed regression results. Data source: GSOEP (n.d.).

the female life course. Further analyses (see Figure 3) show that parental leave in particular leads to an age-employment trajectory with three turning points for women.

However, regarding qualitative conclusions, our results are very similar to previous research: Vocational education increases employment chances at the beginning of the working career, whereas general education leads to better employment chances at the end. This pattern is more pronounced for men than for women. Similar to the Netherlands (Forster & Bol, 2018), we see large initial gains from vocational education in terms of employment prospects, which are not fully compensated later in the career by general education. Furthermore, Figure 2 shows that the turning point of the trade-off seems to lie at an older age than estimated by Hanushek et al. (2017); namely, around 55 (for men).

5.2. Gender and Cohort Variations in Life Cycle Patterns

We now proceed with a systematic assessment whether the life course trajectories outlined above vary by cohort. Figure 4 shows employment patterns of women with vocational and general education by cohort: Employment rates increased considerably between cohort 1 (born between 1919 and 1945) and cohort 2 (born between 1946 and 1959). At the same ages (between 45 and 65) the employment rate is around 15 percentage points higher for the younger cohort for both the generally and the vocationally educated. Furthermore, the late-life reversal is only apparent for cohort 1, but not for cohort 2.

A remarkable pattern emerges when comparing the early life course between birth cohort 3 (born between 1960 and 69), cohort 4 (born between 1970 and 79), and cohort 5 (born between 1980 and 1998). Here, the age-specific employment pattern of the vocationally educated remains fairly stable across all three cohorts, whereas employment opportunities in the general education group decreased remarkably. While the latter had an employment advantage between 30 and 35 for cohort 3, we find no advantage for cohort 4, and a disadvantage for cohort 5. Thus, for women, the early life course advantage of vocational education increased across cohorts.

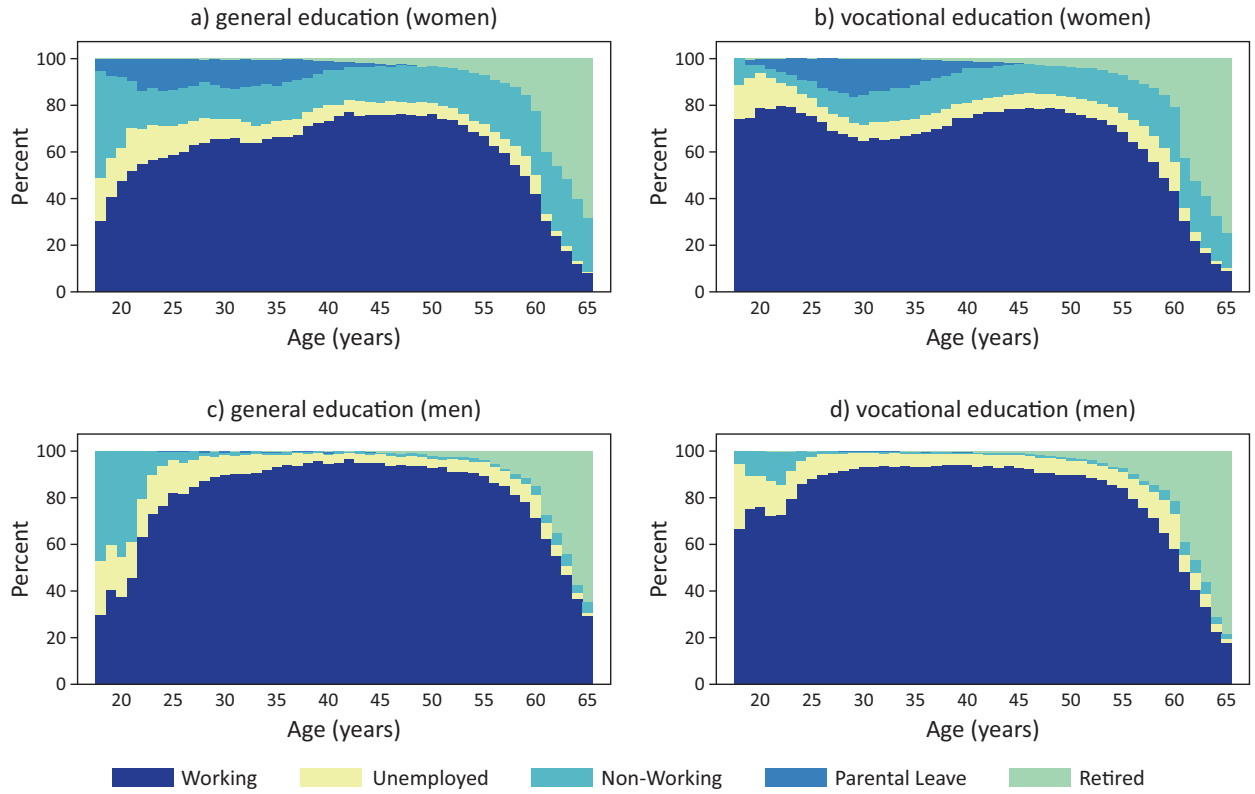

Figure 3. Employment status by education type, age, and gender. Data source: GSOEP (n.d.).

While employment participation has risen for women across cohorts, employment rates of men remain relatively stable at a high level (Figure 5). In contrast to the findings for women, the late-life reversal for men is found for cohort 1 and cohort 2. In accordance with the pattern of women, employment rates of the vocationally educated remained stable across cohort 3, cohort 4, and cohort 5, while employment chances of the generally educated decreased remarkably between cohorts 4 and 5.

These results raise the question as to why the employment opportunities of those with generally education decrease across cohorts. Educational expansion has resulted in an increasing share of young adults in education in later born cohorts. As individuals in education do not enter this analysis, the sample in this young age period becomes increasingly selective across cohorts. This increasing selectivity is more pronounced for general education. Further analyses revealed that the decreasing employment prospects of the generally educated between 20 and 25 across cohorts is driven by young adults who enter the labor market without tertiary education and without a vocational degree. This group has become increasingly negatively selected across cohorts.

However, as Figure 4j and Figure 5j show, there is also a significant advantage of vocational education between ages 30 and 35. At this age, the majority of those with tertiary education have also finished their educational career. Comparing these results with the nonexistent advantage of vocational education in earlier born cohorts in this age range (Figures 4h, 4f, 5h and 5f) suggests that the relative advantage of the vocationally educated in total (and not only of the not-tertiary educated) have increased across cohorts.

5.3. Mediation Analyses: Health as a Potential Mechanism Explaining Differences at the End of Working Life

In this section, we investigate how much of the late-life reversal of employment opportunity is due to a faster deterioration of health among those with vocational education (indirect effect), and how much of the total effect does not work through health (direct effect). We focus on men, because the reasoning of a faster health decline due to more physically demanding jobs for the vocationally educated applies especially to men. We begin with an assessment of the impact of vocational versus general education on health satisfaction (Equation 2, Figure 6). The results show that the two groups do not significantly differ in health satisfaction until 43 years of age. Thereafter, however, a significant health disadvantage appears for those with vocational education.

Having observed that this subgroup indeed shows a faster health decline, we now ask whether the decrease in health mediates a significant proportion of the lower employment probability of this group after midlife. To this end, we conducted 11 KHB mediation analyses for each age and plotted the results in Figure 7. Here, health is measured not only by health satisfaction, but also by

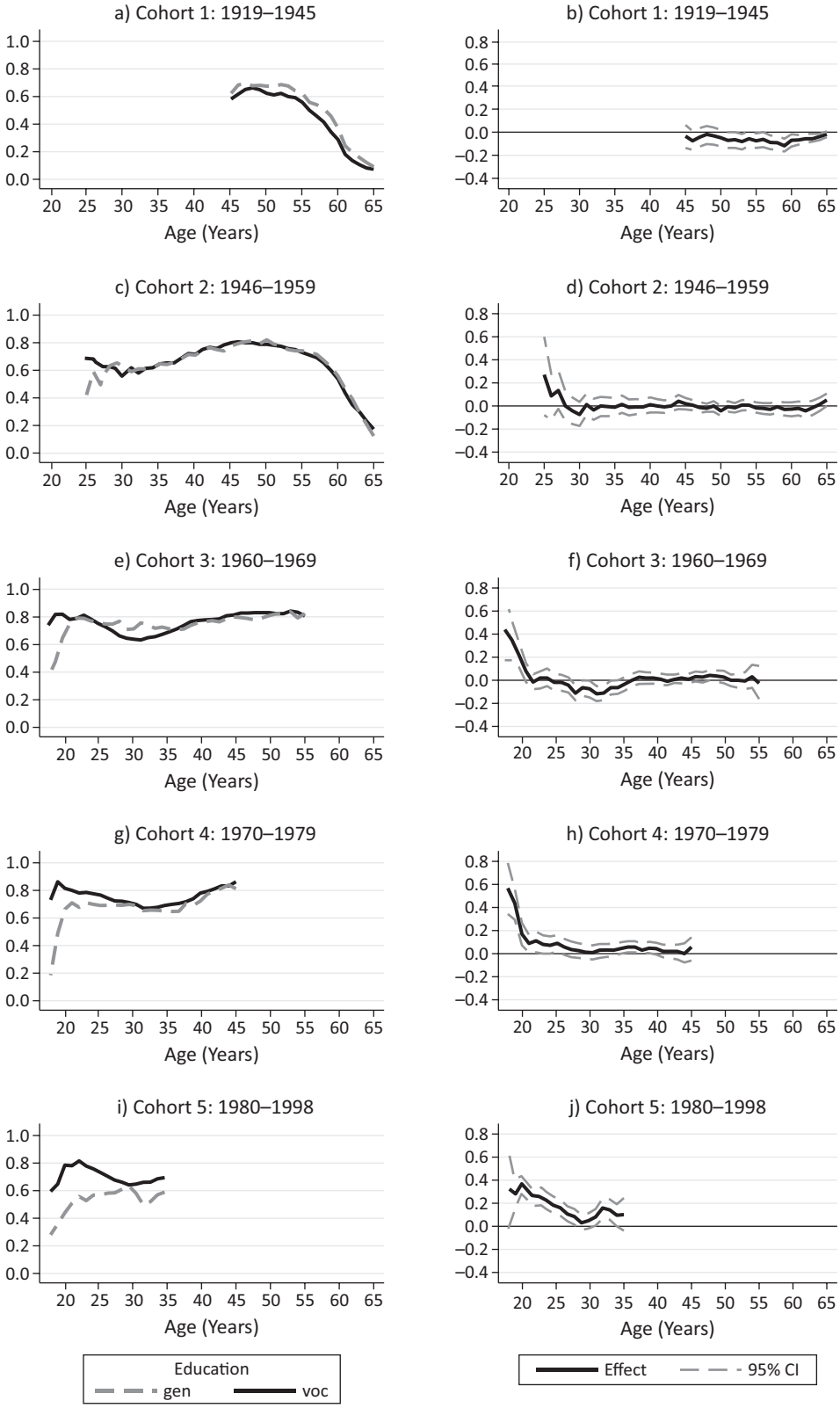

Figure 4. Cohort variation in employment opportunity over the life course: General versus vocational education (women). Notes: Conditional profile plots (left) and conditional effect plots (right) estimated by cohort-specific non-parametric state probability models of vocational and general education on employment probabilities of women. Control variables include period effects, German nationality, parental educational background, residence in West Germany, and educational level. N persons (cohort 1) = 3,365; N person-years (cohort 1) = 29,210; N persons (cohort 2) = 4,870; N person-years (cohort 2) = 52,077; N persons (cohort 3) = 5,752; N person-years (cohort 3) = 48,657; N persons (cohort 4) = 5,094; N person-years (cohort 4) = 30,994; N persons (cohort 5) = 4,135; N person-years (cohort 5) = 13,870. See Tables A5 and A6 in the Appendix for detailed regression results. Data source: GSOEP (n.d.).

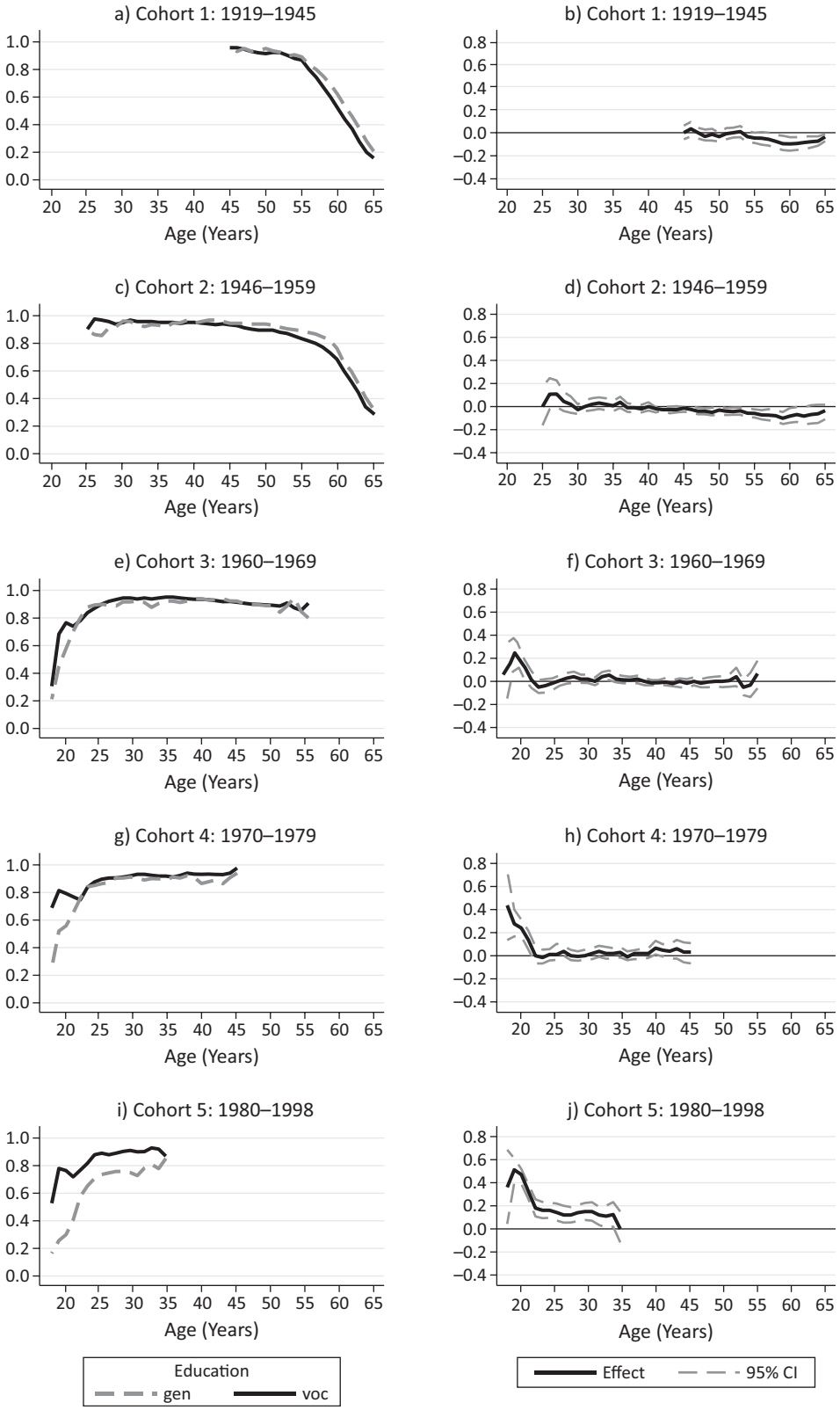

Figure 5. Cohort variation in employment opportunity over the life course: General versus vocational education (men). Notes: Conditional profile plots (left) and conditional effect plots (right) estimated by cohort-specific non-parametric state probability models of vocational and general education on employment probabilities of men. Control variables include period effects, German nationality, parental educational background, residence in West Germany, and educational level. N persons (cohort 1) = 3,232; N person-years (cohort 1) = 28,299; N persons (cohort 2) = 4,778; N person-years (cohort 2) = 49,022; N persons (cohort 3) = 5,463; N person-years (cohort 3) = 45,160; N persons (cohort 4) = 4,205; N person-years (cohort 4) = 24,377; N persons (cohort 5) = 3,547; N person-years (cohort 5) = 10,871. See Tables A7 and A8 in the Appendix for detailed regression results. Data source: GSOEP (n.d.).

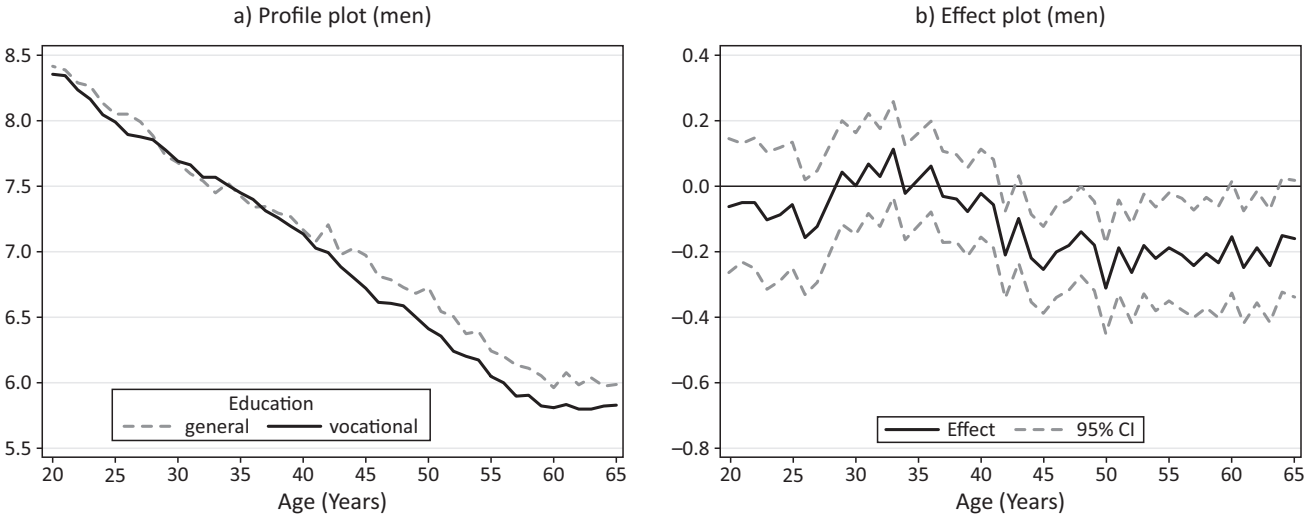

Figure 6. Health satisfaction over the life course: General versus vocational education for men. Note: Conditional profile plots (left) and conditional effect plots (right) estimated by non-parametric models of vocational and general training on health satisfaction. Control variables include period effects, cohort effects, German nationality, parental educational background, residence in West Germany, and educational level. N persons = 20,554; N person-years = 146,548. See Table A9 in the Appendix for detailed regression results. Data source: GSOEP (n.d.).

disability status, nights spent in hospital per year, and the number of doctor visits. Figure 7 shows that a part of the total late-life disadvantage works through health. The significance of this indirect effect depends on the estimation approach: If we pool all age years (55–65) and control for age the overall indirect effect of health is significant. However, if we differentiate by each age as shown in Figure 7, the indirect effect is only significant at ages 57 and 65 (age 63 scratches significance: $p = 0.053$). The corresponding mediated percentage reaches from 5% at 59 to 50% at 65 years of age. The relatively high mediated percentage at age 65 is driven by a small total effect, whereas the indirect effect at this age is comparable in size to that at other ages. In contrast to the indirect effect of vocational versus general education via health, the direct effect is significant at most ages (57–60 and 62–64). Furthermore, Figure 7 shows that the majority of the total effect is a direct effect, not mediated through health.

