Institutional Characteristics of Upper Secondary Vocational Education and Training in Switzerland: How Do They Affect VET Diploma Holders' Early Labour Market Outcomes?

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Abstract

Internationally, the advantages of vocationally oriented education systems are emphasised. In countries with a strong dual vocational education and training (VET) system, vocationally trained individuals experience rapid transitions into the labour market and comparatively high entry wages. This pertains to the Swiss education and training system as well, which is characterised by a high degree of vocational specificity. This leads to a close link between the training occupation and the subsequent employment, as well as low occupational mobility throughout the career. However, this comparative research often overlooks the fact that there is significant variation in institutional characteristics within vocationally oriented training systems as well, which can lead to different labour market returns after VET. This is the starting point of this dissertation, which asks to what extent institutional dimensions of the Swiss VET system influence wages or wage development, upward and downward status mobility and the transition to further, tertiary education. Furthermore, the interplay between institutional and individual characteristics, like gender and socio-economic background are examined. On the one hand, the institutional dimensions refer to the training occupations directly, namely their occupational specificity, standardisation, and vertical differentiation. On the other hand, different labour market segments are considered in which training companies are located. Empirically, two main steps were carried out. First, the institutional characteristics of the over 500 Swiss training occupations were conceptualised, operationalised and measured based on occupation-specific training plans and ordinances. Second, the impact of the institutional characteristics on labour market outcomes were addressed by means of quantitative analysis, using datasets, dependent variables, and modelling strategies appropriate to the research question at hand.

The results show that wages, occupational status mobility and transitions to tertiary education clearly differ even within vocationally oriented education systems. Different forms of skills (general, specific) and the type of knowledge transfer (practical, theoretical) are particularly important for wages and status development during the early career, while vertically differentiated training occupations, only show positive effects in the longer term. The standardisation of examinations can even have a detrimental effect. Furthermore, differentiating the effect of specificity on wages along the lines of gender and the gender typology of occupations reveals new possibilities to understand the gender pay gap. The results suggest that wage returns to skills for men and women are determined by a complex interplay between gender, gendered performance expectations and occupation-specific skill endowment. Finally, the analysis of different labour market segments shows that even within the same training occupation, the segment of the training company matters for career development. VET diploma holders who trained in a labour market segment with institutionalized career pathways (primary segment) are more likely to enter higher education than those who trained in a segment without institutionalized career pathways (secondary segment). Especially those with a lower socio-economic background profit from training in the primary segment. Thus, overall, this dissertation draws attention to within-country variation in institutional characteristic of the training system by analysing the importance of training occupation characteristics and labour market segments for early labour market returns.

Keywords: Vocational education and training, labour market inequality, occupations, institutional characteristics, school-to-work transitions

Zusammenfassung

Das Schweizer Bildungssystem zeichnet sich durch eine hohe Berufsspezifität aus, die zu einer engen Verknüpfung von Ausbildungsberuf und anschließendem Erwerbsberuf sowie zu einer geringen beruflichen Mobilität im Erwerbsverlauf führt. In international vergleichenden Studien werden die Vorteile einer solchen spezifischen Berufsausbildung hervorgehoben. In Ländern mit einem starken dualen Berufsbildungssystem erleben Personen mit einer Berufsbildung einen schnellen Übertritt in den Arbeitsmarkt und vergleichsweise hohe Einstiegslöhne. Allerdings wird in dieser vergleichenden Forschung häufig übersehen, dass es auch innerhalb eines Berufsbildungssystems erhebliche Unterschiede in den institutionellen Merkmalen gibt, die zu unterschiedlichen Arbeitsmarkterträgen nach der Berufsausbildung führen können. Vor diesem Hintergrund wird in der vorliegenden Dissertation untersucht, inwieweit institutionelle Dimensionen des Schweizer Berufsbildungssystems die Löhne bzw. die Lohnentwicklung, die Statusmobilität und den Übergang in eine weiterführende, tertiäre Ausbildung beeinflussen. Darüber hinaus wird das Zusammenspiel zwischen institutionellen und individuellen Merkmalen, wie Geschlecht und sozioökonomischem Hintergrund, analysiert. Die institutionellen Dimensionen beziehen sich zum einen direkt auf die Ausbildungsberufe, nämlich deren berufliche Spezifität, Standardisierung und vertikale Differenzierung. Zum anderen werden verschiedene Arbeitsmarktsegmente betrachtet, in denen die Ausbildungsbetriebe angesiedelt sind. Der empirische Teil umfasst zwei Schritte. Zunächst wurden die institutionellen Merkmale von über 500 Schweizer Ausbildungsberufen anhand von berufsspezifischen Bildungsplänen und -verordnungen konzeptualisiert, operationalisiert und gemessen. Anschliessend wurde der Einfluss der institutionellen Merkmale auf die Arbeitsmarktergebnisse mittels quantitativer Analysen untersucht, wobei der jeweiligen Forschungsfrage angemessene Datensätze, abhängige Variablen und Modellierungsstrategien verwendet wurden.

Die Ergebnisse zeigen, dass sich die Löhne, die Statusmobilität und die Übergänge in die tertiäre Ausbildung auch innerhalb berufsspezifischer Ausbildungssysteme deutlich unterscheiden. Verschiedene Formen von Kenntnissen (allgemein, spezifisch) und die Art der Wissensvermittlung (praktisch, theoretisch) sind besonders wichtig für Löhne und Statusentwicklung während der frühen Karriere, während die vertikale Differenzierung der Ausbildungsberufe erst längerfristig einen positiven Effekt zeigt. Die Standardisierung von Prüfungen kann sich sogar nachteilig auswirken. Die Differenzierung des Effekts der Spezifität auf die Löhne entlang des Geschlechts und der Geschlechtertypologie der Berufe eröffnet neue Möglichkeiten, den Gender Pay Gap zu verstehen. Die Ergebnisse deuten darauf hin, dass die Renditen für berufsspezifische und allgemeine Kenntnisse von Männern und Frauen durch ein komplexes Zusammenspiel zwischen Geschlecht, Kompetenzausstattung und geschlechtsspezifischen Leistungserwartungen bestimmt werden. Schließlich zeigt die Analyse verschiedener Arbeitsmarktsegmente, dass selbst im gleichen Ausbildungsberuf das Segment des Ausbildungsbetriebs einen Unterschied macht, was herkunftsbedingte Bildungsungleichheiten kompensieren kann. Personen mit einer Berufsbildung, die in einem Arbeitsmarktsegment mit institutionalisierten Karrieremöglichkeiten (primäres Segment) ausgebildet wurden, nehmen mit höherer Wahrscheinlichkeit eine tertiäre Ausbildung auf als diejenigen, die in einem Segment ohne institutionalisierte Karrieremöglichkeiten (sekundäres Segment) ausgebildet

wurden. Insbesondere Personen mit einem niedrigeren sozioökonomischen Hintergrund profitieren von einer Ausbildung im primären Segment. Insgesamt lenkt diese Dissertation den Blick auf die Variation der Institutionellen Merkmale innerhalb eines Landes, indem sie die Bedeutung der Merkmale des Ausbildungsberufs und der Arbeitsmarktsegmente für die frühen Arbeitsmarkterträge analysiert.

Schlagworte: Berufsbildung, Ungleichheit auf dem Arbeitsmarkt, Berufe, institutionelle Merkmale, School-to-work transitions

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1 Synopsis

1.1 Introduction

The main aim of this dissertation is to shed light on how institutional dimensions of the education system shape the early labour market outcomes of diploma holders of vocational education and training (VET). Early labour market outcomes such as income and status position largely determine individuals' social and economic standing not only at the beginning of their careers but also throughout their working lives (Dietrich and Abraham, 2005). Analysing how VET influences these outcomes is important considering the high share of VET enrolment in many European countries and attempts worldwide to strengthen VET and thus improve school-to-work transitions (Šćepanović and Martín Artiles, 2020).

To pursue this aim, I apply a structural perspective with institutions at its centre. Thus, I draw upon a long research tradition that understands social stratification as an institutionally embedded process (e.g. Maurice, et al., 1986). Institutions can be defined as rules and norms that regulate social and economic relationships (North, 1990); they guide the distribution of resources in social and economic situations and reduce cooperation and coordination problems (Coleman, 1994). In this sense, two types of institution regulate the linkage between the vocational education and training system and the labour market: training occupations and training firms (Kalleberg and Mouw, 2018, see also Figure 1.1).

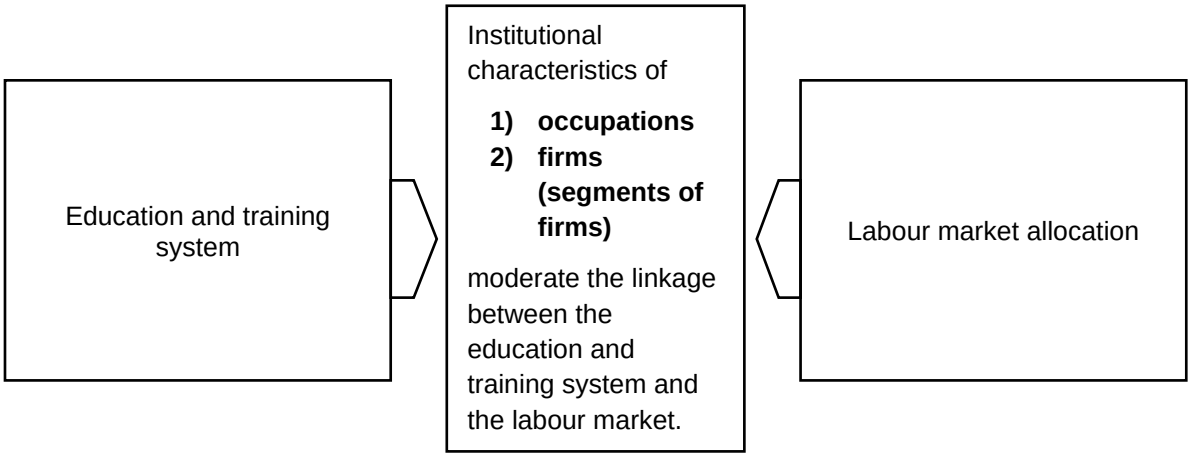

Figure 1.1 Institutional linkage between the education and training system and labour market allocation. Adapted from Damelang, et al. (2018).

On the one hand, the logic of occupations as labour market institutions (Damelang, et al., 2018) originates from the theory of occupationally segmented labour markets (OLMs) (Lutz and Sengenberger, 1974; for further discussions of the institutional view of occupations, cf. Beck, et al., 1980; Witte and Kalleberg, 1995). This conceptualisation focuses on occupations as the main entity structuring the labour market. In OLMs, a high number of clearly defined occupations constitute the largest part of the labour market, termed the occupation-specific labour market segment (Sengenberger, 1987). Where labour markets are mainly structured by occupations, there is a tight link between the occupations and training occupations in VET (Allmendinger, 1989). Training occupations represent standardised bundles of skills and knowledge that correspond to specific task bundles in occupations in the labour market (Damelang, et al., 2018). Access to jobs and further education is thus gained through occupation-

specific qualifications (Gangl, 2003; Iannelli and Raffe, 2007). The training occupations are characterised by institutional dimensions, such as standardisation, vertical differentiation, vocational specificity, and licensing (Damelang, et al., 2018). These dimensions influence such early labour market outcomes as unemployment, income, and occupational match (Allmendinger, 1989; Kerckhoff, 1995; Müller and Shavit, 1998; Weeden, 2002). Because training occupations differ in these characteristics they strongly influence individuals' allocation on the labour market.

On the other hand, the logic of firms as institutions linking education and training and the labour market has hardly been discussed. This logic stems from a strand of segmentation theory that argues that firm characteristics determine the segmentation of the labour market (Kalleberg, 2003; Tolbert, et al., 1980). Within this strand, also termed dual segmentation theory, the main entity in labour markets is the firm. Firms exhibit different characteristics, such as firm size, average education level, and financial resources, and thus belong to two different segments, the primary or the secondary segment (Baron and Bielby, 1980; Sengenberger, 1975; Tolbert, et al., 1980). Depending on these characteristics, the segments exhibit more or less institutionalised career pathways. Therefore, workers' allocation to either the primary or the secondary segment influences such aspects of their further career as status mobility, contract form, and income (e.g. Kalleberg and Mastekaasa, 1998; Kalleberg and Mouw, 2018). Apprentices spend the majority of their training time in firms on the labour market, so the institutional characteristics of the firm moderate the linkage between VET and work. In sum, I argue that the institutional characteristics of training occupations and of training firms both influence diploma holders' opportunities and outcomes on the labour market.

Within this overall topic, the following questions were examined. First, I examined the degree to which the institutional characteristics vary within the VET system. Prior empirical research has focused mainly on differences in institutional characteristics between education and training tracks or levels (e.g. Bol and van de Werfhorst, 2016; Levels, van der Velden, and Di Stasio, 2014; Müller and Shavit, 1998; Wolbers, 2007). The heterogeneity within education systems has only recently been investigated empirically. Some research focuses on differences between training occupations in vocational specificity (DiPrete, et al., 2017; Forster and Bol, 2018; Muja, et al., 2019b). Others focus on differences between firms of differing sizes (Euwals and Winkelmann, 2004; Mohrenweiser and Zwick, 2015; Müller and Neubäumer, 2018). However, the literature still lacks a more comprehensive approach which takes into account first, that training occupations can differ in several institutional characteristics and second, that training firms can be clustered into segments based on a range of firm characteristics.

My second question asks whether this heterogeneity affects VET diploma holders' incomes, vertical status mobility, and chances of entering higher education. Income, occupational status, and further training are related but not identical phenomena and thus give a balanced and comprehensive picture of how the institutional dimensions affect early career outcomes. Hitherto, the research on the effects of institutional characteristics of education and training programmes or training firms on these outcomes has been scattered. The effect of the standardisation of exit exams on income is still unclear (Backes-Gellner and Veen, 2008; Leschnig, et al., 2017; Piopiunik, et al., 2014). Further, some evidence shows that the vocational specificity of an education and training programme has a positive effect on income (Eggenberger, et al., 2018) and occupational match at labour market entry (Bol, et al., 2019; Menze,

2017; Muja, et al., 2019b; Vogtenhuber, 2014) and a negative effect on higher education participation (Sander and Kriesi, 2020, in press). Moreover, the size of the training firm has a positive effect on income at labour market entry (Euwals and Winkelmann, 2004).

Third, I ask whether the effects of the institutional characteristics vary depending on individuals' experience on the labour market, gender, and socioeconomic background. These individual characteristics influence labour market allocation to a high degree. Some research examines how occupation-specific education and training influences labour market outcomes over the life course (Forster and Bol, 2018; Korber, 2019a; Kratz, et al., 2019; Verhaest, et al., 2018), and Estévez-Abe (2005) discusses why the institutional dimensions of VET is likely to influence the gender–pay gap. Nevertheless, many questions are still open about the interrelation between individual and institutional characteristics. Overall, these three related research questions contribute to a better understanding of how institutional characteristics vary between occupations and between firms and how these differences influence labour market outcomes and shape social inequalities throughout the early career.

The research questions are analysed in the following four articles. The first article examines the effect of standardisation, vocational specificity, and vertical differentiation on income. In the second and third articles, I discuss the relationships between vocational specificity and the gender–pay gap and status development throughout the career, respectively. The final article examines the effect of institutional characteristics varying between the primary and secondary segment on the probability to enter higher education.

- Income during the Early Career: Do institutional characteristics of training occupations matter? *Research in Social Stratification and Mobility* (2020) with Kriesi, I., and Sacchi, S.
- Skill specificity of upper-secondary training occupations and the gender pay gap. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* (2020) with Kriesi, I., and Sacchi, S.
- The impact of vocational specificity of training occupations on status mobility during the early career. Under Review
- Does It Matter Where They Train? Transitions into Higher Education After VET and the Role of Labour Market Segments. *Social Inclusion* (2019) with Trede, I.

The scope of my analysis comprises Swiss upper-secondary VET-diploma holders. This education track is well suited to examining my research questions in particular because both the occupation logic and the firm logic apply to the Swiss VET context. In Switzerland, upper secondary VET is the most important postcompulsory education track; two thirds of all compulsory school leavers enter upper secondary VET. Within this context, both segment-specific and occupation-specific institutional characteristics shape the linkage between VET and work. The occupational logic applies to the Swiss context because the Swiss upper secondary training system consists of around 230 different training occupations leading to a federal diploma.[1] These occupations are closely linked to the labour market, as is the case in OLMs, because professional organisations are closely involved in defining training curricula and exams. Upper

[1] In German: Eidgenössisches Fähigkeitszeugnis (EFZ)

secondary VET is governed collectively by professional organisations, cantons, and the federal government. This tripartite organisation ensures that the training occupations are highly standardised across the country. However, the occupations differ greatly in their occupation-specific institutional characteristics. The firm logic applies because a high share of those in upper secondary VET attend dual training (close to 90%) (State Secretariat for Education, Research and Innovation (SERI), 2016). This means that apprentices spend 3 to 4 days a week in the training firm and attend vocational school 1 to 2 days a week. A high share of Swiss firms hire apprentices who undergo training within daily operations (Müller and Schweri, 2006). Because of the high diversity of firms hiring apprentices, apprentices experience differing segment-specific institutional characteristics, depending on the firm in which they train.

The remainder of this chapter is structured as follows. Section 1.2 outlines the theoretical considerations regarding vocational education and early labour market outcomes. This section focuses on the effect of occupation-specific and segment-specific institutional characteristics of VET before considering the interplay between institutional and individual characteristics. Section 1.3 discusses methodological issues. A large part of this section addresses the conceptualisation and measurement of institutional heterogeneity in Swiss VET. Furthermore, the individual-level data and the analytical strategies are presented. Section 1.4 presents the main scientific contributions as well as a summary of the results and scientific contributions for each institutional characteristic. In section 1.5, I discuss the limitations of my research and provide an outlook for further research before closing the synopsis with some policy considerations in section1.6. Chapters 2 to 5 include the four articles on which my dissertation is based.

1.2 Vocational education and early labour market outcomes – The effect of institutional dimensions of the VET system.

Throughout my dissertation, I argue that early labour market decisions are institutionally embedded because diploma holders make career decisions within the institutional framework of VET. Figure 1.2 depicts how the institutional characteristics of VET influence early labour market outcomes through three mechanisms. Both firm-specific and occupation-specific institutional characteristics influence apprentices' competence development, the signalling power of their diploma, and how they perceive their career opportunities. This in turn influences their income after labour market entry, their income and status development throughout their early career, and the probability of their entering further education after VET. In order to shed light on these mechanisms, I draw upon various individual-level theoretical strands, human capital, signalling, and rational choice theory. However, I continuously apply these individual-level theoretical approaches in light of the institutional constraints of VET and of the labour market. Overall, this combination of individual-level theoretical approaches with an institutional embeddedness perspective represents an innovative line of argumentation that describes the interdependences between educational institutions, labour market institutions, and individual decisions.

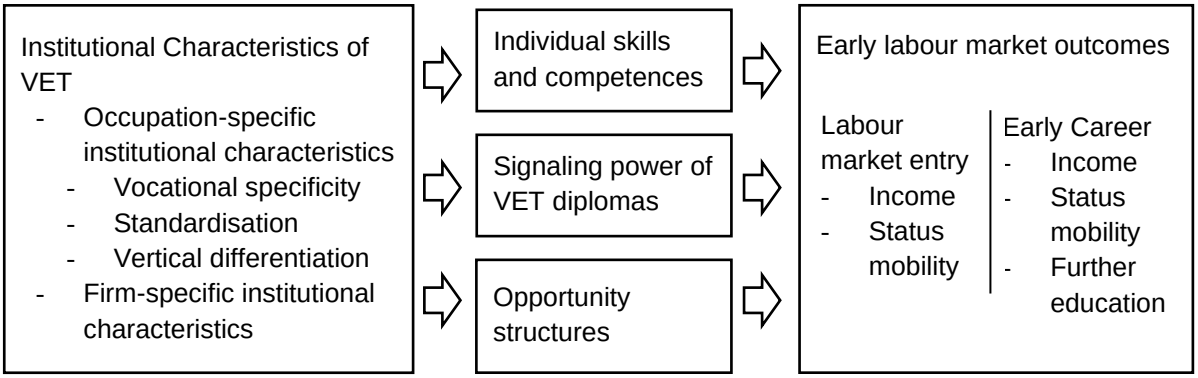

Figure 1.2 The impact of the institutional characteristics on early labour market outcomes

1.2.1 The impact of occupation-specific institutional characteristics

This dissertation is based on two central assumptions. My first assumption is that the differences in occupation-specific institutional characteristics lead to variation in the training occupations' capacities to equip apprentices with labour-market-relevant skill and competences as well as variation in the signalling power of the VET diploma (see also Figure 1.2). Because labour market entrants lack extensive work experience, education is the most important source of labour-market-relevant skills and the most important signal of productivity at labour market entry. Human capital theory states that allocation in the labour market is contingent upon a match between employers' requirements and applicants' human capital (Becker, 1964; Mincer, 1974). Both the quantity and the type of human capital determine individuals' productivity. Human capital theory further assumes that employers hire the most productive applicant at the lowest cost and remunerate their workers according to their productivity. Signalling theory shed light on the information asymmetry between employers and applicants. Employers rely on signals to assess applicants' skills and productivity and thus to make hiring and wage decisions (Arrow, 1973; Spence, 1973). VET diplomas signal both what type of skills individuals have and the level of these skills. These signals can vary between diplomas depending on the specificity of the curricula, the standardisation of the exams, and the differentiation of the occupations.

Next, I present the mechanisms relating each occupation-specific institutional dimension to labour market outcomes in detail. The first institutional dimension, vocational specificity, is based on the distinction between specific and general skills and knowledge. The two types of skills originally referred to firm-specific skills, which are only of use in one firm, and general skills, which are transferable between firms and occupations (Becker, 1964). This distinction was later extended to include occupation-specific or industry-specific skills, which are transferable within the occupation or industry but are applicable to a lesser extent outside the occupation or industry (Neal, 1995; Shaw, 1987). At labour market entry, those with a high quantity of specific skills will be highly productive and need less on-the-job training within their trained occupations than those with more general skills (Arum and Shavit, 1995). Therefore employers have high incentives to hire those with specific skills (Allmendinger, 1989). Furthermore, individuals with specific skills have high incentives to enter jobs which match their diplomas, where their skills will be fully remunerated. Specific skills are more prone to erosion or depreciation when individuals are out of the labour market or when they change occupation because these skills are less transferable and because they are more affected by technological change than general skills (Estévez-Abe, 2005; Hanushek, et al., 2017). Thus, specific education and training has the highest impact on productivity

when the training is fresh: at labour market entry. Because general knowledge depreciates more slowly and facilitates further learning, general education can improve productivity and send positive signals to employers at later career stages (Hanushek, et al., 2017; Korber, 2019a; Lavrijsen and Nicaise, 2017). Further, the transferability of general knowledge and further learning activities means that those with more general education will have access to a wider range of jobs and positions throughout the careers. Thus, their opportunities for upward mobility are more diverse than for those with more occupation-specific skills and knowledge.

The second institutional dimension is exam standardisation, which is defined by curricula-based, centrally organised exams evaluated by fixed criteria (Klein, et al., 2014). In training occupations where exams are standardised schools have higher incentives to teach the curricula and improve quality of teaching rather than lowering grading standards (Bishop and Mane, 2001; Wössmann, 2002). As a result, apprentices' performances are higher and more homogenous, and the test standards and skills tested are transparent to employers and comparable between students (Bishop, 1997; Piopiunik, et al., 2013). Thus, those who trained in occupations with standardised exams are more productive, and their diplomas send clear signals.

The third institutional dimension, vertical differentiation, is the sorting of individuals into different tracks according to their intellectual abilities (Kerckhoff, 1995, p. 328). Vertical differentiation increases the homogeneity of student groups and the performance of higher track students (Hallinan, 1988; van de Werfhorst and Mijs, 2010). Thus, vertically differentiated training occupations send clearer signals about the diploma holders' productivity level than undifferentiated training occupations. The upper track of vertically differentiated occupations is academically more demanding, and thus it also prepares the diploma holders for informal and formal further learning and increases productivity throughout their careers.

Because of the diploma holders' higher productivity and the clear signals of the diplomas, diploma holders who trained in highly specific, standardised, and vertically differentiated occupations are expected to have higher incomes and status at labour market entry than those who trained in more general, less standardised, and undifferentiated occupations. Furthermore, those with more general education and those in vertically differentiated tracks will have a steeper income and status development over time than those with more specific skills and those in undifferentiated tracks.

1.2.2 The impact of firm-specific institutional characteristics

My second central assumption pertains to differences in institutional regulations between training firms. I assume that firm-specific institutional characteristics influence VET diploma holders' perceptions of their career opportunities (see also Figure 1.2). Dual segmentation theory identifies two segments, which are characterised by different opportunity structures (Baron and Bielby, 1984; Sengenberger, 1975; Tolbert, et al., 1980). The primary segment, which consists of large firms with high financial resources, high average education levels, extensive hierarchical structures and high skill and task diversity, provides extensive possibilities for upward mobility. Upward mobility for Swiss VET diploma holders is often contingent upon higher professional education (Sacchi, et al., 2016). Investing in higher education is more attractive in the primary segment than in the secondary segment, which offers few opportunities

for upward mobility, due to small firms, lower average education level, and fewer financial resources. Investing in higher education to achieve upward mobility can therefore be regarded as a more or less promising career strategy depending on the segment in which apprentices receive training.

1.2.3 The interrelationship between institutional and individual characteristics

The signalling power of a VET diploma and the effect of firm allocation on (perceived) career opportunities is likely to differ between groups of individuals, such as men and women or diploma holders with high and low status backgrounds. Thus, I argue that the interplay between institutional and individual characteristics determines the labour market outcomes of different groups. To examine this relationship, I include a rational choice approach. This approach argues that individuals' investments in skills and knowledge represent different costs and benefits depending on gender and socioeconomic status (SES). First, Estèvez-Abe (2005, 2009, 2012) points out that men and women invest differently in specific and general skills. Women tend to go for general skills, which depreciate more slowly than specific skills, because they anticipate times out of the workforce. Men are more likely to go for specific skills, which pay off at the beginning of the career. Because general skills give lower returns at the beginning of the career, this pattern is likely to lead to a gender–pay gap at labour market entry. Second, those with a low SES might perceive higher costs and lower benefits associated with higher education than those with high SES (Boudon, 1974). Because of the more extensive career options and higher demand for tertiary-educated workers in the primary segment, training in this segment could provide access to resources such as information, financial support, and encouragement to which the apprentices with low SES initially lack access. Therefore, low-SES apprentices in the primary segment are likely to adjust how they perceive the costs and benefits of higher education in favour of a transition. In this way, the institutional characteristics of the training firm may compensate for disadvantages due to lower SES. Overall, I argue that there are good theoretical reasons to assume that individual and institutional characteristics interact with regards to early labour market outcomes. Thus, examining one without taking the other into account might at best only present part of the picture.

1.3 Methodological issues

1.3.1 Conceptualising and measuring heterogeneity in institutional characteristics

An examination of my research question requires information on the institutional characteristics of Swiss VET. The collection of this information was part of this dissertation project and included three steps. First, the concept of the institutional dimension needed to be refined and contextualised to apply to training occupations. Hitherto, these concepts have mostly been applied broadly to cross-country differences between whole education systems (e.g. Allmendinger, 1989; Levels, van der Velden, and Di Stasio, 2014; Wolbers, 2007). Second, I operationalised the refined concepts for the Swiss VET context. These two steps are described in further detail below. Third, detailed data on the institutional characteristics was collected from occupation-specific VET ordinances and curricula for all federally recognised three- or four-year upper secondary training occupations in Switzerland. The VET ordinances and curricula are legally binding and describe exam organisation, training time in each training location, number of general and occupation-specific lessons and within-occupation differentiation (number of specialisations or levels). Thus, they give information about differences between the institutional characteristics of the occupations. Due to regular revisions of the curricula and

ordinances, the institutional characteristics of an occupation can also change over time. I had access to all documents in force between 2000 and 2016: in total, 566 occupation-specific ordinances, each with an occupation-specific curriculum. Matching this novel occupational-level data to individual-level data from different data sources enabled an innovative analytical approach.

Next, I describe how each institutional dimension has been conceptualised and operationalised hitherto and my adaptation of the concept and operationalisation to fit the Swiss system. Vocational specificity has been defined as the degree to which education programmes provide occupation-specific rather than general skills (Bol and van de Werfhorst, 2016). Previous operationalisations of this concept have often been rough or inconsistent with the definition. Some research operationalises within-country heterogeneity of specificity by the dichotomisation of general education vs. vocational training or workplace-based vs. school-based training (Korber, 2019b; Kratz, et al., 2019; Müller and Schweri, 2009; Verhaest, et al., 2018). Others use continuous variables of skill similarity between (training) occupations. They estimate the dispersion of skills and competences across occupations based on mobility rates between occupations (DiPrete, et al., 2017; Forster and Bol, 2018; Vogtenhuber, 2014), subjective assessment of transferability of skills (Coenen, et al., 2015; Menze, 2017; Muja, et al., 2019a), or similarity of learning objectives in curricula (Eggenberger, et al., 2018). My criticism of these operationalisation is based on several points. First, the definition states that specificity is a characteristic of the education programme. Although, most research use this definition, some use labour market information such as mobility rates between occupations or individual assessment of fit between job and training to measure vocational specificity. Thus, the relationship between the explanatory variable, a training occupation characteristic, and the outcome variable, labour market outcomes, is blurred, which makes causal interpretation difficult (Muja, et al., 2019b). For example, individuals could be more likely to state that their training does not fit their current job if they are unhappy with their income or work conditions. Further, some operationalisations only apply to differences between education tracks and do not account for differences between education programmes within one track. However, education programmes within one track can be more or less specific and more or less school based. Thus, continuous measures should be incorporated to account for this heterogeneity. Moreover, previous research has assumed that school-based education is general and workplace-based training is occupation specific. However, training at both locations can be both general and specific. Finally, none of the previous contributions has incorporated any measure of horizontal differentiation within education programmes, although this could also be an indicator of how specific or general the skills taught are.

To address the issue of causality, I incorporate measures of the specificity of the training programme itself. Furthermore, this information also allows a multidimensional and continuous conceptualisation of specificity that takes into account both what types of skills and knowledge is taught, the type of skills acquired, and how these skills are taught, the manner of skill acquisition. Thus, I extend both the concept of specificity and its measurement by defining three dimensions of specificity: type of skills, manner of skill acquisition, and horizontal differentiation (see Table 1.1). In the form of VET predominant in Switzerland, dual VET, training is given at three locations: vocational school, intercompany courses, and the training firm. Intercompany courses were established to provide occupation-specific skills and knowledge which cannot be taught at the training firm due to firm specialisation or safety reasons. The

VET ordinances and curricula contain exact information on the quantity of education and training taking place at each location. Therefore, I can distinguish between the type of skills and the manner of skill acquisition. General knowledge (e.g. languages, history, politics) is taught in vocational schools, whereas specific skills are learned at all three locations. Teaching in vocational school is mainly theoretical, whereas training in the firm and intercompany courses are mainly practical. I consider intercompany courses to be providers of practical skills because they are organised by professional associations and are held in large firms or firm-like centres. The ordinances also provide information on the last dimension of specificity, horizontal differentiation. In some occupations, apprentices are sorted into fields of specialisation. Each specialisation partly has its own curriculum. Thus, these occupations provide a narrower set of skills than occupations without horizontal differentiation. An example of a narrow training occupation is that of animal keeper (*TierpflegerIn*), which specialises in domestic animals, laboratory animals, or wild animals. The curricula of the veterinary assistant (*Tiermedizinische PraxisassistentIn*) covers a wider range of animal knowledge and is not differentiated. In sum, I contribute to the literature by using a comprehensive, continuous, and multidimensional operationalisation of specificity. This can improve the understanding of the various effect sizes and directions found in previous research and be a good foundation for policy decisions.

