

RESEARCH

Open Access



Enrolling in a consecutive federal vocational baccalaureate program: effects of successful career choice, needs–supplies discorrespondences and cognitive overload among VET graduates

Jan Hofmann^{1*} , Markus P. Neuenschwander¹ and Lukas Ramseier¹

*Correspondence:

Jan Hofmann
jan.hofmann@epfl.ch

¹University of Applied Sciences and
Arts Northwestern Switzerland,
Brugg-Windisch, Switzerland

Abstract

In Switzerland, federal vocational education and training (VET) diploma holders may choose to obtain a federal vocational baccalaureate by completing a consecutive federal vocational baccalaureate (FVB2) program. This multiwave study investigated the probability of FVB2 program enrollment within the first 4.5 years after the completion of compulsory school among federal VET graduates. Based on the theory of work adjustment (TWA), we conceptualized FVB2 program enrollment as a form of career adjustment in upper-secondary education. The theory lists perceived discorrespondences between individual needs and environmental supplies as the main predictor of career adjustment. As forms of discorrespondences, we analyzed the predictive effects of lack of achievement-related variety and educational status aspiration at the end of first year in company-based VET. Complementing TWA, we also included qualitative workload as a form of perceived cognitive overload, and to link career adjustment with career choice in lower-secondary education, we investigated the predictive effect of successful career choice in the form of anticipated person–environment fit (i.e., similarity between an individual's characteristics and the characteristics of the chosen upper-secondary environment). Controlling for the effects of school tracking and educational status aspiration in lower-secondary education, structural equation modeling was applied ($N=914$). Lack of achievement-related variety and educational status aspiration in VET had positive effects on FVB2 program enrollment, and qualitative workload had a negative effect. Anticipated person–environment fit had a statistically significant negative indirect effect on the probability of FVB2 program enrollment, simply mediated by lack of achievement-related variety. The indirect effects via educational status aspiration in VET and qualitative workload were not statistically significant. Findings shed light on the processes behind one of vocational learners' key paths to university of applied sciences.

Keywords Federal vocational baccalaureate, Career adjustment, Career choice, Person–environment fit, Needs–supplies correspondence, Ability–ability requirement correspondence, Vocational education and training, Secondary education, Variety, Educational status aspiration, Qualitative workload

In Switzerland, universities of applied sciences are part of higher education, alongside universities and universities of teacher education. Universities of applied sciences seek to offer education and training that is not only practice-oriented, but also science-based (Swiss Conference of Cantonal Ministers of Education 2025). For vocational upper-secondary education graduates, it offers a unique form of vocational training at tertiary level. The most common pathway into this program is through a federal vocational baccalaureate (“Berufsmatura”, BM). Usually, this qualification is obtained either as an integrated part of a vocational education and training (VET) program (integrated federal vocational baccalaureate, FVB1) or after completing a VET program with a federal VET diploma (consecutive federal vocational baccalaureate, FVB2)¹.

The two forms differ in their admission requirements, particularly regarding training company’s consent: While most compulsory school completers have to obtain their training company’s consent to enroll in a FVB1 program, this hurdle can be avoided for FVB2 program enrollment due to the possibility of completing FVB2 programs full-time in schools. This is crucial because previous research pointed to the regulating role of training companies as gatekeepers for enrolling in a FVB1 program (Hänni et al. 2022). Enrollment in a FVB2 program thus represents an opportunity for vocational learners to make a career adjustment and achieve a federal vocational baccalaureate which may have been unattainable due to the non-fulfillment of FVB1 admission requirements following the training company’s veto. Alternatively, some compulsory school completers may not have been ready to pursue a federal vocational baccalaureate when making their upper-secondary education choices in lower-secondary school, but then developed an interest in this qualification during VET. In this case too, enrolling in a FVB2 program represents an opportunity to make a desired career adjustment. This is where this study picks up to advance the discussion through two major contributions.