6. Sensitivity Analyses: The Role of Double Qualifications

One of the most problematic issues when assessing returns to vocational education and general education is how to handle cases with double qualifications. In our sample, 6.7% of respondents attained both a vocational and a general degree over the life course. Most of these individuals did not attain both degrees at the same time, but in a temporal order: While some first attain a general and later a vocational degree, most attain first the vocational and later the general degree (sometimes as part of company-internal further education). We argue that in a typical life course, the vocational degree precedes the general. Therefore, we argue that in such situations, the attainment of the second general degree is endogenous to the first vocational degree. Hence, we have valued cases with double qualifications as having attained vocational education.

There are at least three further ways to deal with double qualifications that combine vocational and general education: (1) model such cases explicitly and compare employment trajectories with both the vocationally and the generally educated, (2) define them as generally educated, or simply (3) drop them. We consider the first approach to be the gold standard for comparing and explaining late-life employment patterns. However, it is not possible to model double qualifications explicitly when comparing and explaining early life employment patterns, as individuals start out with one qualification and then either apply for a position or begin a new education or training programme. In our sample, the earliest age at which trajectories can be compared is 26 due to low numbers of individuals with double qualifications before that age (N = 72 for 25 years of age). Thus, one possible estimation strategy would be to drop all information below age 26 and compare the three groups (vocational, general, and double). However, this modelling strategy only allows for a comparison of those with double qualifications from the time point when they have both qualifications. We therefore miss the employment trajectory at young ages after the obtainment of their first education.

Option 2 also has clear drawbacks: If individuals enjoy high employment probabilities at young ages due to their vocational education and then later on obtain a general education degree, the smooth labour market transition that was due to vocational education is erroneously assessed to be due to general education. Option 3 is also problematic. When individuals obtain a vocational or general degree first and afterwards a second degree; then it is highly likely that both the first degree and the

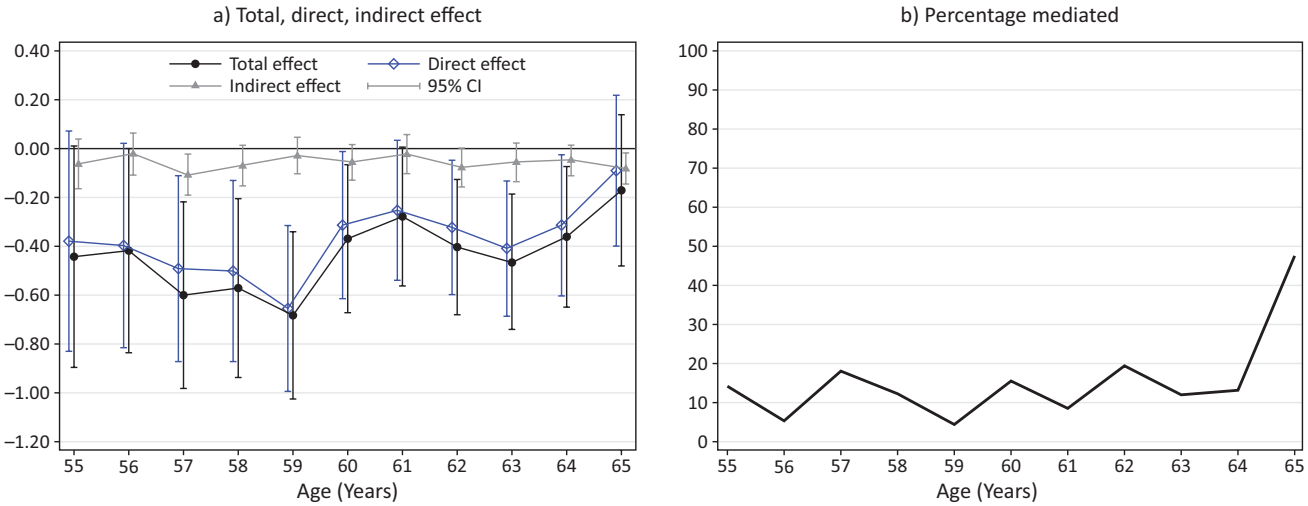

Figure 7. KHB mediation analysis of total, direct, and indirect effects of general versus vocational education on employment probability (not) via health for men. Notes: Total and direct effect of general versus vocational education on age-specific employment probabilities. Indirect effects via health are significant at age 57 and 65. Figure 7a reports log odds. Mediator variables include nights spent in hospital, doctor visits, disability status, and health satisfaction. Control variables include period effects, cohort effects, German nationality, parental educational background, residence in West Germany, and educational level. N persons = 6,026; N person-years = 32,469. Detailed regression results available upon request. Data source: GSOEP (n.d.).

employability situation after the first degree influence the decision to obtain the second degree. Thus, if we drop those with two degrees, we implicitly condition on a collider and the results may be biased due to endogenous selection bias (Elwert & Winship, 2014).

In this robustness section, we present selected results in order to assess the degree of difference between the above sketched options. Figure A3 presents the employment curves for those with double qualifications as compared to those with only vocational and only general degrees. For women, the results show that those with double qualifications have the highest employment probabilities of all three groups until age 52. Between the ages of 53 and 62, employment probabilities do not differ from those with general education only. In later life, employment changes are more similar to those of individuals with vocational education.

For the assessment of the late-life reversal, this pattern has the following implications for women: If those with double qualifications are categorized as having a general education, we estimate an earlier and stronger late-life reversal until the age of 52 and as well a higher late-life reversal from age 53 until 62. After 63, we estimate the same gap with larger confidence intervals. If we exclude this group, the magnitude of the late life-reversal effect until age 52 and again between ages 53 and 62 becomes more pronounced and stays roughly the same after 63 years of age (due to lower number of observations with larger confidence intervals).

For men, the employment pattern of those with double qualifications does not differ substantially from those with vocational education. For the assessment of the late-life reversal, this pattern has the following implications for men: option 2 results in a lower estimation of the late-life reversal effect. If excluded (option 3), the magnitude of the late-life reversal is roughly the same as estimated in Section 5.1 (as the employability pattern does not differ from those of vocationally educated), while confidence intervals increase due to the lower number of cases.

In a second step, we investigate how these differences in measurement affect cohort variations in life course patterns. Due to very small sample sizes of individuals with double qualifications by cohort and age, we are not able to model this group explicitly. Therefore, they were excluded from the analyses. For women, Figure A4 shows that the late-life reversal effect in the earliest born cohort (1919–1945) is roughly the same as in Figure 4, with larger confidence intervals. Results for the other cohorts do not differ between Figure 4 and Figure A4, and are thus not substantially affected by different operationalisations. For men, effect sizes for the oldest cohort (Figure A5) are quite similar to those in Figure 5, aside from larger confidence intervals in the restricted sample. However, for cohort 2, effect sizes differ substantially: no late-life reversal effect is found for the reduced sample. Comparing employment patterns of Figure 5 and Figure A5, the remaining cohort differences are shown to be fully robust when estimated with the restricted sample.

Figure A6 shows that health trajectories of men with double qualifications follow those with general education until 58 years of age. Thereafter, health satisfaction declines faster for those with double qualifications. Thus, the results on health satisfaction would be more pronounced if double qualifications were categorized as gen-

eral education. Furthermore, they would also be more pronounced if excluded.

Finally, Figure A7 shows the somewhat chaotic results for the mediation analysis with the restricted sample. The total effect is only significant for 59 and 64 years of age, losing significance for the other ages. Direct effects are only significant for 59 years of age, whereas indirect effects are not significant for any age. Figure A7b shows the percentage mediated, which is only a meaningful measure when total direct and indirect effects point in the same direction (VanderWeele, 2015). Therefore, we only show this measure after 57 years of age: The percentage mediated circulates around the same magnitude for the restricted sample.

7. Conclusion and Discussion

This study set out to make three important contributions to the lively scientific discussion about returns to vocational and general education over the life course. First, this study dedicates itself to a systematic assessment of cohort variations in life cycle employment patterns between those with general and vocational education. Second, we deliver a systematic assessment of how health in both groups evolves over the life course. Third, we scrutinize health differences as an intervening, mediating mechanism that explains the late-life employment disadvantage of the vocationally educated.

Regarding the importance of cohort effects, our literature review indicated that while several previous studies investigated international variations of the link between general and vocational education and employment patterns over the life course, studies assessing cohort variations are sparse. Therefore, we used long-running multi-cohort panel data to assess cohort variations in life cycle patterns. We propose a theory-guided restriction to control for explicitly measured macro-variables that capture period effects in order to avoid the issue of linear dependency that arises when scholars aim to control for period and cohort effects to estimate age effects. This modelling strategy allows us to control for cohort effects via dummy variables, resting on the assumption that after including explicitly measured period variables, no period trends that are systematically related to age-specific employment differences between the vocationally and the generally educated remain.

While cohort differences do not systematically distort averaged life cycle patterns, averaging age-employment patterns across cohorts masks cohort-specific differences in life cycle patterns as employment patterns vary heavily between cohorts. In particular, the advantage of vocational education at younger ages becomes more pronounced across cohorts. Thus, a modelling strategy that does not explicitly consider such cohort differences misses the boundary conditions that weaken or strengthen the link between vocational versus general education and employability. In contrast, our differentiated research finding suggests that vocational education as a buffer against the risk of employment insecurity and job shopping at the beginning of the professional career has become increasingly important across cohorts.

Regarding health effects, this study illustrates that men with vocational education indeed show a steeper health decline than those with general education. Whereas no significant health differences exist at younger ages, the vocationally educated suffer from lower health satisfaction after midlife. This empirical pattern constitutes an important research finding that supports broadening the scope of research when assessing returns to general versus vocational education. While there is a fast-emerging literature assessing non-monetary returns to education, the literature on vocational versus general education has almost exclusively focused on pecuniary returns.

When it comes to the mediating role of such health differences for the explanation of the lower employability of those with vocational education at older ages, we found that a part of the total effect works through health. We consider this approach as a first step in the direction of explicitly specifying intervening mediating mechanisms and testing such mechanisms using methods of mediation analysis.

Of course, this study has its shortcomings. A causal interpretation of the association between vocational and general education and employment (or health) requires the assumption that there are no unobserved variables between these explanatory variables and the outcomes. However, this assumption is quite unrealistic. As we have outlined in the method section, the identification of direct and indirect effects requires even stronger assumptions than the identification of a total effect. We believe that our efforts to control for period and cohort effects, which are usually unmeasured confounders in previous research, is a step in the right direction. However, there are likely to be more unmeasured confounders at play that endanger a causal explanation. Therefore, as we do not have a causal design, our results are perhaps best regarded as a detailed multivariable description that helps to uncover a broad picture of research explananda.

Furthermore, our finding that the employment advantage of the vocationally educated has become more pronounced across cohorts is based on a comparison of the latest born cohort with the two older cohorts for which we observe career entry. The youngest cohort is particularly selective as many young individuals are still in education. Therefore, future research should assess whether the pattern of increasing employment advantage of vocational education at the beginning of the professional career is still valid once this youngest cohort has become older and entered the labour market entirely. Furthermore, future research should clarify if the pattern of increasing returns of vocational education at the beginning of the professional career holds for future cohorts.

The definition of vocational and general education is another fundamental point. We followed the convention

of previous studies in this field by distinguishing the two groups only with regard to the formal programme type. Furthermore, we presented detailed sensitivity checks that show, in detail, how the decision to handle cases with double qualifications affects results. Similar to other studies, we neglected the fact that the skill content of vocational education and training as well as of higher education programmes strongly differs with regard to its specificity and applicability in different segments of the labour market. In reality, there are highly specific programmes in tertiary education (e.g., medical specialists) and highly general programmes in vocational education and training (e.g., salespersons). This neglect was mainly due to data restrictions: neither PIAAC nor GSOEP data contain information on course content or precise field of study, which would be necessary to identify the degree of vocational programme specificity. Future research in this direction could be conducted with NEPS-SC6 data.

Aside from these limitations, this study has important strengths. It is the first of its kind to show significant cohort variations in life cycle patterns between vocationally and generally educated women and men. Moreover, it provides evidence of a faster health decline among those with a vocational background and shows that some percentage of the total effect of vocational versus general education may work through a faster health deterioration.

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Conflict of Interests

The authors declare no conflict of interests.

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Appendix

1. Tables

1.1. Data Description

Table A1. Distribution of model variables in sample 1 and sample 2. Data source: GSOEP (n.d.).

	Sample 1		Sample 2	
	Mean	Std. Dev.	Mean	Std. Dev.
Employed	0.731		0.733	
Vocational Education	0.738		0.740	
Level of Education				
Lower & Medium Secondary	0.128		0.125	
Higher Secondary	0.533		0.531	
Post-Secondary & Tertiary I	0.195		0.199	
Tertiary II	0.144		0.145	
Health Satisfaction	—		6.830	2.144
Disability	—		0.084	
Hospital nights in "last" year				
None	—		0.891	
1 to 10	—		0.074	
More than 10	—		0.034	
Doctor visits in "last" year				
None	—		0.328	
1 to 10	—		0.355	
More than 10	—		0.316	
Sex: Female	0.526		0.527	
German Nationality	0.966		0.968	
Respondent lives in West Germany	0.752		0.756	
At least one parent with university education	0.131		0.132	
Unemployment Rate (in %)	9.558	1.824	9.637	1.828
GDP Growth Rate (in %)	1.724	2.027	1.699	1.959
Growth Rate of Real Disposable Income (in %)	3.182	2.275	3.103	2.248
Year After the Financial Crisis (2009)	0.033		0.036	
Year Before Cuttings in Unemployment Benefits (2004)	0.038		0.040	
Age	43.154	12.118	43.314	12.047
Cohorts				
1919–1945	0.173		0.165	
1946–1959	0.304		0.304	
1960–1969	0.282		0.285	
1970–1979	0.167		0.172	
1980–1998	0.074		0.074	
Sample-Year				
1984	0.017		0.018	
1985	0.016		0.018	
1986	0.017		0.018	
1987	0.017		0.018	
1988	0.016		0.017	
1989	0.016		0.017	
1990	0.024		—	
1991	0.024		0.025	
1992	0.024		0.025	
1993	0.023		—	
1994	0.023		0.025	
1995	0.023		0.024	
1996	0.023		0.024	
1997	0.022		0.024	

Table A1. (Cont.) Distribution of model variables in sample 1 and sample 2. Data source: GSOEP (n.d.).

	Sample 1		Sample 2	
	Mean	Std. Dev.	Mean	Std. Dev.
1998	0.025		0.026	
1999	0.025		0.026	
2000	0.040		0.043	
2001	0.039		0.042	
2002	0.041		0.043	
2003	0.040		0.042	
2004	0.038		0.040	
2005	0.036		0.038	
2006	0.037		0.040	
2007	0.035		0.038	
2008	0.033		0.035	
2009	0.033		0.036	
2010	0.050		0.053	
2011	0.053		0.052	
2012	0.051		0.052	
2013	0.051		0.050	
2014	0.045		0.045	
2015	0.043		0.045	
N person-years	332,537		309,769	
N persons	44,502		43,106	

Table A2. Educational classification: General vs. vocational education.

ISCED-Level	General	Vocational
2. Lower & medium secondary	Individuals without apprenticeship or other forms of vocational training, but with a lower secondary (i.e., *Hauptschule*) or a middle school (i.e, *Realschule*) degree.	Individuals with partially qualifying apprenticeship or other forms of partially qualifying vocational training and a lower secondary (i.e., *Hauptschule*) or a middle school (i.e, *Realschule*) degree.
3. Higher secondary	Individuals without apprenticeship or other forms of vocational training, but with a high school (i.e., Abitur) degree.	Individuals with fully qualifying apprenticeship or other forms of fully qualifying vocational training and a lower secondary (i.e., *Hauptschule*) or a middle school (i.e, *Realschule) degree*.
4./5. Post-secondary & lower tertiary	Individuals without apprenticeship or other forms of vocational training, but with a university of applied science degree.	Individuals with fully qualifying apprenticeship training or other forms of fully qualifying vocational training and a high school level degree. Individuals with master craftsmen certificates (or any other technical college degrees) and a lower secondary (i.e., *Hauptschule*), a middle school (i.e, *Realschule*) or a high school level (i.e., Abitur) degree. Individuals with fully qualifying apprenticeship training, other forms of fully qualifying vocational training or with master craftsmen certificates (or any other technical college degrees) and with a university of applied science degree.
6. Higher tertiary	Individuals without apprenticeship or other forms of vocational training, but with a university degree.	Individuals with fully qualifying apprenticeship training, other forms of fully qualifying vocational training or with master craftsmen certificates (or any other technical college degrees) and with a university degree.

Table A3. Relative frequencies: General vs. vocational education. Data source: GSOEP (n.d.).

ISCED-Level	General	Vocational	Total
2. Lower & medium secondary	11.67	1.13	12.80
3. Higher secondary	1.62	51.67	53.29
4./5. Post-secondary & lower tertiary	2.97	16.53	19.50
6. Higher tertiary	9.89	4.51	14.40
Total	26.16	73.84	100.00

1.2. Tables for Main Results (Figures 2, 4, 5, and 6)

Table A4. Employment opportunity over the life course: General versus vocational education by gender. Data source: GSOEP (n.d.).

