

The Winners, the Left Behind, and All the Others: Transitions Following Secondary Vocational Education and Training During the COVID-19 Pandemic in Switzerland

Leonhard Unterlerchner* and Matthias Studer*

Abstract: Drawing on the LABB administrative database, this study examines the school-to-work transitions of vocational education and training (VET) graduates in Switzerland. It compares three cohorts to identify changes linked to the COVID-19 pandemic. The results show fewer direct transitions into employment, more precarious trajectories, and increased pursuits of education. Variations across occupations are also analysed. Finally, the paper introduces the use of “noise clustering” to identify atypical trajectories and improve typology quality.

Keywords: School-to-work transitions, vocational education and training, COVID-19, sequence analysis, noise clustering

Les gagnants, les laissés-pour-compte et tous les autres : transitions après la formation professionnelle initiale pendant la pandémie de COVID-19 en Suisse

Résumé: Utilisant les données LABB, cette étude examine les transitions entre l'école et l'emploi des diplômé-e-x-s de la formation professionnelle initiale. Trois cohortes sont comparées afin d'identifier les changements associés à la pandémie. Les résultats mettent en lumière moins de transitions directes vers l'emploi, plus de parcours précaires et de poursuite des études. L'article introduit également l'usage du « noise clustering » pour l'identification de parcours atypiques et l'amélioration de la qualité des typologies.

Mots-clés: Transitions de l'école à l'emploi, formation professionnelle, COVID-19, analyse de séquences, noise clustering

Die Gewinner, die Zurückgelassenen und alle anderen: Übergänge nach der beruflichen Grundbildung während der COVID-19-Pandemie in der Schweiz

Zusammenfassung: Auf der Grundlage der LABB-Verwaltungsdatenbank untersucht diese Studie den Übergang von der Schule ins Berufsleben bei Absolventen der beruflichen Bildung in der Schweiz. Ein Vergleich dreier Kohorten zur Ermittlung pandemiebedingter Veränderungen zeigt, dass es weniger direkte Übergänge in die Beschäftigung gibt, mehr prekäre Verläufe und eine Zunahme der Weiterbildung. Es werden ebenfalls Unterschiede zwischen den Berufen analysiert und das « Noise Clustering » eingeführt, um atypische Verläufe zu identifizieren und die Qualität der Typologie zu verbessern.

Schlüsselwörter: Übergang von der Schule in den Beruf, Berufliche Ausbildung, COVID-19, Sequenzanalyse, Noise Clustering

* University of Geneva, Institute of Demography and Socioeconomics,
Leonhard.unterlerchner@unige.ch, matthias.studer@unige.ch.

1 Introduction

The school-to-work transition (SWT) is a pivotal life-course period that can be strongly affected by turbulent times. This study examines whether, and how, SWT trajectories following vocational education and training (VET) were associated with the COVID-19 pandemic in Switzerland.

A minimal definition of SWT is the period spanning the end of education to the attainment of stable labour-market position. Yet, its operationalization depends on the research agenda and on the population under study. It is a process that extends beyond the first job and may involve back-and-forth movements in the labour market as well as education spells (Brzinsky-Fay, 2007; Chesters & Baffour, 2015; Hillmert, 2002; Schoon et al., 2001; Walther, 2006). These early trajectories may have key consequences for future life trajectories. Studies from Switzerland and Germany associate early unemployment with poor career progression, reduced earnings, and a higher risk of subsequent unemployment (Hänni & Kriesi, 2025; Helbling & Sacchi, 2014; Schmillen & Umkehrer, 2017). These effects are particularly pronounced in Switzerland, where unemployment is generally low (Helbling et al., 2019; Imdorf et al., 2019; Shi et al., 2018). Three underlying mechanisms are typically invoked to explain this phenomenon: skill depreciation during non-working spells, changes in job-search behaviour, and productivity signals transmitted to employers, so-called “*scarring effects*” (Mortensen, 1986; Shi et al., 2018; Spence, 1973).

As life domains are tightly interrelated, SWT is expected to influence family formation, migration, and health (Bernardi et al., 2019). Difficult transitions to employment are associated with later life depression and anxiety, whereas pursuing education is linked to better health outcomes (Adams, 2002; Lee et al., 2019). Therefore, SWT is a key pivot in the life course and warrants careful study (Buchmann & Kriesi, 2011; Settersten Jr., 2007).

In Switzerland, young individuals pursuing VET – approximately 60% of a cohort – graduate around the age of 18 years. In the present study, we focus on SWTs operationalized as the period after VET graduation. Direct entry into stable employment or continuing education are the most expected routes (Laganà & Babel, 2020). However, many deviations from these canonical trajectories have been observed, leaving room for the emergence of atypical ones that may generate inequalities (Helbling & Sacchi, 2014).

The COVID-19 pandemic and its associated measures have severely affected the economy and society (NCS-TF, 2020a; 2020b). The SWT trajectories might also have been affected for two reasons. First, economic turmoil reduces job openings and increases competition among applicants, making job searches harsher for labour-market entrants (Forsythe, 2022; Schoon & Bynner, 2019; Watson, 2020). Second, social relations, health, and even aspirations were deeply impacted. Young people were particularly vulnerable to these social and psychological effects (Carey

et al., 2023; Gondek et al., 2024). These latter aspects might have impaired the apprentices' ability to project themselves into future and may have favoured disrupted SWTs (Gittings et al., 2021).

As entering the labour market is impeded by an adverse economic conjuncture, other SWTs might gain in prevalence. Pursuing education is the most favourable option, as it delays entry into the labour market in the short term and improves career prospects in the long run (Unterlerchner et al., 2023). López Bóo (2012) and Heinz (1987) explained the decision to pursue education from a rational-choice perspective: the opportunity cost of studying is lower in times of crisis, and additional education increases individuals' chances of coping with labour-market uncertainty.

Another mechanism that may explain changes in SWTs during turbulent times comes from the career shock perspective. According to this perspective, disruptions in the labour market can produce radical changes over the life course by altering individual preferences (Akkermans et al., 2018). These shocks may even yield positive long-term outcomes, allowing for reorientations or returns to education.

Performing military duties is another option. Although mandatory for men, its timing can be adapted to recruits' or institutional needs, and women can enrol voluntarily. Therefore, military service can be undertaken to cope with unemployment risk at a lower cost for men who would have completed it regardless (Percia David et al., 2019). No admission rule changes occurred during the pandemic (GD, 2020a; 2020b). These considerations led us to the following research questions.

RQ1: How are SWTs of VET diploma holders associated with the COVID-19 pandemic?

H1: VET graduates from 2019 and 2020 are less likely than 2017 graduates to have a direct transition to employment and more likely to see unstable integration into employment.

H2: VET graduates from 2019 and 2020 are more likely than 2017 graduates to pursue education.

H3: VET graduates from 2019 and 2020 are more likely than 2017 graduates to enrol in military duty.

The intensity of the COVID-related changes in SWT might vary across learned occupations for several reasons. First, economic sectors were unevenly impacted by COVID measures (Bonfiglio et al., 2022; Hänni & Kriesi, 2025). The tourism industry, for instance, was particularly affected by travel restrictions. As learned occupations are not evenly distributed across economic sectors, this triggers an asymmetry in unemployment risk. Second, further education opportunities depend on the

learned occupation (Cortesi & Imdorf, 2013; Lamamra et al., 2021). For example, graduates in informatics have direct access to professional education, whereas prior work experience is required in agriculture (CSFO, 2026a; 2026b).

RQ2: Do the associations between SWT trajectories and the pandemic differ according to the learned occupations?

Answering these research questions is important in two aspects. First, identifying vulnerability profiles is crucial for preventing the potential long-term effects of SWTs associated with the pandemic. Second, a better understanding of this period will improve the response if similar events occur in the future.

As SWT is a process, investigating it requires a longitudinal perspective (Brzinsky-Fay, 2007). Sequence analysis (SA) provides a holistic view of trajectories and is well suited for SWT studies (Ritschard & Studer, 2018). However, SA often fails to identify rare patterns, which are generally key to describing precarious or “at-risk” trajectories (Liao et al., 2022; Piccarreta & Struffolino, 2023; Unterlerchner et al., 2023; Unterlerchner & Studer, 2026). We distinguish between atypical and uncommon trajectories. Uncommonness refers to empirical scarcity, while atypicality is understood sociologically as a divergence from expected or canonical types (Bailey, 1994; Weber, 2011). Once identified, these trajectories should be qualified in two ways. First, we consider their structure, including the states they embed, the number of transitions they exhibit, and their relative frequencies. Second, regarding their sociological meaning, we rely on literature to explain the mechanisms and their potential implications for the life course.

We overcome this methodological limitation of SA in two ways. First, we use exhaustive data. Doing so facilitates the identification of uncommon trajectory types, as they are more numerous and often absent from surveys (Studer et al., 2024). Second, we relied on noise clustering, which allows for better detection of deviant cases (Davé, 1991). To our knowledge, this is the first application of noise clustering in social science SA. It proves effective at both identifying atypical types and improving the overall quality of the typology.

The remainder of this paper is organized as follows. Section 2 presents VET in the Swiss educational system and expected trajectories following graduation. Section 3 reviews the research on SWT during previous crises. Data and methods are introduced in Sections 4 and 5. Finally, the results are reported and discussed in Sections 6 and 7.

2 Vocational Education and Training in Switzerland

The Swiss education system is broadly divided into two pathways at the upper secondary level. The first pathway focuses on general skills and prepares students

for higher education. The VET is the second one and provides occupation-specific skills. It favours rapid entry into the labour market after graduation while still offering further education opportunities through professional education and training (PET) or bridges to general tertiary education (SERI, 2019). Because of the high proportion of pupils following the vocational track and its focus on the acquisition of occupation-specific skills, the Swiss education system is often regarded similar to the Austrian and German ones. However, substantial differences pertain to their organizations or educational opportunities (Lassnigg, 2017).

Aiming to provide specific skills in a broad spectrum of occupations, the VET system exhibits significant heterogeneity. Obtaining the VET diploma requires three to four years and can take place either in full-time vocational schools or in a dual format (Lamamra et al., 2021). Dual apprentices spend three to four days a week at their training firm, gaining on-the-job occupational skills, whereas one to two days are spent in vocational schools, learning general skills.

Once graduated, pupils are expected to enter employment or pursue education (SERI, 2025). The latter option can be undertaken directly or postponed. Several education routes open to them. They can complement their diploma with a vocational baccalaureate that grants direct access to universities of applied sciences and to universities through bridges. PET can be pursued either through federal examinations or through colleges of higher education (Stalder & Nägele, 2011).

VET allows for rapid and smooth transitions to employment, but at the expense of a flatter career progression compared to academic baccalaureate holders (Korber & Oesch, 2019). Most graduates follow this route (Bachmann Hunziker et al., 2021; Laganà & Babel, 2020). Compared to the entry into labour force, the pursuit of training results in better career prospects and protects VET graduates from labour market shocks by allowing for easier occupational changes over their life course (Falcon, 2016). Consequently, we consider these latter SWTs to be positively valued. SWTs involving prolonged inactivity or back-and-forth movements into employment are considered precarious for the following reasons. First, such SWTs may have long-term negative consequences (Helbling et al., 2019). Second, they may have a short-term impact on financial or personal well-being if inactivity is unwanted (Lorenzini & Giugni, 2016). Consequently, the end of VET opens a pivotal period during which SWT trajectories might differentiate.