The first contribution lies in the prediction of FVB2 program enrollment based on determinants measured during VET. For the group of vocational learners who pursue a federal VET diploma without FVB1, we were interested in the extent to which determinants at an early stage of VET can predict their decision to enroll in a FVB2 program, particularly following the completion of VET in company-based training. Company-based training dominates over fully school-based training in Switzerland (Swiss State Secretariat for Education, Research and Innovation 2022). To our knowledge, investigating the enrollment in a FVB2 program with predictors measured at an early stage of company-based VET has not yet been under investigation despite the vast potential of offering interesting insights into one of vocational learners’ key paths on their way to a university of applied sciences diploma. Exploring this study subject helps identify areas at VET-level where changes can be made to increase the enrollment in a FVB2 program.

¹ It is possible to acquire a federal vocational baccalaureate by taking the federal vocational baccalaureate examination after individual preparation. However, this option is less common than choosing a FVB1 or FVB2 program.

This might contribute to improve the higher education quota to address skill shortages (Trede et al. 2020).

The second contribution aims to advance transition research. In recent years, transition research has increased efforts to link career choice processes with later career adjustments, for example by combining subjective outcome indicators for successful career choice with adjustment outcomes (e.g., Bosset et al. 2022). In the context of the transition from lower- to upper-secondary education, we sought to examine the extent to which subjective lower-secondary level career choice success predicts upper-secondary level career adjustment in the form of FVB2 program enrollment. If results show that subjective indicators of lower-secondary-level career-choice success are relevant to FVB2 program enrollment, people in the immediate context of compulsory-school students (e.g., parents and teachers) may help support more successful career choices and thereby reduce the need for later career adjustments.

The contributions of this study can be summarized in the form of the following two research questions:

- 1) To what extent do determinants at an early stage of company-based VET predict the probability of enrolling in a FVB2 program?
- 2) To what extent does successful career choice in lower-secondary education predict the probability of enrolling in a FVB2 program?

The role of consecutive federal vocational baccalaureate programs in the Swiss education system

The Swiss education system builds on three main components: compulsory education, upper-secondary education and tertiary education. Compulsory school is mandatory for all children and is divided into primary education and lower-secondary education. In most cantons, lower-secondary education divides students into school tracks and ends in Grade 9, at age 15 or 16. School track allocation is mainly driven by school grades and performance expectations, with social background playing an important indirect role (Neuenschwander, 2013). A crucial aspect of the lower-secondary education curriculum is career choice. Students prepare their transition to upper-secondary education and decide for one of the upper-secondary education programs available to them. Two-thirds of the students choose VET. Vocational education either takes place as full-time training in a vocational school, or as company-based VET with two main learning contexts, training company and vocational school. Both forms offer the opportunity to acquire skills and knowledge needed to work in a given occupation (Swiss Conference of Cantonal Ministers of Education 2024). Compulsory school completers decide between a 2-year VET program that leads to a federal certificate of VET (federal VET certificate) and a 3- or 4-year VET program that leads to a federal diploma of VET (federal VET diploma). Most adolescents pursue a federal VET diploma: In 2020, federal VET diploma recipients exceeded federal VET certificate recipients by a factor of 9 (Swiss State Secretariat for Education, Research and Innovation 2022). Vocational learners in a 3- or 4-year VET program may complete their vocational training with a FVB1. About 17% of compulsory school completers transition to a FVB1 program within the first two years after completing compulsory school (Hänni et al. 2022). Vocational learners who have completed their 3- or 4-year VET program without FVB1 may acquire a federal vocational baccalaureate in the form of a FVB2. About 14% of federal VET diploma holders

without FVB1 begin a FVB2 program (Hänni et al. 2022); the vast majority transitions to employment (Swiss Federal Statistical Office 2024a). In 2020, the number of federal vocational baccalaureate diploma awarded to vocational learners was roughly double the number of federal VET certificates, but only around 23% of the number of federal VET diploma (Swiss State Secretariat for Education, Research and Innovation 2022). In 2025, approximately 47% of all federal vocational baccalaureate certificates were obtained through the FVB1 pathway, while 53% were obtained through the FVB2 pathway (Swiss Federal Statistical Office 2026).