Table 1.1 Dimensions of Specificity

	Type of skills	**Manner of Skill acquisition**	**Horizontal Differentiation**
High specificity	Specific skills	Workplace based training	High degree of horizontal differentiation
Low specificity	General Skills	School based education	Low degree of horizontal differentiation

The second institutional dimension is standardisation, for which Klein et al. (2014) distinguish between input and output standardisation. Since the input, learning goals, are highly standardised through national occupation-specific curricula, I only consider output standardisation, also termed exam standardisation. Standardised exams can be defined as exams which are curricula-based, defined by a central authority, and evaluated by fixed criteria. (Klein, et al., 2014, p. 8). Using this definition, I identify two dimensions of exam standardisation: exam setting and exam grading. Within-country differences in exam standardisation have only been measured for lower secondary schools and upper secondary baccalaureate schools (Jürges, et al., 2005; Piopiunik, et al., 2014). Exam standardisation within VET has never been discussed before. First, I give a short overview of the final exams in Swiss VET before turning to the operationalisation of standardisation within this context. Final grades are based on grades in three competence areas (see Table 1.2). First, practical occupation-specific skills are tested with a practical exam. This exam can be set and graded by cantonal authorities or by the trainer at the training firm. Second, theoretical occupation-specific knowledge is graded on a combination of the theoretical exam grade and the previous performance grade. Theoretical exams can be written or both oral and written. The previous performance grade is based on teachers' assessment of the apprentices' performance throughout the final school semester. Third, the exam grade for general knowledge is

integrated in the final grade. However, I do not consider this grade when operationalising exam standardisation, because the procedure for setting and grading this exam does not vary between occupations.

Table 1.2: Composition of the final grade in Swiss upper secondary VET*

	Competence area	Type of assessment	
Final Grade	Practical occupation-specific skills	Practical exam(s)	Set and graded by cantonal authorities (VPA) Set and graded by the trainer in the firm (IPA)
	Theoretical occupation-specific knowledge	Theoretical exam	Written Written and oral
		Previous performance grade(s)	Varying weight in final grade
	General knowledge	Theoretical exam Previous performance grade(s) Essay	

*Simplified version (Grønning, et al., 2018). See Wettstein, et al. (2014, pp. 253-254) for a complete description.

Table 1.3 shows which exam setting and grading procedures I consider to be more standardised and which less standardised. Exams set and graded by cantonal authorities are more standardised than those set and graded by the trainer at the training firm, because trainers' exam assignment and grading vary between apprentices and firms. Furthermore, grades from oral exams and previous performance grades are more prone to assessor's subjective standards and therefore less comparable between diploma holders. Therefore, I consider written exams and low proportions of the previous performance grades in the final grade to be more standardised than oral exams and high proportions of previous performance grades.

Table 1.3 Indicators for the standardisation level of assessment types (final exams and grades)*

Level of Standardisation	**Exam-setting agency**	**Grading agency**
High	Practical and theoretical exam prepared by cantonal authorities	Practical exam graded by experts (*Prüfungsexperten*) Written theoretical exams Low importance of previous performance grades
Low	Practical exam prepared by the trainer in the firm	Practical exam graded by trainer in the firm Partly oral theoretical exams High importance of previous performance grades

*Simplified version (Grønning, et al., 2018).

Last, training occupations differ in the degree to which they are vertically differentiated, or tracked. In comparative research, education systems are considered to be highly differentiated when pupils are sorted into school tracks according to their ability levels from an early age (Allmendinger, 1989). Similarly, apprentices within some training fields are sorted into levels according to their ability and school performance. In other occupations, all apprentices are subject to the same curricula. Two types of sorting can be found:

- Basic and advanced levels of training
- Two-year programmes leading to a Federal Certificate of VET

In some training occupations, apprentices have to choose either the basic level or the advanced level. The higher level is characterised by more lessons at vocational school and higher academic requirements. Furthermore, some occupational fields offer a two-year training programme leading to a federal certificate[2] in addition to the three- or four-year training programmes leading to a federal diploma. The two-year programmes are intended to be less intellectually demanding with mainly practical training.

Furthermore, I discuss how to define and operationalise institutional differences between the primary and secondary labour market segments. A set of key characteristics of firms have been used to define and differentiate between the two segments (firm size, financial resources, average education level, complexity of hierarchical structures, and occupation and task diversity: Tolbert, et al., 1980). Data on these characteristics of training firms would be ideal for assigning the firms to one of the segments. However, no such data exists for Switzerland to date. Therefore, I choose to focus on one training occupation, the healthcare assistant apprenticeship. Focusing on the healthcare sector is optimal because it is a large sector with two large segments, acute care (i.e. hospitals) and long-term care (i.e. nursing homes), resembling the primary and secondary segments. Hospitals are often large, have extensive financial resources and hierarchical structures, and are characterised by a wide set of occupations and tasks in the field of nursing. This segment is distinctly different from nursing homes, which are small, have fewer financial resources, a low number of hierarchical levels, and lower diversity in tasks and occupations. Healthcare apprentices spend their training time in only one of the segments, and thus they are subject to segment-specific institutional regulations. Furthermore, trained healthcare assistants are qualified to work in both segments after their training or to continue into nursing studies, independent of where they trained. Because there are no formal barriers to mobility for healthcare apprentices, the healthcare sector is well suited to testing whether segment allocation during training influences career decisions.

1.3.2 Individual level data

To analyse the impact of the institutional dimensions on young VET diploma holders' labour market outcomes, I use several data sources. Common to all data sources is that I limit the data to individuals with a Swiss federal diploma of VET, representing an upper secondary dual vocational training of three or four years' duration. A crucial prerequisite for the analysis was that the time of completion of the training and the training occupation or, for the final paper, the training segment could be identified in the

[2] In German: Eidgenössisches Berufsattest (EBA)

data. The institutional characteristics could only be assigned accurately to each individual through this information.

To examine the influence of the institutional dimensions on income (articles one and two), a pooled cross-sectional dataset was constructed from the Swiss Labour Force Surveys (SLFS) from 2003 to 2016. The SLFS is a representative survey of the Swiss working population. This data was linked to register data on yearly income from the Social protection on the labour market (SESAM) statistical project. Using this data combination has several advantages. First, register data on income is more reliable than self-reported income, which is prone to errors and social desirability bias. Second, the SLFS data provides a large number of respondents who trained in a wide range of training occupations at various time points. These features of the datasets ensure a high variation in the institutional characteristics. Furthermore, I was able to examine the influence of the institutional characteristics on income throughout the early career, because the respondents had different levels of labour market experience at the time of the survey. However, this data also limits the analysis in some respects. First, data on individual abilities and socioeconomic background is not available. This could represent a bias: if individuals sort into training occupations according to their abilities or background, the institutional dimensions therefore correlate with these variables as well. To partly control for selection into occupations based on abilities, I include Stalder's (2011) well-established classification of the intellectual requirement level of Swiss training occupations in the analysis. Second, individuals with a tertiary degree in addition to upper secondary VET diplomas had to be excluded from the sample because information on their initial training occupation title is missing. This might represent a bias, because transition into tertiary education correlate with sorting into both upper secondary training occupations and income.

The first cohort from the Transitions from education to employment data (TREE) allowed me to address these two limitations. This data was used to analyse the impact of the institutional dimensions on status mobility (article three). TREE is a longitudinal survey following a representative sample of individuals who left compulsory school in 2000; it covers 14 years of their education, training, and early career. Therefore, the initial training occupation, further education, and job episodes can all be identified. Because the first wave is based on the Swiss PISA survey, measures of diploma holders' cognitive abilities and socioeconomic background variables are both available. A final advantage of this data is its longitudinal structure, which enables the short- and mid-term effects of the institutional dimensions to be separated. Nevertheless, the number of observations is smaller for this dataset, so examining interactions between the institutional dimensions and individual characteristics is not possible.

Finally, the impact of segment-specific institutional characteristics on transitions into higher education is analysed with a dataset with graduates of one training occupation, healthcare assistants (article four). Examining differences within one occupation increases internal validity, as differences between occupations are absent and thus cannot coincide with differences between segments. The data is from a survey of healthcare apprentices who graduated in 2012, conducted by the Swiss Federal Institute for Vocational Education and Training. The healthcare assistants were surveyed one year before finishing their apprenticeship and then one year and five years after finishing. Thus, their transition into higher education within these five years can be observed. For the analytical sample, only those who trained either in nursing homes or in hospitals were selected. In sum, the triangulation of various individual-level

data sources and matching with unique data on the institutional characteristics increases the robustness of the results.

1.3.3 Analytical strategies

Because both the outcome variables and the size of the datasets differ, I use several analytical strategies to identify the effects of the institutional characteristics. To examine the effect of the institutional dimensions on income, I implement a multilevel strategy (articles one and two). Multilevel modelling is chosen for two reasons. First, it is ideal for examining the proportion of the income variance that can be attributed to the training occupations. In other words, the explanatory power of the institutional characteristics can be examined. Second, this method can correct for violation of the independence assumption, which often occurs with nested data (Rabe-Hesketh and Skrondal, 2006). Neglecting the fact that individuals are sorted into occupations might result in biased standard errors for the effect of the institutional measures. For these two reasons, I estimate linear random intercept regressions as well as linear random slope regressions. The latter is used for analysis of interactions between the higher and lower levels. A low number of groups at the second level can bias the estimates of the second-level standard errors (Maas and Hox, 2005). Thus, I use this analytical strategy only for the SLFS data, which provides a large number of training occupations.

In the third article, I examine the effect of vocational specificity on the probability of experiencing upward or downward status mobility. For dependent variables with more than two discrete outcomes, multinomial logistic regression models are appropriate (Long and Freese, 2006). I take the nested structure of the data into account by using cluster robust standard errors.

The final article also considers selection. Apprenticeship firms are not assigned randomly. School leavers apply for apprenticeships, and training firms choose who to hire. Selection into the primary labour market segment based on characteristics that later also affect transition into higher education might thus bias the estimates. To come closer to the causal effect of training in the primary segment, a comparison of individuals with similar traits who have the same treatment probability is thus meaningful (Morgan and Harding, 2006). I therefore apply propensity score matching, a method in which the average outcome of diploma holders who trained in the primary segment is compared to the average outcome of a similar group of diploma holders who trained in the secondary segment. Similarity is based on the propensity score, which is the probability of entering training in the primary segment given a set of observed characteristics. This method takes selection into treatment into account, based on the observed characteristics.

The labour market outcomes in the first three articles, income and access to higher and lower status positions, is highly dependent on occupation-specific labour market opportunities (Buchs, et al., 2017; Sacchi, et al., 2016). To avoid biased results due to correlation between training occupations and labour market opportunities, I include unique occupation-specific annual measures of labour market demand and supply. Demand measures are drawn from the Swiss Job Monitor Data, a yearly representative sample of all Swiss job ads. Yearly occupation-specific supply measures are based upon data on all registered unemployment episodes in Switzerland provided by the job placement and labour market statistics information system. These measures are linked to individuals' training occupation field (Swiss

Standard Classification of Occupations 2000) and year of completion of training. Thus, they represent VET diploma holders' labour market opportunities at the time of labour market entry.

1.4 Main contributions and summary of results

There is ample evidence that allocation into an education level (e.g. upper secondary education and tertiary education) or education track (e.g. upper secondary baccalaureate track and vocational track) influences individuals' chances on the labour market (e.g. Gomensoro, et al., 2017; Korber, 2019b). My dissertation widens this insight by emphasising the relevance and importance of allocation within education tracks as well. In particular, I focus on two institutions shaping the linkage between VET and work: firms and occupations.

1.4.1 Main research contributions

This dissertation makes three main contributions to the current research on institutional effects of education and training on labour market outcomes. My first main contribution is to concentrate on the institutional heterogeneity within upper secondary VET. I consider two types of heterogeneity: institutional differences between training occupations and institutional differences between segments of training firms. To examine differences between training occupations, I draw upon an extensive line of research that discusses how to conceptualise and understand the effect of within-country heterogeneity in three institutional dimensions: standardisation, vocational specificity, and vertical differentiation (e.g. Coenen, et al., 2015; DiPrete, et al., 2017; Piopiunik, et al., 2013; Vogtenhuber, 2014). I contribute to this literature by arguing that the institutional dimensions should be understood as continuous and multidimensional concepts. Training occupations, for example, differ in the degree to which they standardise exam setting and the grading procedures for final exams. The refinement of these theoretical concepts is important for understanding the precise mechanisms linking the institutional dimensions to early income and status development. In the articles 1-3, I provide empirical evidence that the variation in institutional characteristics within the Swiss VET system is considerable and that it influences early labour market outcomes to different degrees and in different directions. Thus, I develop a more nuanced understanding of the mechanisms behind the impact of occupation-specific institutional characteristics than currently available.

Further, in VET systems in which young adults undergo large parts of their training and education in firms, institutional differences between training firms shape individuals' career opportunities after training. Nevertheless, theoretical considerations of how labour market outcomes are influenced by training firm allocation are rare. I argue that labour market segmentation theory can function as a starting point for these considerations. In article four, I describe how training firms within one training occupation can represent either the primary segment or the secondary segment, depending on the firms' institutional characteristics. Furthermore, I assess how allocation to one of these two segments can influence career development. Young diploma holders can perceive their career options differently depending on the segment in which they train, even though they formally hold the same qualification and have the same further education options. Thus, my dissertation sheds light on the hitherto neglected relevance of firms as institutions that determine early labour market outcomes.

Second, I contribute to the literature by showing that the effects of the institutional characteristics have a temporal dimension. The institutional characteristics unfold their effects at different points throughout the diploma holders' careers. I draw upon research discussing whether the institutional characteristics of VET, in particular specificity, give diploma holders a "happy start and a lousy end to the career" (Korber and Oesch, 2016; see also Forster and Bol, 2018; Hanushek, et al., 2017). Because I use multidimensional continuous measures of specificity, I can go beyond this trade-off perspective by examining the effect of each specificity measure (e.g. practical occupation-specific training) while holding the others constant. In this way, I show how the effect of one institutional dimension is related to the diploma holders' experience of the labour market independently of the other institutional characteristics. For example, the quantity of general education seems to be of less importance for income levels and status at the beginning of the career but increases in importance with experience.

My third main contribution pertains to the impact of institutional characteristics of VET on social stratification. Some research focuses on social disparities in the access to VET. Two important examples of individual characteristics which determine sorting into training occupations are social background and gender (Hupka-Brunner, et al., 2010; Imdorf, 2017a; Protsch and Solga, 2016). I add to this research by showing how the training occupation itself shape income and career inequality. Disadvantages due to social background and gender can be compensated for if all groups have equal access to training occupations and firms with favourable institutional settings. However, disadvantages can also be reinforced if some groups have an easier access to training occupations and firms with favourable characteristics than other groups. For example, if individuals from a low socioeconomic background more seldom gain access to training in a segment with institutionalised career pathways, they might face a double disadvantage: one due to lower financial and social resources in the family and a second due to few mobility options and less support for mobility in their training segment.

Furthermore, the interaction between individual and institutional characteristics seems to be context dependent. The results show how income and status inequality are the results of a complex interplay between individual characteristics, institutional characteristics, and labour market context. An example is the result of the second article that the gender type of the training occupation determines men and women's returns on specific and general skills. If we do not consider this interplay, there is a risk of generalising results that only pertain to a segment of the population. This is illustrated by the prevalent emphasis on specific practical skills to improve labour market entry (Šćepanović and Martín Artiles, 2020). This emphasis neglects that women and men in gender-atypical occupations benefit from general education in terms of income from the beginning of their career.

1.4.2 Summary of results and contributions for each institutional dimension

Several research contributions can be identified for each institutional dimension. The results for standardisation show that those who trained in occupations with highly standardised final exams have a significantly lower income than those who trained in occupations with less standardised exams (Article 1). This results stands in contrast to research finding a positive effect of exam standardisation on income for school leavers with general education (Backes-Gellner and Veen, 2008; Piopiunik, et al., 2014; Schwerdt and Wössmann, 2017). This leads me to question the way we think about exam standardisation in VET. First, locally defined and graded exams might more effectively take local skill

demand into account. Second, exams set and graded by the apprentices' teachers and trainers might incorporate signals of noncognitive skills such as sociability, self-organisation, and work effort, which highly standardised exams cannot incorporate. This may be relevant because employers give higher priority to noncognitive than cognitive signals when hiring individuals with low education levels (Protsch and Solga, 2015). Third, despite a high degree of standardisation of the learning objectives in Swiss VET, the content, scope, and orientation of training is strongly influenced by the training company. In other words, the training environment of dual VET is not as standardised as the training environment in schools. Standardised exams might not do justice to this heterogeneity and thus send unclear signals.

The results for vertical differentiation show that those who trained in vertically differentiated occupations suffer an initial income disadvantage, but this is replaced by an increasing income advantage after some years of experience on the labour market (Article 1). The trade-off between short-term gains and mid-term advantages suggests that the higher tracks provide knowledge that can facilitate further learning and flexibility in new work situations. This only becomes useful after some years of experience. These results show that the concept of vertical differentiation, also termed tracking, can be useful for examining differences in early labour market outcomes not only between education systems (e.g. Andersen and van de Werfhorst, 2010; Bol and van de Werfhorst, 2016), but also between education programmes within one education level.

Furthermore, I found that different dimensions of vocational specificity impact income and status mobility throughout the early career differently. My findings confirm the importance of practical occupation-specific knowledge for a smooth labour market entry found in recent research (Muja, et al., 2019b; Verhaest, et al., 2018). Diploma holders who have a high proportion of practical training during their apprenticeship have a higher income and lower probability of experiencing downward status mobility at labour market entry than those with lower proportions of practical training (articles 1 and 3). This supports the assumption that practical training provides individuals with ready-to-use labour-market-relevant skills that increase their productivity. These skills are remunerated accordingly by employers. However, the results also show the importance of disentangling the effects of the different dimensions of vocational specificity. Neither theoretical occupation-specific training in vocational school nor the narrowness of the training occupation has an effect on income (article 1). The blurring of the three dimensions of specificity in past research could be a reason for inconsistent findings. Furthermore, the results show that diploma holders benefit from a high proportion of general education over time. After some years of experience, those with a high proportion of general education have higher income, a higher probability of upward mobility and a lower probability of downward mobility than those with less general education (articles 1 and 3). This result suggests that general education enhances individuals' flexibility and learning abilities, for instance through tertiary education. This improves their productivity and sends positive signals to employers. Thus, those with high proportions of general education gain access to higher paying and higher status jobs. In line with Korber's (2019b) findings, the positive effect of general education on income is evident during the early career in the Swiss context.

However, the second article shows that the effects of general and occupation-specific skills do not hold for men and women alike. I draw upon Estévez-Abe's (2005, 2012) hypotheses that women tend to invest in general skills rather than occupations-specific skills because they benefit more from these skills

throughout the life course than men. Moreover, I found that the remuneration of men and women's general and specific skills is also influenced by the gender type of the skills. The positive effect of occupation-specific education and training is evident only for men in male-typed and gender-neutral occupations. However, the returns to general knowledge are high for all except for men in male-typed occupations. Thus, the prevalent consensus in the literature, that occupation-specific skills have a positive effect on income at labour market entry and general knowledge becomes important in later career stages, holds only for men in male-typed and gender-neutral occupations. Women's returns to general education are evident immediately after labour market entry. Further, the returns to women's specific skills depends strongly on the gender type of the skill. This can lead to disparities in men and women's skill investment strategies and thus ultimately affect the gender–pay gap.

The results for the institutional characteristics of training firms show that healthcare assistants who trained in firms in the primary segment are more likely to enter higher education after their apprenticeship than healthcare assistants who trained firms in the secondary segment (Article 4). This is in line with the assumption that those who train in the primary segment with its institutionalised career pathways make use of their further training options more often than those who train in the secondary segment, where career progression is less institutionalised. This effect seems to apply to those with lower SES background in particular. Thus, favourable institutional settings can compensate for lower access to financial and social resources at home, which might hamper entry into higher education. However, this compensating effect can only occur if those with lower SES have the same access to training in the primary segment as those with high SES

1.5 Limitations and outlook

The results are based on a unique combination of data. However, I acknowledge that this data combination imposes some limitations on the analysis and conclusions. A first issue to address is possible selection bias. I have chosen analytical strategies that make it possible to control for selection based on observed characteristics. However, selection into training occupations or segments based on individuals' intellectual abilities is only considered in the third article using test scores from the PISA survey. In the first and second articles, I use data from the SLFS to address this issue by including a proxy for the individual abilities and the intellectual requirement level of the occupation. A further selection issue in the articles based on SLFS data is the use of a proxy for labour market experience, time since diploma completion. Because time out of the labour force can impact individuals' productivity levels and send negative signals to employers (Helbling and Sacchi, 2014), using this proxy might cause a bias if individuals in some occupations systematically acquire less labour market experience than those in other occupations. However, this bias is mitigated by the fact that the respondents are on average still in their early twenties and mostly unmarried and childless. Finally, the income analysis using the SLFS data is based on a sample of individuals with only upper secondary education. Thus, I exclude individuals who continued into higher education after VET. This could cause a bias, because transition rates into higher education differ between training occupations and gender (Buchmann, et al., 2007). The results from the third article and from recent research (Sander and Kriesi, 2020, in press) suggest that the positive impact of general education on income might be even higher if VET diploma

holders who continue into higher education were included in the sample. The reason for this is that the effect of general education on status is mediated by higher education.

Ideally, these selection issues would be addressed with longitudinal data with the following information: cognitive ability test scores from a time point before the respondents enter VET and information on employment, unemployment, and education spells throughout the early career. In addition to the rather small TREE sample, the German NEPS cohort Grade 9 meets these criteria (Blossfeld, et al., 2011). However, similar analyses with NEPS data also require data on the institutional characteristics of German training occupations, which is not yet available.

A second issue is the generalisation of the findings. The results are valid for Swiss VET. Whether institutional characteristics have the same impact in other countries needs further attention. Wolbers (2007) finds that the link between the labour market and specificity is the strongest in countries where the education system is most strongly vocationally oriented. Whether the mechanisms described in the articles also apply in education systems with more school-based vocational training and weaker linkage between education programmes and the labour market has yet to be empirically examined. The results from the second article, for example, suggest that education systems with mainly school-based vocational education, which provides pupils with more general and analytical skills, could attenuate the gender pay gap. Furthermore, the results pertain only to upper secondary VET. There is a lack of information about the heterogeneity in institutional characteristics in tertiary (vocational) education. Therefore, we also know little about the effect of institutional characteristics of higher education on labour market outcomes or whether these are comparable to the relationship at the upper secondary education level. However, the contrast between vocational education and training and academic tertiary education has faded with the institutionalisation and standardisation of professional education and training and introduction of internships and dual studies at universities. The impact of this alignment may be of interest for further research. Last, the results in the fourth article pertain only to the occupation of healthcare assistant. To generalise the results to VET, more comprehensive data is needed on training firm characteristics in a range of training occupations.

Finally, I address two open research questions, which emerge from the results of this dissertation. First, the interdependence of institutional characteristics and skill demand and supply over a lifetime is still unclear. Research comparing vocational and general education suggests a trade-off between general and specific skills throughout the career (Hanushek, et al., 2017; Korber, 2019b). Furthermore, labour market demand shapes individuals' labour market chances to a high degree (Brunner and Kuhn, 2014; Buchs, 2018). When occupation-specific demand decreases or skill requirements within the occupation changes, workers can adapt to the situation with such strategies as re-training and occupational mobility. These strategies might differ between diploma holders, depending on the institutional characteristics of their training occupation. Second, in this contribution I have assumed that practical training in the firm is occupation specific. However, a range of transferable skills can be acquired through workplace practice, such as communication and problem-solving skills. In light of their increasing importance (European Center for the Development of Vocational Training (Cedefop), 2015), it would be interesting to examine the proportion and type of these transferable skills provided through training in the firm.

1.6 Policy considerations

Often the dual VET system is presented as a success story in terms of youth labour market integration (European Commission, 2017; Šćepanović and Martín Artiles, 2020). However, this appraisal overlooks the social stratification process within VET (Protsch and Solga, 2016). Existing inequalities may be reinforced if disadvantaged groups experience limited access to training firms or occupations with favourable institutional characteristics. Meyer and Sacchi (2020, p. 1) indeed find that access to training occupations with high academic requirements is "determined less by skills and achievement than by characteristics of social origin." However, VET also has the potential to mitigate inequality in the labour market if equal access is secured to training occupations and training firms with favourable institutional settings. Nevertheless, more research is needed on this topic to understand the social stratification processes in more detail and be able to draw policy conclusions.

Policy considerations regarding VET are subject to conflicting interests and trade-offs. First, there is a trade-off between diploma holders' benefits and firms' benefits from VET. To be able to quickly use the diploma holders as productive workers after or even during apprenticeships, firms and professional organisations have an interest in training apprentices according to (short-term) skill demand (Mohrenweiser and Zwick, 2009). Thus, they have an interest in a high proportion of specific and practical training during the apprenticeship. However, from an individual perspective, some school-based general education is important to enhance diploma holders' long term flexibility on the labour market in case of personal re-orientation and changing labour market demand due, for example, to technological development.

Furthermore, there is a trade-off between the inclusion of low-achieving youth in VET and their optimal preparation for lifelong learning. VET functions as one of the few possibilities for low-achieving school leavers to obtain a federal qualification. Thus, dual VET, especially the more practically oriented training programmes, is an important instrument for meeting the 95% upper secondary graduation quota explicitly set in Swiss education policy (Schweizerische Koordinationsstelle für Bildungsforschung, 2014). However, another aim of VET is to prepare diploma holders for lifelong learning to minimise their disadvantage against individuals with tertiary education. This is a relevant issue, because upper secondary VET diploma holders increasingly face challenges at labour market entry because of employers' rising requirements for experience and further education (Salvisberg and Sacchi, 2014a). The results of my thesis suggest that general education within dual VET can be an important instrument for facilitating lifelong learning without losing the strong connection to the labour market, which improves labour market entry chances. However, more general education and less practical training might be challenging for low-achieving youth. Against this background, I suggest that policy discussions should focus less on the trade-off and more on how to provide both solid practical occupation-specific training and a good foundation in general knowledge within the VET system as a whole. One recently much discussed policy instrument for achieving this is the vocational baccalaureate, which predominantly provides general knowledge and gives access to a wider range of higher education programmes (Wettstein, et al., 2014, pp. 46-47) Vocational baccalaureate classes can be attended either during VET or after Diploma completion. Therefore channelling a higher share of Diploma Holders from a wider range of training occupations into a vocational baccalaureate would not compromise the practical focus

of the dual VET programmes. Another pathway could be to secure permeability between less demanding practically oriented training programmes and more demanding theoretically oriented training programmes, or between baccalaureate schools (Gymnasium) and VET. For example, if dropouts from baccalaureate schools could have their educational achievements recognised as part of a VET programme, both the individual and social costs associated with dropping out could be reduced (Aeschlimann and Trede, 2019).

2 Income during the Early Career: Do institutional characteristics of training occupations matter?

2.1 Introduction

Income differences remain a source of social inequality, even between individuals with the same level of education. In Switzerland, the pronounced differences in average entry-level wages between vocational education and training (VET) occupations with similar training durations are particularly striking (Pfister, et al., 2017). Even though VET is known to facilitate a smooth school-to-work transition (Gangl, 2001; Müller and Shavit, 1998), it still produces considerable inequality in the returns to education (Swiss Federal Statistical Office (FSO), 2018a). The reasons for these inequalities among young people with similar education qualifications and the same training durations are still not fully explored even though differences in income levels between occupations have been a recurring topic in stratification research. Explanations includes differences in employment relations (Goldthorpe, 2000; Wright, 1997), mechanisms of closure, such as licensing and unionization (Bol and Weeden, 2014; Weeden, 2002), gender composition (Leuze and Strauß, 2016; Murphy and Oesch, 2016), risk level in occupations (Rosen, 1986; Viscusi, 1993), and a task-based approach (Autor and Handel, 2013; Williams and Bol, 2018). A further strand of theory focuses on skill requirements within occupations to explain wage inequality (Le Grand and Tåhlin, 2013). We aim at extending this strand of research by arguing that income inequalities in the early careers of people holding VET diplomas are partly due to institutionalized differences in training characteristics, which affect the VET diplomas' signalling value as well as the average skill level of the diploma holders. This argument draws on comparative research on education systems that implies that the institutional characteristics of education systems, such as the levels of standardization, differentiation, and vocational specificity, impact individual skill formation and productivity and thereby affect labour market outcomes (Breen, 2005; Müller and Shavit, 1998; van de Werfhorst, 2011; Wolbers, 2007). These findings suggest that highly standardized and vocationally oriented education systems with a high degree of differentiation give young workers a favourable start in the labour market, and that general education increases in importance over the career (De Lange, et al., 2014; Hanushek, et al., 2017; Wolbers, 2007).

However, the mechanisms that explain the relationship between institutional characteristics and income are situated at the level of educational programmes rather than national education systems. Within VET, individuals are allocated to occupational fields or training occupations. We argue that this context directly influences their skill development and quantity, quality, and type of human capital endowment, which in turn impacts productivity and income levels. We therefore compare training occupations and investigate whether income differences between VET diploma holders are related to the institutional characteristics of their training programmes. In particular, we analyse how the standardization, differentiation, and vocational specificity of occupation-specific upper secondary training programmes impact the income level of VET diploma holders. We focus on the early career: the first 15 years of labour market experience. In this period, institutional characteristics of the training programme should be particularly important for career outcomes because their effects are not yet moderated by work experience or further training.

The Swiss VET context is ideally suited to studying this question. Two thirds of all compulsory school leavers start vocational education and training in one of approximately 230 different training occupations. The majority pursue a dual apprenticeship, with training in three locations: the training firm, inter-company courses, and vocational school. A minority of 10% attend a fully school-based type of VET. Dual programmes combine a large share of practical training with some theoretical education, and they impart occupation-specific skills as well as some general knowledge and skills. Most programmes last three or four years. All are highly standardized, with apprentices following the same curricula and earning nationwide-recognized federal diplomas of VET. Due to the extensive involvement of labour market organizations in the development and implementation of VET, the diploma clearly signals labour-market-relevant skills to employers (Gangl, 2003; Iannelli and Raffe, 2007). However, despite the high standardization within the programmes, the training occupations differ significantly in their levels of exam standardization, differentiation, and specificity (Grønning, et al., 2018). We exploit these differences to gain a closer understanding of how the institutional characteristics of vocational education and training programmes shape income levels.

We contribute to previous research in several ways. First, we focus on the training programmes, because these determine the skill and knowledge development of students. Second, we go beyond the use of simple proxies, such as type or level of education (Korber and Oesch, 2019; Lavrijsen and Nicaise, 2017; Piopiunik, et al., 2014), by making use of detailed curriculum-based data. This allows us to distinguish between subdimensions of institutional characteristics within VET and to analyse the dimensions simultaneously. Third, by controlling for two possible occupational-level confounders, labour market opportunities and intellectual requirement level (Buchs, et al., 2015; Stalder, 2011), we reduce the likelihood of estimating spurious effects of the institutional characteristics, thus avoiding a problem that hampers many existing studies.

2.2 Theory and Hypotheses

We focus on theoretical arguments that explain how skill requirements and the signalling power of education programmes lead to income inequalities. First, differences in income arise because of differences in productivity levels based on individuals' human capital (Becker, 1975; Mincer, 1974). Second, wages may also depend on anticipated rather than actual productivity and trainability. When hiring employees and setting their starting wages, employers derive information on the applicants' productivity levels from available information sources, so-called signs (Spence, 1973; Stiglitz, 1975). For young labour market entrants, education is the main source and signal of labour-market-relevant skills and knowledge (Iannelli and Raffe, 2007; Mincer, 1974; Müller and Shavit, 1998). Our central assumption, depicted in Figure 2.1, is that differences between vocational education and training programmes in their institutional characteristics, vocational specificity, vertical differentiation, and standardization influence 1) human capital development (quantity and quality of skills) and 2) the signalling power of the diploma (Allmendinger, 1989; Müller and Shavit, 1998). This in turn impacts the income levels of VET diploma holders shortly after labour market entry.