VET graduates' profiles are associated with SWTs for several reasons. First, the choice of occupation is highly gendered; women participate more in the tertiary sector (for instance, in care, social work, or tourism), while men participate more in the primary and secondary sectors (for instance, machine operators, electricians, or watchmakers) (Cortesi & Imdorf, 2013; Gauthier & Gianettoni, 2013; Leemann & Keck-Frei, 2005). This influences postgraduate opportunities. Second, finding a training firm is a hiring process. In this context, inequality originates from social and migratory backgrounds and gender, allowing pupils from Swiss, better-off backgrounds, and men to secure the best positions. On the supply side, this may be

caused by better information regarding the labour market; on the demand side, some profiles can be favoured or discriminated during the recruitment process (Gauthier & Gianettoni, 2013; Gomensoro, 2019; Hupka-Brunner et al., 2010).

3 School to Work Transitions in Turbulent Times: The COVID-19 Pandemic

To assess whether COVID-19 is associated with VET graduates' SWTs, we now examine the impact of crises on SWT. Previous studies on economic crises indicate that they render SWT more difficult, for instance, during the Korean 1997 crisis (Woo & Yoon, 2010) and the 2008 financial crisis (Schoon & Bynner, 2019; Watson, 2020). During such periods, declines in economic activity led to a decrease in the number of job vacancies (Forsythe et al., 2020). Additionally, firms protect their employees by reducing or delaying recruitment, thereby intensifying the loss of open positions. As competition among job seekers increases, employers can more easily favour certain candidates. In the US, Forsythe (2022) shows that firms hire older, more educated, and more experienced applicants during economic crises. Similar findings point to heightened competition among jobseekers in Germany in the wake of the pandemic (Bauer et al., 2023). For the same reasons, forms of discrimination occurring in normal times – for instance, based on gender, social origin, or migration background – are likely to be reinforced, resulting in increased differences in SWTs (Fibbi et al., 2006; Gauthier & Gianettoni, 2013; Imdorf et al., 2014).

The COVID-19 measures led to a similar decrease in economic activity, creating detrimental conditions for labour-market entrants. In Switzerland, a moderate increase in unemployment has been observed, with stronger effects among youth and foreigners (Baruffini & Stricker, 2021; Hijzen & Salvatori, 2022; Sheldon, 2020). In the US, Forsythe et al. (2020) and Goolsbee and Syverson (2021) confirmed a decline in vacancies, whereas Bussink et al. (2022) found only a limited increase in unemployment in the Netherlands. Measures implemented by governments to mitigate economic downturns may explain these differences (Schoon & Bynner, 2019). The unprecedented recourse to short-time work might explain the relatively small increase in unemployment in Switzerland (Hijzen & Salvatori, 2022).

Additionally, because of the COVID-19 containment measures, changes in economic activity were unevenly distributed across sectors. Catering, accommodation, entertainment, and manufacturing-related occupations were severely affected, while finance and IT services were largely spared (Dubois et al., 2022). The health sector has experienced a considerable increase in workload, and, more generally, “essential workers” have faced drastic changes in their working conditions (The Lancet, 2020). This unequal pandemic burden might be associated with the diverging SWT patterns across occupations.

The stringency of the economic effects of COVID-19 also differed across regions. Some industries (such as precision manufacturing) are geographically clustered, with two potentially contradictory consequences. Firms located near such clusters perform better, helping mitigate economic turmoil. Alternatively, the regional workforce may be more dependent on these employers, leading to larger losses in open positions and economic activity (Resbeut & Gugler, 2016). The hospitality industry has been particularly affected in urban and rural regions, leaving suburban areas relatively preserved (Kraenzlin et al., 2020).

4 Data and Variables

This study relies on the exhaustive LABB dataset that contains information on educational episodes and key sociodemographic variables for all officially registered residents of Switzerland. It brings together several administrative registers linked to the Structural Survey of the Swiss Federal Statistical Office (FSO) for scientific purposes (FSO, 2024). At the time of writing, the data were available through December 2022.

We selected three cohorts of graduates holding a VET diploma to construct a comparative research design that captures the association between COVID-19 and SWTs. Trainees who graduated in 2017 serve as the control group because their mid-term SWT was unaffected by the pandemic, whereas the other two cohorts were potentially affected. The crisis occurred in the middle of the 2019 cohort's transition, and before the beginning of the 2020 cohort's SWT. The dataset comprises 167 972 observations.

To study the trajectories following VET, educational pathways are coded as state sequences starting in September¹ and lasting 16 months to ensure equal lengths across cohorts. We used nine states to describe the trajectories at a monthly granularity. Five states refer to educational episodes: "secondary vocational", "secondary general", "tertiary general", "tertiary vocational", and non-awarding episodes are coded as "other education". The "job" state refers to work episodes. Episodes of unemployment benefits are coded as "*unemployment*". "Loss of income benefits" aggregates all episodes where graduates receive benefits due to income losses – e.g. invalidity, military duties, maternity/paternity leaves) – unemployment is not included. This state mainly concerns men performing military services, while not employed. Finally, the "NEET" state ("not in employment, education or training") captures individuals who are outside all registers, at least temporarily, and who did not report having left Switzerland. Therefore, we consider them to be inactive.

1 Because graduation occurs between May and July, this starting point avoids gaps due to summer holidays.

Table 1 Descriptive Statistics

	2017	2019	2020
	N = 57 797	N = 54 867	N = 55 308
	(34.4%)	(32.7%)	(32.9%)
Sex:			
Male	30 948 (53.5%)	29 546 (53.9%)	29 957 (54.2%)
Female	26 849 (46.5%)	25 321 (46.1%)	25 351 (45.8%)
Linguistic region:			
German-speaking	43 387 (75.1%)	40 707 (74.2%)	40 727 (73.6%)
French-speaking	12 166 (21.0%)	11 923 (21.7%)	12 326 (22.3%)
Italian-speaking	2 244 (3.9%)	2 237 (4.1%)	2 255 (4.1%)
Agglomeration type:			
Urban	32 142 (55.6%)	30 487 (55.6%)	31 275 (56.5%)
Intermediate	14 043 (24.3%)	13 527 (24.7%)	13 437 (24.3%)
Rural	11 612 (20.1%)	10 853 (19.8%)	10 596 (19.2%)
Migration background:			
Swiss born in Switzerland	46 813 (81.0%)	43 803 (79.8%)	43 449 (78.6%)
Foreigners born in Switzerland	4 094 (7.1%)	3 800 (6.9%)	4 058 (7.3%)
Swiss born abroad	2 804 (4.9%)	2 746 (5.0%)	2 726 (4.9%)
Foreigners born abroad	4 086 (7.1%)	4 518 (8.2%)	5 075 (9.2%)
Age at graduation:			
0–20	35 944 (62.2%)	34 935 (63.7%)	35 169 (63.6%)
21–25	16 466 (28.5%)	14 295 (26.1%)	14 264 (25.8%)
26+	5 387 (9.3%)	5 637 (10.3%)	5 875 (10.6%)
Training type:			
Firm-based	52 283 (90.5%)	49 567 (90.3%)	49 897 (90.2%)
School-based	5 514 (9.5%)	5 300 (9.7%)	5 411 (9.8%)
Learned occupation:			
Commerce and administration	12 723 (22.0%)	11 968 (21.8%)	12 083 (21.8%)
Agriculture and forestry	2 535 (4.4%)	2 318 (4.2%)	2 315 (4.2%)

	2017	2019	2020
Architecture and construction	5 098 (8.8%)	5 108 (9.3%)	4 962 (9.0%)
Engineering	10 812 (18.7%)	9 727 (17.7%)	9 637 (17.4%)
Health (excluding nursing)	2 172 (3.8%)	2 194 (4.0%)	2 340 (4.2%)
Hotel and catering services	2 385 (4.1%)	2 059 (3.8%)	2 043 (3.7%)
Humanities, arts and social sc.	1 827 (3.2%)	1 806 (3.3%)	1 710 (3.1%)
Information and communication	1 831 (3.2%)	1 783 (3.2%)	1 809 (3.3%)
Manufacturing and processing	2 323 (4.0%)	2 145 (3.9%)	2 109 (3.8%)
Nursing	4 018 (7.0%)	4 215 (7.7%)	4 361 (7.9%)
Services	2 439 (4.2%)	2 394 (4.4%)	2 496 (4.5%)
Social protection	2 967 (5.1%)	3 133 (5.7%)	3 384 (6.1%)
Wholesale and retail trade	6 667 (11.5%)	6 017 (11.0%)	6 059 (11.0%)

Source: LABB data, authors calculations.

To examine the association between learned occupations and SWTs, we used a 13-category recoding of the ISCO three-digit typology provided by the FSO to analyse employment dynamics. Particular attention was paid to retaining as much detail as possible without producing categories that would have been too small for subsequent analyses. Consequently, learned occupations related to hospitality formed a dedicated group, whereas engineering- and personal services-related learned occupations were combined. We also included training type (school or firm-based), as it is expected to be associated with trajectories following graduation. Finally, we incorporated the following sociodemographic variables as controls: sex, type of agglomeration, linguistic region, migration background, and age at graduation.

Table 1 presents the distributions and frequencies of the variables used. Our results align with official statistics: women are slightly underrepresented and firm-based VET is largely dominant (FSO, 2016; 2025). The 2019 and 2020 cohorts show a two percentage-point decrease in graduates compared to 2017. Distributions across cohorts remain stable for all variables, with the exception of migration background, where we observe a two percentage-point increase in foreigners born abroad between the 2017 and 2020 cohorts.

5 Methods

The association between the COVID-19 crisis and the SWTs is analysed in two steps. First, we create a typology of SWTs using SA. Second, we examine its association with the covariates introduced in Section 4 to address our research questions.

5.1 Typology Creation Using Clustering With Noise

The typology aims to uncover the main SWT patterns in Switzerland by grouping similar trajectories. Sequences are compared using a dissimilarity measure before cluster analysis is applied to regroup them into types. Finally, the optimal number of groups is determined according to cluster quality indices and theoretical considerations.

In this study, constructing the typology raises two methodological challenges. First, the large dataset raises computational issues, which we address using the CLARA algorithm (Kaufman & Rousseeuw, 1990) as extended by Studer et al. (2024). Second, the commonly used SA algorithms struggle to detect uncommon or atypical trajectories (Liao et al., 2022; Unterlerchner & Studer, 2026). This has two consequences: it limits the researchers' ability to study such trajectories, and grouping these uncommon types with more common ones reduces the overall typology quality. Our strategy is twofold: we retain a highly detailed typology to capture uncommon types, which is possible given our large database, and we identify atypical SWTs by implementing the noise-clustering framework of Davé (1991) within the large database procedure of Studer et al. (2024).