The federal vocational baccalaureate was introduced in 1994 primarily to provide vocational learners with access to higher education and to enhance the attractiveness of vocational training. It also aimed to increase the flexibility of the education system by facilitating transitions from vocational education to academic university studies, while contributing to an overall increase in the proportion of university graduates (Gonon 2017). In both FVB1 and FVB2 programs, learners prepare for the final examination by attending general education courses. Those courses place higher academic and vocational demands on vocational learners compared to vocational training leading to a federal VET certificate or a federal VET diploma (Hänni et al. 2022). The majority of federal vocational baccalaureate holders enter tertiary education. According to Trede et al. (2020), 57% of federal vocational baccalaureate holders start a university of applied sciences program within 5 years after VET completion. Having a degree from a university of applied sciences is lucrative: VET completers with a higher education diploma have the highest income among all VET completers (Swiss Federal Statistical Office 2025a, b).

Research on determinants for enrolling in a FVB2 program

Studies on the determinants of FVB2 program enrollment are scarce. In a study from Switzerland, Hänni et al. (2022) have shown that cantonal admission requirements are a key predictor for the enrollment in a FVB2 program. The admission requirements differ between cantons and may include mandatory entrance exams, grade averages, a combination of grade averages and mandatory entrance exams, teacher recommendations, passing of a preparatory course, and mandatory admission interview. Hänni et al.'s (2022) study findings indicate that more rigor admission requirements like entrance examination reduce the probability of FVB2 program enrollment. Further results pointed out that vocational learners are more probable to enroll in a FVB2 program if they are young, come from a family with a high socioeconomic status, or attended a lower-secondary school track with extended requirements. Learning a profession with high academic requirements also increases the likelihood of enrolling in a FVB2 program (Hänni et al. 2022). Hänni et al.'s (2022) study used administrative data, offering the advantages of full-sample coverage and objective information. However, they indicated a lack of individual-level data on ability, motivation, and the resources that are likely to impact educational aspirations and decisions. In the present study, we followed up their call for studies using survey data to substantiate the theoretical interpretation of their findings.

Enrollment in a FVB2 program and the theory of work adjustment

The theory of work adjustment (TWA; Dawis and Lofquist 1984; Swanson and Schneider 2020) provided the theoretical foundation to answer our research questions. TWA is a person–environment fit model. A multitude of studies on work adjustment were based on this theory (for an overview, see Swanson and Schneider 2020). According to TWA, specific characteristics of the individual and the environment (e.g., individual's abilities and environment's ability requirements) are matched with each other by the individual or the environment. *Correspondence* reflects the degree of similarity between a person and an environment, and *discorrespondence* refers to the degree of mismatch between a person and an environment, both based on individual's or environment's perception. Correspondence and discorrespondence are key predictors of work adjustment. Dawis and Lofquist (1984, p. 237) defined *work adjustment* as a “continuous and dynamic process by which a worker seeks to achieve and maintain correspondence with a work environment”. In the present study, we have broadened the idea of work adjustment and used the overarching concept of career adjustment. In line with work adjustment, *career adjustment* refers to a continuous and dynamic process by which individuals seek to achieve and maintain correspondence between personal career-related characteristics (e.g., needs, values) and their career situation (e.g., supplies, rewards) at a given point in time. We argue that enrolling in a FVB2 program is a career adjustment outcome because it results from actions taken by vocational learners to re-establish correspondence between their personal career-related characteristics and their career situation, after perceiving a discorrespondence at an early stage of company-based VET.

According to TWA, (dis)correspondence predict individual satisfaction with the work environment, as well as the level of satisfactoriness within the work environment. *Satisfaction* refers to an individual's satisfaction with their job, whereas *satisfactoriness* refers to an individual with whom the work environment is satisfied (Swanson and Schneider 2020). Both satisfaction and satisfactoriness predict individual adjustment behaviors. While the level of satisfaction leads to individual-initiated adjustment behaviors, certain levels of satisfactoriness cause individual adjustment behaviors that are initiated by the environment. Because we were interested in adjustment behaviors that are the result of an individual's decision process, the present study focused on characteristics of the individuals that predict their level of satisfaction (and lead to career adjustments) and omitted the role of satisfactoriness and the environment's initiatives for individual career adjustment.