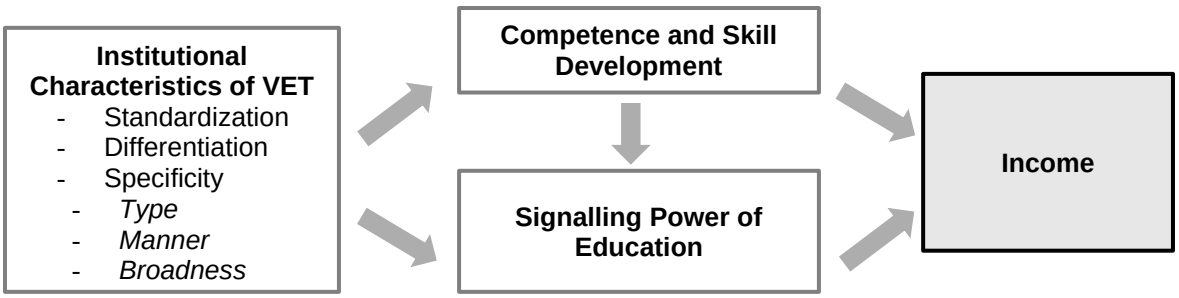

Figure 2.1 Conceptual model of the relationship between institutional characteristics of training programmes and income

2.2.1 Vocational Specificity

Vocational specificity refers to the extent to which an education provides students with specific vocational rather than general skills (Bol and van de Werfhorst, 2016, p. 74). The concept is based on human capital theory, which distinguishes between general and specific skills and knowledge (Becker, 1962, 1975). In Becker's original work, specific skills were conceptualized as skills that can be utilized only within the firm. Later contributions have differentiated between firm-specific and occupation-specific skills (Müller and Shavit, 1998; Shaw, 1987).[3] General skills such as literacy, communication skills, problem solving, and analytical skills are useful regardless of context and transferable between occupations (Borghans and Heijke, 2005).

A handful of studies has analysed the relationship between vocational specificity and income after labour market entry. However, the results are not clear-cut. Whereas Eggenberger et al. (2018) find positive effects for Switzerland, Coenen et al. (2015) find negative effects, and Busemeyer (2015) finds no relationship between specificity and income. The few analyses taking long-term outcomes into account imply that high vocational specificity may be less advantageous for income development than general education (Hanushek, et al., 2017; Korber and Oesch, 2019; Lavrijsen and Nicaise, 2017) and may increase wage losses after displacement (Nawakitphaitoon and Ormiston, 2015). These ambiguous findings are unsurprising and are likely due to the use of diverse concepts of specificity, which are often based on the crude distinction between general and vocational education (for an exception see Eggenberger, et al., 2018). However, fully grasping the vocational vs. general orientation of the curricula requires a more profound theoretical understanding of the concept of specificity that considers how the learning objectives are taught and how broadly training programmes are defined. We therefore develop a multidimensional concept of specificity. It distinguishes between the type of the imparted skills, the *manner of skill acquisition,* and the *broadness* of the taught skills.

The dimension of skill type refers to the classical distinction between occupation-specific and general skills. General skills are transferable between occupations but not immediately convertible into productivity (Hanushek, et al., 2017). However, general skills facilitate further formal and informal learning (Lavrijsen and Nicaise, 2017) as well as occupational mobility (Menze, 2017). For this reason, they are likely to increase productivity and income later in careers. We therefore hypothesize that there

[3] Müller and Schweri (2015) find that the firm-specific element of upper secondary VET in Switzerland is marginal, and that most skills imparted are transferable between firms. Therefore we do not discuss the influence of firm-specific skills any further.

is no significant difference in income between those with high levels of general education and those with low levels at labour market entry (H1a). However, the effect of general education becomes positive with increasing labour market experience (H1b). Occupation-specific skills are only useful in the training occupation or in very closely related occupations. They are thus less transferable between occupations than general skills, but they ensure instant productivity at labour market entry and reduce the need for on-the-job training (Hanushek, et al., 2017; Iannelli and Raffe, 2007; Müller and Shavit, 1998).

Within the Swiss VET system, occupation-specific and general skills differ in their manner of acquisition. While general education is only taught in school, occupation-specific skills are imparted by practical training in a workplace setting and, to a lesser degree, by theoretical education in vocational school. Workplace-based learning is learning by doing in an authentic and up-to-date work environment. It provides highly occupation-specific and well-developed skills for labour market participation. However, the value of these skills are prone to depreciate over the career due to technological change (Hanushek, et al., 2017). Classroom-based education is less close to 'real-life' work environments and more theoretical, and thus not as immediately applicable to the job (OECD, 2010). However, it should promote analytical thinking and problem solving, which makes individuals able to adjust to new situations and requirements (Jonker, et al., 2006) . Previous findings suggest that workplace-based training is associated with a higher-paid first job (Müller and Schweri, 2009; Polidano and Tabasso, 2014), whereas individuals with fully school-based vocational education do better in the long run (Jonker, et al., 2006). Accordingly, we hypothesize that practical occupation-specific training has a positive impact on income at labour market entry (H2a), which subsequently weakens over the career (H2b). Theoretical occupation-specific education has no immediate effect at labour market entry (H3a). However, the effect of theoretical occupation-specific training becomes positive with growing work experience (H3b).

The third aspect of specificity is how broad or narrow the taught skill set is. The narrower the training and education curriculum is, the more specific to a certain subject or occupational subfield the knowledge and skills taught are. These very specific skills are likely to increase the initial productivity of individuals working in their training occupation after labour market entry. Because we focus on individuals in their early careers, we hypothesize that individuals training in programmes that teach narrow skill sets will have higher incomes than individuals training in programmes teaching a broader range of skills (H4). However, Coenen, et al. (2015) found that Dutch VET diploma holders who attended narrow training programmes earned less than those who attended broad training programmes. They assume that narrowly defined training content makes workers less able to undertake diverse tasks and thus hampers their productivity within the occupation at the workplace.

2.2.2 Vertical Differentiation

Vertical differentiation is the degree to which apprentices are sorted into different tracks according to their intellectual abilities (Kerckhoff, 1995, p. 328). For some occupational fields, the Swiss VET system provides three- or four-year programme leading to a federal diploma as well as an intellectually less demanding two-year training programme leading to a federal certificate. The lower track has a lower share of lessons in vocational school and focusses strongly on practical training in the apprenticeship firm. Generally speaking, lower tracks impart less theoretical knowledge and analytical skills but similar practical occupation-specific skills (Wettstein, et al., 2017) .

A number of studies have shown that tracking leads to more homogenous student composition regarding academic performance and ability (Hallinan, 1988; Huang, 2009; van de Werfhorst and Mijs, 2010; Zimmer and Toma, 2000). Within vertically differentiated training fields, allocation to the lower-track two-year programme is based on negative signalling due to low performance in lower-secondary school, irregular school trajectories, and/or lower intellectual abilities. In untracked training fields, all apprentices enter the same track regardless of their intellectual level or school background. Consequently, apprentices who train in vertically differentiated programmes are more homogenous within their track in terms of school backgrounds, skills and productivity. Education tracks with a more homogenous ability group, i.e., vertically differentiated training occupations, are thus likely to have higher signalling value than education tracks with a more heterogeneous ability composition, i.e., undifferentiated training occupations (Allmendinger, 1989; Müller and Shavit, 1998). This also implies that apprentices who train in more demanding tracks on average perform better than apprentices in untracked occupations. Because of their higher average productivity and the signalling power of their diploma, they may receive higher wages. Therefore, we hypothesize that those who trained in the more challenging tracks of vertically differentiated training fields have higher wages than those who trained in untracked occupations (H5a). Furthermore, we assume that, as a result of their positive selection and more extensive training, individuals in vertically differentiated training occupations increase their average productivity faster after labour market entry than their counterparts who trained in untracked fields. The positive income effect of having trained in the more demanding track of a vertical differentiation field should therefore become stronger with growing labour market experience (H5b).

2.2.3 Standardization

Standardization is the “degree to which the quality of education meets the same standards nationwide” (Allmendinger, 1989, p. 233). The literature differentiates between input and output standardization. The former refers to the curricula, whereas the latter taps the standardization of the exams (Bol and van de Werfhorst, 2016). In Switzerland, the VET curricula are highly standardized. However, the standards set for educational achievement in the final exams differ between training occupations. The empirical evidence available on the effect of exam standardization on labour market outcomes yields unclear results. A comparative study of the adult population in 23 countries finds a positive relationship between centralized exams and average earnings (Leschnig, et al., 2017). In contrast, two German studies find positive and significant effects on income only for the minority of pupils who completed the lowest nonacademic track of lower-secondary school (Backes-Gellner and Veen, 2008; Piopiunik, et al., 2014).

We argue that final exam standardization in VET affects the performance of apprentices, their human capital, and the signalling power of a diploma. Highly standardized exams are centrally organized, curriculum-based, and defined and graded by an external regional or national authority (Klein, et al., 2014). In these settings, schools can influence neither the exam questions nor the grading. Standardized final exams are thus assumed to set incentives for teachers and schools to improve the quality of teaching and for pupils and parents to raise their investments in schooling (Bishop and Mane, 2001; Wössmann, 2002). This leads to increased performance, as a number of comparative and single-country studies have shown (Bishop, 1997; Jürges, et al., 2005; Wössmann, 2010). Further, exam standardization forces teachers to teach the curricula and improves the comparability of final grades

(Müller and Shavit, 1998). The tested skills, including the test standards, are apparent to employers. Therefore, diplomas of training occupations with standardized final exams should send clear-cut, reliable signals to employers about apprentices' productivity levels and skill profiles. Accordingly, we hypothesize that individuals who trained in occupations with standardized final exams have higher incomes than individuals who trained in occupations with less standardized final exams (H6).

2.2.4 Other occupation specific, firm specific, and individual determinants of income

Returns to human capital depend on the skill demand in the labour market (Lazear, 2009; Thurow, 1975). The demand for occupation-specific skills depends to some degree on the average skills of workers holding occupation-specific diplomas. However, skill demand is also determined by exogenous factors, such as technological change, size of birth cohorts, globalization, general economic conditions, and outsourcing. To avoid spurious relationships between institutional characteristics of educational programmes and labour market outcomes, most previous research acknowledged these factors by controlling for the general economic situation (e.g. local unemployment rate, year dummies, or region dummies) in their analyses (Coenen, et al., 2015; Eggenberger, et al., 2018; Forster and Bol, 2018; Menze, 2017; Vogtenhuber, 2014). However, as Sacchi et al. (2016) have shown, the general economic situation is an inadequate indicator for individual employment opportunities in occupationally segmented labour markets. Such markets are subdivided into numerous occupation-specific subsegments that are only accessible to those holding a narrow range of occupation-specific training credentials. Due to mobility barriers, occupational subsegments differ in their working conditions, average firm size and structure, opportunities for mobility, and labour demand and supply (Salvisberg and Sacchi, 2014b). These differences are also mostly independent of the institutional dimensions of the segment-specific training programmes. Thus, the occupation-specific employment situation is substantially more important for job quality than the overall employment situation (Buchs, et al., 2015; Sacchi, et al., 2016). When demand for a particular diploma is high, applicants have higher bargaining power than when demand is low. For employers, hiring skilled workers will come at a higher cost in times of labour shortage (Brunner and Kuhn, 2014; Buchs, et al., 2017). Furthermore, training occupations differ in their intellectual requirements and therefore attract school leavers with different intellectual abilities (Stalder, 2011). This is likely to impact the productivity signals sent by the diplomas and thus affect income at labour market entry. To avoid estimating a spurious effect of the institutional dimensions Due to correlation with these occupation-level explanatory variables, we consider both job opportunities and intellectual requirement levels in the analysis.

Region and firm size impact the resources available to employers and thus also the incomes of the employed (Kalleberg, et al., 1981). Regional differences are especially important in Switzerland, because language barriers often prevent workers from moving between language regions. Occupational training programmes are distributed unevenly across regions and firms of different size. To test the effect of the institutional characteristics net of these compositional effects, we control for these potentially wage-relevant variables in our analysis. Further, income levels depend on gender, migration background, work experience, and tenure. These attributes can be used by employers as signals of productivity and of other job-relevant attributes, such as motivation and communication skills (Spence,

1973; Stevens, 2004). Finally, individuals changing their occupation at labour market entry can apply fewer of their learned skills on the job. This impacts income levels negatively (Müller and Schweri, 2009).

2.3 Data and measures

2.3.1 Data

The empirical analyses are based on the Swiss Labour Force Survey (SLFS) from 2003 to 2015. The SLFS is a representative survey of the permanently resident adult Swiss population. Interviews with participants were repeated up to five consecutive years. We combined this data with register data on the yearly income of the respondents from the Social protection on the labour market statistical project (SESAM). Our sample is based on employed individuals who trained in Switzerland in a three- or four-year upper-secondary training programme leading to a federal diploma. These federal diploma holders completed their workplace-based training between 2000 and 2015, when they were between 17 and 25 years old. Individuals who completed higher education subsequently had to be excluded due to missing information about their vocational education and training programmes.[4] Because the SLFS changed their rotation scheme in 2010, most of the respondents are only included once in our sample. To avoid using an unbalanced panel and adding unnecessary complexity to the analysis, we restricted the sample to the first observation after VET for each individual.[5]

Our measures of the institutional characteristics of training programmes stem from training occupation ordinances and curricula in force between 2000 and 2015. These documents are legally binding in all Swiss cantons. The documents provide detailed and comparable information on the number of lessons in the various training locations, the organization of the final exams and exam grades, and subject differentiation within the training programme (for an overview on the collected data see Grønning, et al., 2018). This data makes it possible to compare training characteristics across occupations.

We linked the individual-level data with occupation-level data on institutional characteristics based on the 8-digit codes of the Swiss Standard Classification of Occupations (SSCO2000; FSO 2003). This yielded an accurate match of the individual training occupation with one of the 550 current or former training occupations or subject specializations for which we had collected institutional data. We excluded both individuals with unidentifiable occupational titles and individuals who had graduated at a time for which curriculum and ordinances were not traceable. After excluding observations with missing data and the top and bottom percentiles of the income distribution, our sample consists of 6 123 individuals who completed training in one of 211 training occupations. Whereas some of them have work experience up to 16 years, allowing us to examine whether the relationship between institutional characteristics and income changes with growing experience, about two thirds of our sample are at the beginning of their career, with a maximum of 58 months of work experience and a maximum age of 25 years.

[4] Missing information on the training occupation or the duration since training completion was imputed from previous or consecutive waves as long as the respondents had not finished any further education between the waves.

[5] Using the full data with several observations per individual does not change the results. For testing purposes, we also reduced our sample to individuals who did not change their occupation after completion of training. This resulted in somewhat larger effect sizes for our institutional variables. However, the pattern of results remains the same (results available from authors on request).

2.3.2 Measures

Dependent Variable and Institutional Characteristics

The dependent variable is the gross logged yearly income in the year of interview. For individuals with part-time employment, which is frequent in Switzerland, we calculated the fulltime equivalent.[6]

To capture the three proposed theoretical dimensions of specificity – skill type, manner of skill acquisition, and broadness of skills – we construct four variables (see Table 2.1). The first one refers to the skill type and measures the average days of *general education* in vocational school per week. This includes lessons in language, history, ethics, society, politics, law, and economy, and the time devoted to it ranges from 0.24 (dietary cook) to 1.10 (commercial employees) days a week (see also Figure 2.2).

Table 2.1 Dimensions of specificity and measures

		Skill type	
		General	Occupation-Specific
Manner of skill acquisition	Theoretical	• General education in vocational school in days per week	• Occupation-specific education in vocational school in days per week
	Practical		• Training in intercompany courses & apprenticeship training in firm in days per week
Narrowness of skill set	Broad		• Training occupations without specializations
	Narrow		• Training occupations with field or subject specialization.

Depending on the training location, occupation-specific skills are either taught theoretically in vocational school or through practical training in the firm or in intercompany courses. The manner of skill acquisition thus represents the second dimension of specificity. We capture this with two variables: *Theoretical occupation-specific education* is captured by the occupation-specific lessons in vocational school measured in days per week. Examples of occupations with high levels of theoretical occupation-specific education are desktop publishers (1.13 days a week) and electronic technicians (1.01 days a week); commercial employees and retail traders have far less theoretical occupation-specific education (0.32 and 0.28 days a week respectively). *Practical occupation-specific training* is based on the number of days per week apprentices spend in the training firm and in inter-company courses.[7] The indicator ranges from 3.14 to 4.51 days a week. Occupations in construction have high levels of practical training, while IT specialists receive little practical training (see figure 2.2). To capture the third dimension of specificity, broadness of skill sets, we constructed a dummy, *narrow skill set,* that distinguishes between training occupations with subject or field specializations within the occupation and occupations without any specialization.[8] For example, social care workers specialize in childcare, elderly care, or care for

[6] Because the consumer price index varies with only 7.7% between 2003 and 2015, we used an uncorrected indicator for earnings. However, the results are robust to adjusting for the rate of inflation (results available upon request).

[7] Intercompany courses provide practical occupation-specific skills that cannot be developed during training within the firm due to the firm's small size or specialization (Wettstein, et al., 2017).

[8] Ideally, a measure of broad and narrow general skill sets would be included. However, the available data limits this measure to occupation-specific skills.

disabled people and thus have a narrower skill set than healthcare assistants, who do not specialize during training.

The second institutional characteristic is based on a dummy variable, *vertical differentiation,* which indicates whether a less demanding two-year track existed within the training field at the time of training. Because our sample does not include certificate holders from the two-year track, the indicator measures whether the respondent trained in the more challenging track of a vertically differentiated training field or in an untracked training occupation.[9]

The variable representing our third institutional characteristic, *exam standardization,* is measured with an index based on two indicators of standardization: degree of centralization and relevance of previous performance grades (for a detailed description of the final examinations in Swiss VET see Wettstein, et al., 2017). The indicator of centralization captures whether the final practical exam is set and assessed by a central cantonal authority (1) or by the vocational trainer within the training firm (0). Coursework is marked by teachers and trainers during the school year. Higher proportions given to the coursework marks in the final assessment indicate lower exam standardization. We computed the index based on the mean of the two indicators and reversed the scale so that higher levels indicate higher standardization. The highest level of exam standardization (1) is found in several ordinances where coursework is not taken into consideration in the final assessment and the practical exam is defined by the central authority (e.g. tiler and pharmacy assistant). Retail traders have the least standardized exams (0.24).

Correlations between the institutional characteristics

Figure 2.2 depicts scatter plots of the institutional characteristics and significant and substantial correlations at the occupational level. The measures of general and specific education and training correlate to some degree. The highest correlation can be found between general education and practical occupation-specific training (r = -0.51, p <0.000). Furthermore, there is a negative association between practical and theoretical occupation-specific training (r = -0.46, p <0.000). The standardization level is positively associated with practical occupation-specific training (r = 0.49, p <0.000). Vertical and horizontal differentiation are not systematically associated with other occupation-level variables. In sum, the scatterplots show that there is considerable variation between training occupations in their levels of specificity and exam standardization. Thus, the simple distinction between general and specific, workplace-based and school-based, or standardized and nonstandardized education programmes masks the heterogeneity in institutional characteristics that can be found within Swiss VET.

[9] The 50 training occupations with vertical differentiation include both three- and four-year programmes in various industry sectors (e.g. metal work, retail trade, social and health care, and farming).

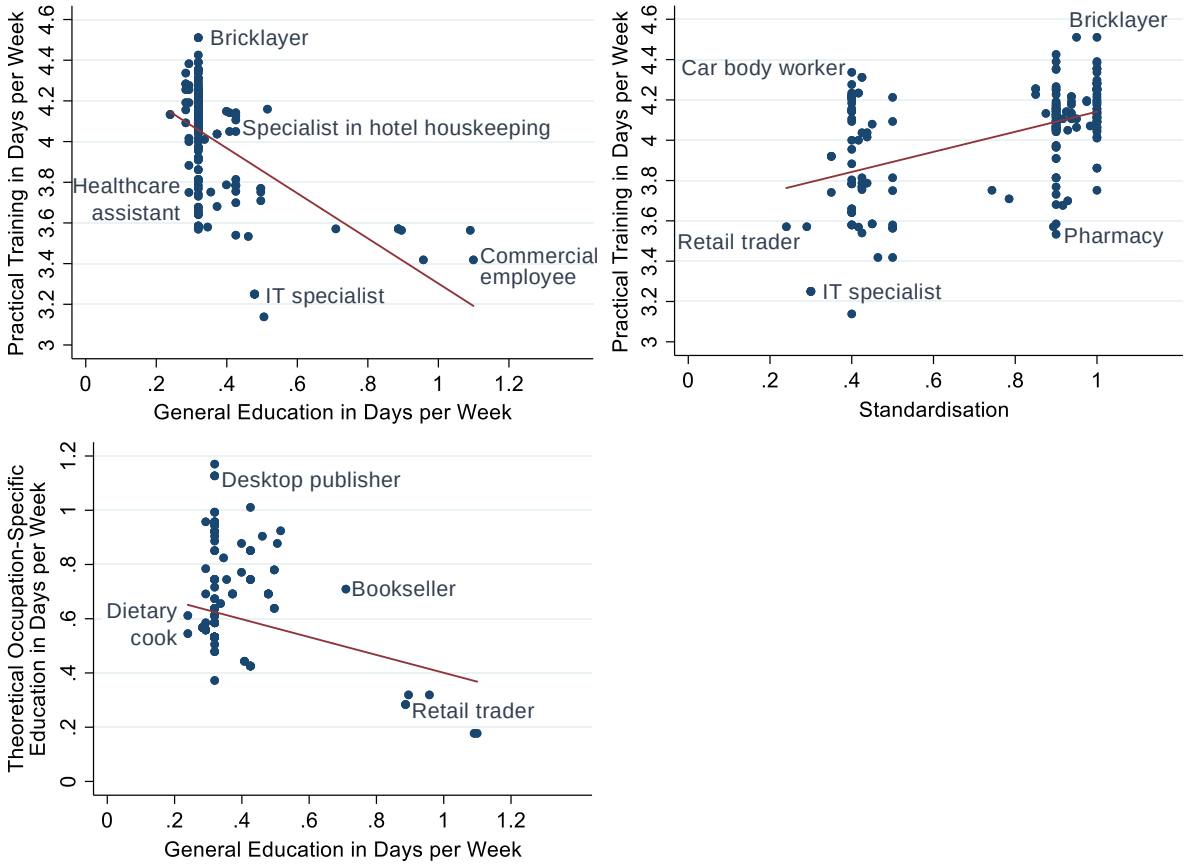

Figure 2.2 Scatter plots of the significant and substantial correlations between the institutional characteristics. The red lines are the estimated correlations at the occupational level

Occupational Level Control Variables

To avoid observing a spurious relationship because our institutional characteristics covary with other occupational context factors affecting income, we include the *intellectual requirement level* of the upper-secondary training occupations. The indicator ranges from 1 (lowest level) to 6 (highest level) (see Stalder, 2011)[10] and captures the sorting of individuals into training occupations according to their abilities.[11]

Furthermore, we include an indicator of occupation-specific individual *labour market opportunities*. It is based on the annual number of vacancies within each occupational field (two-digit level of SSCO2000) open to labour market entrants with a federal diploma relative to the annual number of unemployed with a VET diploma. Higher values indicate more job opportunities. The estimation of the demand side is based on Swiss Job Monitor data (SJM). The SJM is a representative sample of job ads published in newspapers and online job platforms in the German-speaking part of Switzerland. It provides an accurate yearly picture of skill demand in the Swiss labour market (Sacchi, 2014). The supply side is

[10] The indicator is based on the evaluations of career counsellors, ratings of trainers in firms, and statistical data on transition rates between lower-secondary school tracks and VET. We assume that the requirement levels did not change during the time period considered. In cases where occupations were not classified, we imputed the rating of similar training occupations in the same field with the same training duration.

[11] In highly practical occupations, the intellectual requirements tend to be lower ($r = -0.68$, $p < 0.000$). Somewhat surprisingly, high intellectual requirements do not coincide with high levels of general training.

measured with register data on unemployment provided by the job placement and labour market statistics information system. To account for spillovers between occupations, the numbers of both unemployed and open positions were weighted by the transition probability between occupations (see Buchs, et al., 2015 for details). We matched the indicator with the individual SLFS data by training occupation and the year in which the respondents started to work in their current workplace.

Individual Level Variables

We rely on the *time since graduation*, measured in months, to capture the respondents' labour market experience. The fact that the SLFS data does not report inactive times since graduation is mitigated by the low Swiss youth unemployment rate. Gomensoro, et al. (2017) find that at the age of 30, 3% of the 2010 school-leaver cohort who had completed VET were unemployed (see also Fazekas and Field, 2013). Furthermore, young VET diploma holders rarely experience long-term unemployment or recurrent unemployment episodes (Sacchi and Salvisberg, 2012). Thus, the majority of our sample is likely to have experienced a smooth transition into the labour market.[12]

Control variables at the individual level include *gender* (0: male 1: female), *migration background* (0: Swiss by birth 1: born with a foreign nationality), and participation in *further training* or education at tertiary level. The *number of education diplomas* distinguishes between individuals with one federal diploma, with several diplomas or an additional baccalaureate, and individuals with a federal certificate additional to the federal diploma. Furthermore, we measured *tenure* in months after completion of training. *Changes in the occupational field* are captured by comparing the training occupation with the current occupation at the two-digit level.[13] Diploma holders are considered to have *changed firm* if their work experience in their current firm is shorter than the time since graduation. *Labour market region* of the workplace distinguishes seven regions and a missing category. *Firm size* differentiates between firms with less than 10 employees, firms with 10 to 19 employees, firms with 20 to 100 employees, and firms with more than 100 employees, as well as a missing category. Table A1 in appendix A gives a descriptive overview of the institutional characteristics and the controls.

2.3.3 Analytical strategy

First, to analyse the association between our institutional characteristics and income, we estimate linear multilevel regression models, which reflect the hierarchical structure of the data with individuals nested within training occupations. These models take into account that the independence assumption is often violated with nested data (Gross, 2016). We fit a null model, a model that includes only the institutional characteristics (Table 2.4, Model 1), and a main model (Model 2) that includes all the explanatory variables. In addition, the variance components of a model without occupational level variables (Model 1.1) and a model without the institutional characteristics (Model 1.2.) are presented in Table 2.3. A full overview of all models is given in Table A2 in appendix A. These random intercept models are based on the specifications in Equation 1.

[12] The VET diploma holders in the sample are between 17 and 39 years old at the time of the survey. However, 93% of the sample are 30 or younger.

[13] We controlled whether these changes were spurious due to inconsistencies in the classification scheme. If necessary, corrections were made. A list of the corrections can be provided by the authors.

$$Y_{ij} = \beta_0 + \beta_1(institutional\ characteristics)_j + \beta_2(months\ since\ graduation)_{ij} + \beta_q X_{qij} + \beta_r Z_{rj} + \mu_j + \varepsilon_{ij}$$ (Eq. 1)

where Y_{ij} is the logged early income for person *i*, who trained in occupation *j*, and β_0 is the intercept. The regression coefficients for the institutional characteristics are termed β_1, and at the individual level, the regression coefficient for months since graduation is termed β_2. We have *q* control variables *X*, which vary at the individual level (e.g. gender), and *r* control variables *Z*, which vary at the occupational level (e.g. intellectual requirement level). Finally, μ_j is the unaccounted variance between the training occupations, and ε_{ij} is the residual error term. All continuous variables at both the individual level and the occupational level are grand mean centred. Thus, the wage effects in Model 1 and Model 2 pertain to individuals with average sample characteristics: employees at the beginning of their careers, with 47.9 months of experience and 24.5 months tenure.

Second, interactions between months since graduation and practical occupation-specific training (Model 3), general education (Model 4), occupation-specific theoretical training (Model 5), and vertical differentiation (Model 6) are each tested separately. We specify a random slope at the occupation level for months since graduation. Consequently, the slope (the effect of months since graduation) can vary between occupations. Although this is also plausible theoretically, the main reason for the specification is statistical. Not including a random slope for lower-level variables involved in a cross-level interaction could bias the statistical inference (Heisig and Schaeffer, 2019).

$$Y_{ij} = \beta_0 + \beta_1(inst.char.)_j + \beta_2(months\ since\ grad.)_{ij} + \beta_3(inst.char.)_j(months\ since\ grad.)_{ij} + \beta_q X_{qij} + \beta_r Z_{rj} + \mu_{0j} + \mu_{1j}(months\ since\ grad.)ij + \varepsilon_{ij}$$ (Eq. 2)

The specifications for the random slope models are depicted in Equation 2. The term β_3 represents the interaction effects (months since graduation with practical / theoretical occupation-specific training, general education and vertical differentiation). The two error terms μ_{0j} and μ_{1j} express the between-occupation variance of the intercepts and the slopes, respectively. Thus, the term $\mu_{1j}(months\ since\ grad)ij$ represents the extent to which the effect of time since graduation varies across occupations. The main variance components are presented in Table 2.3 (complete information in appendix A, Table A2). We calculate the explained variance at the occupation level according to Raudenbush and Bryk (2002) ($1 - (\sigma^2_{\mu0|m} / \sigma^2_{\mu0|null})$). Last, significant interaction effects are also illustrated graphically by plotting the predicted income level dependent on the institutional characteristics (Figure 2.3).

2.4 Results

There is considerable variation in average income between the training occupations, as Table 2.2 illustrates with some of the most prevalent training occupations. Hairdressers, for example, earn only around two thirds of bricklayers' average incomes. The multivariate regression analyses show that a substantial proportion, 13.5%, of the total variation in income can be attributed to differences between the occupations (Table 2.3, ICC of the null model). When considering only the variation between occupations, the full model (Model 2) explains 78.7% of the income variation (R^2) at this level). Individual-level explanatory variables, i.e. compositional effects, explain 65.4% of the occupation-level

variation (Model 1.1). Occupation-specific control variables explain a further 9.1% (0.746-0.654), and institutional characteristics another 4.2% (0.787-0.746). However, this last figure is a conservative estimate of the explanatory power of institutional characteristics. Additional analyses (not shown) reveal that the institutional characteristics explain more than twice as much (9.0%) of the income variation between occupations if we reduce the sample to those who work in their trained occupation with a maximum of 12 months of experience (detailed results available upon request). A probable explanation is that after some years of experience, VET is no longer the sole provider and signal of labour-market-relevant skills. This holds even more for workers who changed their occupation and no longer work in their trained occupations.

Table 2.2 Average annual income by selected training occupations

	Training Occupation	Average Income in CHF	N Individuals
High Income	IT Specialist	65 679	126
	Bricklayer	62 785	130
Middle Income	Electrician	54 124	280
	Commercial employee	53 349	1078
Low Income	Healthcare assistant	48 212	158
	Hairdresser	43 808	251

Table 2.3 Variance Components

	Model 1.1 Individual Level Variables Only		Model 1.2 Individual Level and Occupational Level Control Variables		Model 2: All Variables	
	Estimate	Std.Err.	Estimate	Std.Err.	Estimate	Std.Err.
Var(between individuals) (Null Model: 0.166***)	0.140***	0.003	0.140***	0.003	0.140***	0.003
Var(between occupations) (Null Model: 0.026***)	0.009***	0.002	0.007***	0.002	0.006***	0.002
ICC (Null Model: 0.135)	0.060		0.045		0.038	
R^2 Individual level (Raudenbusch & Bryk)	0.155		0.157		0.159	
R^2 Occupational level (Raudenbusch & Bryk)	0.654		0.746		0.787	
N Individuals	6123		6123		6123	
K Occupations	211		211		211	

Note: ICC = intraclass correlation. The full models are presented in Table A2 in appendix A

Turning to the regression coefficients in Table 2.4, we first consider the effect of vocational specificity, starting with the type of skill and manner of skill acquisition. In line with our second hypothesis (H2a), the findings show that high proportions of practical occupation-specific training go along with higher income after labour market entry. An additional day of practical training is associated with 14.4% higher annual income (see Model 2). Furthermore, we expected that the income advantage of those with the highest proportions of practical training should diminish with experience, because practical skills may lose their value when skill requirements in the training occupation alter due to technological change (H2b). The significant negative interaction effect in Model 3 confirms this hypothesis. Although large proportions of practical training offer an income advantage throughout most of the early career, the increase in income with experience is less steep for workers who trained in programmes with large

proportions of practical training than for those with low proportions (see Figure 2.3). In contrast to practical training, we expected neither theoretical occupation-specific nor general education to have a significant direct effect on income. The effect of these two variables are neither statistically significant in Model 1 nor when controlling for individual and further occupation-level variables (Model 2), and thus confirm hypotheses H1a and H3a.