	Women Coef./(se)	**Men** Coef./(se)
46 age dummies	✓	✓
Type of Education (ref.: General Education)		
Vocational Education	1.851***	1.060*
	(0.345)	(0.423)
46 Age times Vocational Education Dummies	✓	✓
Educational Level (ref.: Lower & Medium Secondary)		
Higher Secondary	0.480***	0.548***
	(0.054)	(0.071)
Post-Secondary/Lower Tertiary	0.924***	1.244***
	(0.057)	(0.077)
Higher Tertiary	1.355***	1.713***
	(0.058)	(0.079)
Cohort groups (ref.: 1919–1945)		
1946–1959	0.694***	0.263***
	(0.050)	(0.052)
1960–1969	0.914***	−0.016
	(0.058)	(0.075)
1970–1979	0.833***	−0.126
	(0.061)	(0.084)
1980–1998	0.633***	−0.522***
	(0.068)	(0.091)
Unemployment Rate (in %)	−0.055***	0.104***
	(0.005)	(0.007)
GDP Growth Rate (in %)	−0.010*	0.010
	(0.005)	(0.008)
Growth Rate of Real Disposable Income (in %)	−0.019***	−0.001
	(0.004)	(0.007)
Year After the Financial Crisis (2009)	−0.078	0.081
	(0.041)	(0.059)
Year Before Cuttings in Unemployment Benefits (2004)	0.130***	0.051
	(0.025)	(0.036)
German Nationality (ref.: Not German)	0.151*	−0.072
	(0.068)	(0.085)
Respondent lives in West-Germany (ref.: East-Germany)	0.053	0.774***
	(0.032)	(0.040)
Parents Level of Education (ref.: No Parent with College Education)		
At least one Parent with College Education	−0.023	0.117*
	(0.046)	(0.055)
Constant	−2.085***	−1.442***
	(0.156)	(0.191)
Person-years	174808	157729
Number of persons	23250	21252
Degrees of freedom	110	110
Pseudo-R^2	0.137	0.258

Notes: Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; standard errors in parentheses; dependent variable: employed or not (0/1). Figure 2 based on these regression results.

Table A5. Employment opportunity over the life course: General versus vocational education by cohort (women). Data source: GSOEP (n.d.).

	Cohort 1 Coef./(se)	**Cohort 2** Coef./(se)
Age dummies	**25**	**39**
Type of Education (ref.: General Education)		
Vocational Education	−0.140	1.188
	(0.255)	(0.695)
Age times Vocational Education Dummies	**19**	**39**
Educational Level (ref.: Lower & Medium Secondary)		
Higher Secondary	0.624***	0.470***
	(0.173)	(0.123)
Post-Secondary/Lower Tertiary	1.050***	0.957***
	(0.188)	(0.128)
Higher Tertiary	1.302***	1.595***
	(0.154)	(0.123)
Unemployment Rate (in %)	0.007	−0.107***
	(0.015)	(0.011)
GDP Growth Rate (in %)	0.065***	−0.014
	(0.011)	(0.010)
Growth Rate of Real Disposable Income (in %)	−0.057***	−0.010
	(0.010)	(0.008)
Year After the Financial Crisis (2009)	0.460	−0.204**
	(0.237)	(0.066)
Year Before Cuttings in Unemployment Benefits (2004)	0.617***	0.013
	(0.073)	(0.038)
German Nationality (ref.: Not German)	1.201	−0.821*
	(1.073)	(0.403)
Respondent lives in West-Germany (ref.: East-Germany)	0.119	0.014
	(0.078)	(0.067)
Parents Level of Education (ref.: No Parent with College Education)		
At least one Parent with College Education	0.072	0.033
	(0.150)	(0.120)
Constant	−1.396	0.860
	(1.093)	(0.755)
Person-years	28006	52077
Number of persons	3365	4870
Degrees of freedom	52	92
Pseudo-R^2	0.190	0.093

Notes: Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; Standard errors in parentheses; dependent variable: Employed or not (0/1). Figures 4a, 4b, 4c, and 4d based on these regression results.

Table A6. Employment opportunity over the life course: General versus vocational education by cohort (women). Data source: GSOEP (n.d.).

	Cohort 3 Coef./(se)	**Cohort 4** Coef./(se)	**Cohort 5** Coef./(se)
Age dummies	**36**	**26**	**16**
Type of Education (ref.: General Education)			
Vocational Education	1.718**	2.619***	1.481
	(0.581)	(0.600)	(0.782)
Age times Vocational Education Dummies	**36**	**26**	**16**
Educational Level (ref.: Lower & Medium Secondary)			
Higher Secondary	0.524***	0.554***	0.488***
	(0.107)	(0.101)	(0.107)
Post-Secondary/Lower Tertiary	0.836***	0.978***	1.254***
	(0.111)	(0.100)	(0.122)
Higher Tertiary	1.191***	1.187***	1.663***
	(0.118)	(0.101)	(0.139)
Unemployment Rate (in %)	−0.029*	−0.005	0.031
	(0.013)	(0.016)	(0.022)
GDP Growth Rate (in %)	−0.006	−0.080***	−0.236***
	(0.011)	(0.019)	(0.040)
Growth Rate of Real Disposable Income (in %)	−0.003	0.023	0.102***
	(0.009)	(0.015)	(0.031)
Year After the Financial Crisis (2009)	0.108	−0.186	−0.760***
	(0.083)	(0.105)	(0.167)
Year Before Cuttings in Unemployment Benefits (2004)	0.040	−0.023	−0.286*
	(0.044)	(0.063)	(0.143)
German Nationality (ref.: Not German)	0.130	0.312**	0.388**
	(0.125)	(0.101)	(0.119)
Respondent lives in West-Germany (ref.: East-Germany)	−0.021	0.057	0.354***
	(0.069)	(0.058)	(0.071)
Parents Level of Education (ref.: No Parent with College Education)			
At least one Parent with College Education	−0.153	0.006	0.028
	(0.087)	(0.069)	(0.083)
Constant	−1.036***	−2.726***	−2.567***
	(0.292)	(0.372)	(0.286)
Person-years	48657	30994	13870
Number of persons	5752	5094	4135
Degrees of freedom	86	66	46
Pseudo-R^2	0.042	0.048	0.117

Note: Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; standard errors in parentheses; dependent variable: Employed or not (0/1). Figures 4e, 4f, 4g, 4h, 4i and 4j based on these regression results.

Table A7. Employment opportunity over the life course: General versus vocational education by cohort (men). Data source: GSOEP (n.d.).

	Cohort 1 Coef./(se)	**Cohort 2** Coef./(se)
Age dummies	**25**	**39**
Type of Education (ref.: General Education)		
Vocational Education	0.073	0.098
	(0.659)	(1.026)
Age times Vocational Education Dummies	**25**	**39**
Educational Level (ref.: Lower & Medium Secondary)		
Higher Secondary	0.640***	0.982***
	(0.162)	(0.174)
Post-Secondary/Lower Tertiary	1.346***	1.486***
	(0.164)	(0.177)
Higher Tertiary	1.728***	1.948***
	(0.147)	(0.171)
Unemployment Rate (in %)	−0.053***	−0.081***
	(0.015)	(0.016)
GDP Growth Rate (in %)	0.035*	−0.019
	(0.014)	(0.018)
Growth Rate of Real Disposable Income (in %)	−0.013	0.012
	(0.012)	(0.014)
Year After the Financial Crisis (2009)	0.605**	−0.123
	(0.185)	(0.096)
Year Before Cuttings in Unemployment Benefits (2004)	0.351***	−0.041
	(0.069)	(0.057)
German Nationality (ref.: Not German)	−1.882***	0.185
	(0.342)	(0.388)
Respondent lives in West-Germany (ref.: East-Germany)	0.898***	0.740***
	(0.081)	(0.078)
Parents Level of Education (ref.: No Parent with College Education)		
At least one Parent with College Education	0.246	0.208
	(0.140)	(0.143)
Constant	3.919***	1.034
	(0.700)	(0.915)
Person-years	27163	49022
Number of persons	3232	4778
Degrees of freedom	52	92
Pseudo-R^2	0.313	0.176

Notes: Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; standard errors in parentheses; dependent variable: Employed or not (0/1). Figures 5a, b, c and d based on these regression results.

Table A8. Employment opportunity over the life course: General versus vocational education by cohort (men). Data source: GSOEP (n.d.).

	Cohort 3 Coef./(se)	**Cohort 4** Coef./(se)	**Cohort 5** Coef./(se)
Age dummies	**36**	**26**	**16**
Type of Education (ref.: General Education)			
Vocational Education	0.601	2.183**	1.901**
	(0.698)	(0.839)	(0.735)
Age times Vocational Education Dummies	**36**	**26**	**16**
Educational Level (ref.: Lower & Medium Secondary)			
Higher Secondary	0.668***	0.233	−0.004
	(0.152)	(0.142)	(0.129)
Post-Secondary/Lower Tertiary	1.470***	1.157***	0.878***
	(0.169)	(0.177)	(0.174)
Higher Tertiary	2.136***	1.637***	1.247***
	(0.187)	(0.198)	(0.245)
Unemployment Rate (in %)	−0.080***	−0.099***	−0.110***
	(0.021)	(0.022)	(0.021)
GDP Growth Rate (in %)	0.023	0.070**	0.018
	(0.019)	(0.023)	(0.053)
Growth Rate of Real Disposable Income (in %)	−0.001	−0.021	−0.038
	(0.015)	(0.019)	(0.041)
Year After the Financial Crisis (2009)	0.151	0.572**	−0.211
	(0.131)	(0.178)	(0.213)
Year Before Cuttings in Unemployment Benefits (2004)	0.013	0.017	0.020
	(0.081)	(0.099)	(0.156)
German Nationality (ref.: Not German)	−0.116	−0.076	−0.105
	(0.144)	(0.140)	(0.138)
Respondent lives in West-Germany (ref.: East-Germany)	0.826***	0.570***	0.639***
	(0.093)	(0.091)	(0.097)
Parents Level of Education (ref.: No Parent with College Education)			
At least one Parent with College Education	0.120	0.033	−0.069
	(0.118)	(0.108)	(0.104)
Constant	−2.321***	−1.435***	−1.335***
	(0.408)	(0.366)	(0.308)
Person-years	45160	24377	10871
Number of persons	5463	4205	3547
Degrees of freedom	86	66	46
Pseudo-R^2	0.112	0.150	0.252

Notes: Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; standard errors in parentheses; dependent variable: Employed or not (0/1). Figures 5e, f, g, h, i and j based on these regression results.

Table A9. Health satisfaction over the life course: General versus vocational education for men. Data source: GSOEP (n.d.).

	Men Coef./(se)
46 age dummies	✓
Type of education (ref.: General education)	
Vocational education	−0.288
	(0.334)
46 age * vocational education dummies	✓
Educational level (ref.: Lower & medium secondary)	
Higher secondary	0.303***
	(0.050)
Post-secondary/lower tertiary	0.510***
	(0.052)
Higher tertiary	0.749***
	(0.051)
Cohorts (ref.: 1919–1945)	
1946–1959	−0.117**
	(0.043)
1960–1969	−0.224***
	(0.048)
1970–1979	−0.324***
	(0.053)
1980–1998	−0.493***
	(0.060)
Unemployment rate (in %)	−0.017***
	(0.004)
GDP growth rate (in %)	−0.022***
	(0.005)
Growth rate of real disposable income (in %)	0.014***
	(0.004)
Year after the financial crisis (2009)	−0.145***
	(0.033)
Year before Hartz reforms (2004)	−0.079***
	(0.021)
German nationality (ref.: Not German)	−0.238***
	(0.049)
Respondent lives in West Germany (ref.: East Germany)	0.284***
	(0.028)
Parents Level of education (ref.: No parent with college education)	
At least one parent with college education	0.078*
	(0.033)
Constant	8.796***
	(0.119)
Person-years	146548
Number of persons	20554
Degrees of freedom	110
Pseudo-R^2 overall	0.088

Notes: Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; standard errors in parentheses; dependent variable: Health satisfaction. Figure 6 based on these regression results.

2. Figures

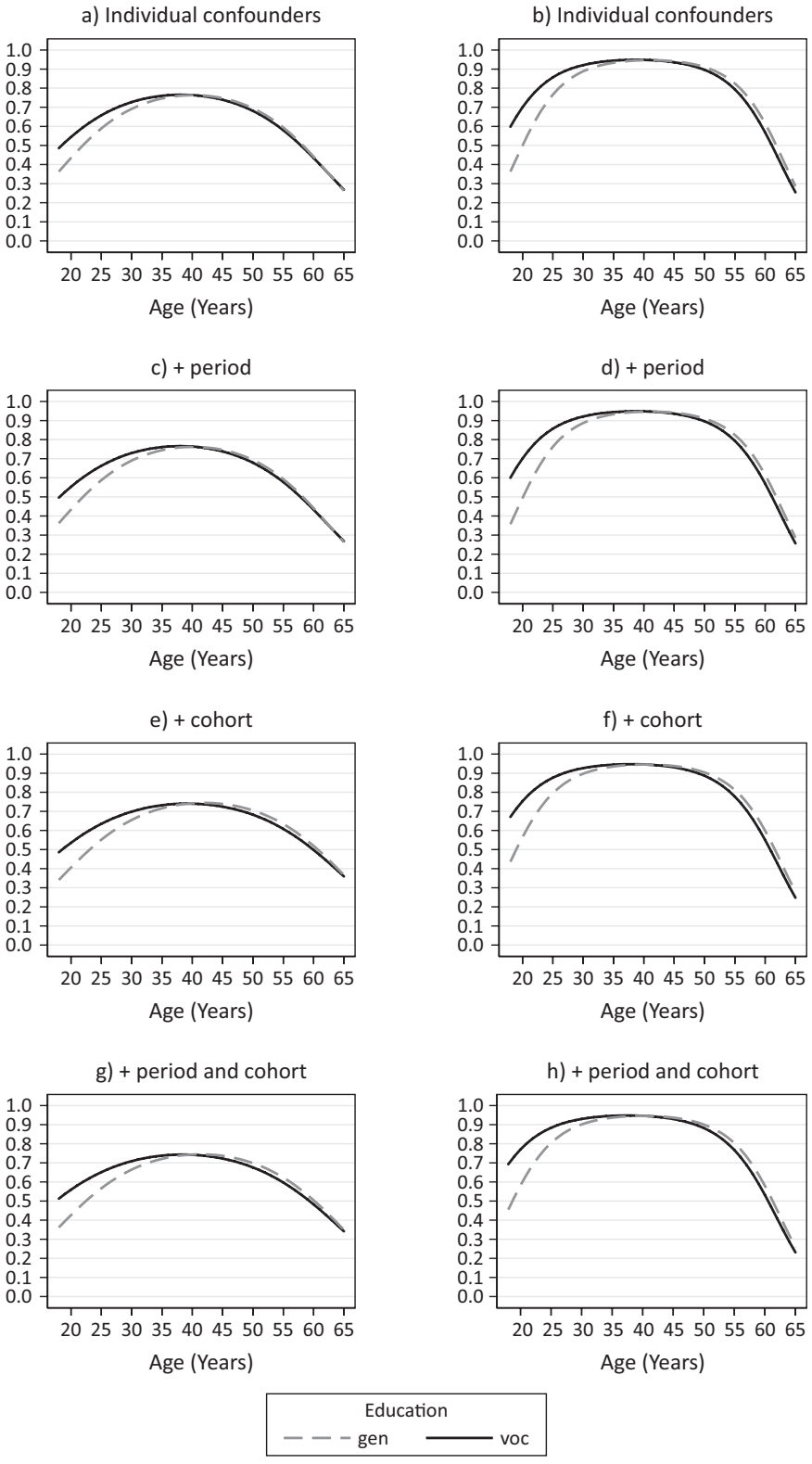

Figure A2. The importance of period and cohort effects for age trajectories for women (left) and men (right). Employment opportunity over the life course: General versus vocational education by gender. Note: Conditional profile plots for women (left) and men (right). Control variables include period effects, cohort effects, German nationality, parental educational background, residence in West Germany, and educational level. N persons = 44,502; N person-years = 332,537. Detailed regression results available upon request. Data source: GSOEP (n.d.).

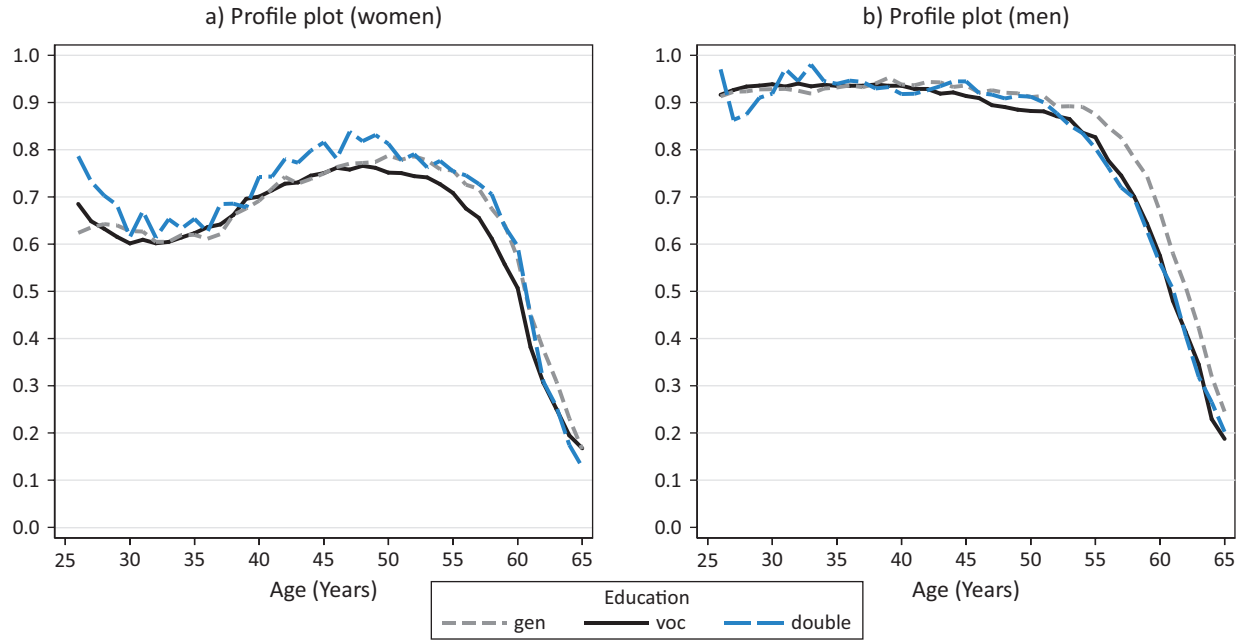

Figure A3. Sensitivity analysis: The role of double qualifications. Employment opportunity over the life course: General, vocational, and double qualifications by gender. Notes: Conditional profile plots for women (left) and conditional profile plots for men (right) estimated by gender-specific non-parametric state probability models on employment probabilities. Control variables include period effects, cohort effects, German nationality, parental educational background, residence in West Germany, and educational level. Detailed regression results available upon request. Data source: GSOEP (n.d.).