Regarding individual-initiated adjustment behaviors, TWA emphasizes the role of individual needs and values. According to TWA, an individual has a set of needs and values that may (or may not) be met by the supplies and rewards available in the environment. If individual needs are met by supplies in the environment, the individual is likely to be satisfied. A discorrespondence between individual needs and the supplies from the environment (needs–supplies discorrespondence; NSD) increases the probability of individual dissatisfaction and, in consequence, may lead to adjustment behaviors (Swanson and Schneider 2020).

For the career adjustment behavior of FVB2 program enrollment, we argue that two of TWA's core values are essential for an individual's level of satisfaction or rather dissatisfaction and, in consequence, the decision to enroll in a FVB2 program: the need for achievement (achievement-related NSD) and the need for status (status-related NSD).

Achievement-related needs–supplies discordance

Achievement refers to an individual need to use abilities and have a feeling of accomplishment (Swanson and Schneider 2020). After enrolling in a FVB2 program, vocational learners are confronted with higher academic and vocational demands compared to the demands in their 3- or 4-year VET program (Hänni et al. 2022). Vocational learners who perceive that their abilities are not adequately met in their VET program (achievement-related NSD) may develop a feeling of nonachievement and dissatisfaction and may take action by enrolling in a FVB2 program as a form of career adjustment. Research has used operationalizations like lack of achievement-related variety to measure achievement-related NSD. For example, Medici et al. (2020) have shown that lack of achievement-related variety increased vocational learners' probability of occupational change as a form of career adjustment. To investigate our first research question about the extent to which determinants at an early stage of company-based VET predict the probability of FVB2 program enrollment, we tested the following hypothesis regarding perceived achievement-related NSD:

Hypothesis 1 The higher the perceived lack of achievement-related variety at an early stage of company-based VET is, the higher is the probability of enrolling in a FVB2 program.

Status-related needs–supplies discordance

Status refers to the need of achieving recognition and being in a dominant position (Swanson and Schneider 2020). For vocational learners in a 3- or 4-year VET program, enrolling in a FVB2 program is the key path to achieve a higher education diploma and to satisfy high levels of status needs. Dissatisfaction caused by unfulfilled educational status aspiration in VET (status-related NSD) may thus lead to career adjustment in the form of enrolling in a FVB2 program. Previous studies evidenced support for this assumption. For example, Hofmann et al. (2014) reported positive correlations between unfulfilled educational status aspirations and undertaking further education as a form of career adjustment among vocational learners. As a part of the first research question's investigation, we tested the following hypothesis regarding status-related NSD:

Hypothesis 2 Vocational learners whose educational status aspirations exceed the status associated with completing their current educational program at an early stage of company-based VET are more likely to enroll in a FVB2 program than those with equal or lower educational status aspirations.

Perception of cognitive overload

Complementing TWA, we argue that the enrollment in a FVB2 program is not merely a career adjustment outcome but also the result of vocational learners' reflection on their ability to meet system-defined performance prerequisites. Because FVB2 programs place higher levels of academic and vocational demands on vocational learners than VET programs that lead to a federal VET certificate or diploma (Hänni et al. 2022), the perception of one's own academic and vocational abilities is crucial, especially the perception of lacking abilities and perceiving cognitive overload. We posit that perceptions of high cognitive overload at an early stage of company-based VET decrease vocational

learners' probability of enrollment in a FVB2 program because they see little chance for FVB2 program completion. Also, in an attempt to keep their needs met by the supplies of their environment (e.g., the need for comfort; Swanson and Schneider 2020), federal VET diploma holders rather continue their work in employment than enroll in a FVB2 program.

Previous research has used the term *qualitative workload* to refer to a working person's perception of cognitive overload (Diestel and Schmidt 2009). In a study with civil administration employees, Diestel and Schmidt (2009) have shown positive correlations between qualitative workload and emotional exhaustion—a concept closely tied to career-impeding adjustment behaviors like voluntary turnover (Wright and Cropanzano 1998). For career-advancing adjustment behaviors, Hofmann et al. (2014) reported that vocational learners with a low ability self-concept were less likely to undertake further education.

Contributing to the investigation of the first research question, we tested the following hypothesis regarding the perception of cognitive overload:

Hypothesis 3 The higher the perceived qualitative workload at an early stage of company-based VET is, the lower is the probability of enrolling in a FVB2 program.