Further, we argued that general and occupation-specific education in vocational school should be more important after some years of experience than immediately after labour market entry (H1b and H3b). The results confirm only the first of these assumptions. Model 4 and Figure 2.3 show that the interaction between time since graduation, our proxy for experience, and general education is significant and positive, as predicted in hypotheses H1b. One year of experience is associated with a 3.1% income gain for those with the lowest proportion of general education (0.24 days a week), and a 6.0% gain for those with the highest proportion of general education (1.1 days a week).[14] However, the association between theoretical occupation-specific education and income does not vary with experience in the labour market (see Model 5). Occupation-specific education does not affect income either directly after labour market entry or after some years of experience. Considering the third dimension of specificity, we hypothesized that a narrow skill set should increase productivity and thus income due to higher specificity (H4). The results show that the income effect of training in a narrow training programme is negative but does not reach statistical significance (see Model 1 and 2). Thus, we cannot confirm our hypothesis. Further research would be needed to assess whether this is due to two countervailing mechanisms, as suggested by (Coenen, et al., 2015). A narrow skill set might have a detrimental effect on income because it is likely to hamper occupational flexibility.

Overall, these findings imply that it is important to consider not only the skill type but also the manner of skill acquisition when assessing the effect of vocational specificity on income. Based on these results, we conclude, first, that practical occupation-specific training in the firm is the main provider of labour-market-relevant skills, which determine VET learners' productivity and thus income immediately after labour market entry. Second, general education taught in vocational school provides individuals with skills that can be converted into productivity after a few years of experience. One likely reason for this is that general education equips individuals with analytical and problem-solving skills. Third, the reason for the insignificant effect of theoretical occupation-specific education could be a lack of knowledge transfer between vocational school and the workplace. This interpretation is supported by insights from educational science, which show that the transfer process depends on the application of skill and knowledge in a variety of situations as well as learning to abstract and generalize the processes (Klieme, 2004; Weinert, 1998).

We analyse vertical differentiation by comparing the income of individuals who trained in higher tracks in vertically differentiated training field with that of those who trained in untracked occupations. Contrary to our hypothesis H5a, we find a negative effect for the former group. Workers who trained in the more demanding track in vertically differentiated fields have a 6.0% lower income than those who trained in occupations without vertical differentiation (Model 2). This effect is almost three times as high in Model

[14] The effect of general education does not decrease, when we exclude the occupations with very high levels of general education (outliers) from the analysis.

1, without the control variables. Stepwise modelling reveals that the initially very strong negative effect of vertical differentiation decreases mainly when including months since graduation (results not shown). The two-year tracks were first introduced in 2005. Thus, the strong initial effect of vertical differentiation likely arises because diploma holders who trained in tracked fields, on average have less work experience than those who trained in untracked programmes. A possible reason for the remaining significant negative effect of tracking could be that employers may be tempted to reduce labour costs by substituting labour market entrants from the higher track with lower-priced ones from the lower track, who do not greatly differ regarding their occupation-specific skills (for a detailed discussion of the conditions for wage pressure and substitution see Brynjolfsson and McAfee, 2014; Levy and Murnane, 2004). Consequently, diploma holders who trained in tracked occupations may face competition at labour market entry from less expensive federal certificate holders who trained in a two-year programme. In contrast to diploma holders from untracked training fields, individuals from tracked occupations may be forced to adjust their initial wage expectations downwards.

Further, we tested whether a positive effect of vertical differentiation emerges with increasing labour market experience (H5b). Figure 2.3 further shows the predicted income level depending on months since graduation for higher track diploma holders in vertically differentiated fields and diploma holders in undifferentiated training occupations (see also Model 6). Workers who trained in tracked training fields experience a wage penalty in the first years after labour market entry but catch up after about three years of experience. Over time, those from vertically differentiated training fields seem to profit from the more demanding training in the higher track, which is likely to facilitate further learning and the accumulation of human capital. The ensuing steeper positive income trajectory compared to those in untracked occupations is likely a result of the concomitant increase in productivity.

Table 2.4 Linear Random Intercept and Linear Random Slope Models (dependent variable: log of annual income)

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Institutional Characteristics												
Practical Occupation-Specific Training	0.128	0.089	0.144 *	0.067	0.169 *	0.066	0.160 *	0.066	0.172 **	0.067	0.165 *	0.067
Theroetical Occupation-Specific Education	-0.091	0.128	-0.080	0.090	-0.050	0.092	-0.057	0.092	-0.050	0.093	-0.052	0.092
General Education	-0.033	0.165	-0.003	0.113	0.084	0.112	0.053	0.112	0.092	0.114	0.042	0.114
Narrowly Defined Skill Set	-0.018	0.030	-0.004	0.021	0.002	0.020	0.000	0.020	0.000	0.020	0.000	0.021
Vertical Differentiation	-0.167 ***	0.017	-0.060 ***	0.016	-0.040 *	0.016	-0.036 *	0.016	-0.040 *	0.016	0.028	0.020
Exam Standardisation	-0.200 **	0.067	-0.127 **	0.048	-0.111 *	0.048	-0.110 *	0.048	-0.115 *	0.049	-0.112 *	0.049
Interactions												
Practical Occupation-Specific Training*Months since Graduation					-0.001 *	0.001						
General education*Months since Graduation							0.003 **	0.001				
Theoretical Occupation-Specific Education*Months since Graduation									0.000	0.001		
Vertical Differentiation*Month since Graduation											0.003 ***	0.001
Occupational Level Controls												
Labour Market Opportunities			0.203 ***	0.043	0.215 ***	0.043	0.213 ***	0.043	0.213 ***	0.043	0.213 ***	0.043
Intellectual Requirement Level			0.027 **	0.009	0.034 ***	0.009	0.033 ***	0.009	0.034 ***	0.009	0.031 ***	0.009
Individual Level Controls												
Months since Graduation			0.003 ***	0.000	0.003 ***	0.000	0.003 ***	0.000	0.003 ***	0.000	0.003 ***	0.000
Intercept	10.80 ***	0.024	10.81 ***	0.024	10.826 ***	0.024	10.82 ***	0.024	10.83 ***	0.024	10.82 ***	0.024
N Individuals	6123		6123		6123		6123		6123		6123	
K Occupations	211		211		211		211		211		211	

Significance level: *p≤.05; **p≤.01; ***p≤.001

Random intercept Model (Model 1-2) and Random slope models (Models 3-6) with a random slope for time since graduation at the occupational level. All continuous variables are grand mean centred. Control Variables Included: Gender, Migration Background, Number of Diplomas, in Further education, Tenure, Firm Change, Change of Occupation, Region and Firm Size. The full models are presented in Table A2 in appendix A.

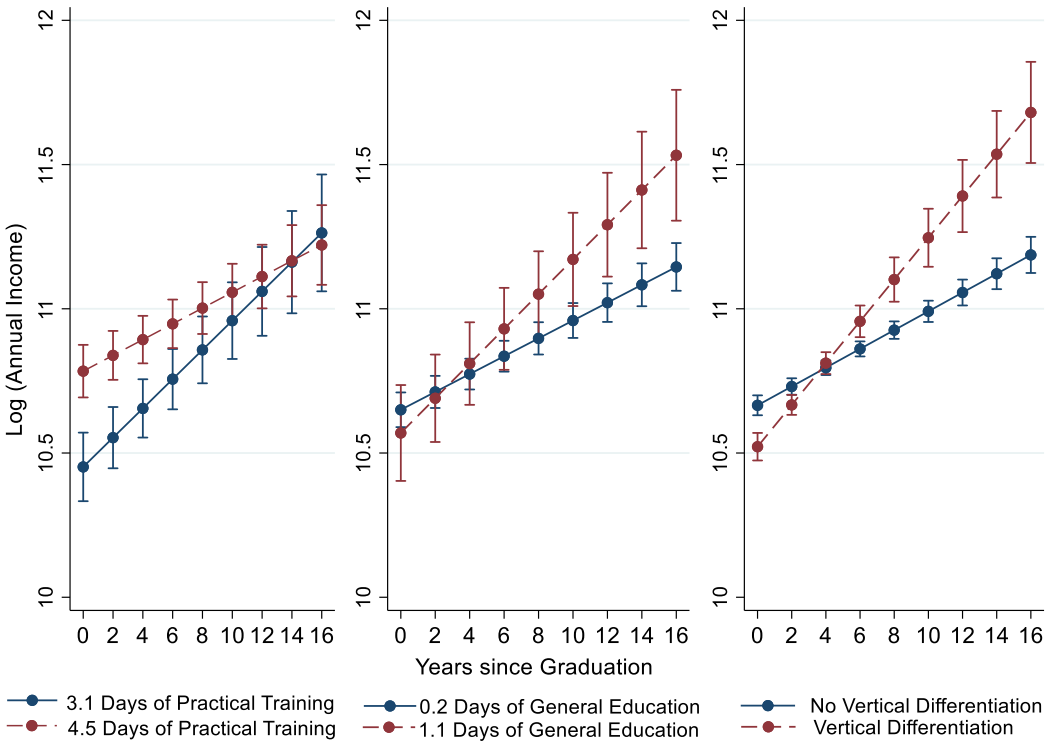

Figure 2.3 Predicted income and institutional characteristics by years since graduation. Predicted Margins with 95% Conf. Int. depicted at the highest and lowest observed levels of the institutional characteristics based on Model 3, 4 and 6 respectively. Fixed portion only. General education and practical training is measured in days per week.

We expected exam standardization to have a positive impact on income (H6). However, we do not find support for this hypothesis. On the contrary, the standardization index remains significant and negative even when including individual- and occupation-level control variables. Individuals who trained in occupations where exams are highly standardized have lower incomes than those who trained in occupations where exams are less standardized. Training in occupations with the highest level of exam standardization is associated with a 12.7% lower income than training in an occupation with the lowest level of standardization. These unexpected findings suggest that centralized exam regimes do not enhance the productivity or the signalling value of VET certificates. A first reason could be that centralized exams do not set incentives for teaching and learning practical skills and thus do not improve the quality of young workers' labour-market-relevant skills and knowledge. Second, locally defined exams might be better suited to testing locally relevant practical and vocational skills and send a clearer signal on these skills than centralized exams.

Our results for the individual- level control variables confirm findings from previous research. We therefore do not discuss these any further but turn directly to the impact of the occupation-level controls. We find a positive and significant association between income and occupation-specific labour market opportunities. More open positions and less competition give applicants higher bargaining power and employers less flexibility when setting wages, which leads to higher income for the employees. Further, those who trained in occupations with higher intellectual requirements have higher incomes than those who trained in occupations with lower intellectual requirements. Both findings are in line with our

expectations. They also imply that the effects of specificity and standardization are not spurious or due to differences in occupation-specific intellectual requirement level or job opportunities.

2.5 Conclusion

This paper sheds light on the mechanisms leading to income differences during the early career by comparing the training characteristics of VET occupations. In line with previous research, we find that, although we compare occupations at the same education level and with similar training duration, significant income differences remain between the occupations (e.g. Bol and Weeden, 2014; Pfister, et al., 2017). Curriculum-based measures enable us to analyse how several institutional dimensions and subdimensions of Swiss training programmes at the upper-secondary level are related to these observed income differences. We thus contribute to the literature by exploiting the heterogeneity in VET regarding the levels of standardization, vocational specificity, and vertical differentiation.

We found that practical training is favourable for income levels during the early career, while general education becomes more important with experience on the labour market. This is in line with our hypotheses and supports the notion that while practical experience is the main driver of positive outcomes at labour market entry (see also Jonker, et al., 2006; Polidano and Tabasso, 2014), general education pays off in the longer run (see also Korber and Oesch, 2019). We also found that vertical differentiation has a detrimental effect on income in the short run, but that this can be compensated with increasing experience. Exam standardization had a negative effect on income. Lastly, and contrary to our expectations, both theoretical occupation-specific lessons and the broadness of the training occupation were found to be irrelevant for earning levels of VET diploma holders.

Based on these results, we highlight four theoretical implications. First, our findings show that the institutional characteristics of the training programmes explain part of the variation between occupations in income. Therefore, occupation-level mechanisms should receive more attention in the development of theories on the wage setting process. Second, the concept and operationalization of vocational specificity needs to be refined and should include both the type of skills imparted and the manner of skill acquisition. These different subdimensions impact labour market outcomes to different degrees and in different phases of the career. A high level of vocational specificity has a positive impact on income only if the skills are taught in a practical and firm-based manner. The insignificant effect of theoretical occupation-specific education highlights the need for further research on the transfer of this type of knowledge between vocational schools and the workplace. Given the opposing influences, it is not surprising that dichotomous or unidimensional measurements of specificity are often unable to explain labour market outcomes.

Third, our results support the recent and still-scarce evidence that the relationship between training characteristics and labour market outcomes has a temporal dimension and depends on workers' career stages. The examples of general education and vertical differentiation show that some become more important as individuals gather more experience. From a social policy perspective, this implies that certain training characteristics offer a trade-off between imparting immediately deployable skills on the one hand and enhancing flexibility and continued learning on the other. This is supported by Lavrijsen

and Nicaise (2017), who show that general education, which coincides with lower income prospects directly after labour market entry, increases the likelihood of further education.

Fourth, our findings imply that the relationship between the institutional characteristics of educational programmes and labour market outcomes is context dependent. Put differently, the skill development and signalling power of educational qualifications also depends on the interplay between labour market structures and characteristics of educational programmes. An illustration is the unexpected negative effect of exam standardization on income. It implies that in occupationally segmented and structurally heterogeneous local labour market settings, output standardization may undermine the productivity or the signalling power of vocational education and training diplomas. Context dependence also becomes apparent when considering our findings on vertical differentiation. The potentially positive impact on income due to the selection of high-ability individuals and a homogenous student composition in vertically differentiated tracks may be hampered by competitors with similar short-term (but inferior long-term) productivity. This situation occurs if the educational system offers standardized labour-market oriented training programmes, which are generally less demanding but teach similar practical skills.

Our study also has some limitations. Most importantly, we are not able to document causality between institutional dimensions and income. This would require longitudinal data and measures of individual intellectual abilities. However, the latter disadvantage is mitigated considerably by controlling the intellectual requirement levels of the different occupational programmes, which serve as a proxy for the average intellectual abilities of the diploma holders. Furthermore, we could only shed light on the early career of workers with an upper-secondary VET diploma. The long-term effects of the characteristics of VET programmes beyond the first few years after labour market entry remain unexplored. In particular, our sample does not allow for testing how transitions into higher education after VET mediate the effect of institutional characteristics on income. Furthermore, it is unknown whether the relationship between institutional dimensions and income differs between social groups, e.g. by gender. Estévez-Abe (2005), for example, argues that across the life course, the investment in specific and general skills pays off differently for men and women. Last, we would like to stress the relevance of our finding in light of the prevalent unequal access to training occupations in the apprenticeship market (Imdorf, 2017b; Protsch and Solga, 2016). If barriers to entering an occupation coincide with favourable institutional settings, institutional differences between occupations can reinforce existing inequalities in the labour market.

3 Skill specificity of upper-secondary training occupations and the gender pay gap

3.1 Introduction

Gender disparities in wages are still fairly large in most Western countries. On average, women earn less than men, even when comparing individuals with the same education level, experience, and working hours (e.g. Blau and Kahn, 2017; Grönlund and Magnusson, 2013). This also holds true for Switzerland, where sizeable income disparities between men and women already occur at labour market entry (e.g. Bertschy, et al., 2014; Combet and Oesch, 2019). In this paper, we focus on the role of skills in the gender pay gap and draw on devaluation theory and the varieties of capitalism approach. Both theoretical perspectives propose that by sorting into different occupations, men and women also acquire different skill sets, which in turn can explain some of the income disparities. The culturalist perspective argues that gender segregation is accompanied by a devaluation of female-typed skills and women's work (e.g. England, 1992; Kilbourne, et al., 1994). Numerous studies have shown that female-dominated occupations pay lower wages than gender-integrated or male-dominated ones (e.g. Bertschy, et al., 2014; Busch, 2013; England and Li, 2006). Within a rational choice perspective, an alternative but rarely tested explanation is proposed by the varieties of capitalism (VOC) approach. This approach focuses on the distinction between firm-specific, occupation-specific, and general skills and argues that young men and women earn different wages because men invest more in well-paid specific skills and women in lower paid general ones. Furthermore, men and women receive different returns for the same skills (Estévez-Abe, 2005, 2012; Tam, 1997).

In Switzerland, vocational education and training (VET) imparts a large proportion of occupation-specific skills as well as some firm-specific and general skills. However, the skill mix differs considerably between the numerous training occupations within VET (Grønning, et al., 2018). VET may therefore produce income inequalities by channelling young men and women into gender-typed training occupations, which may also differ in their proportions of specific and general training. Against this background, we ask two related questions: a) Do the returns to specific and general skills depend on the gender type of the training occupation? b) Are the returns to skills gendered? In other words, do young men and women receive equal returns for the same types of skills?

At labour market entry gender differences in specific and general skills develop because men often undergo upper-secondary level vocational training, which provides specific skills, whereas women often enter baccalaureate school, which provides general knowledge (Eurostat, 2017). Sparse evidence from Denmark and Germany implies that even within VET, women tend to choose school-based vocational training programmes more frequently than men (Estévez-Abe, 2012; Protsch and Solga, 2016). Furthermore, Heiniger and Imdorf (2018) find for Switzerland that men sort into training occupations with a stronger linkage to the labour market and thus a higher level of specificity than the training occupations frequently chosen by women. We contribute to this literature in two respects. First, by exploiting the heterogeneity in Swiss VET to systematically assess the gender differences in skills, we go beyond the simple distinction between school-based and apprenticeship-based training. Second, the VOC literature has hitherto relied solely on country comparisons to test their theoretical framework. However, the mechanisms proposed by this approach describe how different education programmes within a country

can influence individuals' skill endowment and thus their incomes. Therefore, we test the proposed mechanisms at an individual level.

To analyse the income levels of men and women with a VET diploma, we use the Swiss Labour Force Survey from 2003 to 2016. We combined it with data on the specificity level of the training occupations, which we collected from VET ordinances and curricula. This curriculum-based data enables us to measure general and specific skills more precisely than the dichotomous measurements used in most research hitherto (Coenen, et al., 2015; Hanushek, et al., 2017; Korber and Oesch, 2019). Furthermore, by including a range of control variables at the occupational level and using multilevel regression methods, we can isolate the effect of general and specific training from other potentially confounding characteristics of the training occupation.

3.2 Skills in Swiss VET and labour market entry

In Switzerland, about two thirds of a birth cohort enters VET, which consists of approximately 230 training programmes of 3 or 4 years' duration. At completion, they receive a federal VET diploma. The training occupations are governed collectively by the confederation, the cantons, and professional organizations. Thus, within each training occupation curricula and ordinances are standardized at a national level. Close to 90% of those in upper secondary VET finish a dual training programme, where training is provided in three locations: at the workplace, in inter-company courses and in vocational schools. In all training programmes, a large proportion of the skills and knowledge imparted during VET is occupation specific and highly labour market relevant because of the high involvement of employers in both setting the curricula and providing training (Wettstein, et al., 2017). However, all training programmes also impart firm-specific and general skills, although to varying degrees. Whereas some programmes impart predominantly occupation-specific skills, others teach larger proportions of general education (Grønning, et al., 2018). Although all apprentices also acquire some firm-specific skills, this skill type does not play a dominant role.[15]

Taken together, the dominant features of the VET system result in school-to-work transitions that follow what has been termed employment logic (Gangl, 2003; Iannelli and Raffe, 2007); VET diploma holders generally need little on-the-job training after vocational training and thus have favourable income prospects when working in their trained occupation (e.g. van de Werfhorst, 2002), although the average income prospects vary between training occupations (Goggel and Zwick, 2012). Employment in any occupation other than the trained one immediately after labour market entry often entails substantial wage penalties (Müller and Schweri, 2015). This reduces the incentive to change occupation and invest in different skills (Imdorf, et al., 2014). As a result, labour market allocation and initial income are strongly determined by the training occupation (Buchs, et al., 2015; Kriesi, et al., 2010).

3.3 Theoretical Considerations

3.3.1 Types of skills and sorting into occupations

The culturalist perspective and the VOC perspective focus on two different skill dimensions held responsible for the gender wage gap: the gender type and the specificity of skills. Within the first

[15] The reasons are, first, that large firms imparting a lot of firm-specific skills, are infrequent in the Swiss labour market (FSO, 2018b). Second, the high level of curriculum standardization prevents firms from emphasizing firm-specific skills.

perspective, some skills and tasks are considered to have a feminine or masculine connotation, whereas others are less associated with gender (Charles and Bradley, 2009). Because occupations represent bundles of tasks that often have similar gender connotations, occupations and their corresponding skill sets can be classified as female-typed, male-typed, or gender-neutral (Anker, 1997).

The VOC approach draws upon human capital theory which distinguishes between occupation-specific, firm-specific, and general skills (Becker, 1964).These skills differ by their transferability between employers or between occupations (Becker, 1964) and the rate at which they decline or lose their value, termed the atrophy rate (Estévez-Abe, 2012; Polachek, 1981). General skills can be defined as skills with high transferability and low atrophy rates. They can be deployed across a wide range of occupations and situations within and outside the sphere of work, and they are less affected by technological and market changes. Thus these skills hardly depreciate. Firm-specific skills are limited to one employer; they are not transferable and decline rapidly when not used. Occupation-specific skills are skills specific to one particular occupation, but they are transferable between employers within specific industries and occupations (Nawakitphaitoon, 2014). Further, because they are more affected by technological development and decline during periodes out of the workforce, they have higher atrophy rates than general skills (see also Polachek, 1981). Hitherto, the transferability of skills, also termed broadness, has been scrutinized (e.g. Forster and Bol, 2018; Müller and Shavit, 1998). However, the relationship between skill atrophy and specificity and its consequences for gendered skill acquisition has hardly been discussed in the literature (for an exception see Estévez-Abe, 2012)

Table 3.1 provides an overview of the two skill dimensions and shows how specific skills and general skills can be female-typed, gender neutral, or male-typed. However, more than half of the general skills taught in Swiss VET are female-typed.

Table 3.1 Two skill dimension with examples from Swiss VET

	Specific Skills	**General Skills**
Female-typed skills	Health, social, beauty care	Language, ethics
Neutral skills	Graphic design, laboratory methods	Searching for and recording information
Male-Typed skills	Construction, using specific software	Financial reporting, understanding legal documents

In line with their emphasis of differing skill dimensions, these two theoretical strands claim that either cultural beliefs or rational decisions shape the sorting of men and women into different occupations. Seen from a culturalist perspective, socialization processes and young individuals' expression of gender identity follow gendered schemata (Charles and Bradley, 2009; Ridgeway and Correll, 2004). These gendered schemata are also internalized by gatekeepers such as parents, job counsellors or employers, who offer advice on the choice of training occupation or, in the case of employers, may be reluctant to hire apprentices of the "wrong" gender. Thus, women are channelled into female-typed occupations and men into male-typed occupations (Buchmann and Kriesi, 2012; Kriesi and Imdorf, 2019). In contrast, the rational choice approach argues that occupational choices are based on the returns to firm-specific, occupation-specific, and general skills, which differ between men and women. This assumption is supported by the VOC-approach proposed by Estevéz-Abe (2005, 2009, 2012). She claims that

individuals seek to maximize their lifetime earnings while minimizing the risk of losing their investment in education (see also Becker, 1964). For women, both work–family reconciliation and anticipated discrimination have an impact on this cost-benefit calculation. First, women have a higher likelihood of working part-time and of experiencing discontinuous working trajectories due to unpaid care and household work. Second, employers are less willing to hire women for qualified and well paid gender-integrated and male-dominated jobs, because statistically they have a higher likelihood of reducing working hours, missing worktime, and leaving work, resulting in less productive time (Aigner and Cain, 1977; Arrow, 1973). Thus, investment in firm- and occupation-specific skills, which are more prone to erode, represents a higher risk for women than for men (Polavieja, 2008; Tam, 1997). General skills, which provide flexibility on the labour market and attenuate statistical discrimination, represent a safer and more cost-efficient investment for women. Men do not anticipate job interruptions or discrimination and therefore do not perceive similar risks of their skills depreciating or declining. It is therefore safer and more profitable and consequently rational for men to invest in specific skills. In sum, these skill properties induce men to sort into education programmes with high proportions of specific training and women into programmes with high proportions of general education (Estévez-Abe, 2012).

We argue that in a context where female-typed and male-typed occupations both vary in their levels of specificity, the rational choice approach and the culturalist approach can complement each other. Men might sort or be sorted into more specific occupations and women into more general occupations within the range of occupations perceived as acceptable for their gender identity (see Gottfredson, 1981 for a discussion of "acceptable range").

3.3.2 Returns to skills

Because different types of skills yield different returns, the sorting of men and women into training occupations imparting different skill sets can affect the gender pay gap. The culturalist approach argues that women earn less than men because their work has a lower cultural value and thus also lower monetary value (England, 1992; Kilbourne, et al., 1994). Consequently, women's performance and knowledge are generally less valued and lower paid than men's in all spheres of life (quantitative devaluation) (see also Hausmann, et al., 2015). A further version of this approach, qualitative devaluation theory, assumes that the devaluation mainly pertains to female-typed skills and occupations. Consequently, and irrespective of the worker's gender, training providing female-typed skills should yield lower returns than training providing male-typed and gender-neutral skills. This argument is supported by findings showing that both female-dominated occupations (England and Li, 2006; Leuze and Strauß, 2009) and female-typed skills (Busch, 2013; Grönlund and Magnusson, 2013; Liebeskind, 2004) yield lower returns than male-dominated occupations and male-typed skills (For a contrary result see Leuze and Strauß, 2016). Because specific training in female-typed occupations provides predominantly female-typed skills and specific training in male-typed occupations provides mostly male-typed skills, this argument implies that *specific training in female-typed occupations should have a weaker positive effect on income than specific training in gender-neutral or male-typed occupations (H1)*.

Higher income in male-typed occupations could also arise because these training occupations impart a high proportion of well-paid occupation-specific skills, whereas female-typed training occupations impart higher proportions of less profitable general skills, as argued within the VOC framework. Occupation-

specific skills are immediately deployable and employers do not face high costs for on-the-job training when diploma holders enter employment in the occupations they trained in. This leads to high productivity immediately after labour market entry. Workers are paid according to their productivity and training costs (Becker, 1962; Mincer, 1974). Thus, high levels of occupation-specific human capital have a positive impact on income at labour market entry, irrespective of the gender type of the specific skills. The positive effect of specific vocational training and vocational skills on income has been confirmed in a number of studies (Eggenberger, et al., 2018; Hanushek, et al., 2017; Jonker, et al., 2006). Further, practical training at the workplace has been argued to impart individuals with more immediately deployable specific skills than school-based training, which leads to higher earnings (Jonker, et al., 2006; Polidano and Tabasso, 2014). Accordingly, we hypothesize that *the more occupation-specific training individuals have during VET, the higher their income will be at the beginning of their careers. This effect should be comparable in female-typed, male-typed, and gender-neutral occupations (H2).*

General skills are of less immediate practical use when entering a new job. Therefore, individuals with mainly general skills cannot achieve the same productivity level at labour market entry as individuals with mainly specific skills. However, general skills are transferable between occupations, which enhances opportunities for further learning and development (Hanushek, et al., 2017) and do not depreciate (Estévez-Abe, 2005). Individuals thus remain flexible both within their establishment and on the labour market. Research comparing those with a general and a vocational upper secondary degree find an increasingly positive effect of general education over the life course (Korber and Oesch, 2019; Lavrijsen and Nicaise, 2017). Because we focus on individuals at the beginning of their careers, we hypothesize that *general education should have a positive but smaller effect on income than specific training, irrespective of the gender type of the occupation (H3).*

3.3.3 Gendered returns to different types of skills

The relationships between skills and income hypothesized above do not take gender into account. However, men and women may receive different returns for the same skills. The varieties of capitalism and the cultural approach differ somewhat in their explanations of this disparity.

One strand within the culturalist approach, expectation state theory, argues that the returns to female-typed, male-typed, and gender-neutral skills depend on individuals' gender. It is argued that status characteristics determine how we evaluate men and women's competences and performance (Berger, et al., 1977). Status characteristics are cultural beliefs about the social value of competences and personality attributes. They can be diffuse (e.g., men are generally more competent than women; see also England, 1992) or skill-specific. The latter affect expectations about the performance of specific tasks and determine how we evaluate men and women's skills and abilities (Correll and Ridgeway, 2006). Men are expected to be best at performing male-typed tasks, and women are expected to be best at performing female-typed tasks. Moreover, individuals possessing gender-atypical skills are considered to be less competent than those possessing gender-typical skills. The only empirical evidence we are aware of concerning this relationship is a study by Busch (2013), who finds that the lower income for men in female-typed occupations is related to men performing female tasks in these jobs. Accordingly, women who trained in female-typed occupations and men who trained in male-typed occupations are likely to benefit more from their occupation-specific training than employees who trained

in gender-atypical occupations. Therefore, we hypothesize that *the returns to specific training in male-typed training occupations should be higher for men than for women, and the returns to specific training in female-typed occupations should be higher for women than for men (H4a).* Furthermore, because the skills imparted during general education are predominantly female-typed, women should benefit the most from general education. This should be the case both in male-typed occupations and in gender neutral and female-typed occupations. Thus, we hypothesise that *the returns to general education should be higher for women than for men, irrespective of the gender type of the training occupation. (H5a)*. However, another strand within the culturalist approach, quantitative devaluation theory, argues that the gender type of the occupation should not matter for the returns to skills (England, 1992). If women's work is less valued than men's work in general, as this perspective argues, *men should receive higher returns to both general education (H4b) and specific training (H5b) irrespective of the gender type of the training occupation.*

Table 3.2 Expected male-female differences in the returns to specific and general skills: Overview of hypotheses 4 to 7.

	Type of skill	Male-Typed	Gender-Neutral	Female-Typed	Hypothesis	Rationale
Culturalist Approach	Specific	♂	♂ ♀	♀	4a	Gendered expectations of men and women's abilities
	General	♀	♂ ♀	♂	5a	General skills mostly female-typed
	Specific and general	♂	♂	♂	4b and 5b	General devaluation of women's work
VOC-Approach	Specific	♂	♂	♂	6	Gendered expectations of family-related work interruptions
	General	♂ ♀	♂ ♀	♂ ♀	7	No impact of expected interruptions (low skill depreciation)

Legend: ♂ returns for men are higher / ♂ ♀ equal returns / ♀ returns for women are higher

The VOC approach focuses on employers' investment rationale. It argues that employers have higher costs when losing employees with specific skills than when losing employees with general skills (Polachek, 1981; Tam, 1997). Search costs and costs for introductory on-the-job training for positions requiring specific skills are generally higher than those for positions at a similar qualification level requiring more general skills. Furthermore, because occupation-specific skills are more prone to depreciate than general skills, the productivity losses associated with work interruptions and low working hours are higher for those with specific skills than for those with general skills (Fuller, 2008). Employers with a demand for specific skills therefore prefer to invest in male rather than female workers. Accordingly, *specific training should yield higher returns for men than for women (H6)*. VOC predicts similar returns for men and women for general skills, because these skills are less prone to depreciate. Thus, *the returns to general education should not differ between the genders (H7)*. Table 3.2 summarizes the hypotheses according to the VOC and culturalist approaches. Because the two approaches propose different causal mechanisms, hypothesis 4a contradicts hypothesis 6 and hypotheses 5a and 5b contradict hypothesis 7. Although the proposed mechanisms differ, hypotheses 4b and 6 predict the same outcome.