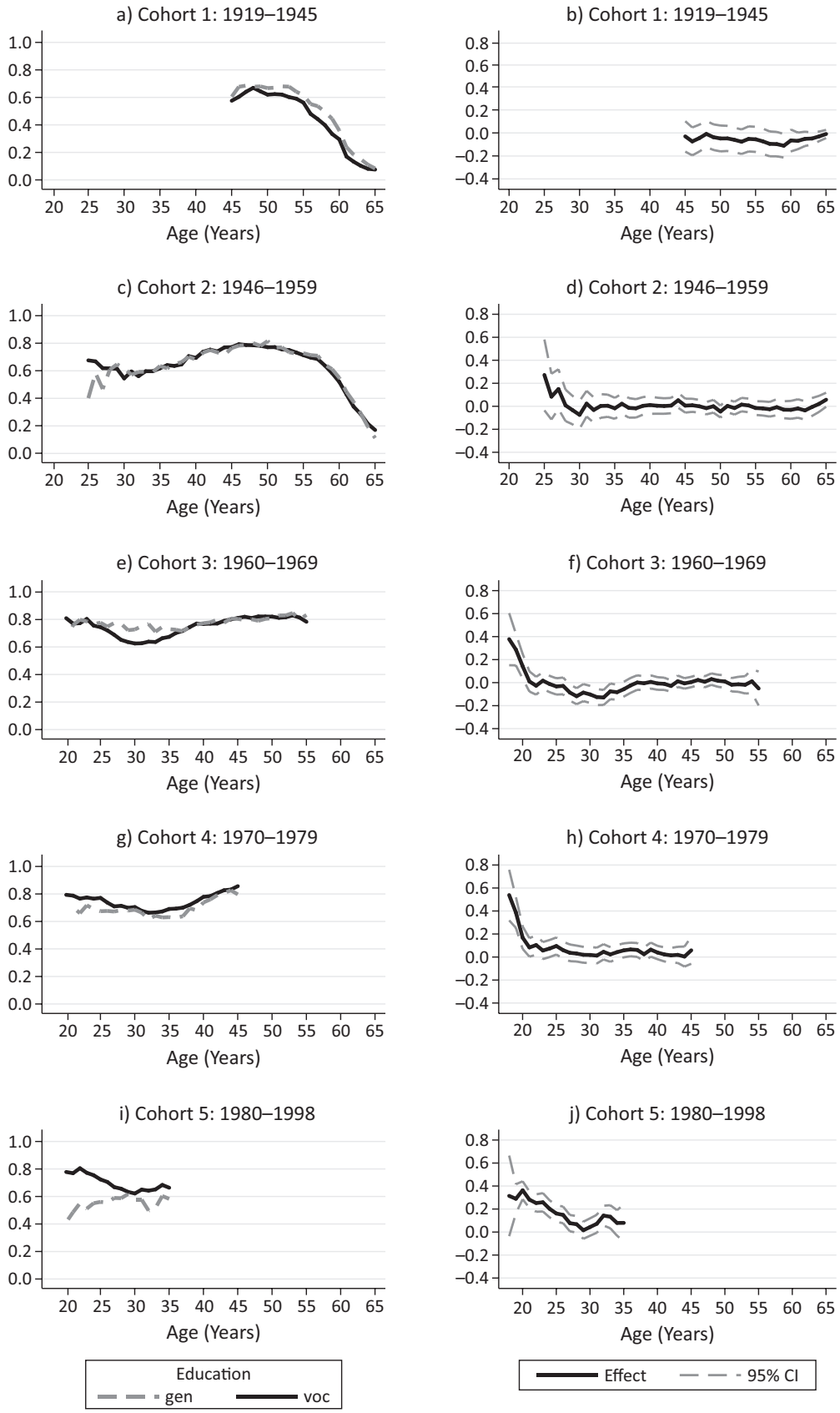

Figure A4. Cohort variation in employment opportunity over the life course: General versus vocational education (women), net of double qualifications (women). Notes: Conditional profile plots (left) and conditional effect plots (right) estimated by cohort-specific non-parametric state probability models of vocational and general education on employment probabilities of women. Control variables include period effects, German nationality, parental educational background, residence in West Germany, and educational level. Detailed regression results available upon request. Data source: GSOEP (n.d.).

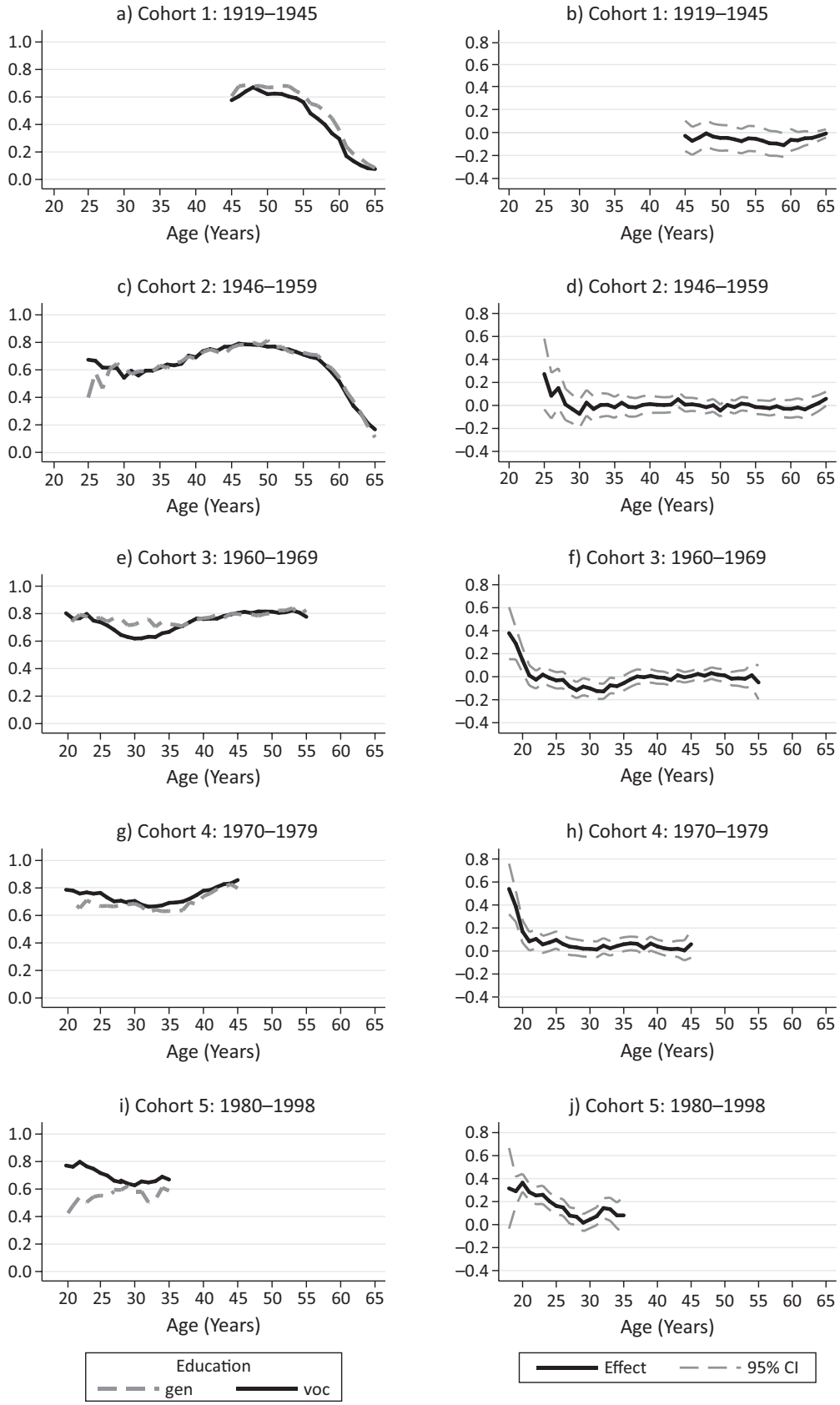

Figure A5. Cohort variation in employment opportunity over the life course: General versus vocational education, net of double qualifications (men). Notes: Conditional profile plots (left) and conditional effect plots (right) estimated by cohort-specific non-parametric state probability models of vocational and general education on employment probabilities of men. Control variables include period effects, German nationality, parental educational background, residence in West Germany, and educational level. Detailed regression results available upon request. Data source: GSOEP (n.d.).

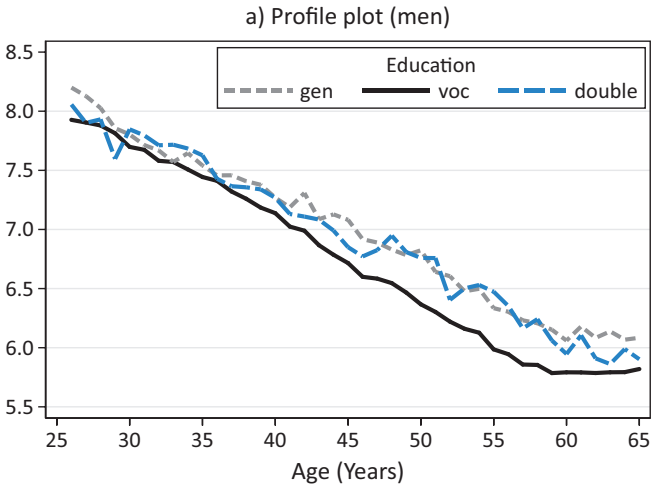

Figure A6. Health satisfaction over the life course: General versus vocational and double qualifications (men). Notes: Conditional profile plot estimated by non-parametric models of vocational and general training on health satisfaction. Control variables include period effects, cohort effects, German nationality, parental educational background, residence in West Germany, and educational level. Detailed regression results available upon request. Data source: GSOEP (n.d.).

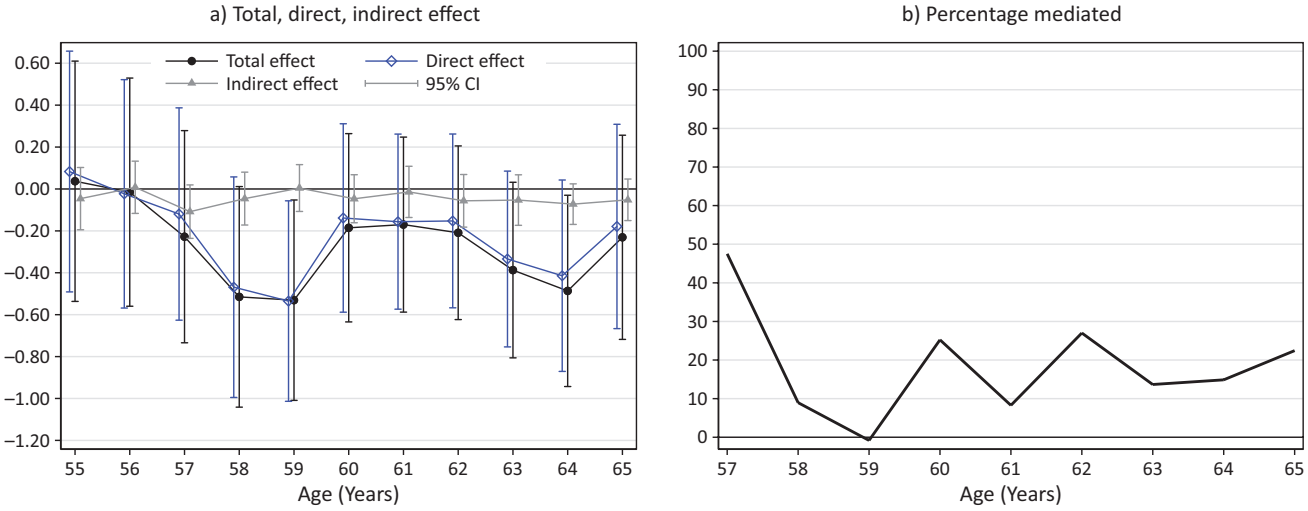

Figure A7. KHB mediation analysis of total, direct, and indirect effects of general versus vocational education on employment probability (not) via health for men (net of double qualifications). Notes: Total and direct effect of general versus vocational education on age-specific employment probabilities. Indirect effects not significant. Figure A7a reports log odds. Mediator variables include nights spent in hospital, doctor visits, disability status, and health satisfaction. Control variables include period effects, cohort effects, German nationality, parental educational background, residence in West Germany, and educational level. Detailed regression results available upon request. Data source: GSOEP (n.d.).

Reference

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Article

The Interplay between Education, Skills, and Job Quality

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Abstract
Compared to general education, vocational education and training (VET) has been shown to facilitate young people's integration into the labour market. At the same time, research suggests that VET falls short in teaching basic skills and, in turn, may lead to less adaptability to labour market changes and long-term disadvantages in individual labour market outcomes. To better understand the relationships between education, skills, and labour market outcomes, we examine to what extent job quality differs between individuals with general education and those with VET with respect to different skill levels. Furthermore, we investigate whether the relationship between type of qualification and job quality differs by skills. We broaden past research by considering four indicators of job quality: earnings, job security, job autonomy, and the match between respondents' abilities and job demands. Using data from the Programme for the International Assessment of Adult Competencies for Germany, we demonstrate that individuals with academic education and advanced VET score higher in job quality concerning earnings and job autonomy as compared to individuals with initial VET. Comparing the two higher qualified groups, academic education is more associated with higher earnings than advanced VET, while the level of job autonomy is similar. Regarding the abilities-demands match, both groups score lower than individuals with initial VET. Moreover, higher literacy skills are associated with higher levels of job quality irrespective of the type and level of formal qualification. Finally, we find no empirical evidence that skills compensate for or reinforce disadvantages in job quality derived from professional qualifications.

Keywords
adult competencies; dual training system; general education; Germany; job autonomy; job quality; job security; literacy skills; Programme for the International Assessment of Adult Competencies; vocational education and training

Issue
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1. Introduction

In the era of digitalisation and knowledge-based societies, strategies to promote high skills are pursued to enhance a country's productivity and competitiveness. Key measures include broadening and raising the share of academic qualifications as well as promoting lifelong learning to increase the overall skills of the adult population. Concurrently, vocational education and training (VET) and equipping the workforce with work-specific skills play a key role in educational policies. In the Riga Conclusions of 2015 (European Commission, 2015), strengthening and modernising the vocational training system remains a priority of the European skills agenda, not least to support social inclusion by promoting the upskilling of the adult population and labour market inclusion of young people and groups disadvantaged on the labour market like migrant or unskilled workers.

This policy connects to studies that have shown that VET facilitates school-to-work transition and results in low rates of youth unemployment (Bol & van de Werfhorst, 2013; Forster, Bol, & van de Werfhorst, 2016; Müller & Shavit, 1998). At the same time, the advantage of VET relative to general education changes over the course of a working life and varies between national contexts, dynamics of the economy, and education and labour market systems (Brunello & Rocco, 2015; Hanushek, Schwerdt, Woessmann, & Zhang, 2017; Levels, van der Velden, & Di Stasio, 2014). One reason for the diminishing advantage of VET in relation to general education over the life-course may be that VET fosters work-specific skills, but compared to general education, it falls short in teaching basic skills such as literacy, numeracy, and problem-solving skills. This may lead to less adaptability to labour market changes and, hence, long-term disadvantages in individual labour market outcomes. While these basic skills have been shown to affect labour market outcomes, in particular wage returns and employment rates (Green & Riddell, 2015; Koutná & Janícko, 2018; McIntosh & Vignoles, 2001), it is as yet unclear whether they impact labour market outcomes over and above the type of professional education.

Moreover, generating income is not the only property of a job. Job security, rewarding relationships with colleagues and management, job autonomy, and having control over one's job tasks are examples of other job quality facets that have been shown to impact job motivation, job satisfaction, productivity, and turnover rates. As basic skills have become ubiquitous in today's society (McIntosh & Vignoles, 2001), we can expect that these skills affect not only earnings, but also other job quality characteristics. If the lack of basic skills is the reason for disadvantages in individual labour market outcomes, improving these skills should also be reflected in higher job quality.

Our research question focuses on whether job quality differs between individuals with general education and those with VET with respect to their different skill levels. Thereby, our contribution to past research is threefold: First, we expand the concept of job quality from earnings to additional labour market outcome variables, namely job security, job autonomy, and the presence (or absence) of a match between job demands and personal abilities. Second, we investigate whether basic skills (operationalised as literacy skills) have an impact on these job quality indicators over and above the level and type of formal qualification. And third, we look at whether well-developed literacy skills can compensate for, or rather reinforce, disadvantages in terms of job quality derived from formal qualifications. In our study, we focus on Germany where the vocational track has traditionally been strong and continues to play a prominent role in the education and labour market system.

We start with contextualising the role of VET in Germany against general education (Section 2). From here we introduce past research and delineate our research questions (Section 3). In Section 4, we specify our sampling approach, data, and variables. Our results, which we present in Section 5, are organised along the models we ran for each job quality indicator.

2. Country Context

Throughout all Organisation for Economic Co-operation and Development (OECD) countries, academic qualifications and higher education (i.e., tertiary education at universities, polytechnics, and universities of applied sciences or in vocational tracks) are of growing importance. Between 2000 and 2017, the share of younger adults with tertiary education (the 24–35 years age group) reached an OECD average of 44%, presenting an increase by more than 19% (OECD, 2018). With 31% and an increase of less than 14% over the same period, Germany remains at the lower end (OECD, 2018). This may be due to the competitive position of the German VET system, which continues to uphold a key role for economic prosperity and social mobility, even under conditions of globalisation, welfare state restructuring, demographic shifts, and economic crises. In Germany, well-developed vocational skills still ensure a smooth school-to-work transition (Müller & Shavit, 1998), low rates of youth unemployment (OECD, 2018), and stable employment and career progression (OECD, 2012).