To capture the internal dynamics of trajectories – crucial for capturing precarity within the SWT – we use the optimal matching of spell dissimilarity measure. This accounts for the sequencing and duration of the trajectories. The spell-expansion parameter defines its sensitivity to sequencing, which was set to 0.2 (Studer & Ritschard, 2016). Other dissimilarity measures yield similar results but were less relevant in describing these trajectories from both sociological and statistical perspectives.

We now discuss the clustering phase of typology creation using CLARA. This medoid-based partitioning algorithm aims to minimize the within-cluster sum of distances. To overcome memory constraints, the distances are computed only for a subsample before being extended to the full dataset. This operation is repeated to ensure robust results. Following the procedure of Studer et al. (2024), we use subsamples of 5 000 sequences and 250 iterations.

Noise clustering aims to identify deviant or atypical cases. This is of particular interest for the following two reasons. First, excluding deviant sequences from well-defined types improves the overall typology quality. Second, our research questions require the identification of atypical trajectories. Technically, a maximal distance from any medoid is defined; sequences exceeding this threshold are labelled as “noise”.

Davé (1991) proposes defining this threshold (δ) based on the average pairwise distance in the sample, with (n) the number of sequences, ($\mathbf{x}$) the sequences, and (λ) a user-defined multiplier:

$$\delta = \lambda \cdot \frac{2}{n(n-1)} \sum_{i=1}^{n-1} \sum_{j=i+1}^n d(\mathbf{x}_i, \mathbf{x}_j) \quad (\text{Eq. 1})$$

Obtaining the full dissimilarity matrix is intractable for computational reasons, so we define δ using a subsample of 10 000 sequences. λ was set to 1.2. Therefore, a sequence is classified as noise if its distance from every medoid exceeds 120% of the sample average. In our application, lower λ values produce an overly large “noise cluster”, which includes sequences belonging to other clusters. Larger values are too restrictive, leaving poorly assigned sequences within existing clusters (see Figure A1 in the Appendix²).

Once identified, “noise” trajectories can be handled in two ways. First, they may be considered as outliers. In this case, researchers may set them aside in subsequent analyses. From this perspective, noise clustering aims to improve the overall typology quality by excluding deviant cases. Second, trajectories labelled as noise can be considered a type in itself and analysed accordingly. Here, noise clustering aims both to study atypical trajectories and increase within-type homogeneity. This simultaneously addresses methodological limitations and epistemological aims.

5.2 Modelling

Once the typology is obtained, we estimate multinomial regressions to explain type membership.

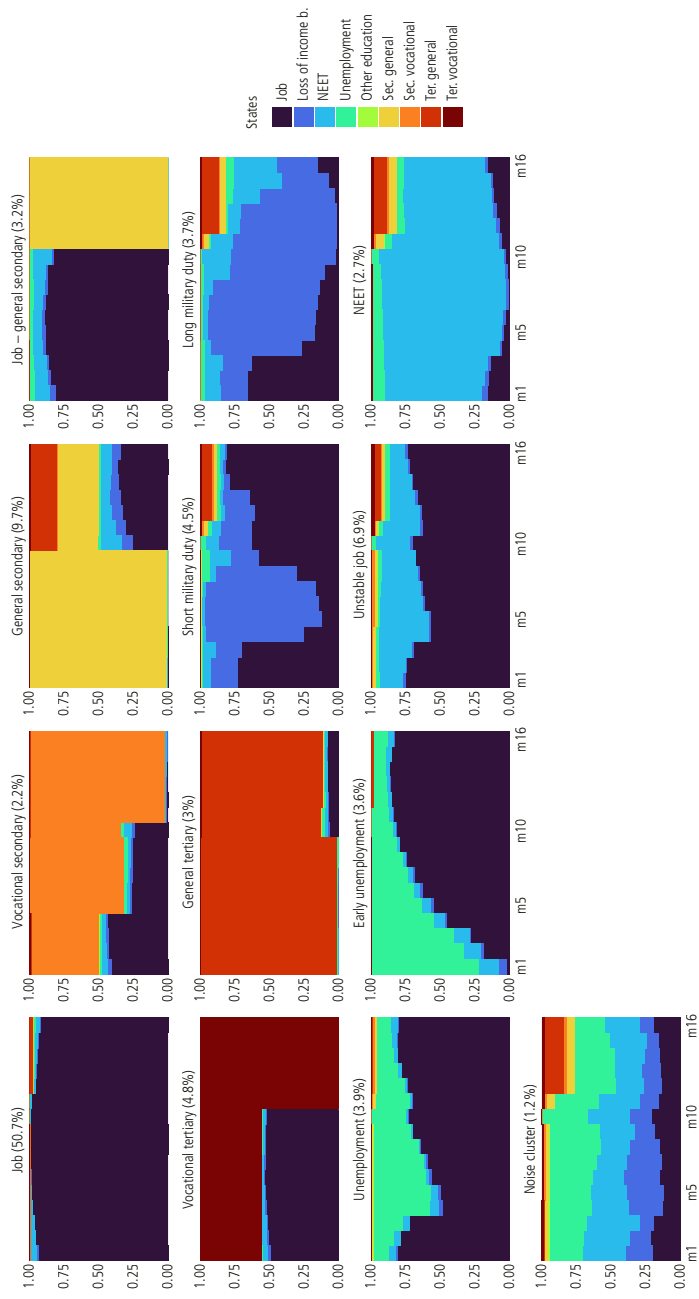
We estimate two models. The first relates the typology to the cohorts to analyse the association between trajectories and the crisis while controlling for identified and measured confounders (see Section 4). The second investigates the interaction between cohort membership and learned occupation. Given the large sample size, we adopt a conservative 0.1 percent significance threshold.

6 Results

First, we describe the SA typology before presenting the first set of regression results (RQ1). Second, we examine the interaction between typology and learned occupations to identify those most associated with this turbulent period (RQ2).

² Coloured figures are available in the Online Appendix <https://doi.org/10.5281/zenodo.21222064> (last consulted the 06.07.2026).

Figure 1 Frequency of States Over Time, Separated by Types



Source: LABB data, authors calculations.

6.1 Identifying Types of School-to-Work Transitions

We select a 12-type typology plus the “noise group”. This choice is guided by cluster quality indices (Xie-Beni, Davies-Bouldin, and PBM) to identify local optima, complemented by visual inspection for interpretability and substantive relevance. We opt for a detailed typology because our research questions require a fine-grained view of the SWT to identify uncommon trajectories. Figure 1 displays chronograms of the states over time for each type. We distinguish four groups of types.

Job type

The “Job type” regroups trajectories characterized by direct entry into stable employment. Accounting for 50.7 percent of the population, this is the most expected pattern, as VET is widely acknowledged for its capacity to foster rapid integration into stable employment (Korber & Oesch, 2019).

Pursuit-of-education types

The second group (22.8%) comprises five types oriented towards the pursuit of education. “general secondary” and “job-general secondary” show similar patterns, differing in the timing of entry into general secondary education and highlighting two routes to the same destination. “Vocational tertiary” and “general tertiary” group trajectories lead to two forms of higher education, with the former showing greater sequencing heterogeneity. All four types involve an increase in the educational level, which is likely to improve career prospects (Korber & Oesch, 2019).

The “vocational secondary” type is less expected, as undertaking a second VET lies outside standard pathways, and its long-term consequences are uncertain. Two situations may arise in this case. If the second VET is unrelated to the first, it captures reorientation without an increased educational level. This might be due to unmet expectations or early orientation misallocations. If the second VET complements the initial one, improved career prospects are expected owing to enhanced skill relevance.

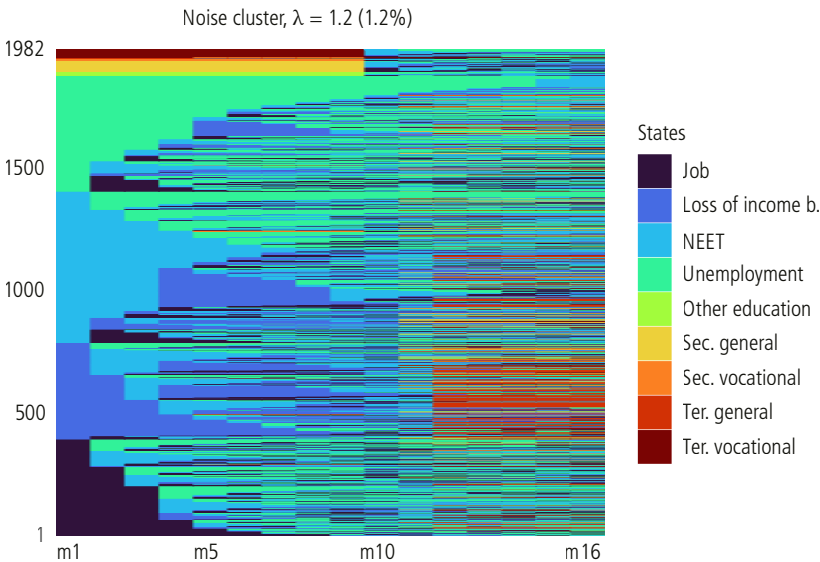
Military duty types

The third group (8.2%) comprises two types characterized by episodes of loss of income benefits. These benefits are received almost exclusively by young men who complete their military duties without being employed. Therefore, we label these types “short military duty” and “long military duty”.

Precarious SWT types

The fourth group (18.3%) comprises types characterized by precarious SWTs for which negative long-term consequences are expected (Helbling & Sacchi, 2014; Spence, 1973). “Early unemployment” and “unemployment” types include unem-

Figure 2 Index Plot of the Noise Cluster, Sorted From Start



Source: LABB data, authors calculations.

ployment-benefit spells. They differ in the timing of their first unemployment spell: directly after graduation and following an initial employment spell. The “unstable job” type features employment trajectories interrupted by spells of inactivity. These three types likely include graduates whose contracts ended with their training firms and who struggled to secure their first positions. The *NEET* type consists mostly of inactive spells. Graduates of this type are less connected to the labour market than in the previous three. As these graduates may face difficulties in entering employment later, with potential skill losses adding to the scarring effects, this type denotes precarious SWTs.

Figure 2 shows the trajectories labelled as noise. Unlike in the other types, sequences are not grouped according to their similarities, but because they differ from all other types. This makes them atypical. We consider them as a type for two reasons. First, these trajectories are characterized by high instability; thus, they are similar in their dissimilarities. Second, their dominant states – “unemployment”, “inactivity”, and “loss-of-income benefit” – denote precarious SWTs. By combining precarious states with high instability, these trajectories indicate particularly difficult SWTs. It would have been impossible to identify them without noise clustering.

To evaluate the added value of noise clustering, we estimate a typology using standard CLARA clustering (see Figure A2 in the Appendix). Both typologies are

very similar, as indicated by a Cramér's V of 0.82³. Sequences categorized as noise are allocated to precarious types in 67% of cases (see Table A1 in the Appendix).