3.4 Data, Measures and Analytical Strategy

3.4.1 Data and sample

Our analysis draws on two main data sources. We pool the waves of the Swiss Labour Force Survey (SLFS) between 2003 and 2016. The SLFS is a representative sample of the permanent Swiss adult population, and respondents are surveyed for up to five consecutive years. We combine this data with register data on income from the social protection on the labour market statistical project (SESAM). Register data reduces the frequent bias in self-reported income. Because we focus on the early career, we only consider employed individuals who had a maximum of ten years of experience on the labour market after VET.[16] Half of the sample had no more than three years of experience and about two thirds had no more than five years (for further descriptive statistics see Table B1 in appendix B). We further restricted our sample to individuals who completed an upper secondary dual or school-based VET programme of three or four years' duration between the years 2000 and 2016 while between the ages of 17 and 25 years.[17] Self-employed respondents and those working abroad at the time of the surveys were excluded from the sample. Furthermore, respondents holding a tertiary-level degree were excluded because information on their initial training programme was lacking.

The SLFS data was combined with data on the specificity of each training occupation, which was collected from federal VET ordinances and curricula. They give detailed and comparable information on the number of lessons in the learning locations. The main variation in the specificity measures is between the training occupations. A smaller part of the variation is time dependent and due to revisions of the documents during the period in question (Grønning, et al., 2018). The individual-level SLFS data was combined with the occupational-level data by using the title of the training occupation and the year of completion of the training. An accurate match with one of the 550 current or repealed ordinances was ensured by using the eight-digit occupational code of the training occupation in the SLFS (over 20 000 occupational titles), which serves as a basis for the Swiss Standard Classification of Occupations (SSCO2000; FSO, 2003). The final sample includes 8473 observations based on 6136 individuals who trained in 215 different training occupations.

3.4.2 Measures

The dependent variable is the log of the yearly (pre-tax) gross labour income in the year of the interview.[18] We dropped observations belonging to the highest or lowest wage percentage. For respondents working part-time we calculated full-time wage equivalents based on their employment percentage (yearly income*(100/employment percentage). In order to control for a potential misspecification we included a dummy variable capturing part-time work.

At the individual level, the main explanatory variable is the gender of the respondent (Women: 1, Men: 0). At the occupation level, the *gender type of the training occupation* is identified with data from the Swiss census 2000 and based on the five-digit level of the SSCO2000. It distinguishes between female-

[16] Ideally, we would restrict our sample to the year directly after labour market entry. However, because insufficient sample sizes would limit the statistical power of our analyses, we extend our observation window to the first ten years. Tests using different cut-off points, including between two and ten years of experience, show that the findings are robust irrespective of the number of years included.

[17] A small minority (N=197) receive their diploma before their 18th birthday. We retain them in the sample because early completion, for example due to early primary school enrolment, is possible.

[18] No other income sources are included.

typed (< 70% female employees in the occupation), gender-integrated (30-70% females), and male-typed (> 30% females) training occupations.

As yet, no consensus has arisen about how to operationalize skill specificity. The dichotomy between workplace- and school-based training programmes used in early comparative research (Jonker, et al., 2006; Wolbers, 2007) disregards the heterogeneity within education tracks (Forster and Bol, 2018). A subsequent strand of research took this critique into account by focussing on the broadness of single education programmes, i.e. the transferability of the skills imparted. This concept is operationalized by measuring mobility rates between occupations (e.g. Forster and Bol, 2018; Vogtenhuber, 2014), subjective assessments of the transferability of skills (e.g. Coenen, et al., 2015; Muja, et al., 2019a), and the similarity of learning objectives in curricula (Eggenberger, et al., 2018). Underlying these measures is the assumption that the sum of skills imparted is equal in all training programmes. However, some training programmes might provide large amounts of both skill types whereas others might provide little of either. Furthermore, these operationalisations rely solely on the transferability of skills, whereas the atrophy rate is neglected. However, atrophy is a crucial aspect of skill specificity in explaining gendered returns to skills. More transferable skills are not necessarily less subject to technological or market change. To answer our research question, both aspects should therefore be taken into account. Using information from VET curricula allows us to distinguish between less transferable skills prone to depreciate (i.e. specific skills) and transferable skills that are highly unlikely to depreciate (i.e. general skills). Furthermore, we are able to simultaneously include continuous measures of both general and specific skills in the analysis.

The variable *general education* captures the number of days in general education in vocational school per week. This includes language lessons and lessons in history, ethics, society, politics, law, and economics. The aim of these lessons is to provide apprentices with competences that enable them to "navigate in their personal life context and in society as well as to handle private and professional challenges" (SERI, 2006, p. 1). Although some of the knowledge is more relevant in some training occupations, such as ethics in healthcare and languages in tourism, the teaching focuses on skill development independently of the occupation. Thus, these skills have a low atrophy rate. General education ranges between 0,24 and 1,10 days a week (Table B1). The variable for *occupation-specific training* is the average number of specific training days per week across all three training locations (see section 3.2). In the firm apprentices acquire practical occupation-specific skills through training and work experience. Basic theoretical occupation-specific knowledge is provided in vocational school. Intercompany courses teach practical skills that are not provided in the firm for safety reasons or because of firm specialization. These specific skills need to be updated continuously through work experience to avoid depreciation. Occupation-specific training ranges between 3,60 and 5,08 days a week.[19] The construction of both skill measures followed two rules: 1) eight lessons are equal to one day of training. 2) one year is equal to 47 weeks of training.

[19] Legally a working week (including vocational school and intercompany courses) cannot exceed 5.5 days.

We control for potential occupation level confounders of the relationship between types of skills and wages. Because occupation-specific demand and supply of labour are highly relevant to the wage-setting process within occupations (Brunner and Kuhn, 2014), we include an indicator measuring respondents' *occupation-specific job opportunities* when they entered employment at their current workplace. The index captures the ratio of annual occupation-specific job openings (two-digit level of SSCO2000) for diploma holders and unemployed with a vocational diploma weighted by the access probability of the opening with a given credential (see Sacchi, et al., 2016 for details). The Swiss Job Monitor Data (Sacchi, 2014) was used to measure the demand side, i.e. job openings, whereas administrative records of all unemployed, the placement services and labour market statistics, were used to estimate the supply side. Higher numbers on the index are associated with better opportunities. In order to account for variation in intellectual requirements and student heterogeneity between the training occupations, we used Stalder's (2011) classification of the *intellectual requirement level*, ranging from low requirements (1) to high requirements (6). Unclassified occupations were given the rating of a similar occupation within the same occupational field with the same training duration. Further, we included a dummy for *vertical differentiation*, which indicates whether there is a two-year training programme leading to a federal certificate within the same occupation. Last, we included the *share of large firms* (>100 employees) in each training occupation.[20] Large firms provide higher quality training than do smaller firms because they often have internal labour markets and train apprentices to meet their own demand for a qualified workforce (Soskice, 1994).

Individual-level control variables include information on *marital status* (single, married/civil union or divorced/separated), if respondents have *children* under the age of 15, *migration background* (born outside of Switzerland or foreign citizenship), if the respondents participated in *further education* (baccalaureate or tertiary degree) at the time of the survey, and if they had completed a *school-based training programme* or one or more *degrees* at upper secondary level.[21] This last variable distinguishes the majority who completed one federal diploma from those who also completed a two-year training programme leading to a federal certificate and those who also completed a baccalaureate[22] or several federal diplomas. Experience, working conditions, and firm characteristics are controlled for by including the number of *months since graduation*, *tenure* in months (excluding time during apprenticeship), *managerial position*, *frequent overtime*, *part-time-work* (less than 80%), *fixed-term contract*, *size of firm,* and seven geographical *labour market regions*. In addition, we measured *change in occupation* since training by comparing the two-digit SSCO2000 code of the training occupation and the current occupation and *workplace change* since the apprenticeship by comparing tenure and time since training.

3.4.3 Analytical strategy

First, to assess whether men and women tend to sort into occupations that impart different proportions of specific and general skills we look at the distribution of skills by gender with kernel density plots. This provides a valid picture of the distribution across the whole range. Second, we analyse men's and

[20] The calculations are based on the two-digit SSCO2000 classification and a pooled dataset of the SAKE waves from 2003 to 2016.

[21] The results remain stable when individuals with school-based VET are excluded.

[22] Because only a tiny proportion of VET diploma holders also holds an academic baccalaureate, we combine them with those holding a vocational baccalaureate (22 observations).

women's returns to skills by running random intercept models. These analyses enable us to account for the person-years as well as for the clustering of individuals into training occupations, thus reducing the risk of assuming a significant relationship where there is none (Gross, 2016). Due to the change in SLFS panel rotation in 2010, more than half of the respondents are observed at one time point only.[23] Nevertheless, we include the person-years in our model because correlated measurement errors are likely for those surveyed several times. Our random intercept models are based on the following specification:

$$Y_{ijk} = \beta_p X_{pijk} + \beta_1 (Gender)_{jk} + \beta_q Z_{qjk} + \beta_2 (Gender\ Type)_k + \beta_3 (Specific\ Training)_k + \beta_4 (General\ Education)_k + \beta_r A_{rk} + v_k + \mu_{jk} + \varepsilon_{ijk} ,$$

where Y_{ijk} is the logged early income in year i for person j, who trained in occupation k. We have p control variables X, which vary between the years within each person (e.g. part time work, tenure), q control variables Z, which vary at the individual level (e.g. migration background), and r control variables A, which vary at the occupational level. The term β_1 is the effect of gender and β_2 to β_4 are the effects of our main explanatory variables at the occupational level: the gender type of the occupation, specific training, and general education. Finally, v_k and μ_{jk} are the error terms at the occupational and individual levels, whereas ε_{ijk} is the residual error term.

For the regression analysis, all continuous variables were grand mean centred. Model 1 includes the gender type of the occupation, gender, and the control variables. In Model 2, we add our specificity measures. Next, we test an interaction effect between the gender type of the occupation and specific training (Model 3) and the gender type of the occupation and general education (Model 4). Last, Models 5 and 6 estimate interactions between the gender type of the training occupation, the respondents' gender and the skill type. Models 1 and 2 are depicted in Table 3.3. Models 3 to 6 are shown in Table B2 in appendix B. The predicted income values (log) are illustrated in Figure 3.2 (Models 3 and 4) and Figure 3.3 (Models 5 and 6).

3.5 Results

3.5.1 Descriptive results – gender differences in skills

In the first step, we examine the association between gender and skill specificity of the training occupation. Figure 3.1 shows kernel density plots for occupation-specific and general skills. They illustrate that the range of general and specific training is considerable. Training occupations vary substantially in the degree to which they impart specific and general skills and knowledge. It is important to consider this heterogeneity in specificity within the VET system when assessing the impact of specific and general training on labour market outcomes.

[23] Until 2010, respondents were surveyed annually for five consecutive years. From 2010 onwards, individuals were interviewed four times over a period of 18 months. We use only annual data for both time periods. For individuals surveyed after 2010, we therefore have a maximum of two observations.

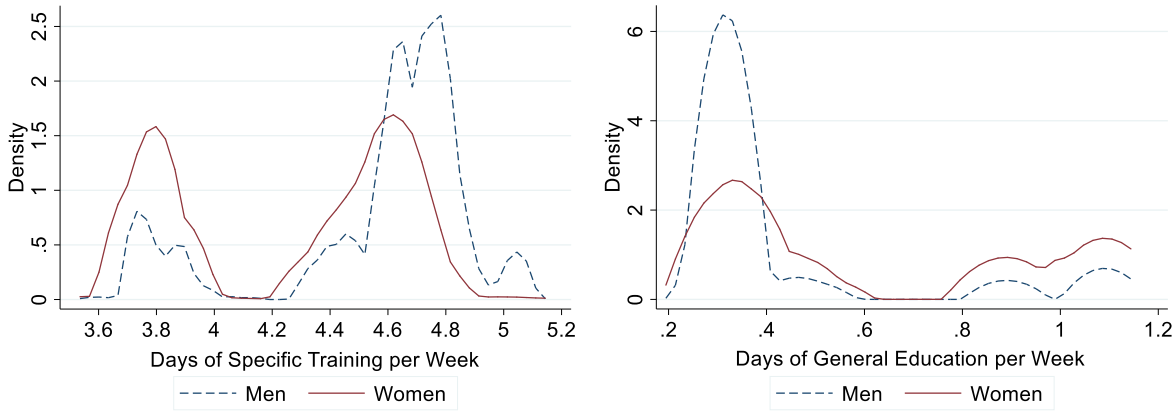

Figure 3.1 Occupation-Specific Training and General Education in Swiss Training Occupations

Furthermore, the range of specific training is similar for the group of female-typed (3,60 to 4,76 specific training days a week), male-typed (3,60 to 5,05 days of specific training), and gender-neutral training occupations (3,60 to 5,08 days of specific training, results not shown). Thus, some female-typed occupations are very specific, whereas some male-typed training occupations rather emphasize general education. However, in absolute numbers men and women sort into occupations with different levels of specific and general education and training. Women tend to sort into training occupations that emphasize general education and provide the least specific training, whereas men predominantly sort into training occupations with more specific training and only a basic level of general education.

3.5.2 Multivariate results – income differences between men and women

We find that women have a significantly lower income than men when including gender as the only covariate in a regression model without random intercepts for occupations (β women = -0,094, se = 0,009; model not shown). We can thus confirm previous findings that women on average earn less than similarly qualified men during the first years of their careers (Bertschy, et al., 2014; Combet and Oesch, 2019). At first glance, the gender pay gap of 9,4 percentage points is smaller than the average income difference between men and women within the vocationally qualified Swiss workforce (Kaiser and Möhr, 2019). A likely reason is the young age and still fairly homogenous work experience of the respondents in our sample. However, the difference is substantial if we consider that most of our respondents have not yet begun families; thus employment patterns do not yet differ by gender due to family considerations. Furthermore, an initial difference has lasting implications, because entry conditions influence individuals' long-term wage trajectories (Brunner and Kuhn, 2014).

The effect of gender decreases to -0,026 (se = 0,014) when including random intercepts for the occupations in the model (model not shown). Thus, a comparison of the effect of gender in the models with and without random effects for the training occupation suggests that the gender pay gap is three times as large if we do not account for the sorting into training occupations. As previous research leads us to expect, the overwhelming part of the gender pay gap in early career is due to women entering lower-paid occupations (Bertschy, et al., 2014). After including the control variables, the gender pay gap increases to 4,7 percentage points (model not shown). Adding the gender-type of the occupation (Model 1, Table 3.3) and the measures for occupation-specific and general training (Model 2) reduces the gender pay gap somewhat. However, women remain disadvantaged even when comparing men and

women's income in occupations with the same gender type and the same amount of general education and occupation-specific training.

Table 3.3 Determinants of Income

	Model 1		Model 2	
	Coef.	Std.Err.	Coef.	Std.Err.
Main explanatory Variables				
Gender Type of Occupation (Ref: Male-Typed Occupation)				
Gender Neutral Occupation	-0,023	0,022	-0,021	0,022
Female-Typed Occupation	-0,075***	0,017	-0,072***	0,017
Occupation-Specific Training (Days per week)			0,130*	0,057
General Education (Days per Week)			0,154	0,090
Women	-0,032**	0,012	-0,030*	0,012
Variance Components				
Variance between Occupations (Null Model: 0,022***)	0,004***	0,001	0,004***	0,001
Variance between Individuals (Null Model: 0,114***)	0,076***	0,003	0,076***	0,003
Variance within Individuals (Null Model: 0,058***)	0,054***	0,002	0,054***	0,002
ICC Occupation Level (Null Model: 0,115)	0,031		0,028	
ICC Individual Level (Null Model: 0,587)	0,566		0,568	
R^2 Occupational Level[1]	0,816		0,831	
N Person-Years		8473		
N Persons		6136		
N Occupations		215		

Random Intercept Models; Significance level: *p≤0,05; **p≤0,01; ***p≤0,001
[1]Raudenbush and Bryk (2002) R^2 at the occupation level.
Control variables included at the occupation level: Job opportunities, intellectual requirement level, vertical differentiation, share of large firms. Control variables included at the individual level: migration background, children, marital status, frequently working overtime, number of diplomas, in further education, school-based training, months since graduation, tenure, management position, firm change since graduation, change ion occupation, fixed term contract, part time work, firm size, region. For full model see Table B2 in appendix B.

3.5.3 Multivariate Results – The Returns to Different Types of Skills

Turning to the income differences between occupations, the intra-class correlation coefficient of the null model indicates that 11,5% of the total variance in income can be attributed to differences between the training occupations (Table 3.3). Thus, allocation into training occupations matters for income during the first years of labour market entry. Considering the variance only at the occupation level, we find that the control variables explain 74,7% of the variation at this level (model not shown). The gender type of the occupation can explain a further substantial part: 6,9%, of the differences in average income between the occupations (see R^2 at the occupation level in Model 1; 0,816-0,747 = 0,069). Including the general and specific training in Model 2 does not change the explained variance at the occupation level substantially. Thus, the specificity of the training explains only a minor part of the differences in income levels between the occupations.

In accordance with previous research, we find that individuals in female-typed occupations earn significantly less than those in male-typed occupations (Model 1) (e.g. England and Li, 2006; Leuze and Strauß, 2009). This is also the case when we control for skill specificity (Model 2). Thus, the lower income in female-typed occupations is not due to the training in these occupations being less occupation-specific.

To answer our first research question, whether the returns to specific skills depend on the gender type of the occupation, we include an interaction between the gender type of the training occupation and specific training and general education (Model 3 and 4 in Table B2, Figure 3.2). This allows us to test hypotheses 1 to 3. First, if we compare the level of the effects in Figure 3.2, we find that individuals who trained in female-typed occupations earn significantly less than individuals who trained in male-typed occupations, independent of the level of specific or general training. Individuals with an average number of days of specific training and general education earn 9,4 percentage points less in a female-typed occupation than in a male-typed occupation. The income in gender-neutral training occupations is slightly lower than in male-typed occupations. However, the difference is not significant in either of the models.

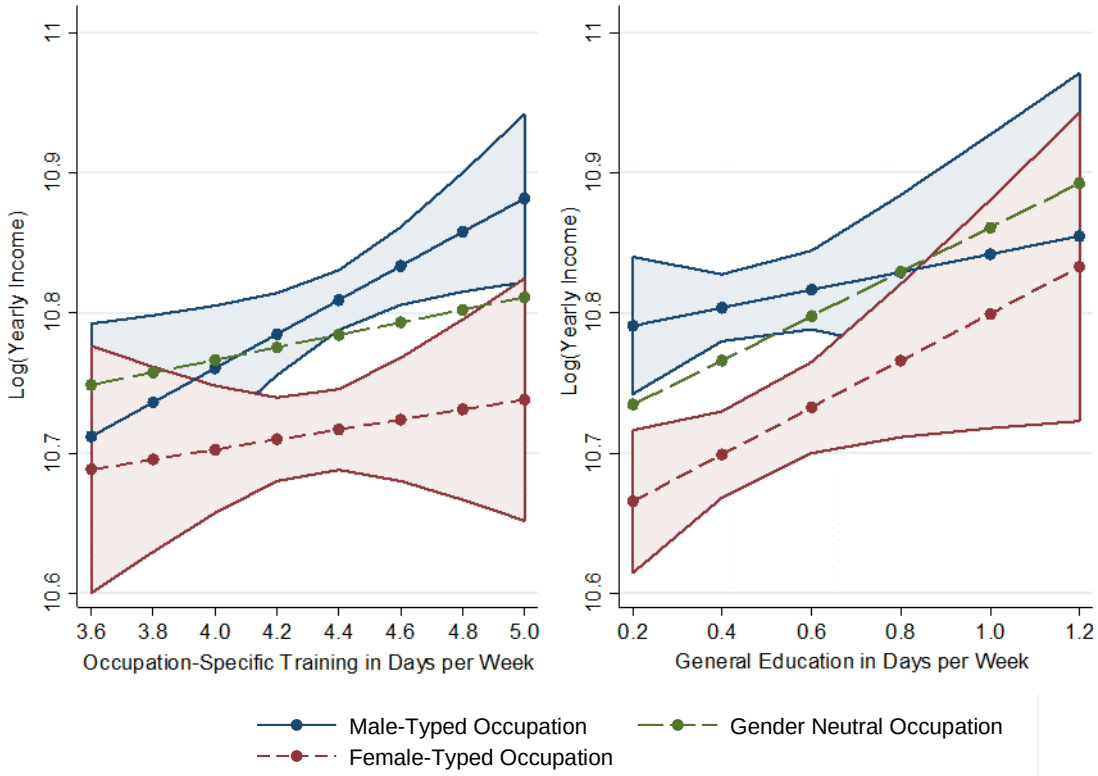

Figure 3.2 Predicted Income of Occupation-Specific Training and General Education in Female-, Male-Typed and Gender Neutral Training Occupations. Linear Prediction based on Models 3 and 4, Fixed Portion, Predictive Margins with 90% Cis for Male- and Female-Typed Occupations

Second, we consider the slopes of the effects of specific training (Figure 3.2, left side) to assess whether the returns to occupation-specific skills depend on the gender type of these skills. Specific training has a positive effect on income in all occupations. This is consistent with the VOC assumptions that occupation-specific skills gained during training enhance labour market entrants' productivity and thus lead to higher wages. It is also in line with research showing that people with vocational upper-secondary education have an income advantage at the beginning of their careers over those with general upper-secondary education (Hanushek, et al., 2017). However, an increase in occupation-specific training pays off less in female-typed and gender-neutral occupations than in male-typed occupations. One more day of specific training in a female-typed occupation is associated with an increase in income of 3,6 percentage points, whereas the corresponding increase in a male-typed occupation is 12,1 percentage points. Thus, as hypothesis 1 predicts, the returns to specific skills are higher in male-typed occupations

than in female-typed occupations, which is in line with the culturalist approach. Consequently, we cannot confirm our second hypothesis that specific skills pay off equally in male-typed gender-neutral and female-typed occupations, as predicted by the VOC approach.

Third, we consider the slopes of the effects of general education (Figure 3.2, right side). General education has a positive effect on income in all occupations. However, the slope is steeper in female-typed and gender-neutral occupations than in male-typed occupations. In female-typed occupations, one more day of general education is associated with an income increase of 16,7 percentage points, whereas the corresponding increase in male-typed occupations is 6,4 percentage points. Thus, the rational-choice argument that specific skills pay more than general knowledge during early careers holds true only in male-typed occupations. In female-typed and gender-neutral occupations, the reverse is the case. Women in female-typed and gender-neutral occupations receive higher returns for general education than for specific training. Therefore, we cannot confirm our third hypothesis that general education yields lower returns than specific training, irrespective of the training occupation. In sum, the results in Figure 3.2 suggest that male-typed and to some extent gender-neutral skills have a higher value on the Swiss labour market than female-typed skills. This evidence points towards a devaluation of skills considered to be female, and contests the prediction of the VOC approach that specific female-typed skills are as valuable as specific male-typed skills.

3.5.4 Multivariate results – unequal returns to skills for men and women

In this section, we analyse our second research question, whether men and women receive different returns to the same type of skills (see Models 5 & 6 in Table B2, Figure 3.3 and Table 3.4). To test whether men have higher returns to specific skills than women (hypotheses H4a, H4b and H6), we interact the gender of the employees with the gender type of the training occupation and the specific training. The results on the left side in Figure 3.3 show that men profit more from male-typed specific skills than women. In male-typed training occupations, men and women with four days of specific training are paid equally, whereas in occupations with five days of specific training a week, men have no less than 14,0 percentage point higher income than women. The higher returns to specific skills for men than for women is also manifest in gender-neutral occupations, although not as pronounced and not statistically significant. For those who trained in female-typed occupations, we see the opposite trend. Men with high levels of female-typed specific skills earn less than men with low levels of female-typed specific skills, whereas for women the level of female-typed specific skills has no effect on income. However, the difference between the genders in female-typed occupations is not significant.

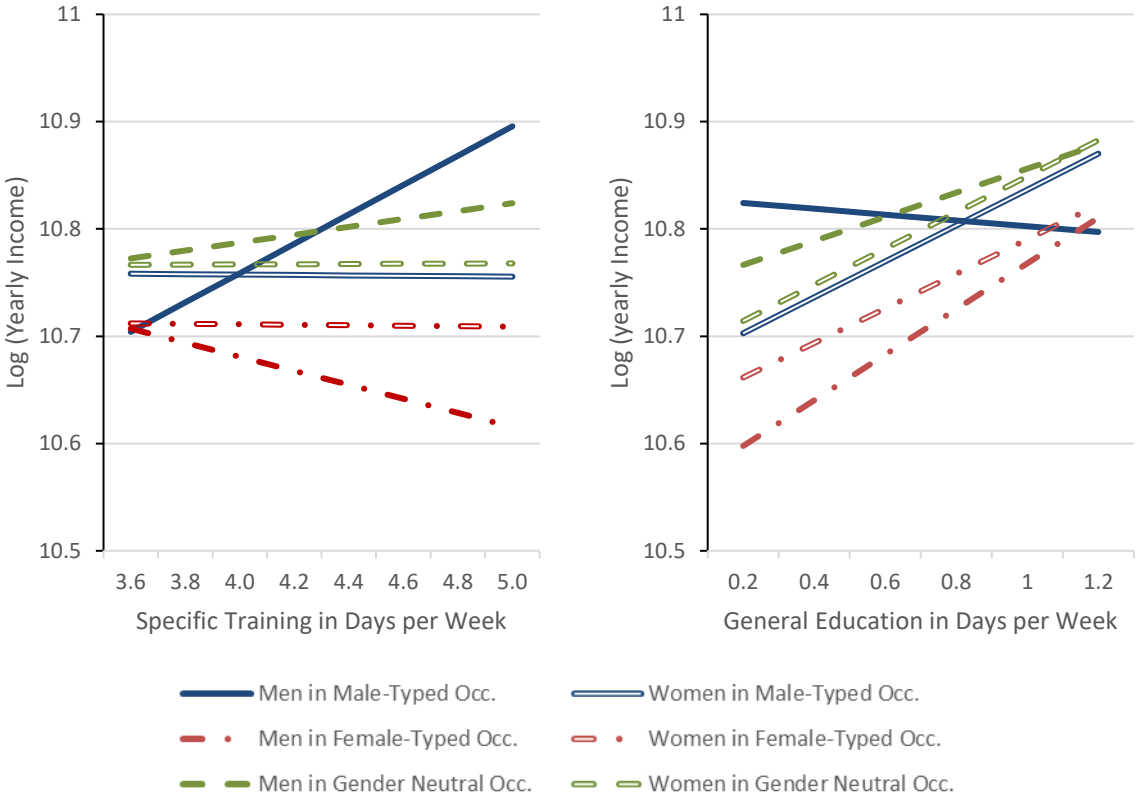

Figure 3.3 Predicted Income of Occupation-Specific Training and General Education for Men and Women in Male-, Female-Typed and Neutral Training Occupations. Linear Prediction based on Model 5 and 6, Fixed Portion

The results in Figure 3.3, left side, leads us to reject our sixth hypothesis, based on VOC, that specific training has a positive effect on income independent of the gender type of the skills. It seems that the value of occupation-specific skills depends on the fit between the gender of the job incumbent and the job itself, which is in line with the culturalist approach (H4). Thus, men are rewarded for acquiring male-typed skills and penalized for acquiring female-typed skills. Furthermore, employers seem to be particularly reluctant to invest in women for jobs requiring substantial male-typed occupation-specific skills, possibly because they doubt their abilities to perform within a male-typed domain.

Table 3.4 Summary of Results

Type of skill	Male-Typed	Gender Neutral	Female-Typed
Specific	♂	(♂)	(♀)
General	♀	♂ ♀	♂ ♀

Legend: ♂ returns for men are higher / ♂ ♀ approx. equal returns / ♀ returns for women are higher. Results in parentheses are not statistically significant.

To test whether the returns to general education differ between men and women (H5a, H5b and H7), we interact the employee's gender with the gender type of the training occupation and general education. The results in Figure 3.3, right side, show that in male-typed occupations, general education is associated with higher income for women but not for men. Men and women in female-typed and gender-neutral occupations receive positive and similar returns to general education. Furthermore, the income differences between men and women in these two types of occupations are not significant.

The pattern in Figure 3.3 (right side), supports a combination of the VOC and culturalist approaches. The comparable returns to general skills for women and men in female-typed and gender-neutral occupations is in line with hypothesis H7 and the VOC approach. Thus, in female-typed and neutral occupations the amount of general education has virtually no influence on the gender pay gap. This result suggests that employers are willing to invest in women with a lot of general skills, possibly because these skills are flexible and do not depreciate when employees are out of the workforce. Nevertheless, the higher returns to general education for women than for men in male-typed occupations could in part also be due to employers' expectations that women with a lot of general skills will perform better than men with the same amount of general skills, because these skills are female-typed.

Taken together, the results in Figure 3.3 show that over most of the skill distribution, women have lower income levels than men in both male-typed and gender-neutral occupations.Only in female-typed occupations do men not have higher incomes. However, the slopes show that the returns to skills are not consistently higher for men than for women, as proposed by quantitative devaluation theory. Thus, we cannot confirm our hypotheses H4b or H5b. Furthermore, the results confirm the findings in Figure 3.2 that the largest difference in income is between male-typed and female-typed occupations, with male-typed occupations yielding the highest returns (see also the discussion in section 5.2). This is in line with the qualitative devaluation theory, which claims that female-typed skills have less value on the labour market than male-typed skills.

3.6 Conclusion

The persistent gender pay gap is widely discussed both in academia and amongst the broader public. The unequal distribution of men and women across occupations has been identified as one possible reason. However, the mechanisms that explain the relationships between gender, occupations and income are still insufficiently explored. By analysing whether young men and women receive different returns for general and specific skills and whether these returns depend on the gender type of the occupation, we aimed to shed more light on this gap.

In summary, we are able to confirm that, in Swiss VET, men train more often in programmes imparting large proportions of occupation-specific skills, whereas women more often choose programmes with larger proportions of general education. Second, workers in male-typed occupations have a higher income than workers in female-typed occupations. Third, high occupational specificity increases young people's income after labour market entry, although only for men in male-typed and to a lesser extent gender-neutral occupations. Fourth, a high proportion of general education pays for both women and men in gender-neutral and female-typed occupations. Fifth, the correspondence between gender and gendered occupation-specific skills pays for both men and women.

Taken together, these findings show that the incomes of men and women in their early careers are affected by a complex interplay between gender and occupation-specific skill endowment. However, the sole recourse to either cultural devaluation theory or the varieties of capitalism approach falls short in explaining the patterns observed, which suggests that various forces are at work simultaneously. At first glance, the lower returns of women for most skills and types of occupation is in line with quantitative devaluation, which claims that women's work is generally devalued irrespective of their skills. However,

the finding that men receive even lower returns than women for general education and for female-typed occupation-specific skills runs counter to this explanation. The result that male and female workers in male-typed occupations have higher incomes than their counterparts in female-typed occupations supports the qualitative devaluation thesis, which assumes that female-typed skills and work are generally devalued and thus pay less. This mechanism seems to be reinforced for men who acquire female-typed skills and therefore experience a mismatch between their gender and the gender type of their occupation. Similarly, women are penalized for a lack of (female-typed) general skills. Women with little general knowledge and a high proportion of female-typed occupation-specific skills even experience a general devaluation of their occupation-specific skills and an additional penalty due to a lack of expected general skills. This supports the assumption that performance and competence expectations are particularly low for men with low-valued female-typed specific skills and for women with only a limited amount of general education. These lead to lower incomes for both groups.

The wage penalty for women may also be due to mechanisms proposed by the VOC approach. A lack of transferable skills that do not decline or depreciate over time, could signal higher productivity losses, because women are expected to take more time off work than men. Thus, for employers to acknowledge women's skill level and adjust their wages accordingly, our results suggest that their skills must be both female-typed and general. Both the devaluation of female-typed skills and the high returns to general skills for women suggest that the overall gender pay gap in Switzerland could decline if more men invested in (occupation-specific or general) female-typed skills. Furthermore, our results suggest that different returns to the same skills for men and women shape the allocation of young individuals into different training occupations. The findings are in line with the rational choice argument that men and women invest in the skills that provide the highest returns. Men acquire male-typed or gender-neutral occupation-specific skills, which yield the highest returns at labour market entry. Women benefit less from these skills, and thus enter occupations imparting more general knowledge. However, our results do not rule out that employers act as gatekeepers and hinder young women and men from entering certain occupations (Fuller, et al., 2005). It is likely that both mechanisms are at work and reinforce each other.