The German system, based on highly standardised and stratified educational and occupational routes, ensures the tight coupling between skill formation and occupational labour markets (Allmendinger, 1989; Greinert, 2007; Rubery & Grimshaw, 2003), which is crucial for the process of job allocation. Employers can expect specific skills based on certificates that are standardised across schools, training programmes, and federal states. At the same time, individuals can expect that their investments in specific skills will pay off as educational and vocational routes are organised along linearity and upward mobility. The attendance of continuing education enhances future career perspectives, typically linked to higher income. For VET, the principle of linearity is reflected in the German *Meister* and *Techniker* advanced vocational qualifications, recognised (since 2014) as equivalent to a bachelor's degree in the German and European Qualifications Framework (EQF). While the *Meister* qualification supports job mobility, it may also be pursued to move into self-employment as it is a precondition in many areas and crafts to establish one's own business. This route, however, is not further considered in our study due to the assumed different notion of job quality associated with self-employment.

Stratified educational and occupational routes are also anchored in the German school system, which prepares pupils as early as at the age of ten (or twelve in some federal states) to either pursue a vocational track (with graduation after grade 9 or 10) or an academic track to obtain university entry qualification (*Abitur* after grade 12 or 13). Changing between the different school

types is possible, but not very common, particularly as concerns moving into higher school tracks (Blossfeld, 2018). This institutional stratification makes the German school system rigid, resulting in early social stratification (Dustmann, 2004; Schindler & Reimer, 2010). Early tracking furthermore restricts subsequent educational and career choices as well as job flexibility among the workforce (Glaesser, 2008; Solga, 2008).

3. Theoretical Framework and Research Questions

Investigating the relationship between education, skills, and job quality connects to theories of labour market returns on education. Traditional human capital theory assumes that higher investments in education yield higher productivity, which is gratified by higher earnings (Becker & Chiswick, 1966). Measured by years of education, this assumption, however, does not shed light on the differentiation between general versus vocational education. When looking closer at investments in general as compared to vocational education, the relative position of advantages and disadvantages in terms of earnings and other job-related variables has been found to change over the lifecycle: comparing 11 countries using the Adult Literacy Survey (IALS)—a Programme for the International Assessment of Adult Competencies (PIAAC) prestudy—Hanushek et al. (2017) found a trade-off between general education relative to vocational education, with advantages in earnings turning from vocational to general education around age 30 and flattening off around age 50. These findings are supported by Hampf and Woessmann (2017) who compare 16 countries using the PIAAC data. Both studies apply a difference-in-difference approach to compare labour-market outcomes (income, employment rate) across different age cohorts for male respondents with general and vocational education.

Apart from earnings (or income) as one important returns-on-education indicator, concepts of job quality include work organisation, job security, job flexibility, and employee participation, among other possible indicators (Holman, 2013). Trade-offs between general versus vocational education were also found for job security, one indicator of job quality we look at: While investments in specific human capital are considered to generate higher job stability particularly at early career stages due to their closer linkage to job requirements (Gervais, Livshits, & Meh, 2008), they are also considered riskier because specific human capital limits individuals' job flexibility and adaptation capacity to changing work tasks, technologies, or service demands. Hence, vocational education may increase the risk of unemployment or wage losses with age (Forster et al., 2016), particularly under conditions of rapid technological change or economic instability (Hanushek et al., 2017).

Signalling theory (Spence, 1973) provides an alternative explanation for the relationship between education and labour market outcomes. Modelling job allocation as an investment decision under uncertainty, observable characteristics such as certificates, educational degrees, or previous work experience serve as a symbol or signal for employers by providing information on the individual's job-related competence and productivity. In turn, individuals invest in signal adjustments (e.g., through education and training) as long as they can expect adequate returns to these investments. Studies have found that in countries with high degrees of external differentiation (i.e., tracking), educational certificates send a stronger signal about an individual's skills than in countries with low external differentiation. Consequently, in the former case, formal qualifications play a stronger role for success on the labour market (Andersen & Van De Werfhorst, 2010; Gesthuizen, Solga, & Kunster, 2011; Solga, 2008).

While the analysis of life-course effects is not within the scope of our article, these theoretical approaches guide us in developing our first two research questions: (1) To what extent does job quality differ between individuals who have completed general education and those who have completed a vocational qualification? (2) Does job quality also differ with respect to their different skill levels?

For Germany, signalling theory suggests that degrees are associated with higher job quality as external differentiation is marked. Furthermore, human capital theory suggests that general education yields higher job quality than vocational education because of higher job flexibility and the capacity to adapt to changing work requirements, which lowers the risk of unemployment or wage losses. Although being categorised as an "apprenticeship country", Hanushek et al. (2017) found that higher earnings for individuals with general education were particularly marked in Germany. This is explained by the fast technological development Germany has been undergoing, which is assumed to disadvantage skilled workers when they become older due to their limited capacities to adapt.

Both human capital and signalling theories fall short in explaining the impact of skills on job quality. While formal education confers credentials in form of years successfully completed and certificates obtained, uncertainty remains about the actual skills individuals have acquired or possess (Hunter & McKenzie Leiper, 1993) and how they affect labour market outcomes. This refers to occupation-specific skills (Eggenberger, Rinawi, & Backes-Gellner, 2018; Forster & Bol, 2018; Kracke, Reichelt, & Vicari, 2018) as well as basic skills commonly assessed as literacy, numeracy, and problem-solving skills (Heisig & Solga, 2015; Zabal et al., 2014). The complexity of work processes, automation, and the decentralisation of decision-making of today's working life lead to growing skill demands across all sectors so that the possession of basic skills can be considered a prerequisite to perform in the labour market (OECD, 2013). The question is how relevant they are as compared to formal qualifications when it comes to job quality. Basic skills have been shown to affect wage outcomes and employment rates (Koutná & Janícko, 2018; McIntosh

& Vignoles, 2001). Based on Canadian data, Green and Riddell (2015) showed that the effect of basic skills on earnings is substantial: in their analyses, a 25-point increase in literacy and numeracy skills (half of a standard deviation) was associated with an increase in earnings equivalent to an additional year of schooling, while one extra year of schooling raised average basic skills by 4.5 to 6%. Work experience, by contrast, had little impact on basic skills, which means that the positive relationship between work experience and earnings arises for other reasons. This shows that basic skills are largely obtained and signalled through formal education and have significant causal effects on labour market success. However, they also have their own independent effect that cannot be explained by schooling (Green & Riddell, 2015; OECD, 2016). While basic skills are also acquired in other contexts than schooling and through lifelong learning as practice engagement theory posits (Massing & Schneider, 2017; Reder, 1994), they are obviously highly recognised by employers.

This means that it is possible that basic skills can compensate for the lack of formal qualification, thus reducing differences in job quality between educational levels. Alternatively, basic skills may widen the job quality gap between different educational levels and qualifications if the opportunities or motivation to acquire these skills correlate with the type of education or if employers reward the combination of formal qualification *and* skills. These considerations lead us to look at the potential interaction between formal education and basic skills and ask: (3) Does the relationship between the type of qualification and job quality vary by skill level?

4. Data and Variables

4.1. Data

We use German large-scale data from the first wave of the PIAAC study conducted in 2012, which comprises a representative sample of 5,465 individuals. PIAAC was initiated by the OECD to provide internationally comparative measures of the skills of the working-age population between 16 and 65 years old (OECD, 2013). In particular, three basic skills are assessed: literacy, numeracy, and problem-solving skills in technology-rich environments. As all three basic skills highly correlate (.7 or higher), we use only literacy for our analyses. Literacy is commonly understood as the most basic of the three skill types (Massing & Schneider, 2017).

Our sample size varies by outcome variable from 2,084 for "earnings" to 2,217 for our "abilities-demands match", due to the different numbers of missing cases for the respective job quality indicator. For our samples, we considered employees who had completed a general or vocational qualification, who showed valid literacy measures, and who were not self-employed. We excluded self-employed individuals, assuming that job quality may be contextualised differently for self-employment and depended employment, which may produce incomparable results.

4.2. Variables

Our dependent variables are four indicators of job quality. *Earnings* is a generated variable defined as gross hourly earnings. We use hourly earnings in Euros to be able to study earnings of full- as well as part-time workers, including bonuses. Earnings are logarithmised to approximate a normal distribution, as the distribution of income is normally skewed to the right, and to prevent potential outliers from becoming too influential. Using logarithmised earnings, our (unstandardized) regression coefficients for earnings can be interpreted as percentage changes of wages. *Job security* is measured by differentiating between permanent and temporary contracts, associating a permanent contract with higher job security. *Job autonomy* is an index variable measured by individuals' self-assessed impact on task sequence, work performance, and working speed/rate. The original questions are: "To what extent can you choose or change the sequence of your tasks; how you do your work; the speed or rate at which you work?" Answers are coded in five categories ranging from one ("not at all") to five ("to a very high extent"). The results of a principal component analysis showed that these items capture one single latent dimension; the rotated factor loadings were all around .8. We use the factor values to measure job autonomy. Finally, we consider a variable assessing employees' perception of whether they need further training in order to cope well with their current duties. This is a binary variable ("yes"/"no") that we labelled *abilities-demands match*. Notably, while PIAAC provides a generated measure of vertical and horizontal skills mismatch, the applicability of this measure is strongly questioned, particularly for Germany (Rammstedt et al., 2013, 223–225). We thus refrained from using this generated measure.

Our main independent variables are *education* and *skills*. We measure respondents' professional qualification by their highest vocational or university degree, harmonised into a common scheme based on the International Standard Classification of Education (ISCED) of 1997 (UNESCO Institute for Statistics, 2006). To differentiate between general and vocational education, we generate three groups: ISCED level 3 (referred to as "initial vocational education" or "initial VET") includes employees who have completed a vocational training leading to skilled worker level (*Facharbeiter* or *Fachangesteller*). ISCED level 3 also includes individuals with higher education entrance qualification, but who did not complete any other vocational or academic qualification. The proportion of this group cannot be identified in the data, but for Germany it is smaller than 10% (Federal Statistical Office, 2018). We differentiate between two further groups, both categorised as ISCED level 5: individuals who have completed an advanced occupation-specific qualification, e.g., the German *Meister* qualifi-

cation or equivalent (categorised at ISCED level 5B and referred to as "advanced vocational education" or "advanced VET"); and individuals who have completed a university or university of applied sciences degree, representing general education (categorised as ISCED level 5A and referred to as "academic qualification" in the following). The OECD defines ISCED levels 5A and 5B both as "tertiary education" or "higher education".

In PIAAC, *literacy skills* are objectively assessed and encompass the ability to understand, use, and interpret written texts, e.g., drug labels or newspaper articles (Rammstedt et al., 2013). Based on the data of all countries participating in PIAAC, the items were scaled using item response theory (IRT). They produced a score ranging from zero to 500 points with an average of 250 points and a standard deviation of 50 points.

PIAAC requires considering the IRT to account for uncertainty resulting from measuring only a subset of items per person, which represent their proficiency distribution (Von Davier, Gonzalez, & Mislevy, 2009). For each person, 10 plausible values are available (Zabal et al., 2014). For this purpose, we treat the plausible values for literacy skills as multiply imputed values. Furthermore, we use replication weights assigned to every respondent, which in Germany are based on the delete-one jackknife approach with 80 replicate weights (Perry, Helmschrott, Konradt, & Maehler, 2017).

Respondents' and their parents' school qualification, age, gender, migration status, and firm size are our control variables. Because it is possible that the relationships between levels of education, skills, and job quality are the result of the (self-)selection of graduates of lower levels of schooling into VET, we control for respondents' school tracks as well as their parents' educational background and include their highest school qualification at the time of the interview into our models. We distinguish between "general education grade 9 or below", "general education grade 10", and "vocational upper secondary or general higher education entrance qualification".

We use *age* as a proxy for worker's experience and seniority, which have been shown to be positively correlated with job quality (Mumford & Smith, 2004; Wright, 1978). However, as previous research has found that the impact of age is not linear (Desjardins & Warnke, 2012; Kirsch, Jungeblut, Jenkins, & Kolstad, 1993), we include age as linear and quadratic term into our models. In addition, we control for gender as women have shown to be disadvantaged compared to men in terms of wage, occupational status, and job promotions (Altonji & Blank, 1999; Blau & Kahn, 2017). This gender gap is particularly marked in Germany, not least due to the German VET system and its close coupling with the labour market and welfare system (Haasler, 2014; Haasler & Gottschall, 2015). To control for migration background, we differentiate between natives, first generation immigrants, and second generation immigrants based on information on the country of birth of the respondents' parents. A vast amount of research demonstrates that immigrants have a lower job quality than natives. Key explanatory factors are limited international transferability of human capital, discrimination, and incomplete assimilation (Aldashev, Gernandt, & Thomsen, 2008; Friedberg, 2000; Junankar & Mahuteau, 2004; Nielsen, Rosholm, Smith, & Husted, 2004). Finally, we include *firm size* as a control for workplace characteristics. In our multivariate analyses, we treat firm size as a numeric variable that can assume five values as can be seen in Table 1.

5. Results

Figures 1 and 2 illustrate the findings of our empirical analyses (our full regression models can be found in the Appendix, Tables A1 to A4). For easier interpretation, we standardised all metric dependent and independent variables to have a mean of zero and a standard deviation of one.

Figure 1 shows the unconditional relationships between qualification, skills, and job quality: an academic or advanced vocational education is associated with higher earnings and job autonomy, whereas job security does not depend on the type or level of qualification. For the fourth dimension, "abilities-demands match", we find that an advanced qualification, vocational or academic, is associated with a wider gap between abilities and job demands than initial vocational education. This means that employees without an advanced qualification expressed less need for further training.

More specifically: the earnings of employees with advanced vocational or academic education are, on average, .38 (advanced VET) and .64 (academic education) standard deviations higher than the income of employees with initial VET. This means that individuals with advanced VET have an earnings advantage of 18% over individuals with initial VET, and individuals with academic education earn 31% more. This can partly be explained by the fact that individuals with tertiary education spend more years in the educational system and thus receive higher returns on their educational investment. The results for job autonomy cannot be translated into an everyday measure as they are based on factor values, but they show the same picture: academic qualification (.32 standard deviations) as well as advanced VET (.23 standard deviations) are associated with higher job autonomy than initial VET. Regarding the matching of abilities and job demands, employees with advanced vocational or academic qualification are 2.5 (academic education) and 1.9 (advanced VET) times more likely to feel that they need further training to be able to do their job well than employees with initial VET. This latter finding could be explained by higher qualified employees being more likely to take on higher level responsibilities which require transversal, leadership, and social skills. These skills are typically acquired through further training, not formal training. Given this assumption, our results can be interpreted from three different perspectives.

Table 1. Summary statistics.

	Overall (mean/%)	Initial VET (mean/%)	Advanced VET (mean/%)	Academic (mean/%)
Dependent variables				
Income				
Hourly earnings incl. bonus in €	16.21	13.45	17.77	21.94
Job security				
Permanent contract (%)	84.05	83.13	87.81	83.74
Job autonomy				
Sequence of tasks (1–5)	3.66	3.52	3.83	3.86
How to do tasks (1–5)	3.78	3.67	3.96	3.93
Working speed (1–5)	3.68	3.63	3.77	3.73
Autonomy factor	0.01	−0.12	0.18	0.24
Abilities-demands match				
No training necessary task fulfilment (%)	51.83	60.32	42.00	38.04
Independent variables				
Literacy skills (0–500)	276.03	260.66	286.58	305.56
Gender (%)				
Female	47.67	48.34	47.86	45.98
Migration (%)				
German	82.76	81.39	85.23	84.38
1st generation migrant	6.98	7.34	8.16	5.34
2nd generation migrant	10.27	11.27	6.61	10.28
Age (in years)	42.68	42.49	43.49	42.61
Professional qualification (%)				
Initial VET	58.94	—	—	—
Advanced VET	16.23	—	—	—
Academic education	24.83	—	—	—
School qualification (%)				
General education grade 9 or below	28.09	46.66	15.14	0.00
General education grade 10	41.96	53.34	51.50	8.70
Vocational upper secondary or general higher education entrance qualification	29.96	0.00	33.36	91.30
Parental educational qualification (%)				
Low (ISCED 1, 2, and 3C short)	9.61	12.57	7.57	3.93
Medium (ISCED 3 [excluding 3C short] and 4)	58.16	67.55	54.32	38.38
High (ISCED 5 & 6)	32.23	19.88	38.11	57.70
Firm size (%)				
1 to 10 people	32.52	28.48	21.58	13.00
11 to 50 people	26.44	26.97	27.88	24.23
51 to 250 people	24.29	23.57	21.98	27.49
251 to 1000 people	15.06	12.72	17.31	19.14
More than 1000 people	10.70	8.26	11.25	16.14

First, employees with advanced education (vocational or academic) simply have a lower job quality (with respect to this dimension) than employees with initial vocational education. Higher level responsibilities at work that may include staff and managerial responsibilities open up the possibility of not being equipped with these skills, leading to employees feeling over-challenged. Second, *not* feeling the need for further training might be an indicator for having a job or employment situation that offers no opportunities for professional development. In this case, our indicator would not measure job quality but a *lack* of job quality. Third, employees with an advanced education might have a different conception of their jobs in that they consider continuously improving their skills as an integral part of their job. In this case, our indicator would not measure job quality, but different job conceptions. This perspective is supported by Gauly and Lechner (2019), who show that highly skilled workers are more inclined to participate in work-related training.