Han et al. (2017) propose evaluating the relevance of a typology using its association with key covariates. In our study, the Cramér's V between the cohorts and typologies is higher with (0.064) than without (0.058) the noise cluster. In this case, the 10.1 percent increase in the Cramér's V when using noise clustering confirms the relevance of the approach.

Noise clustering offers two advantages. First, the other types – mostly the precarious one – are more homogeneous. Second, this approach successfully identifies atypical SWTs that would have been overlooked by the standard CLARA algorithm.

6.2 School-to-Work Transitions in Times of COVID-19

We discuss the association between the typology and the graduation cohorts to answer RQ1. Figure 3 presents the predictive margins this association. The full model, including controls, is available in Table A2 in the Appendix. We begin by presenting the findings shared by both cohorts before turning to the cohort-specific results.

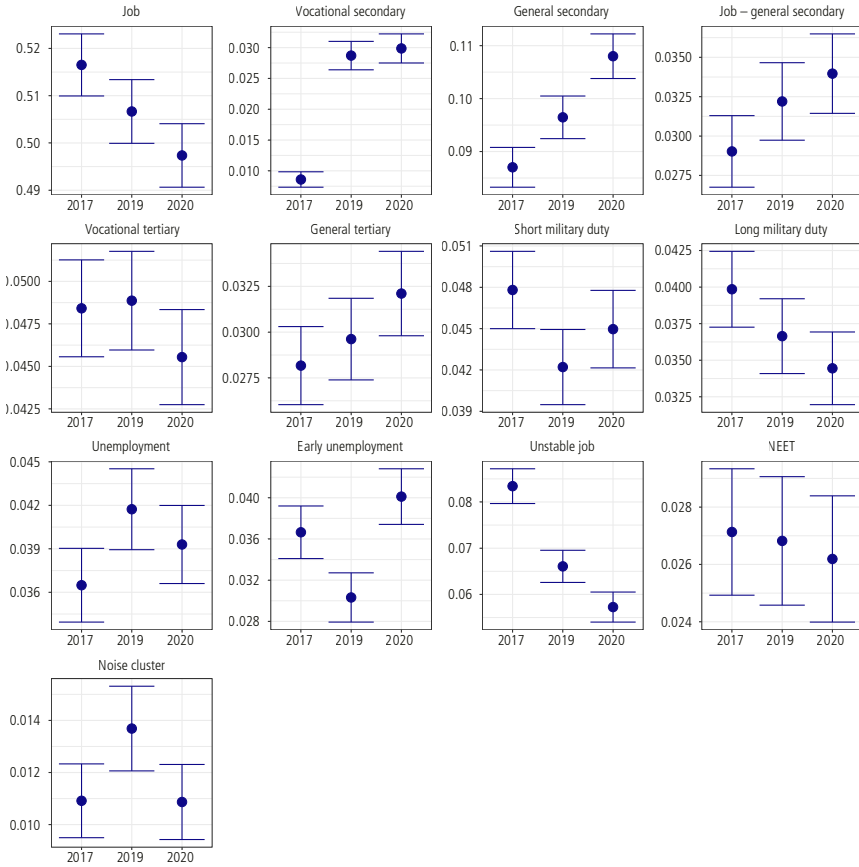
Pandemic cohorts are associated with an increased probability of both “pursuit-of-education types” and “precarious” ones. Effect sizes are small, changes in predicted membership probabilities are between 0 and 5 percentage points, but stronger for education-oriented SWTs. The 2019 and 2020 cohorts show positive associations with pursuit-of-education types: “job-general secondary”, “general secondary”, “vocational secondary”, and “unemployment”. Surprisingly, a negative association is found for “unstable job” in both COVID cohorts. We propose the following two interpretations. First, this type may regroup workers experiencing a period of planned inactivity between jobs. Such trajectories become riskier during uncertain times and may be avoided where possible. Second, transfers may have occurred from the “unstable” to “unemployment” type during the pandemic. Facilitated benefit access or changes in jobseekers' behaviour may explain such transfers. The pandemic is not associated with the two military-duty types.

Differences emerge between the two COVID cohorts. The 2019 graduates have higher probabilities of belonging to the “unemployment” and “noise” clusters. Conversely, the 2020 cohort, affected from the commencement of their SWT, is positively associated with “general tertiary” and “early unemployment” types.

In summary, the findings show fewer transitions to stable employment and more transitions to the pursuit of education or precarious trajectories. This extends earlier evidence on how economic crises reshape SWT patterns (López Bóo, 2012; Watson, 2020) and aligns with the comparatively low crisis stringency in Switzerland (Giugni & Mexi, 2018; Pellizzari & Tabasso, 2015). As both favourable and unfavourable SWTs become more frequent, the results suggest some degree of SWT polarization

3 A strong association is highly expected, as common types (which weight more) are the same in both approaches.

Figure 3 Predictive Margins of School-to-Work Transition Types by Graduation Cohorts, 99.9% Confidence Intervals



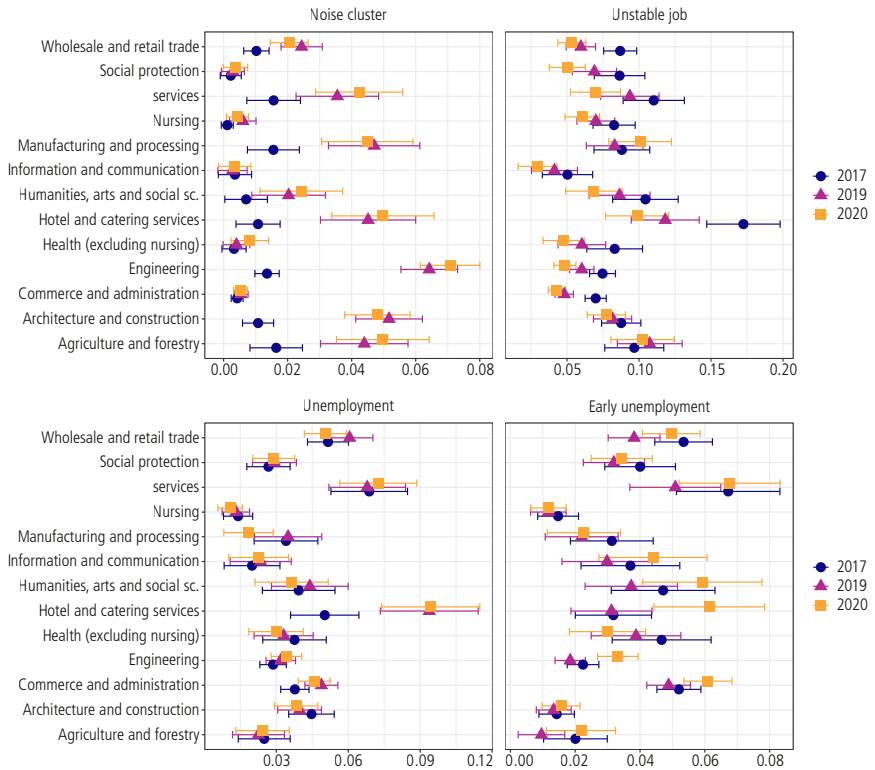
Source: LABB data, authors calculations.

during this turbulent period. They also confirm young people’s vulnerability in such contexts (Forsythe, 2022; Schoon & Bynner, 2019). Finally, the timing of the crisis remains central to understanding graduates’ SWTs, as highlighted by the association between the cohorts, “early unemployment,” and “unemployment” types.

6.3 Learned Occupations and School-to-Work Transitions

We now discuss the association between SWT types and learned occupations. To describe the changes that occurred during the pandemic, we estimated a model

Figure 4 Predictive Margins of the Interaction Between Cohorts and Learned Occupations, 99.9% Confidence Intervals



Source: LABB data, authors calculations.

with an interaction with the cohorts. Figure 4 presents a selection of relevant results displayed as predictive margins, the complete results are available in Table A3 in the Appendix.

Four learned occupations show a distinctive association in the pandemic cohorts. Graduates in agriculture or construction have higher chances of transitioning to “unstable job” type than those in other occupations. Hospitality is associated with increased probabilities of being in “unemployment” or “early unemployment” types among 2020 graduates. The manufacturing sector is negatively associated with the “unemployment” type, but positively with the “unstable job” type; transfers between these two types may explain this finding. Finally, in 2020, health occupations graduates appear to be protected against “early unemployment”.

Only one education type displays interaction effects: “vocational secondary”. Agriculture, construction, engineering, hospitality, and manufacturing all exhibit increased probabilities of following this type in the COVID cohorts, widening the differences between these sectors and the others. This may reflect a stronger desire for reorientation or an unplanned form of further education (The Lancet, 2020).

Overall, the pandemic is strongly associated with occupation-specific differences in SWTs. Two mechanisms are likely to have contributed. First, educational opportunities differ across learned occupations, constraining graduates’ choices when facing adverse labour-market conditions. Second, cohort differences, including an increased risk of precarious SWTs, are stronger in some learned occupations than others.

7 Conclusion

This study investigates the association between the COVID-19 crisis and SWTs in Switzerland. We compare three VET graduate cohorts using the pre-pandemic cohort as the baseline group, allowing changes in SWTs to be linked to the pandemic and its associated measures. As expected, the COVID-19 cohorts show fewer direct transitions to stable employment and more pursuits of education and precarious trajectories. However, the magnitude of these changes is limited, and most graduates still experienced a rapid and smooth transition to employment. This confirms the relative stability of the Swiss youth labour market during crises (Pellizzari & Tabasso, 2015). Three mechanisms may explain this stability. First, firms’ extensive use of short-time work may have mitigated the contraction in available positions (Hijzen & Salvatori, 2022). Second, the proximity of VET graduates to employment may have facilitated their entry into the labour market. Third, changes in employment quality may have been concealed because of missing information on working conditions.

Among graduates who do not transition directly into stable employment, some fare better, while others are left behind, indicating a modest polarization in SWTs. The occupations in which graduates are trained play an important role as they shape educational opportunities and influence the risks of precarious transitions. Thus, COVID-19 may have acted as a catalyst for these inequalities. This period saw widening differences between occupations, with hospitality being particularly affected and health occupations being protected by containment measures. Paradoxically, the long-term consequences of precarious SWTs may be especially strong for this minority group, as employers may interpret them as particularly negative signals in the context of low youth unemployment (Imdorf et al., 2019).

However, causality cannot be strictly established. Attributing these patterns to the pandemic remains the most plausible explanation, as it aligns with the findings on previous crises and our occupation-based hypotheses (Pellizzari & Tabasso, 2015; Schoon & Bynner, 2019). Competing explanations should also be considered. First,

long-term trends affecting either VET graduates' preferences for pursuing education or employers' attitudes toward graduates could, in principle, lead to similar results, although our literature review does not indicate such trends. Second, compositional changes might account for some of the findings. Yet, the descriptive statistics do not indicate major differences between cohorts, except for a two-percentage-point increase in the share of foreign-born graduates, which is unlikely to account for the SWT changes observed in the 2019 and 2020 cohorts. Finally, relevant educational reforms might have increased the transition to further education; for example, the canton of Zurich lowered the entry requirements for vocational maturity in the wake of the pandemic. However, controlling for cantons yielded similar results.