The result for specific training also indicates that, at least in Switzerland, the prevalent empirical finding that vocational skills secure high wages in early careers (Hanushek, et al., 2017; Jonker, et al., 2006) only holds true for young men who trained in male-typed or gender-neutral occupations. We find no evidence that women or men who trained in female-typed occupations benefit from highly specific training. As a consequence, the gender pay gap in Switzerland could even rise if a higher proportion of women invested in male-typed (or gender-neutral) specific skills.

Our results and conclusions pertain to upper-secondary VET in a country where VET and the labour market are strongly linked and occupationally segmented. Recent studies imply that the relationship between skills acquired during education and gendered labour market outcomes is weaker in countries with weaker linkage (Imdorf, et al., 2014; Smyth and Steinmetz, 2015). In countries where VET is less prevalent or is school-based rather than firm-based, the gender pay-gap could be less pronounced, because the education system imparts more general education, which is more favourable for women. A comparative design would be needed to investigate this question further. In addition, our results could

be biased because we use a proxy for experience, time since training. However, this is mitigated by the fact that the respondents in our sample are rather young (mean age 23), mostly unmarried (87%), and without family obligations (92%). Last, we cannot control a potential selection bias into tertiary education by gender. Given that, on average, men with vocational education and training still have higher transition rates to higher education (Buchmann, et al., 2007), this may lead to an underestimation of women's income disadvantage. Further research based on longitudinal data is necessary to overcome these data restrictions.

4 The impact of vocational specificity of training occupations on status mobility during the early career.

4.1 Introduction

This paper examines how the specificity of vocational education and training (VET) programmes affects status mobility during the early career. Downward mobility, in particular at labour market entry, is often costly for workers (Scherer, 2004). It is often related to persistent overqualification throughout the career (Verhaest and Van der Velden, 2013), lower earnings (Levels, Van der Velden, and Allen, 2014; Montt, 2015), and reduced job satisfaction and happiness (Green and Zhu, 2010; Zhu and Chen, 2016). Upward mobility is the key parameter of a successful career (Hillmert, 2011).

Despite the importance of status mobility for individual careers, current research has focused on the relationship between specificity and occupational and education level match. A few research contributions find that those with education and training qualifications that provide skills specific to one or a few occupations give individuals a better chance to find a job that matches their education level (Menze, 2017; Muja, et al., 2019a). More is known about the relationship between specificity and occupational mobility. Workers from occupation-specific training programmes more often find a job corresponding to their qualification than those from more general programmes (e.g. Damelang, et al., 2015; Geel and Backes-Gellner, 2011; Menze, 2017; Muja, et al., 2019b). The focus on occupational mobility disregards the fact that occupation mismatch can have substantially different consequences depending on its timing within a career. At labour market entry, finding a job that does not match one's qualification is often costly and associated with downward mobility (Wolbers, 2003), whereas occupational mobility at later career stages more often indicates upward mobility, because job change at this stage is more often voluntary. Occupational match indicates no change in status. Because highly specific training facilitates occupational match, it can have a positive impact at labour market entry and a more negative impact at later career stages. The opposite can be the case for more general education and training. However, research on the trade-off between the short-term gains and long-term drawbacks of occupation-specific training has focused on income and employment chances. Over the life course, the benefits of having a vocational education in terms of higher earnings and lower risk of unemployment disappear and in some countries turn to disadvantages compared to those with a general education (Forster and Bol, 2018; Hanushek, et al., 2017; Lavrijsen and Nicaise, 2017).

I contribute to this literature in two ways. First, I apply a more comprehensive approach by systematically distinguishing between the short-term and midterm effects of vocational specificity on the probability and direction of status mobility. Thus, I go beyond the close focus on occupational or education level match at labour market entry. Second, I examine the impact of heterogeneity in specificity within one education track. The distinction between general and vocational education hitherto used in the literature on the short-term and long-term effects of specificity masks heterogeneity within education tracks (Forster and Bol, 2018). Within VET, some training occupations provide a very specific and narrow set of skills, whereas other training occupations have rather broad curricula (DiPrete, et al., 2017; Eggenberger, et al., 2018; Forster and Bol, 2018). Overall, this paper asks how occupation-specific and general training and education during VET affect status mobility immediately after labour market entry and during the early career.

The Swiss context is ideally suited to examine this research question. Around two thirds of all Swiss compulsory school leavers enter a vocational education program leading to a federal diploma. The around 230 different VET occupations are standardised across regions and governed collectively by the confederation, the cantons, and professional organisations. Of those in VET, 90% enter a dual programme with education and training in different locations, such as a training firm and vocational school. The proportions of occupation-specific and general education and training in these locations vary widely between the training occupations. Empirically, I exploit this large variation to examine my research question.

My analyses are based on the transition from education to employment (TREE) data (Gomensoro and Meyer, 2017). I combine this individual-level data with detailed occupation-specific information on the proportion of general and occupation-specific training and education collected from occupation-specific VET curricula. The next section briefly describes status mobility in occupationally segmented labour markets (OLM). Thereafter, I discuss how vocational specificity can be understood along two dimensions of skill acquisition and how these dimensions impact the short-term and midterm status mobility of VET diploma holders. Section 4.3 describes the data, variables, and analytical strategy with which the hypotheses are tested. The descriptive and multivariate results are presented in Section 4.4 and summarised and discussed in Section 4.5.

4.2 Theory and Hypotheses

4.2.1 VET and Status mobility in occupationally segmented labour markets

This paper is based on the theoretical assumption that mobility opportunities are shaped by the structure of the labour market (Kalleberg and Mouw, 2018; Rosenfeld, 1992). Research has identified firms and occupations as two important institutions structuring these opportunities (Haller, et al., 1985; Kerckhoff, 1995). In labour markets mainly organised within firms, termed internal labour markets, firms are the main providers of mobility options and mobility is contingent upon firm characteristics (Althauser and Kalleberg, 1981; Doeringer and Piore, 1971). In contrast, the Swiss labour market is mainly organised into occupations and occupational qualifications (Kriesi, et al., 2010). Thus, Switzerland represents an occupationally segmented labour market (OLM). Labour markets of this type are threefold, with two minor segments representing firm-internal and unskilled labour markets and the largest part by far representing an occupation-specific labour market (Sengenberger, 1987). Within the occupation-specific segment, occupations can be understood as subsegments (Blossfeld and Mayer, 1988; Kriesi, et al., 2010). In this context, VET occupations are of high significance and closely linked to the labour market. The high involvement of labour market organisations in defining the curricula and providing training ensures that VET imparts relevant skills and knowledge to the apprentices (Gangl, et al., 2003; Iannelli and Raffe, 2007). Training occupations represent skill and knowledge bundles that correspond with task bundles in occupations (Damelang, et al., 2018). Thus, upper secondary VET diplomas give access to skilled employment in one or sometimes a few occupational subsegments (Kriesi, et al., 2010).

Sacchi, et al. (2016) argue that status mobility in OLMs is limited to occupational mobility chains. Because of the high specialisation of occupations, mobility is limited to a few related occupations. First, downward mobility after labour market entry takes place either when diploma holders find a job within the unskilled or semi-skilled labour market segment, e.g. in positions such as barkeepers, childminders,

and shop assistants, or when individuals find a job with a lower status within their occupational mobility chain, such as a car mechanic who works as a truck driver. Second, upward mobility at labour market entry occurs when diploma holders find a job in related occupational fields with higher status. Examples include pharmacy assistants who find work as chemical laboratory technicians and commercial employees who take jobs as accounting clerks. After some years of experience, diploma holders can gain access to positions with higher responsibility within their occupation. Examples include a bricklayer who is employed as a foreman and a cook employed as a kitchen chef. Furthermore, in Switzerland upward mobility within a mobility chain is often contingent on further education. All VET diploma holders have access to professional education at collages of higher education and, with a vocational baccalaureate, at universities of applied science (Buchmann, et al., 2007). These higher education institutions offer both occupation-specific further education and more general education programmes, such as management or business administration. To enter these education programmes, a specific VET Diploma and/or some years of relevant experience are required (Buchmann, et al., 2007). For example, trained healthcare assistants can study nursing and become registered nurses. Last, diploma holders might not experience status mobility in their early careers. This occurs when diploma holders work in their trained occupation or in a similar occupation with the same status after their apprenticeship.

4.2.2 Specificity in VET along two dimensions of skill acquisition

Although the Swiss VET system is highly specialised, the training occupations still differ in how specific they are. The central assumption in this paper is that diploma holders' opportunities for mobility differ between training occupations according to their specificity. In other words, the mobility chain for some training occupations is more extensive than for others, depending on the specificity of the occupation. Vocational specificity can be defined as the extent to which an education programme provides students with specific vocational skills rather than general skills and knowledge (Bol and van de Werfhorst, 2016, p. 74).[24] Three characteristics have been used to differentiate between general and specific skills and knowledge: transferability, depreciation rate, and relevance for further learning (Estévez-Abe, 2009; Forster and Bol, 2018; Hanushek, et al., 2017; Shavit and Müller, 1998). Furthermore, some research uses the degree to which an education programme provides practical or theoretical skills and knowledge to define vocational specificity (Müller and Schweri, 2009; Neyt, et al., 2019; Polidano and Tabasso, 2014). Implicitly, this research assumes that practical skills are typically specific skills and that theoretical knowledge resembles general knowledge (for an exception see Verhaest, et al., 2018). However, both general knowledge and occupation-specific skills can be taught both practically in the training firm and theoretically in vocational school (Grønning, et al., 2018). I disentangle these two dimensions, type of skills and manner of skill acquisition, and discuss how they relate to short-term and midterm labour market outcomes. I argue that these two dimensions influence short-term and midterm productivity differently and thus also impact status mobility; The concomitant mechanisms are discussed in section

[24] Originally, this concept was introduced by Becker (1964) and referred to firm-specific skills. Later contributions refer to occupation-specific or industry-specific skills as well. In Switzerland where labour markets are structured along the lines of occupations and occupational fields (Sacchi, et al., 2016), and a large majority of the firms are small or medium sized (FSO, 2019), occupation-specific skills determine workers labour market situation to a higher degree than firm- or industry-specific skills.

4.2.3 and 4.2.4. Table 4.1 describes the characteristics of the four types of skills and knowledge identified along the two dimensions of skill acquisition.[25]

Table 4.1 Dimensions of skill acquisition in VET

		Type of skills General	Occupation-Specific
Manner of skill acquisition	Theoretical	1. High transferability 2. Low depreciation rate 3. Beneficial for further learning	1. Medium transferability 2. Medium depreciation rate 3. Beneficial for further learning especially within OMC
	Practical	Not applicable in the Swiss context 1. Low transferability 2. Low depreciation rate 3. Not beneficial for further learning	1. Very low transferability 2. High depreciation rate 3. Not beneficial for further learning

First, skills and knowledge can differ in how specific or transferable they are. Theoretical general knowledge, such as language and analytical and problem-solving knowledge, is transferable between firms and occupations and can be used in diverse contexts (Becker, 1964). By contrast, specific skills are limited to the occupation in which they were acquired in (Shaw, 1987). Practical occupation-specific training is closely tied to labour market needs. Theoretical occupation-specific education is more abstract and less labour market oriented (Neyt, et al., 2019). Therefore, practical occupation-specific skills are more specific to the firm and less transferable between occupations than theoretical occupation-specific knowledge. Second, skills can differ in how fast they lose their value on the labour market. General knowledge hardly depreciates, because it can be used in various occupations across the labour market and thus also throughout the career (Estévez-Abe, 2012; Grønning, et al., 2020b). In contrast, specific skills, which are strongly tied to the occupational context, can lose their value as a result of technological development or changing labour market demand. This is especially the case for practical occupation-specific skills because these skills can be more easily replaced by machines than theoretical specific skills. In industries with rapid technological change, practical occupation-specific skills can depreciate even during the early career (Hanushek, et al., 2017). Last, the skills differ in how they prepare the diploma holders for further formal and informal learning. General education in VET focuses on basic academic subjects (e.g. reading, writing, second language, economics and ethics) and on analytical thinking, self-reflection, and analysing one's own learning process (SERI, 2006; Wettstein, et al., 2017). Thus, a high proportion of general education during VET provides a good foundation for further learning, whether informal, nonformal, or formal through higher vocational education (Korber, 2019a; Lavrijsen and Nicaise, 2017; Sander and Kriesi, 2020, in press). Theoretical occupation-specific education also to some degree fosters analytical thinking and provides basic occupation-specific academic knowledge (Wettstein, et al., 2017). Therefore, theoretical occupation-specific training is likely to be more favourable for further learning than practical training, especially within the occupational field.

[25] One type of skills, practical general knowledge is not applicable to the Swiss context, because general knowledge is mainly taught in vocational school (Wettstein, et al., 2017). Thus, I concentrate on the three other types of skills and knowledge.

4.2.3 The effect of specificity on status mobility at labour market entry

At labour market entry, the first dimension of skill acquisition, the type of skills acquired, influences status mobility through the training costs associated with hiring diploma holders with general knowledge and occupation-specific skills. Highly specific, less transferable skills increase diploma holders' immediate productivity and reduce training costs within the occupation (Hanushek, et al., 2017; Müller and Shavit, 1998). Labour market entrants who received very occupation-specific training therefore have high incentives to enter employment within their trained occupation, where they can apply most of their skills and where their skills will be fully remunerated (Vicari and Unger, 2020). Those with more general education need more on-the-job training to acquire the same level of occupation-specific skills and productivity (Breen, 2005; Müller and Shavit, 1998; Wolbers, 2003). Labour market entrants with general knowledge are therefore more disadvantaged against experienced workers with the same qualification than those with more specific skills (Vogtenhuber, 2014). As a result, those who trained in occupations with a high proportion of general education are more likely to change their occupation at labour market entry than those with more specific training (Arum and Shavit, 1995; Geel and Backes-Gellner, 2011; Menze, 2017; Muja, et al., 2019a).

However, it is still unclear to what degree occupational mismatch relates to status mobility. I expect that those with more general education experience downward mobility more often at labour market entry than those with more occupation-specific training for two reasons. First, employers have higher training costs when hiring labour market entrants with more general knowledge. They might compensate for these costs by employing these labour market entrants in positions with lower pay and status. Second, because individuals with high levels of general knowledge are more inclined to attend further learning, a downward change in status may be viable at labour market entry if the lower status job is associated with further learning options and thus improved career chances. To my knowledge, two studies have focused on the effect of training programmes' specificity on status position of labour market entrants. Vogtenhuber (2014) finds that specificity has a positive impact on the status score of the first job, independent of the status of the trained occupation. He explains this finding with the fact that those with more specific training are more likely to find a job within their occupation. Therefore, they will have a higher status job than those with more general education, who are more likely to be downwardly mobile (Vogtenhuber, 2014). Menze (2017) finds a somewhat different result. She shows that those who trained in more general training occupations have a significantly lower likelihood of finding employment in an unskilled (i.e. lower status) position within the trained occupation than those who trained in more specific occupations. However, she does not control for occupation-specific labour market opportunities. If those with highly occupation-specific training occupations are subject to a less favourable labour market situation, this could cause biased results.

The second dimension, the manner of skill acquisition, compares the impact of practical and theoretical occupation-specific training. Diploma holders with high proportions of practical occupation-specific training are more likely to stay in their occupation than those with more theoretical occupation-specific education. Practical training is closely tied to local labour market needs. Therefore, mainly the practical training in training firms imparts the relevant and ready-to-use specific skills that are crucial for productivity at labour market entry (Bol and van de Werfhorst, 2016; Breen, 2005). Employers have high

incentives to retain apprentices with these skills (Wolbers, 2003). Furthermore, because of the lower transferability of practical skills, changing occupation will result in higher wage losses for those with predominantly practical occupation-specific skills than for those with more theoretical occupation-specific skills. In sum, both workers and employers have high incentives to realise a match between workers with predominantly practical training and vacancies requiring this training. Indeed, some evidence suggests that the manner of skill acquisition affects occupational match. The positive relationship between being vocationally trained and finding a matching job has been found to be strongest in countries with a high proportion of firm-based VET (Levels, van der Velden, and Di Stasio, 2014). Exploiting heterogeneity within one education system, Müller and Schweri (2009) find that those with firm-based vocational training have a higher likelihood of experiencing a match than those with only school-based training. Because horizontal match coincides with vertical match at labour market entry, those with a high proportion of practical occupation-specific training are expected to experience less vertical mobility at labour market entry. Based on these considerations, I hypothesise that

- *labour market entrants who trained in occupations with a high proportion of general education are less likely to enter a job with the same status position and more likely to experience downward mobility than those who trained in occupations with lower proportions of general education (H1).*
- *labour market entrants who trained in occupations with a high proportion of practical occupation-specific training are more likely to enter a job with the same status position and less likely to experience upward or downward mobility than those who trained in occupations with lower proportions of practical training (H2)*.

4.2.4 The effect of specificity on status mobility during the early career

Furthermore, the two dimensions of skill acquisition influence status mobility between training and the midterm job around the age of 30. At this age, most VET diploma holders have gathered some years of labour market experience. Moreover, at this age a large share of those who continue in professional education have finished a tertiary degree. The median graduation age for professional education is 28 (FSO, 2011, p. 35).

Because general knowledge increases flexibility on the labour market and because these skills depreciate slowly, they are signs of productivity throughout the career. General knowledge can even enhance productivity because it facilitates further learning, either formal or informal (Hanushek, et al., 2017). In Switzerland, higher education strongly improves individuals' chances of upward mobility, because many open positions require higher-level qualifications (Sacchi, et al., 2016). Furthermore, all types of learning activities throughout the career can be a signal of motivation and adaptability to employers (Li, et al., 2000). Increased productivity and signals of motivation should give access to higher status positions. Because general knowledge is transferable, more general education may also give individuals access to equal or higher status positions outside their occupational mobility chain. These considerations are in line with Vogtenhuber's (2014) findings that those who have trained in broad training occupations experience higher status gains between the first and later jobs than those with more specific training occupations. Vicari and Unger (2020) find somewhat differing results, with the vocational specificity of an initial job having a positive effect on upward mobility and a negative effect on downward

mobility compared to the subsequent job. However, they do not take into account that specificity can have different effects depending on the career phase.

Over time, occupation-specific training becomes less reliable as a signal of productivity, because the specific skills learned during training become outdated and lose their value on the labour market. Thus, they can even become a burden and hamper upward mobility (Forster and Bol, 2018; Hanushek, et al., 2017). This mechanism should pertain mainly to practical occupation-specific skills, which can be more easily replaced by machines than theoretical occupation-specific skills. Furthermore, those with a high proportion of practical skills should be less able to adapt to new or changing requirements within their occupational field. They should also be less inclined to enter higher positions, which requires developing new skills, or continue in further education, which may lead to jobs with a higher status. These considerations lead to the following three hypotheses:

- *Individuals who trained in training occupations with a high proportion of general education are more likely to experience upward or no status mobility and less likely to experience downward mobility during their early career than those who trained in occupations with lower proportions of general education (H3).*
- *During the early career, individuals who trained in training occupations with a high proportion of practical occupation-specific training have a higher probability of experiencing downward mobility or being in a job with the same status and a lower probability of experiencing upward mobility than those with lower proportions of practical occupation-specific training (H4).*
- *The effect of general education and practical occupation-specific training on midterm status position is mediated by higher education participation. When higher education is controlled for, the positive effect of general education on upward mobility declines, and the negative effect of practical occupation-specific training declines (H5).*

Table 4.2 provides an overview of the hypothesised impact of the two dimensions in short-term and midterm perspectives. The proportion of general education is expected to have opposite effects on downward mobility and on no status mobility at the beginning of the career compared to the midterm job. Practical occupation-specific training is expected to have similar effects on no status mobility and upward mobility at both points in the career. However, a difference can be seen in the impact on downward mobility, which is expected to turn from negative at labour market entry to positive during the early career.

Table 4.2 Overview of hypotheses 1-4

	First Job				**Job around the age of 30**			
	Downward Mobility	No Status Mobility	Upward Mobility		Downward Mobility	No Status Mobility	Upward Mobility	
Proportion of general education	+	−		H1	−	+	+	H3
Proportion of practical occupation-specific training	−	+	−	H2	+	+	−	H4

4.2.5 Other occupation-specific and individual determinants of status mobility

Other characteristics of the training occupation as well as individual characteristics of the diploma holders matter for status mobility as well. On the occupational level, labour market entry conditions are very important for later career development (Brunner and Kuhn, 2014). In OLMs, demand and supply within the occupational mobility chain is substantially more important for career development than the overall economic situation (Buchs, et al., 2015; Sacchi, et al., 2016). Thus, the highly aggregated measures of labour market supply or demand (e.g. year or region dummies or local unemployment rates) used to control for opportunities in previous research are insufficient (Menze, 2017; Vogtenhuber, 2014; Wolbers, 2008). Furthermore, Sacchi, et al. (2016) show that individual opportunities are highly contingent on the status distribution of the positions available. Vacant positions with higher status within individuals' mobility chain are a prerequisite for upward mobility. Downward mobility is more likely when more of the vacant positions are of lower status.

On the individual level, I consider a range of determinants of status mobility. Individual abilities and lower secondary school level play an important role in labour market integration (Wolbers, 2008). Because women tend to take family considerations into account differently from men, they often have less favourable career prospects, especially if they have children (Kalmijn and Luijkx, 2006). Individuals with migration background tend to have worse prospects than natives both on the apprenticeship market and on the labour market (Imdorf, 2010; Vogtenhuber, 2014). Individuals' career aspirations can also be affected by parents' socio-economic background (Boudon, 1974). Menze (2017) argues that better training quality increases individuals' chances of finding suitable work after training. Further, unemployment spells at labour market entry send negative signals to employers and thus can have a long term impact on the career (Helbling and Sacchi, 2014). Part-time work can also signal less work commitment. Temporary contracts and retention of apprentices in the training firm exposes workers to the fluctuations of the labour market (Wolbers, 2008). Last, the labour market situation differs strongly between regions in Switzerland and thus impacts mobility prospects (Schenker and Straub, 2011).

4.3 Data, Measures and analytical strategy

4.3.1 Data

The individual-level data source used is the Transitions from Education to Employment study (TREE), a panel survey of a representative sample of the Swiss compulsory school leaver cohort in 2000. The data comprises nine waves carried out between 2001 and 2014. From 2003 onwards, monthly employment spells with information on the job title and characteristics were recorded (Gomensoro and Meyer, 2017). Two samples were constructed to test the effect of specificity on 1) status mobility directly after labour market entry and 2) status mobility during the early career. Both samples are based on respondents who finished a dual upper secondary VET degree of three or four years' training duration. The first sample consists of all VET diploma holders for whom a first employment episode is observed up to two years after training. More than 90% of this sample were 21 years old or younger when they entered the labour market; almost 50% had entered their first job within two months after graduation and more than 80% within a year after graduation. The second sample consists of all VET diploma holders who were in employment and not in education or military/civil service 14 years after compulsory school (wave 9). Because of a low number of respondents, I also included diploma holders in employment 10

years after compulsory school (wave 8) if they had not been observed or employed in the previous wave. I excluded respondents who had finished their vocational training less than four years prior to the final observed time point, to clearly distinguish between short and midterm labour market outcomes. On average, the individuals in the second sample had finished their VET nine years prior to the final observed time point. The ages ranged from 24 to 32, and more than 60% were 29–30 years old (for a detailed description of the sample characteristics see Table C1 in appendix C). After excluding observations with nonidentifiable training occupation titles or training occupations with nontraceable ordinances, the first sample consists of 1451 VET diploma holders, who had trained in 116 occupations. The second sample includes 1180 diploma holders, of whom 266 were last observed in wave 8. The individuals in the second sample had trained in 107 occupations.

The occupation level specificity indicators are based on information from occupation-specific VET curricula and ordinances. These documents are highly standardised and legally binding across all Swiss cantons. They include information on the number of lessons individuals have in vocational school and inter-company courses and the average days a week apprentices spend in the training firm. This information was used to compute the proportions of general and specific education and training and the distribution of the training across training locations. The occupation-level data was linked to the individual-level data by the training occupation title (official titles provided by the Swiss Federal statistical office) and the year of graduation.

4.3.2 Measures and analytical strategy

Dependent Variables

Two dependent variables were used: 1) status mobility between the training occupation and first job and 2) status mobility between training occupation and job around the age of 30. The status of an occupation is measured by the ISES status score (Ganzeboom, et al., 1992).[26] Upward mobility is defined as at least 5% increase in ISEI score and downward mobility is defined as at least 5% decrease in ISEI score. At labour market entry, large mobility leaps are unlikely. Thus, I use lower cut-off points than previous research when identifying those that experience mobility (Sacchi, et al., 2016; Wolbers, 2008).[27] The relative definition of status mobility ensures comparability between respondents' mobility patterns regardless of initial status position (Sacchi, et al., 2016). Further, the dependent variables are measured independently of horizontal mobility. Upward or downward mobility can thus occur either within or outside the occupational field.

Explanatory Variables

Previous research has focused on either the type of skills or the manner of skill acquisition when measuring specificity. The type of skills is often operationalised as the share of skills used in one occupation that can be used in other occupations, either based on self-reported skills or mismatch (Geel and Backes-Gellner, 2011; Menze, 2017) or skills catalogues for the occupations (i.e. BERUFENET; Damelang, et al., 2015; Vicari and Unger, 2020). Others focus on the manner of skill acquisition by distinguishing between fully school-based and firm-based training (Müller and Schweri, 2009; Neyt, et

[26] Because of inconsistencies in the categorisation of the commercial employee training occupation, all individuals with this training occupation were manually given the same ISEI score (43).

[27] Robustness checks using dependent variables with cut-off points of 10% yield substantially the same results (available upon request).

al., 2019). To my knowledge, only one article simultaneously incorporates both dimensions in a single analysis (Verhaest, et al., 2018). In contrast to Verhaest et al. (2018), who identify four types of training programmes, I include two continuous variables measuring both dimensions of skill acquisition for each programme, the proportion of general education and the proportion of practical occupation-specific training. Thus, I exploit the full heterogeneity of specificity in Swiss VET.

In Swiss VET, training takes place at three locations: training firm, vocational school, and intercompany courses (Wettstein, et al., 2017). General education is mainly provided in vocational school and includes lessons in language, communication, economics, business management, administration, politics, ethics, and culture. Specific skills and knowledge are provided through both practical training and experience in the training firm and through occupation-specific lessons in vocational school and intercompany courses. Intercompany courses provide occupation-specific education and training, which is not part of the training in the firms due to safety reasons or firm specialisation. Because the information about the training time at the various training locations is provided in different units, I followed two rules to calculate the total duration of training at all three training locations: 1) Eight lessons are equal to one day of training. 2) One year is equal to 47 weeks of training. The first dimension of skill acquisition, the proportion of general education, was calculated by dividing the time the apprentices participate in general education in vocational school by the total training time. The second dimension of skill acquisition, the proportion of practical training, was calculated by dividing the time apprentices spend in the training firm by the time they spend in occupation-specific training at all three training locations.[28] A one-unit increase in an index represents a 1% increase in general education or practical training. For an overview of the distribution of the dimensions across the occupations, see Figure C1 in appendix C. To examine the mediating effect of general education during the early career, I include a variable measuring whether the diploma holders had finished a tertiary degree in the final wave (0: no tertiary education, 1: tertiary B, 2: tertiary A).

Control Variables

Because labour market segments coincide strongly with training occupations, the labour market situation at the beginning of the career could represent a confounding factor. I control for occupation-specific labour market demand by using data from the Swiss job monitor (SJM). This data provides a representative sample of all vacant positions from 1950 onwards on a yearly basis. They give an accurate picture of the yearly skill demand in the Swiss labour market (Sacchi, 2014). Two indicators were calculated, representing the number of vacant positions with 10% higher and 10% lower status than the training occupation of the diploma holder. The numbers were based on a subsample of the SJM consisting of the yearly vacant positions open to labour entrants with a VET Diploma (for a definition of these positions see Buchs, et al., 2015). The number of advertised positions was then weighted by the probability with which a "worker with occupation x is able to access jobs in other occupations" (Sacchi, et al., 2016, p. 14). By weighting the vacant positions, I account for the fact that access to open positions depends on diploma holders' occupations. Thus, the two variables represent the diploma holders' possibilities for upward and downward mobility within their occupational mobility chain at labour

[28] Intercompany courses became compulsory in 2004. For those who trained according to the regulations in force before 2004, intercompany courses are not included in the total training time.

market entry. For a detailed description of the construction of the job opportunities, see Sacchi, et al. (2016). To account for the supply side, I included a variable with the number of unemployed with a vocational degree within the diploma holder's training occupation based on register data on monthly unemployment counts. This data was provided by the Swiss job placement and labour market statistics information system. The three controls for the occupation-specific labour market situation were z-standardised. Last, industry specific characteristics were taken into account by controlling for the industrial sectors of the training occupation based on the 1-digit classification of the SSCO (7 sectors).

An advantage of the TREE dataset is that it includes a rich set of individual-level background variables, including ability test scores. In the multivariate analysis I included the sex (0: female, 1: male), country of birth (0: Switzerland, 1: other), and age of the respondents at completion of the apprenticeship. Furthermore, respondents' PISA reading score (z-standardised), lower secondary education track (0: basic requirements, 1: pre-gymnasia track, 2: extended requirements and 3: no formal tracking), and vocational baccalaureate (0: no, 1: yes) measures abilities and school performance. For the second sample, a variable was included indicating whether respondents had children when they started their current occupation. Because larger firms tend to employ more apprentices, invest more in their apprentices, and thus have higher quality training (Menze, 2017), a variable was constructed for the training firm size (0: one apprentice, 1: 2–5 apprentices, 2: more than 5 apprentices). VET diploma holders' general satisfaction with their VET programme captures training quality as well as individuals' motivation to continue working in their training occupation. This variable is measured one year before completion of training (0: extraordinarily, very, or rather dissatisfied or so so; 1: rather, very or extraordinarily satisfied).

Family background is controlled for by including the mean of the socioeconomic status of the parents (ISEI, z-standardised). Job characteristics pertaining to the first job include labour market region (7 regions), whether the diploma holder was retained by the training firm, contract form (0: permanent 1: temporary), and working hours (0: less than 32 hours a week, 1: 32 or more hours a week). Furthermore, months between graduation and first job was included to control for possible unemployment spells after VET. For the second sample, variables were constructed for the labour market region (7 regions) and full-time employment (0: less than 80% employment, 1: 80% employment or more) pertaining to the job around the age of 30.

Analytical strategy

To assess the impact of the proportion of general education and practical training on status mobility, I ran multinomial logistic regressions (Long and Freese, 2006). For a more tangible understanding of the effects, I present the average marginal effects (AME). These can be interpreted as the effect of the independent variables on the probability of experiencing upward mobility, downward mobility, and a lack of status mobility. In order to compute correct standard errors for the occupation specific variables, I estimated cluster-robust standard errors for the training occupations. The results are reported using design weights that correct for the disproportionality of the sample (Sacchi, 2008). The results pertaining to the first job after labour market entry are presented in Model 1. Models 2 and 3 present the results pertaining to status mobility during the early career. Predicated probabilities based on Models 1 and 3 are depicted in Figure 4.1. The regression lines on the left side of the figure display diploma holders

predicted probability at labour market entry to experience upward mobility (dotted line), downward mobility (solid line), and no mobility (dashed line) for the observed proportions of general education (upper graph) and practical occupation-specific training (lower graph). The regression lines on the right side display the predicted mobility probability at midterm, when the diploma holders are around the age of 30.

4.4 Results

4.4.1 Descriptive Results

Table 4.3 shows the share of diploma holders who experience downward and upward mobility in their first job after labour market entry and in their job around the age of 30. At labour market entry, the majority (68%) of diploma holders find a job with the same status score as their training occupation. A considerable fraction also experiences upward mobility; 19% find a job with higher status score than their training occupation. During the early career, the share of individuals who experience upward mobility rises to 56%. Overall, these results show a favourable labour market situation for young Swiss VET diploma holders. Nevertheless, I find that more than every tenth diploma holder enters a first job with lower status than their training occupation. Around the age of 30, a similar proportion had a job with lower status than their training occupation. Given that two thirds of the Swiss school leavers enter VET, downward mobility affects a group sizable in total numbers.