To determine which of the three perspectives most likely applies needs further data and analyses, but also depends on the definition of "job quality". If one considers *subjectively perceived* job quality, the third perspective is probably correct. From a more normative stand-

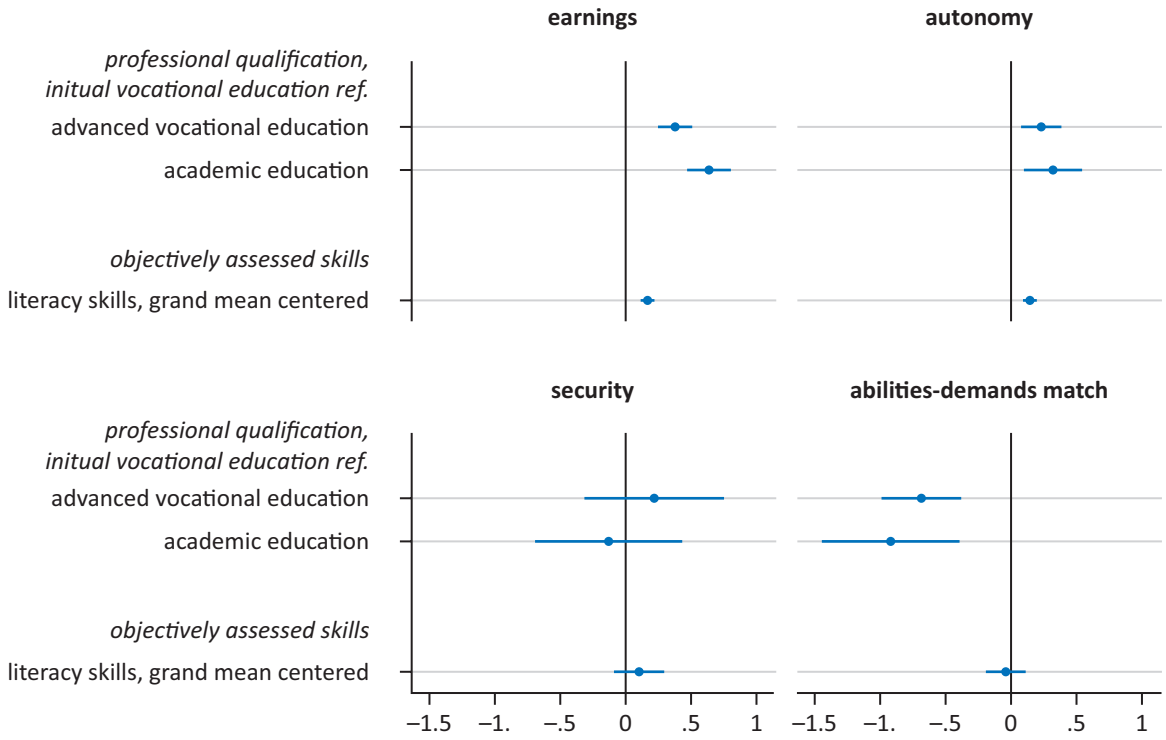

Figure 1. Associations of professional qualification and literacy skills with four indicators of job quality. Notes: PIACC 2012, continuous variables standardized; N(earnings) 2,084, N(autonomy) 2,216, N(security) 2,218, N(abilities-demands match) 2,217; the axis refers to either changes in S.D. (earnings and autonomy) or logits (security and abilities-demands match); controls: gender, migration, school qualification, age, age-squared, firm size, parental education.

point, job quality might be associated with how a job affects the individual's quality of life or opportunities for career development. If the quality of life is deemed decisive, and if the perceived need for further training is an indicator for being overstrained or feeling inadequate, our results may point to employees with advanced education having worse jobs than those with initial VET (with respect to this dimension of job quality). If opportunities to further one's career are being understood as an indicator of a good job, our results show that employees with an advanced education have better jobs.

Turning to our second research question, we find that literacy skills correlate with two dimensions of job quality, namely earnings and autonomy. For job security and the match between abilities and demands, the coefficients are not statistically significant. Since we use cross-sectional data, we cannot be sure whether literacy skills lead to jobs which are better paid and grant more autonomy, or whether well-paid jobs with a high level of autonomy imply tasks that enhance literacy skills, or both.

An argument in favour of the first perspective—literacy skills leading to better paid jobs with higher levels of job autonomy—is evidence that the number of years of work experience has little impact on enhancing literacy and numeracy skills (Green & Riddell, 2015). Against this, one could argue that not just working in general, but having a job that is cognitively demanding is decisive for improving one's basic skills. Such a job is more likely to require advanced vocational or academic education. Accordingly, studies have shown that a stimulating work environment facilitates using one's skills and learning by doing (Bynner & Parsons, 1998; Reder, 2009).

To answer our third research question, we included an interaction term between the level and type of education and literacy skills in model 2 (Figure 2). We wanted to find out whether literacy skills can compensate for a low level of formal qualification, or rather increase differences in job quality between individuals with different levels of qualification. Our results show that none of the interaction effects are statistically significant. It might be possible that both effects are decisive at the same time. Within the limits of our analyses, we cannot answer this question.

In conclusion, we found differences in job quality between employees with initial vocational education on the one hand, and those with advanced vocational or academic education on the other. These differences refer to two job quality dimensions, earnings and autonomy. Our results for the match between abilities and demands cannot be easily interpreted. For job security, measured by type of employment contract (i.e., permanent versus temporary), we found no differences between the three groups. This let us conclude that for the type of employment contract held, factors like age, gender, and sector may be more decisive than education. For example, temporary employment contracts are more common among young employees than older workers, and women are more affected than men. They are also much more used

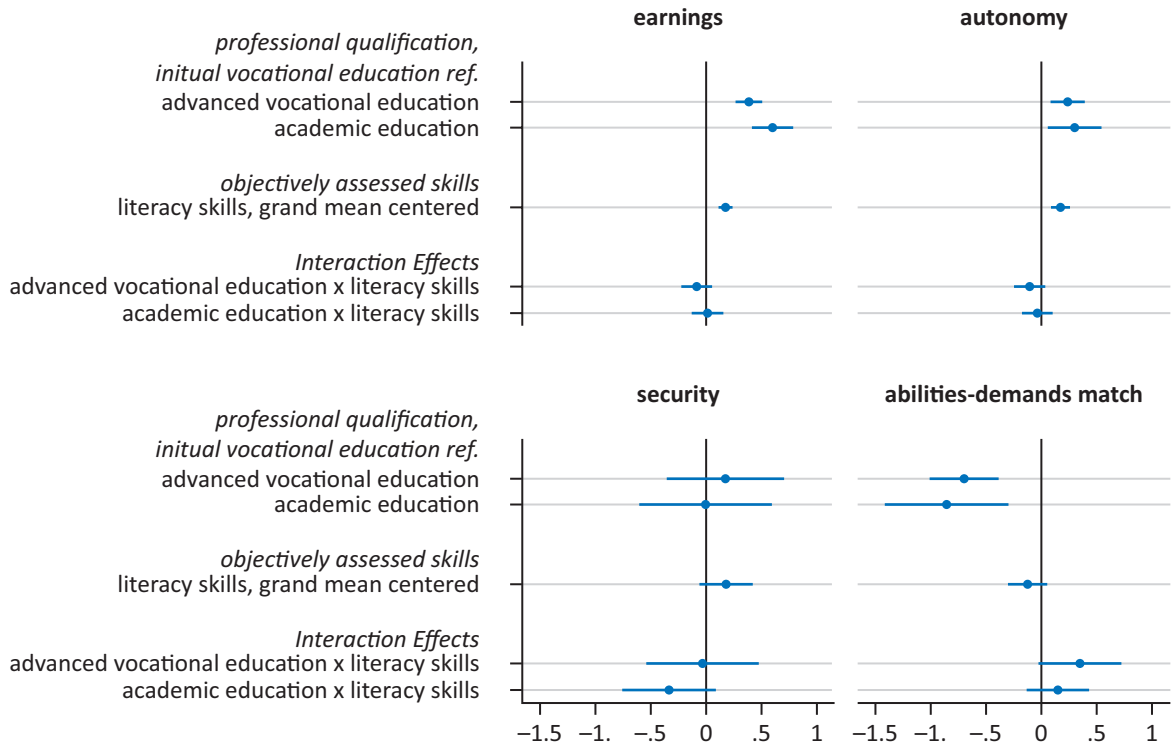

Figure 2. Associations of professional qualification and literacy skills and interactions between the two with four indicators of job quality. Notes: PIACC 2012, continuous variables standardized; N(earnings) 2,084, N(autonomy) 2,216, N(security) 2,218, N(abilities-demands match) 2,217; the axis refers to either changes in S.D. (earnings and autonomy) or logits (security and abilities-demands match); controls: gender, migration, school qualification, age, age-squared, firm size, parental education.

in the service sector (particularly in personal social services) than in industry (Haasler & Gottschall, 2015).

6. Conclusions

Our aim was to answer the question whether job quality differs between skills and types of professional education. In a second step, we wanted to shed light on the interaction between types of education and skill levels in impacting on job quality. Using the German PIAAC data, we could consider job security, job autonomy, and abilities-demands match as indicators of job quality in addition to earnings.

Our results show that employees with academic and advanced vocational qualification score higher in job quality with respect to earnings and job autonomy than individuals who have completed initial VET. Comparing the two higher-qualified groups, an academic education was associated with higher earnings than an advanced vocational qualification, while the level of job autonomy was similar for both groups and higher than for initial VET. Employees with academic or advanced vocational qualification more often expressed that they needed further training to cope with their job demands (abilities-demands match) than employees with initial VET. This result is difficult to interpret but may result from higher qualified employees assuming more responsible jobs and managerial tasks that require further training. Job security, by contrast, did not depend on the type or level of qualification.

With respect to literacy skills, our results showed that irrespective of the type and level of formal qualifications, basic literacy skills have an independent impact on job quality. This result is also supported by Hanushek et al. (2017), who find an incremental effect of literacy skills on income. Importantly, basic literacy skills are not solely the result of schooling but are also acquired in other contexts and through lifelong learning. Hence, the level of formal qualification either frames the opportunities and incentives to increase literacy skills, or employees are selected (or select themselves) into a career that enhances opportunities for increasing literacy skills, or both. We assume that both mechanisms may apply but leave this question to future research.

Our analyses lead to a double-sided conclusion: On the one hand, basic skills have shown to affect job quality irrespective of the level of qualification. On the other hand, skills and schooling are important for individual labour market outcomes; but for Germany, the level of professional qualification based on certificates is still decisive for job quality. This finding can be attributed to the highly formalised VET system and tight coupling between formal qualifications and the labour market system. The high scores for job quality for individuals with an advanced vocational qualification at *Meister* level reflects the strong position of the vocational track with es-

tablished career progression routes and protected employment. In this context, the possible impact and social inclusion effect of informal and lifelong learning, accreditation of prior learning, and similar measures to include disadvantaged groups into the labour market may potentially be rather weak.

Our study certainly has limitations. First, neither the data nor our analytical model allow for analysing causal effects. Rather, we make conclusions on relationships between education, skills, and job quality and derive possible explanations. Second, we cannot detail which specific skills could enhance job quality. Specifying literacy, numeracy, and problem-solving skills (which in PIAAC highly correlate), or occupation-specific skills acquired in general versus vocational education, may lead to differentiated results. Third, our categorisation of professional qualification may not adequately represent the actual skills acquired in a particular educational programme (Eggenberger et al., 2018), which may vary in their degree of occupational specificity (Forster & Bol, 2018). Fourth, our findings apply only to dependently employed and not to self-employed individuals. Fifth, the PIAAC data does not allow for completely ruling out potential selection effects. Still, our study introduces new perspectives on the relationships and interactions between skills, education, and labour market outcomes, in particular through considering different dimensions of job quality and providing insight into the specific role of advanced vocational qualifications on job quality in Germany.

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Conflict of Interests

The authors declare no conflict of interests.

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Appendix

Table A1. Full regression results for hourly earnings.

	Model 1			Model 2		
	exp(b)	se		exp(b)	se	
Gender (Male = Ref.)						
Female	−.30	.04	***	−.30	.04	***
Age	1.17	.14	***	1.17	.14	***
Age-squared	−.97	.14	***	−.98	.14	***
Migration status (Native = Ref.)						
1st generation migrant	.14	.06		.14	.07	
2nd generation migrant	−.12	.06		−.12	.06	
Professional qualification (Initial VET = Ref.)						
Advanced VET	.38	.05	***	.39	.06	***
Academic education	.64	.08	***	.60	.09	***
Literacy skills	.17	.02	***	.18	.03	***
School qualification (Higher education = Ref.)						
General education I (≤ grade 9)	.02	.08		.00	.07	
General education II (= grade 10)	−.02	.07		−.03	.09	
Parental educational qualification (Medium (ISCED 3 [excl. 3C short] and 4) = Ref.)						
Low [ISCED 1, 2, and 3C short	.00	.06		.00	.06	
High (ISCED 5 & 6)	−.02	.04		−.01	.04	
Firm size	.33	.02	***	.33	.02	***
Interactions						
Advanced VET*literacy				−.08	.07	
Academic education*literacy				.02	07	
Constant	−.08	.08		−.06	.09	
Number of observations	2,084			2,084		
Population size	20,683,806			20,683,806		

Notes: *** p < .001, ** p < .01, *p < .05; continuous variables standardized. Estimation with sample design weights. Cluster-robust standard errors with correction for the 10 plausible values of literacy skills.

Table A2. Full regression results for job autonomy.

	Model 1			Model 2		
	exp(b)	se		exp(b)	se	
Gender (Male = Ref.)						
Female	−.07	.04		−.07	.04	
Age	.12	.18		.13	.18	
Age-squared	−.02	.19		−.04	.19	
Migration status (Native = Ref.)						
1st generation migrant	.03	.10		.03	.10	
2nd generation migrant	−.42	.09	***	−.42	.09	***
Professional qualification (Initial VET = Ref.)						
Advanced VET	.23	.08	**	.24	.07	**
Academic education	.32	.11	**	.30	.12	**
Literacy skills	.15	.03	***			
School qualification (Higher education = Ref.)						
General education I (≤ grade 9)	.14	.13		.12	.13	
General education II (= grade 10)	.12	.11		.10	.11	
Parental educational qualification (Medium (ISCED 3 [excl. 3C short] and 4) = Ref.)						
Low [ISCED 1, 2, and 3C short	−.05	.07		−.05	.08	
High (ISCED 5 & 6)	.08	.05		.08	.05	
Firm size	−.05	.02	*	−.06	.03	*
Interactions						
Advanced VET*literacy				−.11	.07	
Academic education*literacy				−.04	.07	
Constant	−.14	.11		−.11	.12	
Number of observations	2,216			2,216		
Population size	22,012,599			22,012,599		

Notes: *** p < .001, ** p < .01, *p < .05; continuous variables standardized. Estimation with sample design weights. Cluster-robust standard errors with correction for the 10 plausible values of literacy skills.

Table A3. Full regression results for job security, logit coefficients.

	Model 1			Model 2		
	exp(b)	se		exp(b)	se	
Gender (Male = Ref.)						
Female	−.32	.14	*	−.33	.14	*
Age	3.00	.49	***	3.03	.50	***
Age-squared	−2.60	.51	***	−2.65	.52	***
Migration status (Native = Ref.)						
1st generation migrant	.37	.29		.38	.29	
2nd generation migrant	−.10	.20		−.11	.20	
Professional qualification (Initial VET = Ref.)						
Advanced VET	.22	.27		.18	.27	
Academic education	−.13	.28		−.01	.30	
Literacy skills	.10	.10		.18	.12	
School qualification (Higher education = Ref.)						
General education I (≤ grade 9)	.15	.31		.16	.31	
General education II (= grade 10)	.22	.25		.17	.25	
Parental educational qualification (Medium (ISCED 3 [excl. 3C short] and 4) = Ref.)						
Low [ISCED 1, 2, and 3C short	−.35	.25		−.35	.26	
High (ISCED 5 & 6)	.19	.14		.20	.15	
Firm size	.12	.06		.13	.07	
Interactions						
Advanced VET*literacy				−.03	.26	
Academic education*literacy				−.34	.21	
Constant	1.73	.30	***	1.78	.31	***
Number of observations	2,218			2,218		
Population size	21,975,517			21,975,517		

Notes: *** p < .001, ** p < .01, *p < .05; continuous variables standardized. Estimation with sample design weights. Cluster-robust standard errors with correction for the 10 plausible values of literacy skills.

Table A4. Full regression results for abilities-demands match, logit coefficients.

	Model 1			Model 2		
	exp(b)	se		exp(b)	se	
Gender (Male = Ref.)						
Female	−.07	.08		−.06	.08	
Age	−1.07	.36	**	−1.11	.36	**
Age-squared	1.31	.36	**	1.35	.37	***
Migration status (Native = Ref.)						
1st generation migrant	−.33	.18		−.33	.18	
2nd generation migrant	.37	.20		.38	.20	
Professional qualification (Initial VET = Ref.)						
Advanced VET	−.68	.15	***	−.70	.16	***
Academic education	−.92	.27	***	−.86	.28	**
Literacy skills	−.04	.08		−.13	.09	
School qualification (Higher education = Ref.)						
General education I (≤ grade 9)	−.02	.29		.04	.28	
General education II (= grade 10)	−.29	.24		−.23	.24	
Parental educational qualification (Medium (ISCED 3 [excl. 3C short] and 4) = Ref.)						
Low [ISCED 1, 2, and 3C short	.15	.18		.15	.18	
High (ISCED 5 & 6)	−.10	.11		−.11	.11	
Firm size	−.07	.05		−.08	.05	
Interactions						
Advanced VET*literacy				.35	.19	
Academic education*literacy				.14	.14	
Constant	.60	.26	*	.50	.27	*
Number of observations	2,217			2,217		
Population size	22,018,324			22,018,324		

Notes: *** p < .001, ** p < .01, *p < .05; continuous variables standardized. Estimation with sample design weights. Cluster-robust standard errors with correction for the 10 plausible values of literacy skills.

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Article

"I Didn't Have the Luxury to Wait": Understanding the University-to-Work Transition among Second-Generations in Britain

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Abstract
Second-generations—children of immigrants—experience particular university-to-work transitions in the UK, including precarious entry into the labour market This article examines the importance of intersecting social divisions, such as gender and ethnicity to these transitions, and also explores complexities within long-term economic progression. By comparing the educational achievement and labour market integration of British-born female graduates from one of the largest—Pakistani—and newly settled—Algerian—migrant groups and by focusing on long-term progression from the first job post-graduation to the most recent one. Using repeat semi-structured interviews with twelve British Pakistani and Algerian female graduates, this article produces a fine-grained analysis of key academic and economic stages. It reveals how the contextualised impact of intersecting social divisions—social class, ethnicity, as proxy for culture and religion, and gender—and the ability to maximise and increase one's identity capital improve employability, transforming initial disadvantages into pathways for success.