Relying on exhaustive data allowed us to construct a detailed typology of trajectories to investigate the pandemic's association with SWTs. This made it possible to identify SWTs leading to a second VET diploma. The use of noise clustering – its first application in SA, to the best of our knowledge – proved extremely useful. It simultaneously identifies atypical trajectories, improves the overall typology quality, and allows for more accurate estimates of SWT associations with cohorts. These advantages make the algorithm a valuable alternative when working with weakly structured data or when aiming to detect atypical patterns. This new approach is implemented in the `WeightedCluster` R library (Studer, 2013).

Our study has limitations that also point to opportunities for future research. First, we lack information on working conditions. As a result, we may have underestimated the changes in employment associated with pandemic cohorts. Investigating changes in earnings or a potential increase in job mismatches among new entrants would be an interesting complement to this study. Second, the 16-month observation window does not allow us to examine the long-term consequences of SWTs. Additionally, it does not allow us to grasp every SWTs in their full length as some graduates take more time to reach a stable status regarding the labour market. Replicating the study when new data become available address this limitation and likely attracts considerable interest.

8 Declaration of Generative AI Use

During the preparation of this article, the authors used large language models to correct the text and reformulate sentences. The authors reviewed and edited the manuscript as required and take full responsibility for the content of the publication.

9 References

- Adams, S. J. (2002). Educational attainment and health: Evidence from a sample of older Adults. *Education Economics*, 10(1), 97–109. <https://doi.org/10.1080/09645290110110227>

- Akkermans, J., Seibert, S. E., & Mol, S. T. (2018). Tales of the unexpected: Integrating career shocks in the contemporary careers literature. *SA Journal of Industrial Psychology*, 44(0), 10. <https://doi.org/10.4102/sajip.v44i0.1503>
- Bachmann Hunziker, K., Leuenberger Zanetta, S., Mouad, R., & Rastoldo, F. (2021). Obtenir un CFC, et après? Profils et parcours postsecondaire II des diplômé.e.s. In J. Lamamra & J. Rey (Eds.), *Finalités et usages de la formation professionnelle – Apprendre un métier, trouver un emploi, poursuivre ses Études ?* (pp. 145–168). Éditions Antipodes. Institut national d'étude du travail et d'orientation professionnelle (INETOP). <https://doi.org/10.33056/ANTIPODES.11964>
- Bailey, K. D. (1994). *Typologies and taxonomies: An introduction to classification techniques*. SAGE.
- Baruffini, M., & Stricker, L. (2021). Disparities in unemployment and economic activity in Switzerland during the COVID-19 pandemic health crisis: Evidence at the regional level. In C. Larsen, S. Rand, A. Schmid, T. Nagel, & H. Hoess (Eds.), *Transformations of regional and local labour markets across Europe in pandemic and post-pandemic times: Challenges for regional and local observatories* (pp. 203–224). Nomos. <https://doi.org/10.5771/9783957104007-203>
- Bauer, A., Keveloh, K., Mamertino, M., & Weber, E. (2023). Competing for jobs: How COVID-19 changes search behaviour in the labour market. *German Economic Review*, 24(4), 323–347. <https://doi.org/10.1515/ger-2021-0010>
- Bernardi, L., Huinink, J., & Settersten, R. A. (2019). The life course cube: A tool for studying lives. *Advances in Life Course Research*, 41, 100258. <https://doi.org/10.1016/j.alcr.2018.11.004>
- Bonfiglio, A., Coderoni, S., & Esposti, R. (2022). Policy responses to COVID-19 pandemic waves: Cross-region and cross-sector economic impact. *Journal of Policy Modeling*, 44(2), 252–279. <https://doi.org/10.1016/j.jpolmod.2022.03.009>
- Brzinsky-Fay, C. (2007). Lost in transition? Labour market entry sequences of school leavers in Europe. *European Sociological Review*, 23(4), 409–422. <https://doi.org/10.1093/esr/jcm011>
- Buchmann, M. C., & Kriesi, K. (2011). Transition to Adulthood in Europe. *Annual Review of Sociology*, 37(1), 481–503. <https://doi.org/10.1146/annurev-soc-081309-150212>
- Bussink, H., Tobias Vervliet, T., & ter Weel, B. (2022). The short-term effect of the COVID-19 crisis on employment probabilities of labour-market entrants in the Netherlands. *De Economist*, 170(2), 279–303. <https://doi.org/10.1007/s10645-022-09406-8>
- Carey, R. L., J. Bailey, M. J., & Polanco, C. I. (2023). How the COVID-19 pandemic shaped adolescents' future orientations: Insights from a global scoping review. *Current Opinion in Psychology*, 53, 101655. <https://doi.org/10.1016/j.copsyc.2023.101655>
- Chesters, J., & B. Baffour. 2015. School-to-work transitions during volatile economic times. *The Australian Journal of Labour Economics*, 18(3), 307–327. <http://hdl.handle.net/1885/262031>
- Cortesi, S., & C. Imdorf. (2013). Le certificat fédéral de capacité en Suisse – Quelles significations sociales pour un diplôme hétérogène? *Cahiers de La Recherche Sur l'éducation Et Les Savoirs, Hors-série* (4), 91–108. <https://doi.org/10.4000/cres.2506>
- Centre suisse de services Formation professionnelle orientation professionnelle universitaire et de carrière, CSFO. (2026a). *Agriculteur CFC/Agricultrice CFC*. Orientation.ch. <https://www.orientation.ch/dyn/show/1900?idx=30&id=8>
- Centre suisse de services Formation professionnelle orientation professionnelle universitaire et de carrière, CSFO. (2026b). *Informaticien CFC/Informaticienne CFC*. Orientation.ch. <https://www.orientation.ch/dyn/show/1900?lang=fr&idx=30&id=152>
- Davé, R. N. (1991). Characterization and detection of noise in clustering. *Pattern Recognition Letters*, 12(11), 657–664. [https://doi.org/10.1016/0167-8655\(91\)90002-4](https://doi.org/10.1016/0167-8655(91)90002-4)
- Dubois, C., Lambertini, L., & Wu, Y. (2022). Gender effects of the COVID-19 pandemic in the Swiss labor market. *Swiss Journal of Economics and Statistics*, 158(1), 23. <https://doi.org/10.1186/s41937-022-00099-z>

- Falcon, J. (2016). Les limites du culte de la formation professionnelle: Comment le système éducatif Suisse reproduit les inégalités sociales. *Formation Emploi. Revue Française de Sciences Sociales*, 133, 35–53. <https://doi.org/10.4000/formationemploi.4641>
- Fibbi, R., Lerch, M., & Wanner, P. (2006). Unemployment and discrimination against youth of immigrant origin in Switzerland: When the name makes the difference. *Journal of International Migration and Integration*, 7(3), 351–366. <https://doi.org/10.1007/s12134-006-1017-x>
- Forsythe, E. 2022. Why don't firms hire young workers during recessions? *The Economic Journal*, 132(645), 1765–1789. <https://doi.org/10.1093/ej/ueab096>
- Forsythe, E., Kahn, L. B., Lange, F., & Wiczer, D. (2020). Labor demand in the time of COVID-19: Evidence from vacancy postings and UI claims. *Journal of Public Economics* 189: 104238. <https://doi.org/10.1093/ej/ueab096>
- Federal Statistical Office, FSO. (2016). *Portrait de la Suisse – Résultats tirés des recensements de la population 2010–2014*. Federal Statistical Office. <https://www.bfs.admin.ch/asset/fr/1021365>
- Federal Statistical Office, FSO. (2024). *Analyses longitudinales dans le domaine de la formation (LABB)*. <https://www.bfs.admin.ch/bfs/fr/home/statistiken/bildung-wissenschaft/erhebungen/labbb.html>
- Federal Statistical Office, FSO. (2025). *Formation professionnelle initiale: tableaux de base – 2024*. <https://www.bfs.admin.ch/asset/en/35587601>
- Gauthier, J.-A., & Gianettoni, L. (2013). Socialisation séquentielle et identité de genre liées à la transition de la formation professionnelle à l'emploi. *Swiss Journal of Sociology*, 39(1), 33–55. <https://doi.org/10.5169/SEALS-814987>
- Groupeement Défense, GD. (2020a). *Début des écoles de recrues d'été comme prévu avec un concept de protection et reprise du recrutement*. Conseil Fédéral. <https://www.news.admin.ch/fr/nsb?id=79115>
- Groupeement Défense, GB. (2020b). *L'école de recrue en période de pandémie*. Conseil Fédéral. <https://www.vtg.admin.ch/fr/lecole-de-recrue-en-periode-de-pandemie>
- Gittings, L., Toksa, E., Medley, S., Cluver, L., Logie, C. H., Ralayo, N., Chen, J., & Mbithi-Dikgole, J. (2021). 'Now my life is stuck!': Experiences of adolescents and young people during COVID-19 lockdown in South Africa. *Global Public Health*, 16(6), 947–63. <https://doi.org/10.1080/17441692.2021.1899262>
- Giugni, M., & Mexi, M. (2018). The Silent Crisis: Perceptions and Experiences of the Economic Crisis in Switzerland. In M. Giugni & M. T. Grasso (Eds.), *Citizens and the crisis: Experiences, perceptions, and responses to the Great Recession in Europe* (pp. 215–238). Palgrave Macmillan. https://doi.org/10.1007/978-3-319-68960-9_9
- Gomensoro, A. (2019). *Les parcours scolaires des descendants d'immigrés en Suisse: Influences et imbrications des dimensions familiales, individuelles et institutionnelles* (Doctoral dissertation, Université de Lausanne). https://serval.unil.ch/notice/serval:BIB_F6421CD208DD
- Gondek, D., Vandecasteele, L., Sánchez-Mira, N., Steinmetz, S., Mehmeti, T., & Voorpostel, M. (2024). Correction to: The COVID-19 pandemic and wellbeing in Switzerland-worse for young People? *Child and Adolescent Psychiatry and Mental Health*, 18(1), 137. <https://doi.org/10.1186/s13034-024-00760-w>
- Goolsbee, A., & Syverson, C. (2021). Fear, lockdown, and diversion: Comparing drivers of pandemic economic decline 2020. *Journal of Public Economics*, 193, 104311. <https://doi.org/10.1016/j.jpubeco.2020.104311>
- Han, Y., Liefbroer, A.C., & Elzinga, C.H. (2017). Comparing methods of classifying life courses: Sequence analysis and latent class analysis. *Longitudinal and Life Course Studies*, 8(4), 319–41. <https://doi.org/10.14301/llcs.v8i4.409>
- Hänni, M., & Kriesi, I. (2025). Unemployment Scarring in the Early Career: Do Skills and Labour Demand Matter?. *Social Inclusion*, 13, Article 9530. <https://doi.org/10.17645/si.9530>
- Heinz, W.R. (1987). The transition from school to work in crisis: Coping with threatening unemployment. *Journal of Adolescent Research*, 2(2), 127–141. <https://doi.org/10.1177/074355488722003>