Table 4.3 Status mobility between training occupation and first and midterm job

	First Job	**Job around the age of 30**
	Percent.	Percent
Downward Mobility	12.4	10.6
No Status Mobility	68.3	33.7
Upward Mobility	19.3	55.8
Total	100	100
N	1451	1180

Note: weighted results (design weights)

To provide a first impression of the relationship between status mobility and the specificity of the training occupation, the mean shares of general education and practical training for each mobility group are presented in Table 4.4. The VET diploma holders spend between 6% and 23% of their training time in general education in vocational school. Thus, most of the training is occupation specific. Those who experienced upward mobility on average trained in occupations with a significantly higher proportion of general education than those who did not (one-sided *t*-test, p<0.01). This is the case both at labour market entry and around the age of 30. The diploma holders' occupation-specific training is largely practical. Between 69% and 96% of the occupation-specific training takes place in the training firm. Those who experience upward mobility have a slightly but significantly higher proportion of practical occupation-specific training than the two other groups in both short-term and midterm perspectives (one-sided *t*-test, $p < 0.01$). There are no significant differences in the proportion of general education or practical training between those who experience downward mobility and those who do not experience status mobility.

Table 4.4 Distribution of the proportion of general education and practical training by status mobility

	Downward Mobility		No Status Mobility		Upward Mobility		Total				
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Min	Max	N
First Job											
General Education	10.7	5.2	10.4	4.8	14.1	5.2	11.1	5.2	5.8	22.6	1451
Practical Training	88.9	6.1	88.7	5.4	92.4	5.1	89.4	5.6	68.6	96.1	1451
Job around age of 30											
General Education	9.4	4.6	9.8	4.8	12.3	5.2	11.1	5.2	5.8	22.6	1180
Practical Training	88.3	5.4	88.0	5.5	90.0	6.0	89.2	5.9	68.6	96.1	1180

Note: weighted results (design weights)

4.4.2 Multivariate results

Model 1 in Table 4.5 presents the AMEs of the explanatory variables at labour market entry. For the first dimension of skill acquisition, I find no evidence that the type of skills matters for diploma holders' status mobility between training occupation and first job after apprenticeship. Although the direction of the effects of general education are as expected, the effect on neither downward nor upward mobility are significant. Thus, I cannot confirm hypothesis 1, that those with more general education are more likely to experience status loss and less likely not to experience status mobility than those with less general education. For the second dimension, the manner of skill acquisition, the results show a negative relationship between the proportion of practical occupation-specific training and downward mobility. If the proportion of practical occupation-specific training rises by 1%, the average probability of experiencing downward mobility decreases by 0.8%. In other words, those who trained in training occupations with a high proportion of practical occupation-specific training have a significantly lower probability of experiencing downward mobility than those with higher proportions of theoretical occupation-specific training. As Figure 4.1 illustrates, those who have the lowest observed proportion of practical occupation-specific training have a 30.4% higher risk of being downwardly mobile than those who have the highest. This result partly confirms hypothesis 2. Thus, at labour market entry, practical skills seem to protect from status loss. However, there is no evidence that those with more practical training are also less likely to enter jobs with higher status than those with less practical training, as hypothesised. Nevertheless, practical occupation-specific skills seem to be an important vehicle for finding a first job that at least matches the status position of the training occupation. These results complements research which shows that those with dual training programmes face fewer problems at labour market entry, such as finding employment (Neyt, et al., 2019) and being undereducated or inadequately skilled (Verhaest, et al., 2018) than those with more school-based education.

The results pertaining to midterm status mobility are presented in Models 2 and 3. They show that the type of skills becomes more important for status mobility over time. Around the age of 30, diploma holders' probability of being in a job with a lower status than the training occupation decreases significantly, and their probability of being in a job with higher status increases significantly with increasing proportions of general education (Model 2). If the proportion of general education during VET rises by 1%, the average risk of experiencing downward mobility decreases by 1.7% and the average probability of experiencing upward mobility increases by 3.0%. Thus, I can confirm hypothesis 3, that

general education improves diploma holders' occupational status prospects and reduces the risk of downward mobility in a midterm perspective. When I control for tertiary degrees in Model 3, the positive effect of general education on upward mobility diminishes but remains significant at the 10% level. Tertiary education also has a significant positive effect on the probability of experiencing upward mobility and a significant negative effect on the probability of remaining in the same status position as the training occupation. These results are in line with my fifth hypothesis and support the assumption that general education channels young VET diploma holders into tertiary education, which improves their long-term upward mobility chances. However, the negative relationship between general education and downward mobility hardly diminishes and remains significant when comparing Model 2 with Model 3. As Figure 4.1 shows, those with the lowest observed proportion of general education have a 23.0% higher probability of being downwardly mobile than those with the most general education when controlling for tertiary degrees. Thus, the findings also suggest that general education shelters VET diploma holders from status loss through other mechanisms than tertiary education, such as a more positive attitude towards learning, higher participation rates in on-the-job or informal learning activities, and lower depreciation rates of general knowledge (see also Lavrijsen and Nicaise, 2017). This can enhance diploma holders' productivity throughout their early career, send positive signals to employers, and therefore make diploma holders with general education better equipped to hold or improve their status position in a midterm perspective. Because comparing coefficients and AMEs between nested logistic models can be problematic (e.g. Breen, et al., 2013), I also applied the KHB-method to compare Model 2 with Model 3. This method is "unaffected by the rescaling or attenuation bias that arises in [logistic] cross-model comparison" (Kohler, et al., 2011, p. 420). The KHB estimations yield almost identical results (available upon request).

Last, in a midterm perspective, I find no evidence that those with more practical occupation-specific training have a higher probability of experiencing downward or no status mobility and a lower probability of experiencing upward mobility than those with less practical occupation-specific training (H4). Thus, beyond labour market entry, the results suggest that practical occupation-specific skills are neither detrimental nor favourable for status mobility during the early career.

Table 4.5 The effect of general education, practical occupation-specific training and tertiary education on status mobility

	First Job			**Job around age of 30**					
	Model 1			Model 2			Model 3		
	Downward Mobility	No Status Mobility	Upward Mobility	Downward Mobility	No Status Mobility	Upward Mobility	Downward Mobility	No Status Mobility	Upward Mobility
Proportion of general education	0.003	-0.005	0.002	-0.017 ***	-0.013	0.030 *	-0.016 ***	-0.008	0.024 +
	(0.007)	(0.011)	(0.007)	(0.004)	(0.012)	(0.014)	(0.004)	(0.012)	(0.014)
Proportion of practical occupation-specific training	-0.008 *	0.007	0.001	0.003	0.004	-0.007	0.003	0.002	-0.005
	(0.003)	(0.007)	(0.006)	(0.004)	(0.008)	(0.010)	(0.004)	(0.008)	(0.010)
Highest tertiary degree (ref: No tertiary degree)									
Tertiary B							-0.023	-0.176 ***	0.198 ***
							(0.037)	(0.036)	(0.051)
Tertiary A							-0.075 **	-0.282 ***	0.357 ***
							(0.025)	(0.051)	(0.045)
N	1451			1180			1180		

Note: Average marginal effects from multinomial logistic regressions; weighted results (design weights); control variables not reported; cluster-robust standard errors in parentheses; Significance levels: + $p < 0.10$ * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

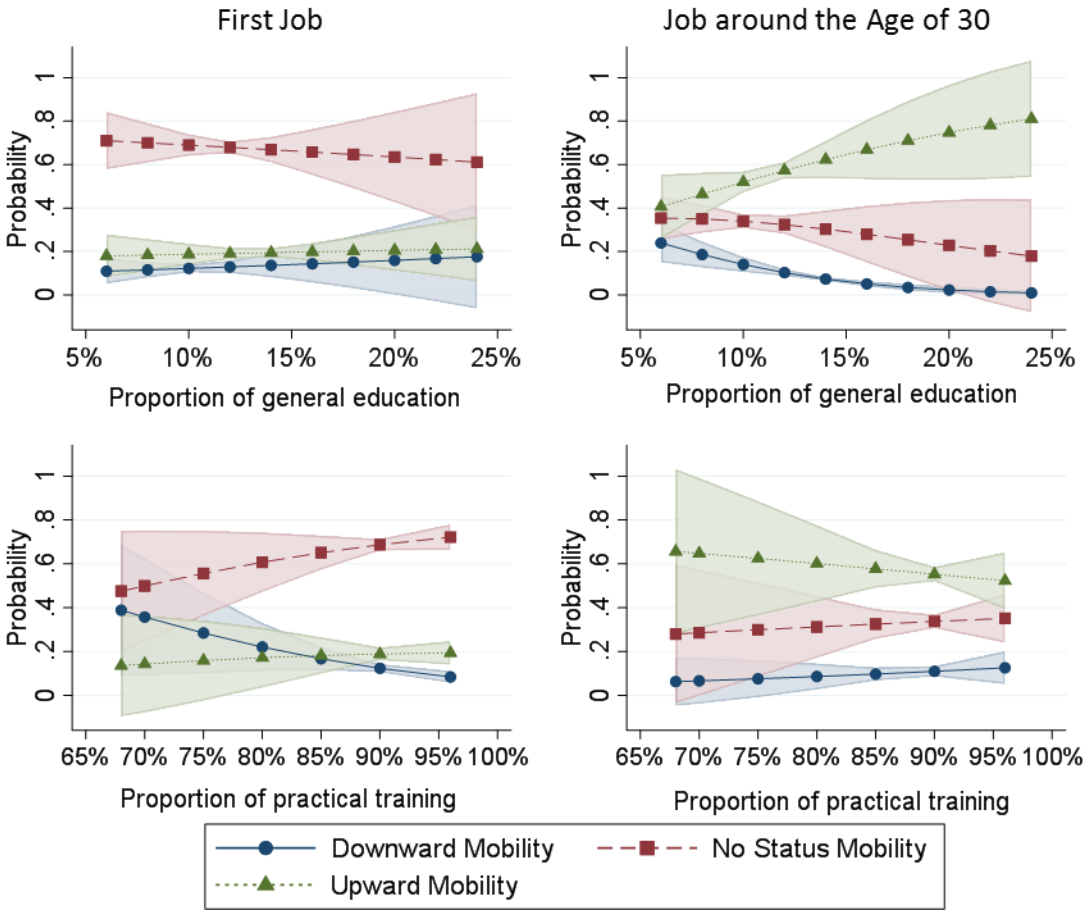

Figure 4.1 Predicted mobility by the proportion of general education and practical occupation-specific training at labour market entry and during the early career. Predicted margins with 95% Conf. Int. depicted for the observed proportions of general education and practical occupation-specific training based on Models 1 and 3.

Most of the results concerning the control variables are in line with the expectations. The AMEs in Table C2 (in Appendix C) show that the occupation-specific labour market opportunities at labour market entry matter for VET diploma holders' short and midterm mobility. As expected, the number of vacancies with higher status has a negative impact on downward mobility and a positive impact on upward mobility. A higher number of vacancies with lower status score increases the probability of experiencing downward mobility. Furthermore, both in short-term and midterm perspectives, VET diploma holders' mobility depends on the labour market region they work in, the size of their training firm, and full-time employment. Those who train in firms with more than five apprentices are less likely to stay in the same status position than those with only one apprentice. Those who work fulltime (full hours) are less likely to experience downward mobility than those who work part time (lower hours). Three variables have a significant effect on mobility, but only for the first job. A higher compulsory school track or no tracking and being satisfied with the apprenticeship shelter diploma holders from entering a first job with lower status. The longer the time between training and first job, the more likely it is that they experience downward mobility. Around the age of 30, those who work in commercial professions and administration are more likely to experience downward mobility than those working in any other sector. Somewhat surprisingly, those with higher PISA reading scores are more likely to be in a job with lower status and less likely to be in a job with the same status than their training occupation around the age of 30. An

explanation for this may be that these individuals more often enter training occupations with high intellectual requirements and high status. Thus, they have relatively less opportunities for upward movement and relatively more opportunities for downward movement.

4.5 Conclusion

This paper discusses the relationship between vocational education and training and status mobility in occupationally segmented labour markets. I shed light on the mechanisms behind this relationship by examining the effect of vocational specificity of training occupations on VET diploma holders' status mobility during the early career. This contribution goes beyond the close focus on occupational or education level match, found in current research, by systematically differentiating between upward, downward and no status mobility. Furthermore, the article sheds light on how different dimensions of skill acquisition are related to short and midterm status mobility. I distinguish between two dimensions: type of skills acquired and manner of skill acquisition. This is possible because Swiss training occupations vary in their proportions of general and occupation-specific as well as practical and theoretical education and training. Methodologically, I contribute to the literature by controlling for occupation-specific labour market opportunities at the time of labour market entry and sorting into occupations based on individuals' intellectual abilities.

At labour market entry, the results show that receiving a high proportion of practical occupation-specific training prevents individuals from experiencing downward mobility. This suggests that those with highly specific practical skills have high incentives to enter a job in their training occupation, where their skills will be fully remunerated. Thus, they experience neither status gain nor loss. This finding is in line with previous research which shows that practical occupation-specific training smooths labour market entry (Grønning, et al., 2020a; Neyt, et al., 2019; Polidano and Tabasso, 2014; Verhaest, et al., 2018). In the longer run, those with more general education experience downward mobility less often and upward mobility more often than those with more occupation-specific education and training. The latter effect is mediated by higher education. Thus, the results indicate two mechanisms. Because of the transferability and low depreciation rate of general knowledge, those with more general education have more options when they want to or are forced to leave their occupation. This prevents them from experiencing status loss. Further, general education fosters further learning activities and a positive attitude towards learning (see also Lavrijsen and Nicaise, 2017), which gives VET diploma holders access to higher status positions throughout their early careers. Thus, general education can enable diploma holders to keep pace with increasing and changing skill requirements on the labour market.

These results have several theoretical implications. First, the results show that a refined conceptualisation and operationalisation of occupational specificity is fruitful when examining labour market outcomes after VET. In line with recent research, I show that specificity varies between education programmes within one education system (Forster and Bol, 2018; Muja, et al., 2019b). Furthermore, the type of skills acquired and the manner of skill acquisition are distinct dimensions that matter to different degrees during different career phases. A common operationalisation of vocational specificity based on variance between education programmes regarding both dimensions might improve the comparability of results across countries or education levels. For example this could allow a comparison between

emerging forms of professional education (e.g. dual studies) and traditional vocational training or academic studies.

Second, the results imply that the effect of vocational specificity has a temporal dimension. In line with previous research, the results show that general education gains in importance and improves career chances in the longer run (Forster and Bol, 2018; Hanushek, et al., 2017; Korber and Oesch, 2019). However, I cannot confirm that general knowledge represents a disadvantage at the beginning of the career – at least not within the range observed in Swiss VET, where between 5% and 23% of the training time pertains to general education. These results feed into the current debate on the so-called academisation of VET. The debate centres around the question how VET can keep up with the increasing skill requirements of rapidly developing technology. It envisages a trade-off between meeting the increasing demand for tertiary-educated workers and continuing to provide enough vocationally trained workers with sound occupation-specific skills and knowledge (Euler and Severing, 2017; Kriesi and Leemann, 2020). Along with other recent empirical research, the result in this paper suggests that general education during VET can attenuate this trade-off. It can play a role in meeting the demand for a tertiary-educated, skilled, and flexible workforce without compromising the vocational orientation of the Swiss education system.

However, the results of this paper are limited to the Swiss context, which exhibits highly standardised curricula and narrow education programmes. Verhaest et al.'s (2018) findings suggest that practical training is particularly effective when combined with a narrow and occupation-specific focus, as can be found in Switzerland. Future research should examine in more detail the conditions under which practical, workplace-based training is beneficial for labour market entry. Such research is especially relevant in the light of current intentions to strengthen the apprenticeship system throughout Europe despite differences in the underlying education system and labour market structure (Šćepanović and Martín Artiles, 2020). Furthermore, my results pertain only to the first ten years of labour market experience. The effect of the dimensions of skill acquisition on mobility through the later phases of the life course remains unknown. Last, scarce evidence suggests that the relationship between specificity and labour market outcomes is moderated by gender (Estévez-Abe, 2012; Grønning, et al., 2020b). For women, who often have discontinuous careers, general education could be especially beneficial in avoiding downward mobility or facilitating upward mobility despite time out of the work force.

5 Does it matter where they train? Transitions into higher education after VET and the role of labour market segments.

5.1 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 and Bol, 2018; Lavrijsen and 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 and Sacchi, 2014a). 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, et al., 2018; Forster and 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, et al., 2006; Müller and Schweri, 2009) but are less mobile (Müller and 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 (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 and 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 paper, 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, et al., 2016). Lifelong learning and permeable education systems have also been stressed as solutions for retaining a competent and up-to-date workforce (Cedefop, 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, et al., 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.

5.2 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, et al., 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 5.1. 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 5.1). 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 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.

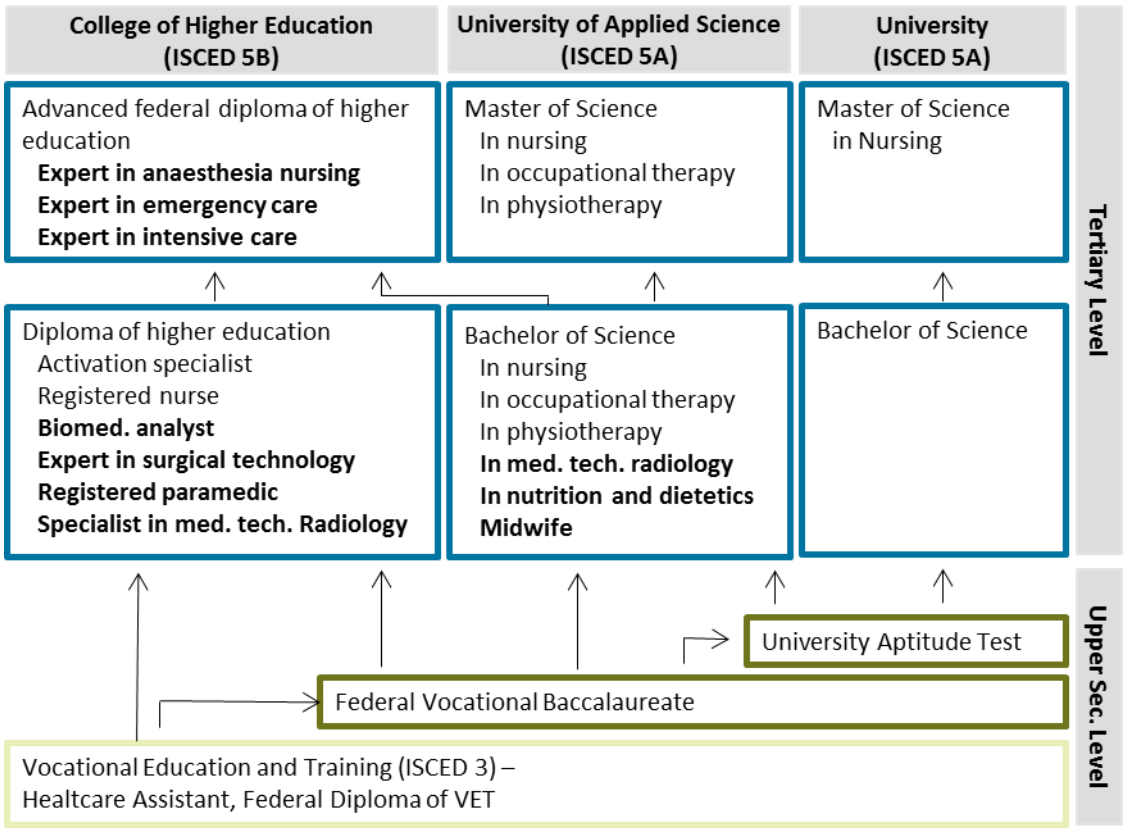

Figure 5.1 The Swiss Healthcare Education System. The figure depicts pathways and occupations common in long-term and acute care in the time period of 2011-2016. Education programmes/occupations in bold pertain to hospitals only. The ISCED 1997 classification is used. Source: Adapted from Trede, et al. (2017) and Dolder & Grünig (2016)

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.[29] 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 (FSO, 2011).

5.3 Labour Market Segmentation

5.3.1 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

[29] These numbers are based on own calculations using data from a longitudional study with a representative sample of healthcare assistant apprentices. For more information on the data, see section 5.5.1.

segments. Although there are disagreements regarding the number of segments (Doeringer and Piore, 1971; Lutz and Sengenberger, 1974; Tolbert, et al., 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 and 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, 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, et al., 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.

5.3.2 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 and 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 5.1 in section 5.2; 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 and 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 and 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 and Hartog, 2017; Trede and 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.*

5.4 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, et al., 2016; Denzler, 2011; Schmid and Gonon, 2016; Trede and 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 and 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, i.e., 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 and 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 and Gonon, 2016) as well as higher compulsory school tracks and grades (Trede and Kriesi, 2016) have a positive effect on the probability of entering 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 and Gonon, 2016; Trede and 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 and Trede, 2018; Trede and Kriesi, 2016). Furthermore, a gap year or periods of unemployment upon labour market entry can have scarring effects regarding later labour market outcomes (Helbling and Sacchi, 2014; Sacchi and Meyer, 2016). In addition, lower compulsory school tracks or gap-year activities can hamper the transition into upper-secondary vocational training (Dustmann, 2004; Helbling and Sacchi, 2014; Sacchi and Meyer, 2016).

5.5 Data and Methods

5.5.1 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 (FSO, 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.[30] 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.

5.5.2 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 5.5.3). To overcome this possible selection bias, we use propensity score matching (PSM). 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 (ATE) is computed as the difference in outcomes between the matched groups.

PSM 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 and 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.

5.5.3 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 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

[30] We excluded individuals who 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.

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 and 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.

5.6 Results

5.6.1 Descriptive Results

Table 5.1 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 5.2 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 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 5.1). 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).[31] These results show that we compare similar individuals based on the observed characteristics.

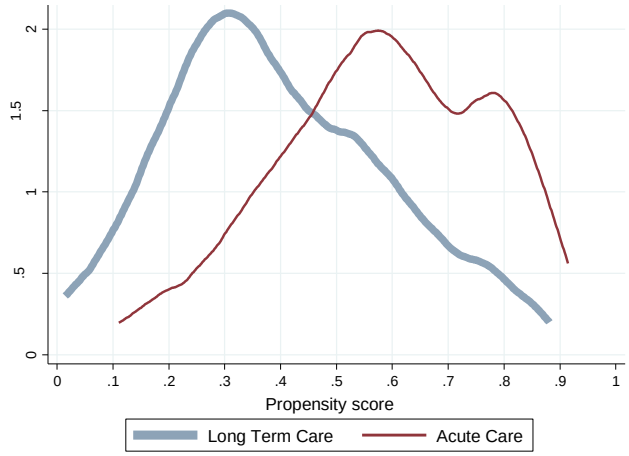

Figure 5.2 Kernel density plot of the estimated propensity scores, calculated separately for the treatment and control groups

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

Table 5.1 Sample Composition by Training Segment

	Long-Term Care		Acute Care		Total			% Bias
	Mean	SD	Mean	SD	Mean	SD	% 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[1] was the Desired Profession	0.70	0.46	0.47*	0.50	0.59	0.49		
HA[1] as a Stepping Stone	0.25	0.43	0.50*	0.50	0.37	0.48	53.1	2.0
HA[1] 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

[1]HA = Healthcare Assistant, *$p < 0.05$

5.6.2 Main Results

The average treatment effect (ATE) 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 5.2 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[32] and, second, use the larger sample surveyed one year after the apprenticeship. These results are presented in the second and third column in Table 5.2. The ATE 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 percentage points.

Table 5.2 Average Treatment Effects of Training in a Hospital on the Transition into Higher Education

	Main Results			**Including Attrition Weights**			**Transition within One Year after VET**		
	ATE (SE)	N Treated	N Control	ATE (SE)	N Treated	N Control	ATE (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

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

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 percentage points. 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,

[32] 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, et al., 2014).

experienced less support, and had less information about their advancement possibilities and the benefits thereof.

Last, the ATE for those with at least one parent with a tertiary education is shown in the third row in Table 5.2. 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 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.

5.7 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, et al., 2013), social origin (e.g Denzler, 2011), migration background (e.g. Trede and Kriesi, 2016), or expected returns (Schweri and 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 and Meyer, 2016) or the access to the favoured occupation. These bottlenecks influence individuals' chances and reinforce earlier disadvantages (Hupka-Brunner, et al., 2010; Protsch and 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 5.2). 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.

6 References

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7 Appendix A

Table A 1 Descriptive statistics

	Mean	SD	Median	Min	Max	K Occ.	N Ind.
Dependent Variable							
Log of Income	10.79	0.43	10.90	8.88	11.70		6123
Independent Variables							
General education (Days per week)	0.35	0.12	0.32	0.24	1.10	211	6123
Practical occupation-specific training (Days per Week)	4.02	0.26	4.09	3.14	4.51	211	6123
Theoretical occupation-specific education (Days per Week)	0.61	0.16	0.53	0.18	1.17	211	6123
Narrowly Defined Skill Set	0.44					92	2806
Vertical Differentiation	0.20					50	1663
Exam Standardization	0.75	0.26	0.90	0.24	1.00	211	6123
Control Variables Occupational Level							
Labor Market Opportunities	0.22	0.14	0.18	0.03	1.16		6123
Intellectual Requirement Level	2.87	1.46	3.00	1.00	6.00	211	6123
Control Variables Individual Level							
Months since Graduation	47.94	42.96	34.40	0.20	193.90		6123
Women	0.46						2808
Migration Background	0.38						2338
in further Education	0.16						994
Tenure in Months	24.46	27.11	13.00	0.00	157.00		6123
Firm Change after Training	0.69						4247
Change in occupation after Training	0.27						1653
Education							
one Federal Diploma	0.89						5431
Federal Certificate & Diploma	0.01						66
Several Diplomas/Baccalaureate	0.10						626
Region							
Lake Geneva	0.13						774
Espace Mittelland	0.20						1233
Northwest CH	0.12						757
Zurich	0.19						1154
East CH	0.15						936
Central CH	0.16						972
Ticino	0.03						190
missing	0.02						107
Firm size							
Very Small (<9)	0.27						1654
Small (10-19)	0.17						1058
Medium (20-99)	0.30						1848
Big (>100)	0.23						1389
Missing	0.03						174

Table A 2 Effects of institutional dimensions on income: All models with variance components

	Model 1		Model 1.1		Model 1.2		Model 2		Model 3		Model 4		Model 5		Model 6	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Institutional Characteristics																
Practical Occupation-Specific Training	0.128	0.089					0.144 *	0.067	0.169 *	0.066	0.160 *	0.066	0.172 **	0.067	0.165 *	0.067
Theroetical Occupation-Specific Education	-0.091	0.128					-0.080	0.090	-0.050	0.092	-0.057	0.092	-0.050	0.093	-0.052	0.092
General Education	-0.033	0.165					-0.003	0.113	0.084	0.112	0.053	0.112	0.092	0.114	0.042	0.114
Narrowly Defined Skill Set	-0.018	0.030					-0.004	0.021	0.002	0.020	0.000	0.020	0.000	0.020	0.000	0.021
Vertical Differentiation	-0.167 ***	0.017					-0.060 ***	0.016	-0.040 *	0.016	-0.036 *	0.016	-0.040 *	0.016	0.028	0.020
Exam Standardisation	-0.200 **	0.067					-0.127 **	0.048	-0.111 *	0.048	-0.110 *	0.048	-0.115 *	0.049	-0.112 *	0.049
Interactions																
Practical Occupation-Specific Training*Months since Graduation									-0.001 *	0.001						
General education*Months since Graduation											0.003 **	0.001				
Theoretical Occupation-Specific Education*Months since Graduation													0.000	0.001		
Vertical Differentiation*Month since Graduation															0.003 ***	0.001
Occupational Level Controls																
Labour Market Opportunities					0.222 ***	0.043	0.203 ***	0.043	0.215 ***	0.043	0.213 ***	0.043	0.213 ***	0.043	0.213 ***	0.043
Intellectual Requirement Level					0.019 **	0.007	0.027 **	0.009	0.034 ***	0.009	0.033 ***	0.009	0.034 ***	0.009	0.031 ***	0.009
Individual Level Controls																
Months since Graduation			0.003 ***	0.000	0.003 ***	0.000	0.003 ***	0.000	0.003 ***	0.000	0.003 ***	0.000	0.003 ***	0.000	0.003 ***	0.000
Women			-0.044 ***	0.013	-0.043 ***	0.012	-0.036 **	0.013	-0.039 **	0.013	-0.039 **	0.013	-0.037 **	0.013	-0.036 **	0.013
Migration Background			0.012	0.010	0.013	0.010	0.011	0.010	0.011	0.010	0.011	0.010	0.011	0.010	0.009	0.010
Number of Diplomas (ref. one Federal Diploma)																
Federal Certificate & Diploma			-0.027	0.047	-0.025	0.047	-0.026	0.047	-0.027	0.046	-0.026	0.046	-0.026	0.046	-0.027	0.046
Several Diplomas			0.039 *	0.016	0.038 *	0.016	0.037 *	0.016	0.040 *	0.016	0.040 *	0.016	0.040 *	0.016	0.039 *	0.016
in further Education			0.065 ***	0.013	0.062 ***	0.013	0.064 ***	0.013	0.062 ***	0.013	0.062 ***	0.013	0.062 ***	0.013	0.059 ***	0.013
Tenure			0.003 ***	0.000	0.003 ***	0.000	0.003 ***	0.000	0.003 ***	0.000	0.003 ***	0.000	0.003 ***	0.000	0.003 ***	0.000
Firm Change			-0.045 ***	0.012	-0.044 ***	0.012	-0.044 ***	0.012	-0.047 ***	0.012	-0.047 ***	0.012	-0.047 ***	0.012	-0.049 ***	0.012
Change in Occupation			-0.035 **	0.012	-0.035 **	0.012	-0.034 **	0.012	-0.034 **	0.012	-0.034 **	0.012	-0.034 **	0.012	-0.036 **	0.012
Region (Ref: Zuerich)																
Lake Geneva			-0.036 *	0.018	-0.037 *	0.018	-0.037 *	0.018	-0.041 *	0.018	-0.040 *	0.018	-0.039 *	0.018	-0.043 *	0.017

Table A 2 continued

	Model 1		Model 1.1		Model 1.2		Model 2		Model 3		Model 4		Model 5		Model 6	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Espace Mittelland			-0.040 *	0.016	-0.040 *	0.016	-0.040 *	0.016	-0.041 **	0.015	-0.040 **	0.015	-0.040 **	0.015	-0.041 **	0.015
Northwest CH			-0.006	0.018	-0.005	0.018	-0.006	0.018	-0.006	0.018	-0.006	0.018	-0.006	0.018	-0.007	0.018
East CH			-0.075 ***	0.017	-0.075 ***	0.017	-0.075 ***	0.017	-0.074 ***	0.017	-0.074 ***	0.017	-0.074 ***	0.017	-0.075 ***	0.017
Central CH			-0.018	0.017	-0.017	0.017	-0.016	0.017	-0.016	0.017	-0.016	0.017	-0.016	0.017	-0.019	0.016
Ticino			-0.156 ***	0.030	-0.152 ***	0.030	-0.154 ***	0.030	-0.155 ***	0.030	-0.155 ***	0.030	-0.155 ***	0.030	-0.158 ***	0.029
Missing			-0.090 *	0.039	-0.093 *	0.039	-0.092 *	0.039	-0.091 *	0.039	-0.092 *	0.039	-0.092 *	0.039	-0.096 *	0.039
Firm size (ref. very small (<9))																
Small (10-19)			0.072 ***	0.015	0.071 ***	0.015	0.073 ***	0.015	0.071 ***	0.015	0.072 ***	0.015	0.072 ***	0.015	0.071 ***	0.015
Medium (20-99)			0.082 ***	0.013	0.082 ***	0.013	0.083 ***	0.013	0.082 ***	0.013	0.083 ***	0.013	0.083 ***	0.013	0.083 ***	0.013
Big (>100)			0.105 ***	0.015	0.104 ***	0.015	0.107 ***	0.015	0.106 ***	0.015	0.107 ***	0.015	0.106 ***	0.015	0.108 ***	0.015
Missing			-0.023	0.031	-0.023	0.031	-0.023	0.031	-0.026	0.031	-0.026	0.031	-0.026	0.031	-0.027	0.031
Intercept	10.80 ***	0.024	10.80 ***	0.021	10.80 ***	0.020	10.81 ***	0.024	10.826 ***	0.024	10.82 ***	0.024	10.83 ***	0.024	10.82 ***	0.024
Variance Components																
Var(Between Individuals) (Null Model: 0.166***)	0.164 ***	0.003	0.140 ***	0.003	0.140 ***	0.003	0.140 ***	0.003	0.138 ***	0.003	0.138 ***	0.003	0.138 ***	0.003	0.137 ***	0.003
Var(Between Occupations) (Null Model: 0.026***)	0.019 ***	0.004	0.009 ***	0.002	0.007 ***	0.002	0.006 ***	0.002	0.005 ***	0.002	0.005 ***	0.002	0.006 ***	0.002	0.006 ***	0.002
Var(Months since Graduation Deviation)									1.E-03 ***	2.E-04	8.E-07 ***	4.E-07	1.E-06 ***	4.E-07	7.E-07 ***	3E-07
Cov(Months since Graduation Deviation between occupations)									1.E-06 *	4.E-07	-4.E-05 *	2.E-05	-4.E-05	2.E-05	-2.E-05	2E-05
ICC (Null Model: 0.135)	0.103		0.060		0.045		0.038		0.038		0.037		0.039		0.040	
R2 Individual level (Raudenbusch & Bryk)	0.011		0.155		0.157		0.159		0.159		0.168		0.169		0.172	
R2 Occupational level (Raudenbusch & Bryk)	0.271		0.654		0.746		0.787		0.792		0.792		0.784		0.781	
N Individuals	6123		6123		6123		6123		6123		6123		6123		6123	
K Occupations	211		211		211		211		211		211		211		211	

Significance level: *p≤.05; **p≤.01; ***p≤.001

Note: Dependent variable: log(annual income). Random intercept Model (Model 1-2) and Random slope models (Model3-6) with a random slope for time since graduation at the occupational level. All continuous variables are grand mean centered. ICC = intraclass correlation from one-way random effects.