Keywords
capital; ethnicity; female graduates; gender; second-generation; social class; UK labour market; university education

Issue
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1. Introduction

Driven by colonial ties, Pakistani migrants arrived in the UK in the 1970s to support the country's industrial development following the end of World War II (Judt, 2007). Being predominantly male, uneducated and from working-class backgrounds, these migrants lacked immediate transferable skills, were confined to low-paid manual jobs and had limited opportunities to move up the social ladder (Rattansi, 2011).

Pakistani women, by contrast, arrived as spouses and experienced a more complex engagement in the labour market as upon migration, they suffered economically from the then declining industrial sector in the late 1970s (Brah, 1996, 2003). Being subjected to attributions that were in operation during colonial times (e.g., constraining cultures) created further obstacles as these affected the support the women received from governmental and educational bodies which in turn influenced jobs employers offered (Brah, 1996). Expectations from within their families to act as symbolic bearers of strict cultural, ethnic and gender identities also meant that these women were compelled to take on only unpaid jobs in family-run businesses or stay out of work (Afshar, 1989).

In many aspects, Algerians' settlement in the UK differs considerably from that of Pakistanis. For instance, Algerians do not have any colonial links with the UK which can have a significant impact on how they are perceived. Absence from the social imaginary of the majority ethnic group may indeed protect Algerians from the extent of negative stereotype experienced by Pakistanis, as a well-known group who has historically suffered from racism and discrimination (Rattansi, 2011; Weedon, 2004). Moreover, the initial wave of Algerian migrants

in the 1980s included mostly well-qualified individuals (Collyer, 2003). It is only during the late 1990s that migrants from more remote, poorer and rural areas, with limited education came to Britain and joined its industrial workforce (Collyer, 2003).

Unlike Pakistanis who are now the second largest South Asian group and the largest Muslim group in the UK (Office for National Statistics, 2016), there are only an estimated 22,000 Algerian migrants (Migration Policy Centre, 2013). It is mainly a male population, very young and for the most part with no academic qualifications (The Change Institute, 2009). However, Collyer (2003) has argued that university-educated but undocumented Algerians are unable to secure professional jobs as a result of their illegal status in the country. Similarly, he pointed to the limited opportunities for Algerian healthcare professionals to work as independent practitioners because of the language requirement necessary for the recognition of their qualifications.

Although structural barriers affect the employability of university-educated migrants, their UK-born children, the second-generation, can become a means of upward social mobility for the family by gaining academic qualifications (Modood, 2004). Indeed, in post-industrial European countries, such as the UK, significant value is attached to Higher Education (HE) qualifications which are perceived to guarantee individual economic success (Organisation for Economic Co-operation and Development [OECD], 2018). By opening access to high-skilled jobs with higher earnings, academic qualifications can thus help second-generation to transcend initial individual and family disadvantages over the life course, including class and/or ethnic disadvantages especially those experienced within the context of migration (OECD, 2018).

Using semi-structured interviews, this article focuses on the university-to-work transition among British-born Pakistani and Algerian female graduates. The relationship between educational achievements and labour market outcomes is examined through elements of stratification of HE, including choice of institution and field and level of study. This cross-group comparison offers a unique insight into how intersecting social divisions—gender, class and ethnicity—may influence educational and employment pathways not only in access to first job post-graduation but also in terms of long-term impact of HE qualifications on career progression.

2. Theoretical Framework

Bourdieu (1980) argues that children from working-class backgrounds are unlikely to succeed in tertiary education unless they undergo a process of acculturation, that is, they acquire a minimum of the social and cultural capitals which dominate in HE and are shared by their privileged peers. Consequently, they struggle at the lowest levels of society, educationally and professionally, as they lack profitable capital altogether—including material, social and cultural forms.

Although Bourdieu's point on acculturation is useful, it remains grounded within a class-based perspective, overlooking the importance of other intersecting social divisions such as ethnicity as argued by Modood (2004), for whom, children of immigrants do not have to acculturate to succeed in HE. By examining the 'unconventional' educational patterns of working-class minority ethnic students, he suggests that these students may lack profitable capital, as defined by Bourdieu, but possess an ethnic capital, that is their individual agency and parental involvement, which works to raise aspirations for the pursuit of, and success in, tertiary education.

Encompassing all forms of capital (i.e., material, social, cultural and ethnic), Côté (1996, p. 424) advances the concept of identity capital which examines how individuals develop educational, social and psychological resources "to secure social-class mobility, or to reproduce one's class position". In relation to education, this concept offers insights into how students negotiate their education-to-work transition; placed within the labour market framework, it recognises how individuals manage their entry and then maintain their professional positions. Identity capital thus allows understandings of how "social background, educational experiences, and other 'investments'" can materialise into economic success over the life course (Côté, 1996, p. 424). The latter relates to investment in one's identities such as one's student identity (e.g., through completion of additional degrees).

In that sense, the existence of multiple identities, shaped along various categories, allows for the intersection of all forms of capital and in turn, understanding these multiple identities illuminates how individuals negotiate new social positions. This is precisely what Anthias (2008) argues but with a focus on the spatial and contextual processes involved in the construction of social positions, such as student and worker positions, making it possible to uncover how individuals are placed (or place themselves) in a given space at a certain time. Attention to contextualised social positions thus complements the fluid reading of Côté's (1996, 2002) notion of identity capital since it recognises shifts in how identity capital can be used as a resource, for example, for educational and employment achievements.

In this article the notion of identity capital helps to understand how individuals deploy strategies to navigate personal and structural challenges in a situated and relational way, not only during their university-to-work transition but also when settling within other social spaces such as HE and employment spaces. Additionally, the intersectional approach allows a consideration of social class, ethnicity—as a proxy for culture and religion—and gender dynamics. The latter relates to the ways in which the feminine body goes through pressure to conform to various expectations (Brah, 1996; Weedon, 2004). This intersectional framework helps to examine how the female participants in this study are positioned within their families and in society and how societal, cultural and religious expectations and/or barriers may operate to make

them 'adjust' their behaviour, first, as students and then as professional women.

3. Patterns and Gaps in UK Higher Education and Labour Market

3.1. Experiences and Outcomes of British Pakistani Female Graduates

Although traditionally second-generation Pakistanis have had low educational attainment in compulsory and tertiary education, in recent years, these patterns have changed (Heath, Rothon, & Kilpi, 2008). In 2017/18, eleven per cent of all university students were British Asians (Higher Education Statistics Agency [HESA], 2019). Compared to their White peers, they are now also more likely to go to university and pursue undergraduate studies (Modood & Calhoun, 2015).

This increase in university participation is nonetheless shaped by intersecting factors involving structural barriers and personal social divisions including gender, ethnicity and social class. For instance, the existence of "institutional filtering", as Malik and Wykes (2018) suggest, partly explains the underrepresentation of minority ethnic students in elite universities. At the same time, working-class students tend to join local institutions to reduce financial costs, but also because of fears of not fitting in to more prestigious institutions (Reay, Crozier, & Clayton, 2009). The latter is also true for minority ethnic students from middle-class backgrounds (Noden, Shiner, & Modood, 2014). In that respect, for minority ethnic students, both social class and a sense of belonging, strongly influence university choices since these enable feelings of social acceptance at university by a group with whom they share similar characteristics (Bourdieu, 1980).

Research focused on South Asian women identifies an additional dynamic between gender and ethnic factors in producing university entry, experiences and outcomes (e.g., Dale, Shaheen, Kalra, & Fieldhouse, 2002; Dwyer & Shah, 2009; Hussain & Bagguley, 2012). The need for South Asian women to maintain strict gender identities reinforces pressure to conform to cultural expectations, which in turn, affects their entry at university, especially for Pakistanis who may be subject to religious expectations too (Brah, 1996). They also have to negotiate the pursuit of tertiary education with their parents who view the university environment as a white space which can negatively impact on their daughters' behaviour (Ijaz & Abbas, 2010). These negotiations may translate into applications made to local universities which would not require on-campus living for instance (Dwyer & Shah, 2009).

These initial structural and personal barriers strongly impact British Pakistani graduates' transition into the labour market. For instance, qualifications from less-prestigious institutions restrict access to high-profile professions (Noden et al., 2014). Similar to their migrant peers, South Asian female graduates may also face racist and discriminatory practices and cultural stereotypes held by potential employers, preventing them from converting their qualifications into matched professional statuses (e.g., Kamenou, Netto, & Fearfull, 2013; Khattab, 2009). These racist and discriminatory practices and cultural stereotypes are grounded in discourses of otherness which construct hierarchical positions between the 'us' (i.e., majority ethnic group) and 'them' (i.e., minority ethnic groups) in post-colonial societies (Rattansi, 2007). These discourses position the 'other' as constrained and subordinated and subsequently exclude it from (privileged) spaces, such as higher managerial and professional jobs, which are perceived to be an entitlement of the majority ethnic group (Goldberg, 2009).

Further research on the impact of ethno-religious factors on occupational attainment indicates that non-White British Muslim women with academic qualifications are less likely to "obtain high non-manual positions in the labour market" compared to their White Christian and Jewish counterparts (Khattab, 2009, p. 316). More specifically, Muslim Pakistani female graduates are less likely to be in full-time employment or to secure managerial and professional occupations than their Indian peers (Khattab, 2012). When compared to Pakistani men, these women face an "extra penalty" due to the existence of a gendered labour market (Khattab, 2009, p. 316) and gender-driven cultural expectations within their families (Dale et al., 2002). These findings suggest that British Pakistani women's transition and progression in the labour market are influenced by personal and structural factors since the existence of gender, religious *and* ethnic penalties positions these women behind their male counterparts, White women and Muslim Indian women.

3.2. Experiences and Outcomes of British Algerian Female Graduates

Existing research on Algerians has largely overlooked the position of the second-generation (Migration Policy Centre, 2013). A parallel with other minority ethnic groups, who are numerically less important than British Pakistanis and who have no shared colonial history with the UK, can provide insights into the group's education and work. For instance, research on British-born Chinese reveals that even though parental involvement in education leads to high attainment levels, the group experiences barriers in securing employment due to persisting initial disadvantages (Archer & Francis, 2007). Moreover, research with Algerian parents highlights concerns about the upbringing of their children within an English environment, aspects of which are perceived to contradict their religious values (The Change Institute, 2009). Taken together, this evidence suggests that Algerian parents' involvement in their children's formal education may have two outcomes: (1) similar to Chinese parents, it may allow them to contribute to their children's academic success and (2) it may ensure that their children's behaviour

is in line with religious expectations, mirroring Pakistani parents' involvement.

Upon entry and progression into the labour market, Algerian graduates may face difficulties due to their status as new graduate. For example, limited geographical mobility or lack of relevant work experience prior to graduation may limit job opportunities (Brown & Hesketh, 2004). Moreover, persisting barriers as they affect Muslim and minority ethnic women in the labour market may also work to oppress and exclude female graduates, especially those who are visibly Muslim (e.g., Afshar, 2008; Malik & Wykes, 2018). Nevertheless, being absent from the social imaginary of the majority ethnic group suggests the existence of a potential difference between the ways in which Pakistanis and Algerians are positioned and thus, Algerians may not be subjected to similar stereotypes as experienced by their Pakistani peers.

Despite being built on a parallel and research with migrant parents, the above evidence provides useful insights into the importance of gender, social class and ethnicity in the navigation of education and employment pathways among second-generation Algerians.

3.3. Contributions to the Literature

Although existing research offers useful understandings of British Pakistani women's education and employment outcomes, it, nevertheless, does so by grouping Pakistani women with other South Asian and Muslim women and focuses on education-to-work transition only or experiences/outcomes within education/employment. This article addresses these issues by examining qualitatively the dynamic between three important spheres, rarely brought together: family, education and the labour market. It does so (1) by separating Pakistanis from other South Asian and Muslim women, (2) by focusing on parent-daughter relationship and its impact on the daughters' education and employment, and (3) by providing insights into the graduates' career pathways over the life course.

Empirically, this article also depicts for the first time the educational and employment experiences of second-generation Algerians. By comparing Pakistanis, a well-established group, to Algerians, a newly settled one, it examines how two different minority ethnic groups engage in similar social, economic and structural settings. This furthers understandings of how specific life phenomena—education-to-work transition *and* progression once employed—impact both similarly and differently graduates from the two minority ethnic groups (Hantrais, 2009). This article thus considers similarities in class and gender positions in relation to differences in ethnic position and migration history.

4. Data

This article draws on a larger comparative study between France and the UK which brought together the largest Muslim minority ethnic groups in each country, namely Algerian and Pakistani respectively. It specifically focuses on six British Pakistani and six British Algerian women recruited for the comparative study through snowballing and who participated in repeat in-depth semi-structured interviews between January 2012 and August 2013. The aim of the first interviews was to gather views on career ambitions, educational choices, university-to-work transition and long-term progression. Second interviews provided insights into potential socio-economic changes during the time of the research (e.g., return to education).

All participants were employed at the time of their recruitment. The youngest participant had 2 years of work experience post-graduation while the oldest had 22 years. This range allowed the examination and comparison of economic integration longitudinally, from the first job post-graduation to the professional position at the time of the first interview. Table 1 gives additional socio-economic information.

5. Discussion of Findings

5.1. Understanding University Pathways

5.1.1. Post-92 or Elite University? Negotiating Choice of University and Strategies for Academic Success

Except two women who attended elite universities (Russell group institutions), all the other participants chose a less prestigious post-92 university, following the general pattern for minority ethnic students (e.g., Hussain & Bagguley, 2012). The rationale for their choice was driven by gender and ethnic factors with the chosen institutions being local and/or ethnically diverse. For example, Neelum (Pakistani, working-class) attended a local post-92 institution because, as an unmarried woman, her family expected her to live at home (e.g., Dale et al., 2002). Similar gender and religious expectations also shaped her friends' circle:

> My friends were mostly like me you know. Muslims. But not necessarily Pakistani. Like my best friend is Chinese but she is Muslim. I think it's good to have friends like you…because they go through the same thing.

The above extract also hints towards a lack of acculturation, as defined by Bourdieu (1980), since Neelum decided to make friends with other Muslims only which enabled her to create her own space and develop psychological and emotional resources (Côté, 2002). In that sense, religion was not only at the origin of family expectation, but it also became a resource to foster social support. Deploying religion as a resource was a strategy used by women in both elite and post-92 universities.

For example, Leila (Algerian, middle-class) attended a Russell group but local university, lived off-campus (for similar reasons to Neelum) and she too decided to form

Table 1. Key socio-economic characteristics of British Pakistani and Algerian participants.

Pseudonym	Age	Type of Local University Attended	Qualification	First job post-graduation	Total years of work experience post-graduation	Occupation during first interview	Social class	Parental profession
Pakistanis								
Raheela	28	Post-92	Postgraduate diploma in counselling	HR assistant	6 years	University programme coordinator	Working-class	F: Unemployed M: Unemployed
Neelum	30	Post-92	PGCE in Physics	School assistant	6 years	Physics teacher	Working-class	F: Unemployed M: Unemployed
Mariam	35	Post-92	Postgraduate certificate in English Literature	TV Channel programme assistant	10 years	Care assessor	Middle-class	F: Business owner M: Head of secondary school
Noreen	35	Elite	Master in Pharmacy	Surgical pharmacist	10 years	Clinical lecturer	Middle-class	F: Chemical engineer M: Media analyst
Sehrish	42	Post-92	Master in Media and communication	Job centre advisor	17 years	Executive director	Working-class	M: Unemployed
Anya	45	Post-92	Master in Education Management	Restaurant manager	22 years	Deputy Head	Middle-class	F: Restaurant owner M: unemployed
Algerians								
Heena	23	Post-92	Bachelor in International Business	Retail assistant	2 year	Special educational needs advisor	Working-class	F: Unemployed M: Unemployed
Latifa	25	Post-92	Master in Marketing	Call centre operator	3 years	Junior Marketing researcher	Working-class	M: Unemployed
Saadia	25	Post-92	Master in Journalism	Web content editor	3 years	Freelance editor	Middle-class	F: University lecturer M: Unemployed
Malika	26	Post-92	Master in Psychology	Retail assistant	2 years	Assistant research psychologist	Working-class	F: Unemployed M: Unemployed
Leila	26	Elite	Bachelor in Business Management	Administrator	4 years	Database analyst	Middle-class	F: IT manager M: Unemployed
Karima	30	Post-92	PGCE in Science	Private Science Tutor	5 years	Science teacher	Working-class	F: Unemployed M: Unemployed

Notes: In the comparative study, participants' class background was identified through their parents' occupations until they secured their first job post-graduation and was based on the European socio-economic classification model: salariat/upper-class (e.g., large employers), intermediate/middle-class (e.g., high-grade white/blue collar workers) and working-class (e.g., never employed, unskilled workers; Rose & Harrison, 2007). Throughout this article, when participants' class background is mentioned, it always refers to their parents' social class. Where the mother is widowed or divorced and raised the participant as a single parent, the father's profession has been disregarded. F stands for Father and M for Mother.

a group membership with female and Muslim students only, thus avoiding the need to acculturate. In a way, by consciously excluding herself from the student life of the majority student cohort ("I didn't want to get involved [in Friday nights-out]"), Leila created an environment on the basis of exchangeable resources, to borrow Côté's (2002) term, such as appearance and values, leading to similar experiences of inclusion to the women in post-92 institutions. In that respect, women in prestigious and post-92 institutions did not have to acculturate, as argued by Bourdieu (1980), but instead they drew on their existing identity capital strategically to build ethnically uniform social networks (grounded in religion) and in some cases, female only. This strategy constructed feelings of being accepted as a full member of a traditionally white space and thus, enabled the women to fit into the environment of HE as a Muslim female *and* minority ethnic student.

While choice of university was partly driven by the women's decision to meet their families' cultural, gender and religious expectations, other university-related decisions had to be in line with parental aspirations.