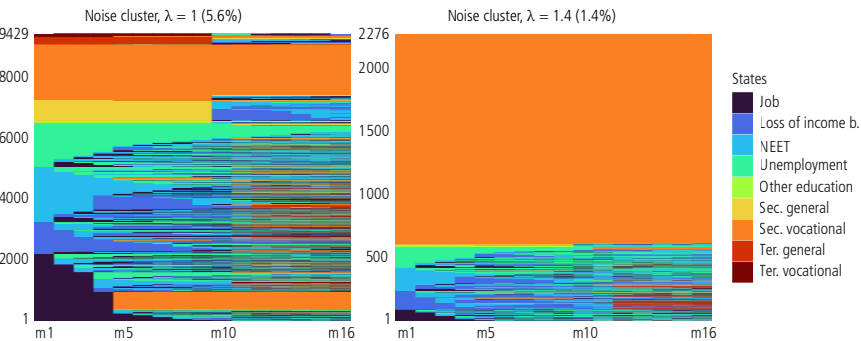
- Helbling, L. A., Sacchi, S., & Imdorf, C. (2019). Comparing long-term scarring effects of unemployment across countries: The impact of graduating during an economic downturn. In B. Hvinden, J. O'Reilly, M. A. Schoyen, & C. Hyggen (Eds.), *Negotiating early job insecurity: Well-being, scarring and resilience of European youth* (pp. 68–89). Edward Elgar Publishing. <https://doi.org/10.4337/9781788118798.00011>
- Helbling, L. A., & Sacchi, S. (2014). Scarring effects of early unemployment among young workers with vocational credentials in Switzerland. *Empirical Research in Vocational Education and Training*, 6(1), 12. <https://doi.org/10.1186/s40461-014-0012-2>
- Hijzen, A., & Salvatori, A. (2022). *The impact of the COVID-19 crisis across different socio-economic groups and the role of job retention schemes: The case of Switzerland* (OECD Social, Employment and Migration Working Papers No. 268). OECD Publishing. <https://doi.org/10.1787/38fc6bad-en>
- Hillmert, S. (2002). Labour market integration and institutions: An anglo-german comparison. *Work, Employment and Society*, 16(4), 675–701. <https://doi.org/10.1177/095001702321587424>
- Hupka-Brunner, S., Sacchi, S., & Stalder, B. (2010). Social origin and access to upper secondary education in Switzerland: A comparison of company-based apprenticeship and exclusively school-based programmes. *Swiss Journal of Sociology*, 36(1), 11–31. <https://doi.org/10.5167/uzh-43185>
- Imdorf, C., Sacchi, S., Wohlgemuth, K., Cortesi, S., & Schoch, A. (2014). How cantonal education systems in Switzerland promote gender-typical school-to-work transitions. *Swiss Journal of Sociology*, 40(2), 175–196. <https://doi.org/10.7892/boris.67589>
- Imdorf, C., Shi, L. P., Sacchi, S., Samuel, R., Hyggen, C., Stoilova, R., Yordanova, G., Boyadjieva, P., Ilieva-Trichkova, P., Parsanoglou, D., & Yfanti, A. (2019). Scars of early job insecurity across Europe: Insights from a multi-country employer study. In M. A. Schoyen, C. Hyggen, B. Hvinden, & J. O'Reilly (Eds.), *Youth unemployment and job insecurity in Europe: Problems, risk factors and policies* (pp. 93–116). Edward Elgar Publishing. <https://doi.org/10.4337/9781788118897.00011>
- Kaufman, L., & Rousseeuw, P. J. (Eds.). (1990). *Finding groups in data: An introduction to cluster analysis*. John Wiley & Sons. <https://doi.org/10.1002/9780470316801>
- Korber, M., & Oesch, D. (2019). Vocational versus general education: Employment and earnings over the life course in Switzerland. *Advances in Life Course Research*, 40, 1–13. <https://doi.org/10.1016/j.alcr.2019.03.003>
- Kraenzlin, S., Meyer, C., & Nellen, T. (2020). COVID-19 and regional shifts in Swiss retail payments. *Swiss Journal of Economics and Statistics*, 156(1), Article 14. <https://doi.org/10.1186/s41937-020-00061-x>
- Laganà, F., & Babel, J. (2020, May). *Trajectoires professionnelles des certifiés de la formation professionnelle initiale dans les cinq ans suivant le titre: Analyses longitudinales dans le domaine de la formation*. Office fédéral de la statistique. <https://www.bfs.admin.ch/bfs/fr/home/statistiques/education-science.assetdetail.12947494.html>
- Lamamra, N., Kuehni, M., & Rey, S. (Eds.). (2021). *Finalités et usages de la formation professionnelle: Apprendre un métier, trouver un emploi, poursuivre ses études?* Antipodes. <https://doi.org/10.33056/ANTIPODES.11964>
- Lassnigg, L. (2017). Apprenticeship policies coping with the crisis: A comparison of Austria with Germany and Switzerland. In M. Pilz (Ed.), *Vocational education and training in times of economic crisis: Lessons from around the world* (pp. 127–148). Springer International Publishing. https://doi.org/10.1007/978-3-319-47856-2_7
- Lee, J. O., Jones, T. M., Yoon, Y., Hackman, D. A., Yoo, J. P., & Kosterman, R. (2019). Young adult unemployment and later depression and anxiety: Does childhood neighborhood matter? *Journal of Youth and Adolescence*, 48(1), 30–42. <https://doi.org/10.1007/s10964-018-0957-8>
- Leemann, R., & Keck Frei, A. (2005, March). *Der Übergang von der Ausbildung in den Beruf: Die Bedeutung von Qualifikation, Generation und Geschlecht*. Bundesamt für Statistik.
- Liao, T. F., Bolano, D., Brzinsky-Fay, C., Cornwell, B., Fasang, A. E., Helske, S., Piccarreta, R., Raab, M., Ritschard, G., Struffolino, E., & Studer, M. (2022). Sequence analysis: Its past, present, and future. *Social Science Research*, 107, Article 102772. <https://doi.org/10.1016/j.ssresearch.2022.102772>

- López Bóo, F. (2012). In school or at work? Evidence from a crisis. *Oxford Development Studies*, 40(3), 381–404. <https://doi.org/10.1080/13600818.2012.689276>
- Lorenzini, J., & Giugni, M. (2016). Long-term unemployed youth in Switzerland: Coping with exclusion from the labor market in a country with low unemployment. In C. Lahusen & M. Giugni (Eds.), *Experiencing long-term unemployment in Europe: Youth on the edge* (pp. 73–106). Palgrave Macmillan UK. https://doi.org/10.1057/978-1-137-50487-6_4.
- Mortensen, D. T. (1986). Job search and labor market analysis. In O. Ashenfelter & R. Layard (Eds.), *Handbook of labor economics* (Vol. 2, pp. 849–919). Elsevier. [https://doi.org/10.1016/S1573-4463\(86\)02005-9](https://doi.org/10.1016/S1573-4463(86)02005-9)
- National COVID-19 Science Task Force, NCS-TF. (2020a, June 16). *Analyse de l'augmentation du chômage durant la pandémie*. <https://scienctaskforce.ch/fr/policy-brief/analyse-de-laugmentation-du-chomage-durant-la-pandemie/>
- National COVID-19 Science Task Force, NCS-TF. (2020b, August 18). *Quels compromis entre santé et économie?* <https://scienctaskforce.ch/fr/policy-brief/quels-compromis-entre-sante-et-economie/>
- Pellizzari, M., & Tabasso, D. (2015). Swiss youth unemployment during the Great Depression. In J. J. Dolado (Ed.), *No country for young people? Youth labour market problems in Europe* (pp. 35–46). CEPR Press.
- Percia David, D., Keupp, M. M., Marino, R., & Hofstetter, P. (2019). The persistent deficit of militia officers in the Swiss Armed Forces: An opportunity cost explanation. *Defence and Peace Economics*, 30(1), 111–127. <https://doi.org/10.1080/10242694.2017.1354171>
- Piccarreta, R., & Struffolino, E. (2024). Identifying and qualifying deviant cases in clusters of sequences: The why and the how. *European Journal of Population*, 40(1), Article 1. <https://doi.org/10.1007/s10680-023-09682-3>
- Resbeut, M., & Gugler, P. (2016). Impact of clusters on regional economic performance: A methodological investigation and application in the case of the precision goods sector in Switzerland. *Competitiveness Review*, 26(2), 188–209. <https://doi.org/10.1108/CR-09-2015-0078>
- Ritschard, G., & Studer, M. (Eds.). (2018). *Sequence analysis and related approaches: Innovative methods and applications* (Vol. 10). Springer International Publishing. <https://doi.org/10.1007/978-3-319-95420-2>
- Schmillen, A., & Umkehrer, M. (2017). The Scars of youth: Effects of early-career unemployment on future unemployment experience. *International Labour Review*, 156(3–4), 465–494. <https://doi.org/10.1111/ilr.12079>
- Schoon, I., McCulloch, A., Joshi, H. E., Wiggins, R. D., & Bynner, J. (2001). Transitions from school to work in a changing social context. *YOUNG*, 9(1), 4–22. <https://doi.org/10.1177/110330880100900102>
- Schoon, I., & Bynner, J. (2019). Young people and the great recession: Variations in the school-to-work transition in Europe and the United States. *Longitudinal and Life Course Studies*, 10(2), 153–173. <https://doi.org/10.1332/175795919X15514456677349>
- State Secretariat for Education Research and Innovation, SERI. (2019). *Swiss education system*. https://www.sbf.admin.ch/dam/sbf/en/dokumente/2019/07/Berufsbildungssystem_2019.pdf
- State Secretariat for Education Research and Innovation, SERI. (2025). *Vocational Education and Training (VET)*. <https://www.sbf.admin.ch/en/vocational-education-and-training-vet>.
- Settersten Jr., R. A. (2007). The new landscape of adult life: Road maps, signposts, and speed lines. *Research in Human Development*, 4(3–4), 239–252. <https://doi.org/10.1080/15427600701663098>
- Sheldon, G. (2020). Unemployment in Switzerland in the wake of the Covid-19 pandemic: An intertemporal perspective. *Swiss Journal of Economics and Statistics*, 156(1), Article 8. <https://doi.org/10.1186/s41937-020-00058-6>
- Shi, L. P., Imdorf, C., Samuel, R., & Sacchi, S. (2018). How unemployment scarring affects skilled young workers: Evidence from a factorial survey of Swiss recruiters. *Journal for Labour Market Research*, 52(1), Article 7. <https://doi.org/10.1186/s12651-018-0239-7>