8 Appendix B

Table B 1 Descriptive Statistics

	Men					Women					Total				
	Mean	Sd	Min	Max	N	Mean	Sd	Min	Max	N	Mean	Sd	Min	Max	N
Log of Income	10,85	0,41	8,84	11,72	4596	10,75	0,43	8,82	11,70	3877	10,81	0,42	8,82	11,72	8473
Occupation-Specific Training (Days per week)	4,54	0,37	3,60	5,08	4596	4,25	0,40	3,60	5,08	3877	4,41	0,41	3,60	5,08	8473
General Education (Days per week)	0,44	0,26	0,24	1,10	4596	0,62	0,33	0,24	1,10	3877	0,52	0,31	0,24	1,10	8473
Gender Type															
Male-Typed Occupation	0,76		0	1	3476	0,17		0	1	653	0,49		0	1	4129
Neutral Occupation	0,16		0	1	717	0,28		0	1	1078	0,21		0	1	1795
Female-Typed Occupation	0,09		0	1	403	0,55		0	1	2146	0,30		0	1	2549
Job Opportunities	0,25	0,16	0,03	1,16	4596	0,19	0,10	0,03	0,65	3877	0,22	0,14	0,03	1,16	8473
Intellectual Requirement Level (Stalder)	3,25	1,63	1	6	4596	3,70	1,69	1	6	3877	3,46	1,68	1	6	8473
Vertical Differentiation (EBA)	0,21		0	1	984	0,35		0	1	1363	0,28		0	1	2347
Share of Large Firms in Occupation	0,26	0,11	0,04	0,60	4596	0,28	0,11	0,04	0,60	3877	0,27	0,11	0,04	0,60	8473
Migration Background	0,41		0	1	1885	0,36		0	1	1401	0,39		0	1	3286
Children	0,07		0	1	324	0,10		0	1	380	0,08		0	1	704
Marital Status															
Single	0,89		0	1	4071	0,85		0	1	3296	0,87		0	1	7367
Married/partner	0,11		0	1	505	0,14		0	1	554	0,12		0	1	1059
Divorced	0,00		0	1	20	0,01		0	1	27	0,01		0	1	47
Number of Diplomas															
one Federal Diploma	0,89		0	1	4077	0,89		0	1	3454	0,89		0	1	7531
Federal Certificate & Diploma	0,01		0	1	50	0,01		0	1	45	0,01		0	1	95
Several Diplomas	0,10		0	1	469	0,10		0	1	378	0,10		0	1	847
School-based Training	0,05		0	1	238	0,05		0	1	197	0,05		0	1	435
in further Education	0,17		0	1	770	0,18		0	1	707	0,17		0	1	1477
Months since Graduation	43,07	30,88	0,20	120,00	4596	40,65	30,52	0,20	119,93	3877	41,96	30,74	0,20	120,00	8473
Tenure	24,96	24,12	0,00	119,57	4596	23,20	23,03	0,00	116,13	3877	24,15	23,65	0,00	119,57	8473
Management Position	0,34		0	1	1576	0,29		0	1	1139	0,32		0	1	2715
Firm Change since Graduation	0,65		0	1	2992	0,69		0	1	2669	0,67		0	1	5661
Change in Occupation	0,28		0	1	1282	0,23		0	1	906	0,26		0	1	2188
Fixed-Term Contract	0,09		0	1	400	0,10		0	1	397	0,09		0	1	797
Part time work (<80)	0,05		0	1	229	0,15		0	1	597	0,10		0	1	826

Table B 1 continued

	Men					Women					Total				
	Mean	Sd	Min	Max	N	Mean	Sd	Min	Max	N	Mean	Sd	Min	Max	N
Frequently working overtime															
No	0,63		0	1	2880	0,69		0	1	2661	0,65		0	1	5541
Yes	0,37		0	1	1687	0,31		0	1	1198	0,34		0	1	2885
Missing	0,01		0	1	29	0,00		0	1	18	0,01		0	1	47
Firm size															
very small (<9)	0,24		0	1	1120	0,31		0	1	1189	0,27		0	1	2309
Small (10-19)	0,18		0	1	809	0,18		0	1	685	0,18		0	1	1494
Medium (20-99)	0,33		0	1	1539	0,26		0	1	1009	0,30		0	1	2548
Big (>100)	0,22		0	1	1018	0,23		0	1	905	0,23		0	1	1923
Missing	0,02		0	1	110	0,02		0	1	89	0,02		0	1	199
Region															
Zuerich	0,16		0	1	756	0,21		0	1	815	0,19		0	1	1571
Lake Geneva	0,14		0	1	630	0,12		0	1	469	0,13		0	1	1099
Espace Mittelland	0,18		0	1	850	0,21		0	1	833	0,20		0	1	1683
Northwest CH	0,12		0	1	571	0,13		0	1	489	0,13		0	1	1060
East CH	0,17		0	1	762	0,13		0	1	513	0,15		0	1	1275
Central CH	0,17		0	1	777	0,14		0	1	554	0,16		0	1	1331
Ticino	0,04		0	1	200	0,04		0	1	145	0,04		0	1	345
Missing	0,01		0	1	50	0,02		0	1	59	0,01		0	1	109

Table B 2 Determinants of Income: All models with variance components

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Gender Type of Occupation (Ref: Male-Typed Occupation)												
Gender Neutral Occupation	-0,023	0,022	-0,021	0,022	-0,027	0,022	-0,028	0,022	-0,014	0,026	-0,015	0,026
Female-Typed Occupation	-0,075***	0,017	-0,072***	0,017	-0,095***	0,020	-0,094***	0,019	-0,165***	0,041	-0,153***	0,040
Occupation-Specific Training (Days per week)			0,130*	0,057	0,121*	0,058	0,100+	0,058	0,137*	0,058	0,089	0,058
General Education (Days per Week)			0,154+	0,090	0,084	0,093	0,064	0,097	0,040	0,095	-0,027	0,102
Women	-0,032**	0,012	-0,030*	0,012	-0,022+	0,012	-0,022+	0,012	-0,061**	0,021	-0,062**	0,021
Occupation-Specific Control Variables												
Job Opportunities	0,104**	0,035	0,100**	0,035	0,098**	0,036	0,099**	0,036	0,094**	0,036	0,093**	0,035
Intellectual Requirement Level (Stalder)	0,018**	0,006	0,023**	0,007	0,023**	0,007	0,022**	0,007	0,024***	0,007	0,023**	0,007
Vertical Differentiation	-0,035**	0,013	-0,035**	0,014	-0,035**	0,013	-0,035**	0,013	-0,035**	0,013	-0,035**	0,013
Share of Large Firms in Occupation	0,244***	0,067	0,257***	0,067	0,235***	0,067	0,229***	0,068	0,232***	0,067	0,223***	0,068
Individual Control Variables												
Migration Background	0,005	0,010	0,006	0,010	0,005	0,010	0,005	0,010	0,003	0,010	0,003	0,010
Children	-0,055**	0,019	-0,056**	0,019	-0,056**	0,019	-0,056**	0,019	-0,055**	0,019	-0,055**	0,019
Marital Status (Ref. Single)												
Married/partner	0,014	0,016	0,014	0,016	0,014	0,016	0,014	0,016	0,013	0,016	0,013	0,016
Divorced	0,042	0,057	0,043	0,057	0,043	0,057	0,043	0,057	0,044	0,057	0,043	0,057
Frequently working overtime (Ref:No)												
Yes	0,024**	0,008	0,024**	0,008	0,024**	0,008	0,024**	0,008	0,023**	0,008	0,023**	0,008
Missing	-0,093+	0,049	-0,092+	0,049	-0,092+	0,049	-0,093+	0,049	-0,093+	0,049	-0,094+	0,049
Number of Diplomas (ref. one Federal Diploma)												
Federal Certificate & Diploma	0,045	0,042	0,045	0,042	0,043	0,042	0,043	0,042	0,039	0,042	0,039	0,042
Several Diplomas	0,084***	0,014	0,083***	0,014	0,083***	0,014	0,083***	0,014	0,082***	0,014	0,082***	0,014
in further Education	0,030**	0,010	0,030**	0,010	0,031**	0,010	0,031**	0,010	0,030**	0,010	0,030**	0,010
School-Based Training	-0,115***	0,021	-0,114***	0,021	-0,115***	0,021	-0,115***	0,021	-0,110***	0,021	-0,109***	0,021
Months since Graduation	0,003***	0,000	0,003***	0,000	0,003***	0,000	0,003***	0,000	0,003***	0,000	0,003***	0,000
Tenure	0,002***	0,000	0,002***	0,000	0,002***	0,000	0,002***	0,000	0,002***	0,000	0,002***	0,000
Management Position	0,045***	0,009	0,045***	0,009	0,044***	0,009	0,045***	0,009	0,044***	0,009	0,044***	0,009
Firm Change since Graduation	-0,031**	0,010	-0,030**	0,010	-0,030**	0,010	-0,030**	0,010	-0,029**	0,010	-0,029**	0,010
Change in occ.	-0,015	0,010	-0,015	0,010	-0,015	0,010	-0,015	0,010	-0,014	0,010	-0,014	0,010
Fixed-Term	-0,330***	0,013	-0,330***	0,013	-0,330***	0,013	-0,330***	0,013	-0,329***	0,013	-0,330***	0,013
Part time work (<80)	0,116***	0,014	0,117***	0,014	0,119***	0,014	0,119***	0,014	0,122***	0,015	0,122***	0,015

Table B 2 continued

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Firm size (ref. very small (<9))												
Small (10-19)	0,057***	0,012	0,057***	0,012	0,057***	0,012	0,057***	0,012	0,057***	0,012	0,057***	0,012
Medium (20-99)	0,080***	0,011	0,080***	0,011	0,080***	0,011	0,080***	0,011	0,080***	0,011	0,080***	0,011
Big (>100)	0,130***	0,012	0,129***	0,012	0,130***	0,012	0,130***	0,012	0,130***	0,012	0,130***	0,012
Missing	0,004	0,025	0,004	0,025	0,004	0,025	0,004	0,025	0,005	0,025	0,004	0,025
Region (Ref: Zuerich)												
Lake Geneva	-0,022	0,016	-0,023	0,016	-0,025	0,016	-0,025	0,016	-0,028+	0,016	-0,028+	0,016
Espace Mittelland	-0,024+	0,014	-0,025+	0,014	-0,026+	0,014	-0,026+	0,014	-0,027+	0,014	-0,027+	0,014
Northwest CH	0,013	0,016	0,012	0,016	0,013	0,016	0,013	0,016	0,012	0,016	0,012	0,016
East CH	-0,063***	0,015	-0,064***	0,015	-0,064***	0,015	-0,064***	0,015	-0,065***	0,015	-0,065***	0,015
Central CH	-0,021	0,015	-0,021	0,015	-0,021	0,015	-0,021	0,015	-0,023	0,015	-0,023	0,015
Ticino	-0,130***	0,025	-0,130***	0,025	-0,131***	0,025	-0,131***	0,025	-0,132***	0,025	-0,132***	0,025
Missing	-0,092**	0,035	-0,093**	0,035	-0,094**	0,035	-0,094**	0,035	-0,094**	0,035	-0,095**	0,035
Interaktion Effects												
Male Occupation*Specific Training												
Mixed Occupation*Specific Training					-0,077	0,051			-0,100	0,063		
Female Occupation*Specific Training					-0,086*	0,037			-0,202**	0,071		
Male Occupation*General Education												
Mixed Occupation*General Education							0,094	0,069			0,139+	0,085
Female Occupation*General Education							0,104*	0,044			0,240**	0,086
Male Occupation*Women												
Mixed Occupation*Women									0,025	0,030	0,027	0,030
Female Occupation*Women									0,118**	0,044	0,110*	0,043
Women*Specific Training									-0,139**	0,046		
Male Occupation*Specific Training*Women												
Mixed Occupation*Specific Training*Women									0,103	0,072		
Female Occupation*Specific Training*Women									0,202**	0,078		
Women*General Education											0,194**	0,060
Male Occupation*General Education*Women												
Mixed Occupation*General Education*Women											-0,138	0,097
Female Occupation*General Education*Women											-0,246*	0,096
Intercept	10,846***	0,019	10,845***	0,021	10,843***	0,021	10,844***	0,021	10,839***	0,021	10,840***	0,021

Table B 2 continued

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Variance Components												
Variance between Occupations (Null Model: 0,022***)	0,004***	0,001	0,004***	0,001	0,004***	0,001	0,004***	0,001	0,003***	0,001	0,003***	0,001
Variance between Individuals (Null Model: 0,114***)	0,076***	0,003	0,076***	0,003	0,076***	0,003	0,076***	0,003	0,076***	0,003	0,076***	0,003
Variance within Individuals (Null Model: 0,058***)	0,054***	0,002	0,054***	0,002	0,054***	0,002	0,054***	0,002	0,054***	0,002	0,054***	0,002
ICC Individual Level (Null Model: 0,587)	0.566		0.568		0.569		0.569		0.569		0.569	
R^2 Occupational Level[1]	0.816		0.831		0.841		0.842		0.845		0.847	
N Person-Years	8473		8473		8473		8473		8473		8473	
N Persons	6136		6136		6136		6136		6136		6136	
N Occupations	215		215		215		215		215		215	

Dependent Variable: Log(annual income). Random intercept models (Model 1 and 2) and random slope models (Model 3-6); Significance level: + p≤0,10; *p≤0,05; **p≤0,01; ***p≤0,001

[1]Raudenbusch & Bryk (2002) R^2 at the occpuational level.

9 Appendix C

Table C 1 Descriptive Sample Statistics

	First job			Job around the age of 30		
	Mean	SD	Count	Mean	SD	Count
Mobility						
Down (<=.95)	0.12		167	0.10		123
Same	0.70		1018	0.38		444
Up (>=1.05)	0.18		266	0.52		613
Proportion of general education	11.03	5.18	1451	11.12	5.23	1180
Proportion of practical occupation-specific training	89.19	5.77	1451	88.95	5.96	1180
Individual Level Controls						
Male	0.45		658	0.49		580
Age at graduation	19.25	1.63	1451	19.25	1.46	1180
Born abroad	0.11		153	0.10		117
PISA reading score	501.09	79.07	1451	508.31	74.13	1180
Compulsory school track						
pre-gymnasial	0.20		295	0.22		265
extended academic requirements	0.43		620	0.43		505
basic academic requirements	0.32		458	0.29		339
no (formal) tracking	0.05		78	0.06		71
Size of training firm						
one apprentice	0.15		219	0.14		161
2-5 apprentices	0.51		734	0.51		596
More than 5 apprentices	0.25		363	0.28		335
Missing	0.09		135	0.07		88
Satisfaction with training						
Dissatisfied/so so	0.13		183	0.12		145
Satisfied	0.76		1096	0.78		923
Missing	0.12		172	0.09		112
Vocational baccalaureate	0.24		346			
Tertiary education						
No tertiary education				0.63		740
Tertiary B				0.22		260
Tertiary A				0.15		180
Parents ISEI	41.05	14.73	1451	42.20	15.20	1180
Occupational level controls						
Number of vacancies with more than 10% higher status	33.90	25.13	1451	31.95	24.34	1180
Number of vacancies with less than 10% lower status	30.57	28.93	1451	30.50	26.19	1180
Number of unemployed in occupational field	5680	4033	1451	5636	4093	1180
Sector of training occupation						
Production	0.16		229	0.18		214
Technical and ICT professions	0.08		116	0.10		115
Construction	0.09		124	0.08		91
Trade and Transport	0.11		159	0.10		115
Hotel and restaurant professions and personal services	0.09		134	0.08		100
Commercial and administrative professions	0.36		522	0.36		430
Other	0.12		167	0.10		115

Table C 1 continued

	First job			Job around the age of 30		
	Mean	SD	Count	Mean	SD	Count
Variables pertaining to first job						
Months between graduation and first job	5.36	6.06	1451			
First job: working in training firm						
No	0.63		916			
Yes	0.10		152			
Missing	0.26		383			
First job: labour market region						
Lake Geneva	0.19		282			
Espace Mittelland	0.24		355			
Northwest CH	0.10		138			
Zurich	0.12		170			
East CH	0.17		241			
Central CH	0.06		80			
Ticino	0.08		110			
missing	0.05		75			
First job: Temporary contract						
No	0.80		1156			
Yes	0.14		205			
Missing	0.06		90			
First job: Working hours a week						
<32 Hrs.	0.12		174			
>=32 Hrs.	0.86		1243			
Missing	0.02		34			
Variables pertaining to job around the age of 30						
Child at entry to midterm job				0.25		293
Midterm job: labour market region						
Lake Geneva				0.21		247
Espace Mittelland				0.25		291
Northwest CH				0.09		107
Zurich				0.14		168
East CH				0.14		162
Central CH				0.07		77
Ticino				0.07		79
missing				0.04		49
Midterm job: level of employment						
80 % or less				0.19		220
more than 80				0.54		642
missing				0.27		318

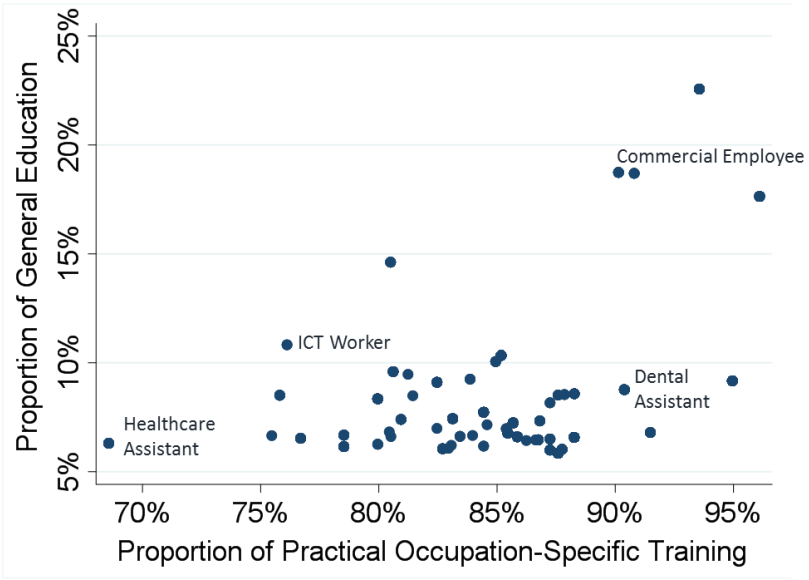

Figure C 1 Scatter plot of the proportions of general education and practical occupation specific training

Table C 2 Determinants of Status Mobility: full models

	First job			Job around the age of 30					
	Model 1			Model 2			Model 3		
	Downward Mobility	No Status Mobility	Upward Mobility	Downward Mobility	No Status Mobility	Upward Mobility	Downward Mobility	No Status Mobility	Upward Mobility
Proportion of general education	0.003	-0.005	0.002	-0.017***	-0.013	0.030*	-0.016***	-0.008	0.024+
	(0.007)	(0.011)	(0.007)	(0.004)	(0.012)	(0.014)	(0.004)	(0.012)	(0.014)
Proportion of practical occupation-specific training	-0.008*	0.007	0.001	0.003	0.004	-0.007	0.003	0.002	-0.005
	(0.003)	(0.007)	(0.006)	(0.004)	(0.008)	(0.010)	(0.004)	(0.008)	(0.010)
Individual level control variables									
Highest tertiary degree (ref: No tertiary degree)									
Tertiary B							-0.023	-0.176***	0.198***
							(0.037)	(0.036)	(0.051)
Tertiary A							-0.075**	-0.282***	0.357***
							(0.025)	(0.051)	(0.045)
Male	0.011	-0.056	0.045	0.016	-0.082*	0.066	0.022	-0.053	0.031
	(0.019)	(0.058)	(0.053)	(0.022)	(0.042)	(0.047)	(0.023)	(0.041)	(0.044)
Age at graduation	-0.01	0.014	-0.004	-0.016	0.035*	-0.019	-0.018+	0.022	-0.004
	(0.009)	(0.014)	(0.016)	(0.010)	(0.017)	(0.019)	(0.010)	(0.018)	(0.021)
Born abroad	0.015	-0.032	0.016	-0.009	-0.004	0.014	-0.010	-0.002	0.012
	(0.036)	(0.045)	(0.032)	(0.026)	(0.044)	(0.043)	(0.025)	(0.040)	(0.038)
PISA reading score	-0.020+	0.007	0.013	0.018*	-0.034*	0.016	0.021**	-0.024+	0.003
	(0.010)	(0.016)	(0.011)	(0.007)	(0.013)	(0.015)	(0.007)	(0.014)	(0.014)
Compulsory school track: (ref: basic academic requirements)									
Pre-gymnasial	-0.042	0.041	0.001	-0.083+	0.018	0.066	-0.075+	0.065	0.01
	(0.036)	(0.051)	(0.051)	(0.049)	(0.047)	(0.065)	(0.045)	(0.042)	(0.055)
Extended academic requirements	-0.054+	0.025	0.029	-0.069+	-0.038	0.108*	-0.063+	-0.021	0.084
	(0.031)	(0.031)	(0.035)	(0.038)	(0.034)	(0.053)	(0.037)	(0.033)	(0.052)
No tracking	-0.076**	0.018	0.058	-0.057	0.053	0.005	-0.053	0.057	-0.004
	(0.028)	(0.050)	(0.049)	(0.052)	(0.066)	(0.062)	(0.050)	(0.059)	(0.056)
Size of training firm (ref: one apprentice)									
2-5 apprentices	0.004	-0.021	0.017	-0.024	-0.105**	0.129**	-0.018	-0.073+	0.091*
	(0.027)	(0.031)	(0.025)	(0.028)	(0.040)	(0.042)	(0.028)	(0.038)	(0.041)
more than 5 apprentices	0.017	-0.068*	0.051	0.040	-0.142**	0.102+	0.048	-0.099*	0.051
	(0.032)	(0.034)	(0.031)	(0.029)	(0.044)	(0.052)	(0.029)	(0.040)	(0.047)
Missing	0.031	0.006	-0.037	0.017	-0.106	0.089	0.02	-0.061	0.041
	(0.047)	(0.074)	(0.073)	(0.061)	(0.074)	(0.080)	(0.057)	(0.071)	(0.072)

Table C2 continued

	First job			Job around the age of 30					
	Model 1			Model 2			Model 3		
	Downward Mobility	No Status Mobility	Upward Mobility	Downward Mobility	No Status Mobility	Upward Mobility	Downward Mobility	No Status Mobility	Upward Mobility
Satisfaction with training (ref: dissatisfied/soso)									
Satisfied	-0.060+	0.089+	-0.029	-0.011	0.026	-0.014	-0.001	0.049	-0.047
	(0.035)	(0.048)	(0.022)	(0.029)	(0.040)	(0.039)	(0.028)	(0.037)	(0.036)
Missing	-0.065	-0.036	0.101*	0.036	0.006	-0.042	0.040	0.008	-0.047
	(0.045)	(0.063)	(0.050)	(0.051)	(0.074)	(0.073)	(0.049)	(0.067)	(0.069)
Vocational Baccalaureate	0.004	-0.005	0.002						
	(0.012)	(0.035)	(0.029)						
Parents ISEI	-0.001	-0.010	0.010	-0.009	-0.026	0.034*	-0.006	-0.016	0.022
	(0.011)	(0.013)	(0.009)	(0.013)	(0.023)	(0.016)	(0.013)	(0.022)	(0.017)
Occupational level control variables									
Number of vacancies with more than 10% higher status	-0.023+	-0.038+	0.061**	-0.033**	-0.017	0.050**	-0.035**	-0.021	0.056**
	(0.012)	(0.023)	(0.021)	(0.012)	(0.019)	(0.017)	(0.012)	(0.019)	(0.018)
Number of vacancies with less than 10% lower status	0.029+	-0.053*	0.024	0.028**	-0.049*	0.021	0.028**	-0.041+	0.013
	(0.015)	(0.024)	(0.027)	(0.009)	(0.024)	(0.021)	(0.009)	(0.024)	(0.021)
Number of unemployed in occupational field	0.021	-0.105*	0.085	-0.028	0.033	-0.005	-0.029	0.052	-0.024
	(0.033)	(0.047)	(0.057)	(0.025)	(0.052)	(0.053)	(0.023)	(0.055)	(0.054)
Sector of training occupation (ref: Commercial & Admin.)									
Production	-0.039	0.053	-0.015	-0.279**	0.086	0.193	-0.258**	0.152	0.106
	(0.128)	(0.196)	(0.156)	(0.099)	(0.160)	(0.199)	(0.097)	(0.169)	(0.223)
Technical & ICT professions	0.098	0.023	-0.121	-0.223*	0.285	-0.062	-0.196+	0.399*	-0.203
	(0.184)	(0.218)	(0.127)	(0.108)	(0.204)	(0.248)	(0.104)	(0.194)	(0.248)
Construction	-0.1	0.111	-0.011	-0.289**	0.205	0.084	-0.271**	0.231	0.039
	(0.100)	(0.186)	(0.142)	(0.094)	(0.153)	(0.202)	(0.092)	(0.152)	(0.215)
Trade & transport	-0.074	0.168	-0.094	-0.185+	0.096	0.089	-0.173	0.099	0.073
	(0.098)	(0.135)	(0.079)	(0.106)	(0.109)	(0.183)	(0.108)	(0.106)	(0.190)
Hotel, restaurant & personal services	0.042	0.000	-0.042	-0.216*	0.056	0.161	-0.198*	0.097	0.101
	(0.152)	(0.192)	(0.129)	(0.101)	(0.133)	(0.178)	(0.099)	(0.139)	(0.197)
Other	-0.085	0.014	0.071	-0.197+	0.206	-0.009	-0.182+	0.25	-0.068
	(0.114)	(0.206)	(0.163)	(0.107)	(0.176)	(0.226)	(0.106)	(0.171)	(0.233)

Table C 2 continued

	First job			Job around the age of 30					
	Model 1			Model 2				Model 3	
	Downward Mobility	No Status Mobility	Upward Mobility	Downward Mobility	No Status Mobility	Upward Mobility	Downward Mobility	No Status Mobility	Upward Mobility
Variables pertaining to first job									
Months between graduation and first job	0.008***	-0.012***	0.004						
	(0.002)	(0.003)	(0.004)						
First Job: Working in training firm (ref: no)									
Yes	-0.008	0.044	-0.035						
	(0.036)	(0.060)	(0.051)						
Missing	0.042+	0.024	-0.066**						
	(0.023)	(0.029)	(0.020)						
Firts job: Labour market region (ref: Lake Geneva)									
Espace Mittelland	0.001	-0.036	0.035+						
	(0.024)	(0.028)	(0.020)						
Northwest CH	-0.010	-0.055	0.065*						
	(0.036)	(0.045)	(0.033)						
Zurich	0.051+	-0.129*	0.078						
	(0.029)	(0.057)	(0.054)						
East CH	0.056	-0.081+	0.026						
	(0.052)	(0.049)	(0.035)						
Central CH	0.105*	-0.105**	0.000						
	(0.045)	(0.039)	(0.036)						
Ticino	-0.031	0.06	-0.029						
	(0.030)	(0.063)	(0.068)						
Missing	0.174**	-0.292***	0.118						
	(0.053)	(0.088)	(0.085)						
First job: Temporary contract (ref: no)									
Yes	0.032	-0.059	0.027						
	(0.027)	(0.039)	(0.035)						
Missing	-0.052	0.047	0.005						
	(0.043)	(0.046)	(0.055)						
First job: Working hours (ref: <23 Hrs)									
23 Hrs. or more	-0.132***	0.103**	0.029						
	(0.028)	(0.037)	(0.036)						
Missing	0.164+	-0.116	-0.048						
	(0.096)	(0.087)	(0.067)						

Table C 2 continued

	First job			Job around the age of 30					
	Model 1			Model 2			Model 3		
	Downward Mobility	No Status Mobility	Upward Mobility	Downward Mobility	No Status Mobility	Upward Mobility	Downward Mobility	No Status Mobility	Upward Mobility
Variables pertaining to job around the age of 30									
Child at entry to midterm job				0.036	-0.077	0.042	0.032	-0.112+	0.080
				(0.023)	(0.057)	(0.060)	(0.026)	(0.058)	(0.065)
Midterm job: labour market region (ref: Lake Geneva)									
Espace Mittelland				0.043	-0.041	-0.003	0.051+	-0.002	-0.049
				(0.031)	(0.038)	(0.048)	(0.030)	(0.030)	(0.040)
Northwest CH				-0.027	-0.122**	0.150**	-0.020	-0.085*	0.105*
				(0.039)	(0.043)	(0.048)	(0.038)	(0.043)	(0.046)
Zurich				-0.043	-0.137**	0.180***	-0.036	-0.094*	0.130**
				(0.027)	(0.044)	(0.044)	(0.026)	(0.041)	(0.041)
East CH				0.010	-0.112*	0.102*	0.012	-0.075+	0.063+
				(0.031)	(0.050)	(0.040)	(0.031)	(0.044)	(0.035)
Central CH				-0.010	-0.075	0.085	-0.003	-0.02	0.023
				(0.044)	(0.051)	(0.056)	(0.046)	(0.049)	(0.060)
Ticino				-0.005	-0.036	0.042	-0.005	-0.033	0.037
				(0.030)	(0.079)	(0.070)	(0.027)	(0.074)	(0.067)
Missing				-0.021	-0.046	0.068	-0.017	-0.019	0.036
				(0.039)	(0.056)	(0.061)	(0.038)	(0.058)	(0.062)
Midterm job: level of employment (ref: <=80%)									
>80%				-0.046*	-0.043	0.089**	-0.044+	-0.032	0.076*
				(0.023)	(0.036)	(0.031)	(0.024)	(0.036)	(0.033)
missing				0.052+	0.008	-0.060+	0.046	-0.022	-0.024
				(0.029)	(0.038)	(0.033)	(0.029)	(0.040)	(0.039)
N	1451			1180			1180		

Note: Average marginal effects from multinomial logistic regressions; weighted results (design weights); cluster-robust standard errors in parentheses;
Significance levels: + p < 0.10 * p < 0.05, ** p < 0.01, *** p < 0.001