5.1.2. Managing Parental Aspirations and Personal Preferences in Degree Subject and Level of Study

The limit and extent of migrant parents' support in their children's education is well-documented. For instance, despite their positive intentions, they struggle to make a concrete difference to their children's actual attainment (e.g., Engzell, 2018). Yet, their material and emotional support works to raise their children's aspirations, leading to the successful pursuit of tertiary education (e.g., Jackson, Jonsson, & Rudolphi, 2012; Lessard-Philips & Li, 2017). Although the achievement of the Pakistani and Algerian participants mirrors these findings (i.e., they completed tertiary education thanks to parental motivation), many interviewees perceived going to university as a burden, forced upon them by their parents, producing similar experiences across groups regardless of ethnic and class differences:

> If it wasn't for my parents I would have (pause) finished college and started working. But I did go to uni thanks to them. (Heena, Algerian, working-class)

> I was in the mindset of doing some work, getting into the employment market [after A-levels]. My mum was like 'you got to do a Master' [sad voice]. My mum…she made me go to uni. She forced me [high pitch]. (Mariam, Pakistani, middle-class)

Both Heena and Mariam went to university unwillingly. In retrospect, Heena appreciates her parents' persistence in getting her to study for a degree, notably to gain financial independence (note the "thanks to them"). Financial independence was important to all parents (as reported by the women) which highlights a different class and gender intersection compared to existing research. Indeed, previous findings suggest that encouragement to gain university qualifications are given to *male* second-generations, so they can support their families as bread-winners (e.g., Dale et al., 2002).

Unlike Heena, Mariam still recalls her experience as negative (note the "made me"/"forced"). Reportedly, the only route which would satisfy her mother was getting a masters; an undergraduate qualification was not enough. She resisted this pressure by completing one semester only which translated into a postgraduate certificate and led to her mother's disappointment. Heena and Mariam's pursuit of undergraduate and postgraduate qualifications respectively brings forth the importance of social class in influencing education-related decisions *contextually*. Loury, Modood and Teles (2005) argue that for minority ethnic groups from lower class backgrounds, higher educational achievements convey a sense of accomplishment, as they potentially open doors to social mobility. Heena's experience is a case in point since her achievement became a source of family pride ("[my father] was just…proud"). In Mariam's case, her mother's involvement ensured a reproduction of their family's social status since the importance was for Mariam to maintain prestige within her family's social network (Côté, 1996). In that sense, although social class differences were irrelevant in decisions regarding HE entry, these became prominent in explaining the rationale for the level attained.

While some women went to university unwillingly, others, who already intended to pursue tertiary education, experienced parental involvement as a barrier when they had to negotiate between their preferred degrees and what their parents considered as prestigious and/or lucrative degrees. For instance, Anya (Pakistani, middle-class) completed an Economics degree despite being interested in becoming an English teacher:

> So obviously [the best thing for Pakistani parents] is the field of doctor and the next thing would be business, banking is definitely next in line. And I remember when I proposed to be a teacher [long silence]. My mother was horrified.

There is a point of similarity here between Anya and, Heena and Mariam's experiences. Anya's experience shows how, even in middle-class families, parents give priority to the material outcome of education (like Heena) but which contributes to sustaining an already high social status (like Mariam). Anya completed her studies reluctantly since she did not have parental support in studying for her personal fulfilment. This type of parental involvement acted both as tangible (e.g., parental investment) and intangible identity capital (e.g., development and acquisition of new resources). The former created opportunities to "access and benefit structural networks and positions" during the university-to-work transition and eventually, for successful management of employment spaces (Côté, 2002, p. 120).

The similarities and differences in Heena, Mariam and Anya's academic-related choices precisely illustrate Anthias's (2008) argument regarding the contextualised dimension of social divisions and how they may shift over time and space. Indeed, the selection of the university attended was grounded in the intersection of ethnicity and gender rather than social class since both middle-class and working-class participants shared a similar route into HE by opting for a local institution. Yet, once at university, which brought structural and individual changes, this dynamic shifted. The rationale for pursuing a degree was grounded in the women's social class, instead of their gender or ethnicity. These examples suggest how situational aspects allow privileging the intersection of certain identity categories contextually (such as gender and ethnicity over social class in choice of university) rather than "in any essential or given way" (Anthias, 2009, p. 12). In turn, these situational aspects enabled the women to draw on their identity capital in a diversified way in pursuit of success at university (even when completing their studies reluctantly).

5.2. Strategies and Challenges in Building Successful Long-Term Careers

5.2.1. Waiting for a Graduate Job? The Impact of Social Class on Labour Market Transition

Except Noreen (Pakistani, 35, middle-class) who found a position as surgical pharmacist immediately after graduation and Anya (Pakistani, 45, middle-class) who worked in her father's fast-food restaurant as manager, all the other participants experienced a period of unemployment. The longest unemployment period was 8 months (Leila, 26, Algerian, middle-class) and the shortest was 2 months (Raheela, 28, Pakistani, working-class). This was due to various factors, for instance, the women who gained their degrees shortly before/after 2008, suffered from the economic recession following the 2008 banking crisis as it made competition stiffer for them, especially for those who graduated in an oversubscribed field (e.g., business and administration) like Heena (Algerian, 23, working-class; HESA, 2009). When making sense of her four-month long unemployment, Heena, like the other new graduates, also attributed her failure to secure a job to a lack of added-value on her CV:

> When you go for job interviews, they mainly ask about your experience and your experience will determine whether you get the job or not. You can have a first-class degree…but if you don't have the experience then someone with the experience is more likely to get the job.

Brown and Hesketh (2004) argue that adding value to their CV is deemed indispensable for new graduates as degrees alone are no longer sufficient in an increasingly competitive market. Added value is not defined as relevant work experience, as many women described, but as something more tangible such as extra skills gained through charity work or a gap year that would increase the profitability of social capital (Bourdieu, 1980).

Accordingly, initial failure to secure suitable roles—matching education level and field—pushed many women to accept precarious positions but which they believed would enhance their long-term employability. For example, Malika (Algerian, 26, working-class) who gained an MSc in Psychology was unemployed for five months. She then decided to work as a part-time retail assistant because the role offered flexibility and some financial independence. This decision enabled her to secure an unpaid assistant psychologist researcher position to gain much-needed work experience. Like Malika, the other women's lack of success in their initial attempts to find suitable jobs led them to take on non-relevant paid jobs and at the same time, pursue unpaid relevant roles. They believed that this strategy would add value to their CV and eventually, improve their chances of being employed in a relevant paid position.

Although this type of university-to-work transition (e.g., work on precarious contracts in unrelated fields at first) is in line with graduates' experiences in general (Moreau & Leathwood, 2006), initial disadvantages remain significant, since the ability to add value to one's CV is highly affected by social class and ethnic factors. For example, many working-class women did not have the "luxury to wait or to pick and choose", as Sehrish (Pakistani, 42, working-class) described, for the right opportunity to come along, to be in unpaid roles or to remain unemployed for an extended period of time. Sehrish, who graduated with an MA in Media and Communication, took on the role of a job centre advisor because she needed to support her family. Middle-class participants also compromised with their transition into employment but differently to their working-class counterparts.

For instance, Leila (Algeria, 26, middle-class) started off as an administrator, a role for which she was overqualified even though within her field. Nevertheless, she was promoted to a management position within a few months, a role equivalent to her academic qualifications. This strategy, being overqualified and underpaid in a relevant field, was made possible thanks to Leila's privileged class position. She was able to build her career by drawing on her parents' capital (here material capital, in comparison to Sehrish) and remained unemployed for eight months until the 'right job' came along. Thus, although both working- and middle-class parents' ethnic capital had a similar impact during the women's education (e.g., attendance of local institution), within the context of their university-to-work transition, the profitability of parent's capital, here material, differed (Anthias, 2008). Less-advantaged women were more likely to take a job, regardless of its status or employment conditions, compared to their more privileged peers, since they could not rely on their parents' material and ethnic capitals. In that respect, similarity in social class produced similarity

in the women's decision-making process regarding their university-to-work transition.

5.2.2. Tackling Racial Discrimination: The Impact of Ethnicity on Entry into the Labour Market

In addition to managing initial personal disadvantages, the women also faced structural barriers. However, these barriers were perceived differently across groups. Although existing research shows the association between minority ethnicity and restricted labour market opportunities (e.g., Martin, Heath, & Bosveld, 2010), no British Pakistani participant speculated about the existence of racism in the hiring process despite repeated and long-term job rejections ("I've never thought anything like that: 'your [last] name is Muhammad, it makes a difference [in job applications]'", Raheela, Pakistani, working-class). The reluctance of the British Pakistani women to recognise the existence of racism in the labour market was due to their strong belief in equal opportunity discourses and the comparison they drew between theirs and their parents' experiences stating that earlier generations (i.e., migrants from former colonies who arrived during the post-World War II migration wave) had to deal with racial discrimination but since then, legislation has been put in place to prevent any similar occurrences.

By contrast, British Algerian women discussed the existence of racism and how it impacts different spheres of life. For instance, six months into her period of unemployment, Leila (Algerian, middle-class) conducted a field experiment. Scholarly, this is known to reveal the extent of racial discrimination in the hiring process, where minority ethnic candidates are less likely to be called for an interview compared to White candidates (e.g., Wood, Hales, Purdon, Sejersen, & Hayllar, 2009). This discrimination produces differences between minority and majority ethnic candidates in respect to their unemployment, earnings and occupational attainment (Heath & Cheung, 2006):

> I sent my CV to a job, hmm, and just changed the name. And, hmm, I was Sarah Adam [chuckled], who doesn't exist but got a call back for an interview. But the same CV with the same experience on it but with Leila Ibadi, the neutral sounding name got a call back for interview and the Muslim sounding name got rejected....I sent first with my name and got a rejection letter. And then sent the Sarah Adam's one and got a call to come in for an interview....And that kinda really depressed me for a really, really long time....I was really, really angry that I got a call back in, just a case of changing my name.

Anthias (2001, p. 847) argues that "a marketable skill [depends] on who possesses the skill" and who you deal with. In that respect, Leila's application, which demonstrated possession of the required skills (for at least to be considered for an interview), was rejected due to her name. Her ability "to fulfil the requirement of specific jobs" was weighed against her perceived religious identity and stereotypes associated with Muslim women (Brown & Hesketh, 2004, p. 24). Her professional identity was challenged since certain characteristics, such as working as professionals, are attributed to White groups only (Weedon, 2004). In other words, Leila's application was rejected because she may have been positioned as an 'illegitimate' candidate who cannot claim her right to a graduate-level professional job (Goldberg, 2009). Leila's experience illustrates the complexity of the processes of identification of the minority ethnic graduates in this study, how they dealt with both personal (e.g., social class, degree gained) and structural factors (e.g., racial discrimination) and how these were managed both similarly and differently across and within groups during their university-to-work transition.

5.2.3. Transforming Precarious Starts into Successful Long-Term Economic Positions

Comparisons between the new graduates (with less than 5 years' experience post-graduation) and well-established women (over ten years' experience with the oldest participant, Anya, having accumulated 22 years) revealed strategies deployed by the latter in order to transform initial precarious professional positions into long-term economic stability and success. However, this remains true for the Pakistani women only due to their longer migration history. These women's employment trajectories showed a common pattern: they initially took on voluntary, fixed-term and/or part-time contracts in a relevant field and eventually saw their status changed. For example, Sehrish (Pakistani, 42, working-class), who started on a fixed-term civil servant position (after the job centre position) moved to a permanent role following the end of her contract. She was able to create new social connections, and, as Bourdieu (1980) suggests, was able to take advantage of her expanded social capital. Indeed, when she decided to change careers, Sehrish was recommended by a previous work colleague for her current role as an executive director of a charity. These experiences were similar to the other well-established women suggesting that in many aspects, the women's identity capital was/is subject to shift and change with time.

Some women also decided to change careers for their personal fulfilment by creating a new negotiation-resistance nexus with their parents. For example, Anya (Pakistani, 45, middle-class) who wished to become a teacher, returned to HE after having worked 5 years as a manager in her father's fast-food establishment. After successfully completing her initial teacher training, she moved up the employment ladder starting as an English supply teacher and achieving the position of Deputy Head (her current role). In line with the findings of previous studies (e.g., Dale et al., 2002), having gained an

initial status in her family thanks to the empowerment conferred by her first job (as manager), she was able to negotiate her career progression with her parents and, after initial disapproval, they finally "recognised what a valuable career [teaching] is".

Returning to education was also used as a strategy to seek promotion. For example, Noreen (Pakistani, 35, middle-class) who started working as a surgical pharmacist enrolled for doctoral studies in order to become a clinical lecturer after 6 years of practice. By the time the participants took part in the second interview (approximately one year after the first), several new graduates also discussed having enrolled in or contemplating enrolling in additional (postgraduate) qualifications. For example, Malika (Algerian, 26, working-class) was finishing an application for her doctoral studies funded by the employer for whom she worked as an assistant psychologist researcher in a voluntary capacity. In that respect, returning to HE was seen by the new graduates as an additional strategy to add value to their CV, increase their identity capital and thus, enhance their employability in their preferred field.

Similar to the women's academic-related decisions, these work-related strategies, yet again, illuminate the situational reading of how social divisions operate dynamically over time and space (Anthias, 2008). Upon transition into the labour market, social class and ethnicity remained significant in shaping the women's decisions but in different contexts. The women in more privileged positions were able to wait longer for their preferred role, while their working-class counterparts had to compromise to secure a financial position as soon as possible. Ethnicity, however, became prominent in creating structural barriers in finding employment which captures the relational construction of ethnic categories in post-colonial societies. The examination of the women's careers further highlights the existence of shifting, transformative and contextual social categories since an empowered gender and ethnic position (partly afforded by a change in class position) altered the parent-daughter dynamic and subsequently, the women's professional pathway over the life course.

6. Conclusions

This article discusses the university-to-work transition and long-term economic positions of second-generation Pakistani and Algerian female graduates. It does so by highlighting both similarities and differences across the groups which helped consider the impact of personal and structural barriers over their life course. Theoretically, it brings forth the dynamic and contextualised interplay between the women's gender, social class and ethnicity (as a proxy for culture and religion) and, the specific use of their identity capital which shaped their choice of university, entrance in HE, degree choice and level and, subsequent professional positions. In doing so, this article underlines the uniqueness of the women's experiences which lies in the ways in which their social class, gender and ethnic positions and identity capital (i.e., material, social, cultural and ethnic) shifted over time enabling them to navigate first their academic and then their professional pathways (Anthias, 2008). This article thus offers an intersectional reading of university-to-work transition and progress once in employment in three ways which moves beyond class-based or ethnic perspectives only.

First, for both groups, ethnicity was a major factor in the deployment of their ethnic and cultural capitals when selecting the university but the experience of going through HE differed across groups. In retrospect, Algerian participants shared satisfactory feelings for obtaining a university qualification, despite initial parental pressure, since it opened doors to professional roles and financial independence. Pakistani participants, instead, remained very negative while recalling similar experiences. This difference in how the women valued having a degree could be explained by the difference in the groups' migratory patterns and experiences. With a history of colonisation and the continuous existence of racism and discrimination in British society, Pakistani participants emphasised their right to equality in all spheres of lives. They shared a stronger sense of entitlement to professional roles (regardless of their CV) whereas Algerian participants expressed gratitude towards the UK for 'allowing' them to go to university and for accessing professional positions. This feeling among Pakistani participants was particularly intense considering these women's experiences of racism in the workplace (for a detailed discussion see, Naseem, 2017). In other words, degree or no degree, the women believed that they should have access to the labour market in a similar way to their White peers and should not "have to work twice as hard" (Sehrish, Pakistani, 42, working-class). In that sense, the ethnic comparison suggests that the interplay between migratory history and one's perception in British society may influence one's engagement within the educational system.

In other university-related decisions, the women's social class was more prominent than their ethnicity, especially in relation to their parents' input. Getting a university degree, for example, was valued by both Algerian and Pakistani parents (as reported by the participants) but the rationale for obtaining a degree differed. Although all women experienced strong parental involvement, for middle-class parents, getting a degree ensured maintenance of the family's prestige; while for working-class parents, the notion of pride was more significant. Accordingly, the women experienced a similar negotiation and resistance dynamic with their parents which positioned them as one and the same in this specific context.

Second, to a certain extent, upon transition into the labour market, the issues British Pakistani and Algerian women in this study faced mirrored those of any recently graduated individual. For instance, attending a post-92

university may disadvantage candidates in favour of those who graduate from elite institutions (e.g., Noden et al., 2014). Similarly, potential employers' preference for candidates with relevant work experience prior to graduation can create stiffer competition for those without such credentials (e.g., Brown & Hesketh, 2004). At the same time, these initial barriers can be overcome, for example, by the completion of further studies or, as discussed, by accepting roles 'below' the level of qualification. Indeed, difficulties in securing suitable jobs compelled many women, especially those from working-class backgrounds who were unable to rely on their parents' material and ethnic capitals, to take on precarious employment, which often required lower qualifications, were unpaid and/or fixed-term positions. In that sense, despite being in employment, the minority ethnic graduates experienced inequalities which exist in forms beyond traditional understandings of economic segregation, gaps in earnings and differential professional progress (as is defined in existing research). Being in employment does not necessarily warrant professional success.

Precarious starts in relevant fields, however, enabled some women to increase their identity capital by expanding their social network and adding value to their CV. In addition, perseverance and ability to re-assess initial career and degree choices suggest possibilities to gradually move into stable employment positions and to build successful long-term careers. With time, the achievements of the well-established women may reflect in the progression of the new graduates in this study who discussed similar strategies to them, suggesting that precarious starts as new graduates may be temporary only.

The comparison between Algerian and Pakistani women further suggests how being absent from the social imaginary of the majority ethnic group becomes irrelevant in face of common structural barriers (here, religious discrimination), thus producing similar inequalities. Thus, compared to other new graduates, the women's university-to-work transition remained particular since their minority ethnicity became prominent in the assessment of their fit for a given role.

Finally, unlike other groups, including minority ethnic men, the dynamic of the parent-daughter relationship remained important beyond the women's education *but* differently. Their ability to negotiate with their parents was relevant in changing the course of their professional lives since university qualification and subsequent first employment enhanced their identity capital (notably material and social). Their new position (as a professional and university-educated woman) empowered them and, for some, placed them in a stronger position vis-à-vis their parents. This was especially important for the Pakistani and Algerian women who experienced the 'burden' of gender-specific cultural and religious expectations and/or those who lacked individual profitable identity capital compelling them to comply with their parents' decisions. This shift in the women's identity capital therefore highlights the fluidity of how gender and ethnicity operate in a situated and relational way (Anthias, 2008). In turn, the Pakistani and Algerian women's educational and employment experiences, overall, suggest that shifts in one's identity capital can change one's employability (positively) over the life course.

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Conflict of Interests

The author declares no conflict of interests.

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