- Spence, M. (1973). Job market signaling. *The Quarterly Journal of Economics*, 87(3), 355–374. <https://doi.org/10.2307/1882010>
- Stalder, B., & Nägele, C. (2011). Vocational education and training in Switzerland: Organisation, development and challenges for the future. In M. M. Bergman, S. Hupka-Brunner, A. Keller, T. Meyer, & B. E. Stalder (Eds.), *Youth transitions in Switzerland: Results from the TREE panel study* (pp. 18–39). Seismo. <http://doi.org/10.33058/seismo.30881>
- Studer, M. (2013). WeightedCluster library manual: A practical guide to creating typologies of trajectories in the social sciences with R. *LIVES Working Papers*, 24. LIVES, National Centre of Competence in Research (NCCR). <https://doi.org/10.12682/lives.2296-1658.2013.24>
- Studer, M., & Ritschard, G. (2016). What matters in differences between life trajectories: A comparative review of sequence dissimilarity measures. *Journal of the Royal Statistical Society. Series A (Statistics in Society)*, 179(2), 481–511. <https://doi.org/10.1111/rssa.12125>
- Studer, M., Sadeghi, R., & Tochon, L. (2024). Sequence analysis for large databases *LIVES Working Papers*, 104. LIVES, Swiss Centre of Expertise in Life Course Research. <https://doi.org/10.12682/lives.2296-1658.2024.104>
- The Lancet. (2020). The plight of essential workers during the COVID-19 pandemic. *The Lancet*, 395(10237), 1587. [https://doi.org/10.1016/S0140-6736\(20\)31200-9](https://doi.org/10.1016/S0140-6736(20)31200-9)
- Unterlerchner, L., & Studer, M. (2026). What are we looking for? A comparative review of clustering algorithms and cluster quality indices for sequence analysis. *LIVES Working Papers*, 108. LIVES, Swiss Centre of Expertise in Life Course Research. <https://doi.org/10.12682/lives.2296-1658.2026.108>
- Unterlerchner, L., Studer, M., & Gomensoro, A. (2023). Back to the features. Investigating the relationship between educational pathways and income using sequence analysis and feature extraction and selection approach. *Swiss Journal of Sociology*, 49(2), 417–446. <https://doi.org/10.2478/sjs-2023-0021>
- Walther, A. (2006). Regimes of youth transitions: Choice, flexibility and security in young people's experiences across different European contexts. *YOUNG*, 14(2), 119–139. <https://doi.org/10.1177/1103308806062737>
- Watson, I. (2020). The youth labour market: From education to work before and after the global financial crisis. *Journal of Industrial Relations*, 62(1), 33–57. <https://doi.org/10.1177/0022185619843959>
- Weber, M. (2011). *Methodology of social sciences*. Transaction Publishers. <https://doi.org/10.4324/9781315124445>
- Woo, H., & Yoon, I.-J. (2010). Transition from school to work before and after the '97 Korean economic crisis: Macroeconomic context and differential impacts of education. *Korean Journal of Sociology*, 44(6)s 87–110.

Appendix

Figure A1 Index Plot of the Sequences Labelled as Noise, Using Two λ Values, Sorted From Start



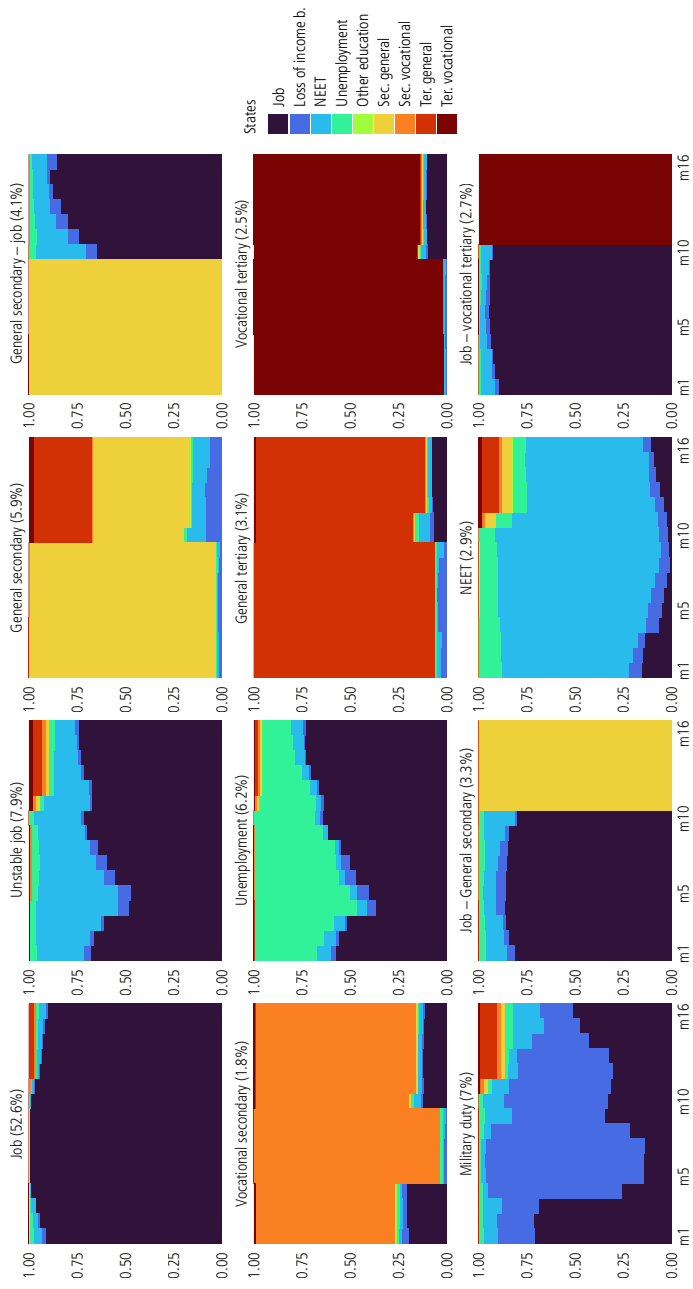
Source: LABB data, authors calculations.

Table A1 Share of Trajectories in the Noise Cluster Compared to CLARA Crisp Clustering in 12 Groups

	Noise Cluster
Job	0.00
Unstable job	0.21
General secondary	0.04
General secondary – job	0.02
Vocational secondary	0.02
Unemployment	0.28
General tertiary	0.05
Vocational tertiary	0.03
Military duty	0.15
Job – general secondary	0.01
NEET	0.18
Job – vocational tertiary	0.00

Source: LABB data, authors calculations.

Figure A2 Distribution of States Over Time, CLARA Clustering Without Noise, Separated by Types



Source: LABB data, authors calculations.

Table A2 Multinomial Regression: Association Between VET Cohorts and SWT Types, Reference Category = 'Job' Type, Results Expressed as Odds Ratios

	Voc. Sec.	Gen. Sec.	Job - Gen. Sec.	Voc. Ter.	Gen. Ter.	Short Mil. D.	Long Mil. D.	Unemp.	Early Unemp.	Unst. Job	NEET	Noise C.I.
VET cohort, ref. 2017												
2019	3.467 *	1.139 *	1.136 *	1.029	1.083	0.903 *	0.939	1.166 *	0.842 *	0.809 *	1.011	1.283 *
2020	3.671 *	1.316 *	1.229 *	0.971	1.222 *	0.981	0.903	1.122 *	1.144 *	0.715 *	1.015	1.046
Learned occupation, ref. commerce and admin.												
Agriculture, Forestry and Veterinary Sciences	5.850 *	0.223 *	0.344 *	2.279 *	0.365 *	1.301 *	0.670 *	0.441 *	0.256 *	1.514 *	0.953	0.391 *
Architecture and Construction	6.141 *	0.388 *	0.573 *	1.775 *	0.645 *	1.143	0.710 *	0.780 *	0.223 *	1.279 *	0.639 *	0.530 *
Engineering	8.347 *	0.349 *	0.607 *	2.601 *	0.591 *	1.167 *	0.796 *	0.604 *	0.382 *	0.958	0.571 *	0.657 *
Health (excl. Nursing)	0.830	0.516 *	1.000	1.766 *	0.115 *	1.023	0.879	0.627 *	0.575 *	0.966	0.466 *	0.672
Hospitality	6.948 *	0.233 *	0.503 *	1.257	0.066 *	1.827 *	2.125 *	1.817 *	0.774 *	2.440 *	1.190	1.420
Humanities, Arts and Social Sc.	3.165 *	0.420 *	0.710 *	1.581 *	0.376 *	1.299	1.520 *	0.861	0.840	1.512 *	1.668 *	1.140
Information and Communication	0.625	0.628 *	0.757	4.554 *	2.272 *	0.916	1.003	0.483 *	0.667 *	0.735 *	0.962	0.970
Manufacturing and Processing	5.929 *	0.296 *	0.522 *	1.535 *	0.087 *	1.582 *	1.096	0.557 *	0.390 *	1.386 *	1.028	0.663
Nursing	0.741	0.428 *	0.580 *	12.309 *	0.615 *	1.121	0.900	0.277 *	0.225 *	1.309 *	0.382 *	0.390 *
Services	4.800 *	0.086 *	0.255 *	0.560 *	0.008 *	1.017	0.646 *	1.308 *	0.946	1.335 *	1.236	1.306

Continuation of Table A2 on the next page.

Continuation of Table A2.

	Voc. Sec.	Gen. Sec.	Job - Gen. Sec.	Voc. Ter.	Gen. Ter.	Short Mil. D.	Long Mil. D.	Unemp.	Early Unemp.	Unst. Job	NEET	Noise Cl.
Social Protection	0.410 *	0.257 *	0.474 *	1.368 *	0.275 *	1.229	0.712	0.475 *	0.478 *	0.922	0.448 *	0.366 *
Wholesale and Retail	2.787 *	0.343 *	0.715 *	0.683 *	0.057 *	0.816 *	0.548 *	0.974	0.686 *	0.954	0.664 *	0.757
Sex, ref. male												
Female	0.997	1.020	1.492 *	1.170 *	1.275 *	0.013 *	0.021 *	0.980	0.935	1.060	0.997	0.317 *
Age at grad., ref. ≤ 20												
Age 20–25	0.408 *	0.459 *	0.567 *	0.866 *	1.044	0.655 *	0.657 *	1.412 *	1.553 *	0.901 *	1.063	1.252 *
Age 25+	0.082 *	0.046 *	0.078 *	0.392 *	0.285 *	0.032 *	0.019 *	0.931	1.159 *	0.411 *	0.843	0.479 *
Agglomeration type, ref. urban												
Intermediate	1.135	0.860 *	0.819 *	1.014	0.941	1.095	1.028	0.812 *	0.778 *	0.983	0.800 *	0.746 *
Rural	1.433 *	0.747 *	0.619 *	1.013	0.816 *	1.098	0.878 *	0.618 *	0.617 *	0.879 *	0.647 *	0.633 *
Ling. region, ref. german speaking												
French speaking	1.933 *	1.456 *	0.577 *	0.933	2.064 *	0.798 *	0.954	1.795 *	2.204 *	0.989	2.188 *	2.465 *
Italian speaking	2.290 *	1.216 *	0.370 *	2.041 *	3.483 *	1.471 *	2.603 *	2.041 *	2.591 *	0.953	3.812 *	4.678 *
Training, ref. firm-based												
School-based	1.106	1.988 *	1.403 *	2.594 *	13.057 *	1.875 *	3.420 *	0.881	1.484 *	2.449 *	5.045 *	3.355 *

Continuation of Table A2 on the next page.

Continuation of Table A2.

	Voc. Sec.	Gen. Sec.	Job - Gen. Sec.	Voc. Ter.	Gen. Ter.	Short Mil. D.	Long Mil. D.	Unemp.	Early Unemp.	Unst. Job	NEET	Noise Cl.
Mig. Background, ref. Swiss born in CH												
Foreigners born in Switzerland	0.845	0.642 *	0.887	0.891	0.787 *	0.004 *	0.002 *	1.308 *	1.481 *	0.920	0.943	0.578 *
Swiss born abroad	1.031	1.196 *	1.226	0.832	1.041	0.979	1.109	1.318 *	1.450 *	1.096	1.334 *	1.442 *
Foreigners born abroad	0.935	0.749 *	0.810	0.701 *	0.699 *	0.005 *	0.009 *	1.169 *	1.108	0.918	0.936	0.529 *
BIC = 553465												
N = 167972												

Source : LABB data, authors calculations.

Table A3 Multinomial Regression: Interaction Between VET Cohorts and Learned Occupations, Reference Category = ‘Job’ Type, Results Expressed as Odds Ratios

	Voc. Sec.	Gen. Sec.	Job - Gen. Sec.	Voc. Ter.	Gen. Ter.	Short Mil. D.	Long Mil. D.	Unemp.	Early Unemp.	Unst. Job	NEET	Noise Cl.
VET cohort, ref. 2017												
2019	1.317	1.146*	1.187	0.954	1.094	0.831	0.930	1.318*	0.957	0.701*	1.002	1.365
2020	1.326	1.292*	1.095	1.105	1.315*	0.973	0.865	1.280*	1.240*	0.650*	0.942	1.092
Learned occupation, ref. commerce and admin.												
Agriculture and Forestry	3.076*	0.215*	0.453*	2.148*	0.398*	1.386*	0.703	0.529*	0.306*	1.097	0.738	0.420*
Architecture and Construction	2.107*	0.422*	0.600*	1.858*	0.733	0.941	0.648*	0.989	0.228*	1.042	0.638*	0.652
Engineering	2.617*	0.339*	0.650*	2.659*	0.635*	1.127	0.742*	0.623*	0.351*	0.873	0.484*	0.579*
Health (excl. Nursing)	0.638	0.500*	0.859	1.814*	0.144*	0.574	0.957	0.846	0.755	0.992	0.475*	0.926
Hospitality	2.451*	0.215*	0.431*	1.079	0.114*	1.742*	1.840*	1.298	0.594*	2.381*	1.145	1.164
Humanities, Arts and Social Sc.	1.565	0.425*	0.741	1.631*	0.337*	1.120	1.561*	0.996	0.866	1.411*	1.519*	0.993
Information and Communication	0.879	0.739*	0.913	5.504*	2.567*	1.061	1.125	0.546	0.743	0.759	0.976	1.088
Manufacturing and Processing	3.054*	0.301*	0.473*	1.462	0.071*	1.567*	1.141	0.758	0.501*	1.043	1.022	0.726
Nursing	0.267	0.426*	0.450*	12.123*	0.647*	0.895	0.876	0.365*	0.275*	1.178	0.435*	0.564

Continuation of Table A3 on the next page.

Continuation of Table A3.

	Voc. Sec.	Gen. Sec.	Job - Gen. Sec.	Voc. Ter.	Gen. Ter.	Short Mil. D.	Long Mil. D.	Unemp.	Early Unemp.	Unst. Job	NEET	Noise Cl.
Services	2.968 *	0.081 *	0.186 *	0.516	0.014 *	1.140	0.643	1.554 *	1.103	1.281	1.213	1.342
Social Protection	0.394	0.257 *	0.434 *	1.519 *	0.279 *	1.061	0.715	0.545 *	0.586 *	0.932	0.482 *	0.421
Wholesale and Retail	1.908 *	0.321 *	0.692 *	0.739	0.048 *	0.823	0.602 *	1.121	0.837	0.986	0.713 *	0.996
Sex, ref. male												
Female	0.991	1.020	1.493 *	1.171 *	1.280 *	0.013 *	0.021 *	0.980	0.934	1.058	0.995	0.316 *
Age at grad., ref. ≤ 20												
Age 20–25	0.409 *	0.458 *	0.567 *	0.866 *	1.045	0.655 *	0.657 *	1.414 *	1.557 *	0.903 *	1.064	1.252 *
Age 25+	0.082 *	0.046 *	0.079 *	0.392 *	0.285 *	0.032 *	0.019 *	0.930	1.158 *	0.411 *	0.841	0.476 *
Agglo. type, ref. urban												
Intermediate	1.133	0.860 *	0.818 *	1.014	0.941	1.094	1.028	0.810 *	0.777 *	0.983	0.799 *	0.746 *
Rural	1.431 *	0.748 *	0.619 *	1.013	0.818 *	1.097	0.878 *	0.618 *	0.617 *	0.878 *	0.646 *	0.633 *
Ling. region, ref. German-speaking												
French-speaking	1.938 *	1.458 *	0.578 *	0.933	2.064 *	0.797 *	0.954	1.795 *	2.204 *	0.990	2.191 *	2.468 *
Italian-speaking	2.294 *	1.218 *	0.371 *	2.042 *	3.487 *	1.473 *	2.603 *	2.049 *	2.595 *	0.950	3.815 *	4.687 *
Training, ref. firm-based												
School-based Training	1.104	1.987 *	1.400 *	2.597 *	13.068 *	1.873 *	3.419 *	0.879	1.481 *	2.454 *	5.039 *	3.346 *

Continuation of Table A3 on the next page.

Continuation of Table A3.

	Voc. Sec.	Gen. Sec.	Job - Gen. Sec.	Voc. Ter.	Gen. Ter.	Short Mil. D.	Long Mil. D.	Unemp.	Early Unemp.	Unst. Job	NEET	Noise Cl.
Mig. Background, ref. Swiss born in CH												
Foreigners born in CH	0.846	0.642 *	0.886	0.89	0.787 *	0.004 *	0.002 *	1.307 *	1.480 *	0.921	0.942	0.577 *
Swiss born abroad	1.029	1.196 *	1.228	0.831	1.038	0.979	1.111	1.315 *	1.447 *	1.095	1.335 *	1.439 *
Foreigners born abroad	0.935	0.750 *	0.810	0.701 *	0.701 *	0.005 *	0.009 *	1.169 *	1.110	0.920	0.938	0.530 *
Interactions: VET cohort X Learned occupation												
2019: Agriculture and Forestry	2.141	1.227	0.635	1.264	0.634	1.000	0.899	0.713	0.518	1.658 *	1.270	0.819
2019: Architecture and Construction	3.934 *	0.940	0.931	1.102	0.954	1.460	1.071	0.712	1.032	1.416 *	1.004	0.791
2019: Engineering	3.940 *	1.057	0.825	1.087	1.074	1.086	1.115	0.906	0.925	1.244	1.307	1.173
2019: Health (excl. Nursing)	0.952	1.012	1.067	1.060	0.772	2.977	0.688	0.667	0.863	1.044	1.007	0.587
2019: Hospitality	3.374 *	0.663	0.983	1.391	0.381	1.206	1.278	1.503	1.088	1.026	0.926	1.102
2019: Humanities, Arts and Social Sc.	2.209	0.962	0.732	1.116	1.228	1.176	0.899	0.851	0.830	1.186	1.065	1.290
2019: Information and Communication	0.542	0.779	0.579	0.863	0.822	0.846	0.81	0.824	0.775	1.068	1.040	0.882
2019: Manufacturing and Processing	2.367	0.955	0.901	1.182	1.085	1.048	0.995	0.791	0.745	1.376	0.988	0.611

Continuation of Table A3 on the next page.

Continuation of Table A3.

	Voc. Sec.	Gen. Sec.	Job - Gen. Sec.	Voc. Ter.	Gen. Ter.	Short Mil. D.	Long Mil. D.	Unemp.	Early Unemp.	Unst. Job	NEET	Noise Cl.
2019: Nursing	4.143	0.965	1.194	1.127	0.887	1.617	1.015	0.722	0.845	1.241	0.661	0.755
2019: Services	1.680	1.085	1.253	1.156	0.000	0.758	0.904	0.725	0.764	1.176	0.951	0.996
2019: Social Protection	0.947	0.86	0.915	0.919	1.208	1.360	0.677	0.798	0.801	1.098	0.844	0.693
2019: Wholesale and Retail	1.781	1.067	1.044	0.975	1.110	0.963	0.903	0.871	0.726	0.959	0.830	0.679
2020: Agriculture and Forestry	2.448*	0.911	0.651	0.945	1.080	0.805	0.942	0.809	0.937	1.740*	1.672	0.995
2020: Architecture and Construction	3.528*	0.836	0.942	0.783	0.721	1.230	1.234	0.689	0.905	1.403*	0.998	0.660
2020: Engineering	4.375*	1.033	0.986	0.859	0.757	1.030	1.124	1.019	1.304	1.093	1.270	1.253
2020: Health (excl. Nursing)	1.931	1.072	1.422	0.870	0.677	1.575	1.044	0.615	0.509*	0.885	0.943	0.654
2020: Hospitality	4.110*	1.611	1.613	1.163	0.338	0.966	1.240	1.735*	1.846*	1.025	1.223	1.663
2020: Humanities, Arts and Social Sc.	2.751	1.010	1.191	0.803	1.117	1.299	1.028	0.757	1.065	1.062	1.251	1.097
2020: Information and Communication	0.695	0.795	0.958	0.647	0.851	0.755	0.873	0.845	0.913	0.852	0.914	0.792
2020: Manufacturing and Processing	2.325	1.008	1.456	0.983	1.560	0.988	0.866	0.442*	0.609	1.864*	1.032	1.215
2020: Nursing	2.962	1.050	1.649	0.925	0.966	1.178	1.071	0.608	0.653	1.155	0.983	0.346

Continuation of Table A3 on the next page.

Continuation of Table A3.

	Voc. Sec.	Gen. Sec.	Job - Gen. Sec.	Voc. Ter.	Gen. Ter.	Short Mil. D.	Long Mil. D.	Unemp. Unemp.	Early Unemp.	Unst. Job	NEET	Noise Cl.
2020 : Services	2.074	1.092	1.862	1.096	0.752	0.912	1.126	0.830	0.816	0.981	1.112	0.912
2020 : Social Protection	1.252	1.117	1.351	0.795	0.779	1.120	1.335	0.842	0.687	0.893	0.960	0.977
2020 : Wholesale and Retail	1.498	1.130	1.051	0.800	1.399	1.009	0.814	0.752	0.735	0.932	0.958	0.623
BIC = 556275.3												
N = 167 972												

Source : LABB data, authors calculations.