Successful career choice

In view of our second research question about the extent to which successful career choice in lower-secondary education predicts the probability of enrolling in a FVB2 program, we have further expanded our theoretical model. A multitude of indicators can be used to measure successful career choice in lower-secondary education (Dette et al. 2004; Ng and Feldman 2014; Ng et al. 2005). One indicator which has been investigated extensively is person–environment fit (PEF; Kristof-Brown and Guay 2011). In the context of lower-secondary education career choice, PEF refers to *anticipated PEF*, that is the degree of anticipated similarity between individual characteristics and the characteristics of the chosen upper-secondary environment. Unlike other indicators of successful career choice, PEF measures career fit holistically by incorporating different aspects of the upper-secondary education environment into the fit assessment. Research (e.g., Findeisen et al., 2022; Nägele & Neuenschwander, 2014; Neuenschwander & Hofmann, 2022) among vocational learners has shown that those individuals who perceive high levels of (anticipated) PEF at one career stage most probably perceive high levels of PEF at later career stages, as indicated by low levels of perceived discrepancies. Consequently, individuals with high levels of anticipated PEF in lower-secondary education should be less likely to face achievement-related NSD, which in turn affects the probability of career adjustment by enrolling in a FVB2 program. Individuals with a successful career choice have chosen an upper-secondary environment that is likely to fit their individual characteristics, and less likely to offer an achievement-related variety which individuals perceive as unsatisfactory. Results from previous research point in this direction although we could not find studies on achievement-related NSD that also measured PEF in lower-secondary education. In their study with vocational learners, Hofmann et al. (2021) reported positive correlations between perceived PEF at upper-secondary level and perceived skill variety at the workplace.

Regarding status-related NSD, we argue that successful individuals (i.e., those with high levels of anticipated PEF) hold high educational status aspirations. Individuals who perceive themselves as having made a successful career choice have effectively navigated one of the initial and critical challenges in the career development process. They not only extend this perception of success to future career endeavors, but their successful career choice also makes them more likely to navigate successfully through upcoming career phases. In consequence, they aspire ambitiously. This assumption is grounded in the findings of Patton and Creed (2007) among Australian high school adolescents with career decision-making self-efficacy and career indecision as successful and unsuccessful career choice indicators, respectively. For career status aspiration, a positive and negative relationship occurred for career decision-making self-efficacy and career indecision, respectively.

For the perception of cognitive overload, we argue that individuals with a successful career choice are less likely to perceive cognitive overload in VET due to their high level of preparedness following their extensive career choice efforts. In a study with vocational learners, Findeisen et al. (2022) reported positive correlations between anticipated PEF in lower-secondary education and occupational self-efficacy in VET, an inversely related construct to the perception of cognitive overload. To answer our second research question, we specified hypotheses that address the relationships between anticipated PEF, lack of achievement-related variety, educational status aspiration and qualitative workload. We then formulated hypotheses that address the indirect effects on the probability of enrolling in a FVB2 program:

Hypothesis 4 The higher the anticipated PEF in lower-secondary education is, the lower is the perceived lack of achievement-related variety (H4a), the greater is the probability of aspiring to an educational status that exceeds, rather than equals or falls below, the status associated with completing the current educational situation (H4b), and the lower is the perceived qualitative workload (H4c); all at an early stage of company-based VET.

Hypothesis 5 There is a negative indirect effect of anticipated PEF on the probability of enrolling in a FVB2 program, simply mediated by lack of achievement-related variety (H5a). There is a positive indirect effect of anticipated PEF on the probability of enrolling in a FVB2 program, simply mediated by educational status aspiration (H5b), and simply mediated by qualitative workload (H5c); all at an early stage of company-based VET.

Control variables

Educational status aspiration in lower-secondary education

To estimate the indirect effects of successful career choice (i.e., anticipated PEF) on the probability of enrolling in a FVB2 program more accurately, we included educational status aspiration in lower-secondary education in our model. We assumed effects on educational status aspiration in VET, lack of achievement-related variety, and qualitative workload based on longitudinal stability assumptions and Hofmann et al.'s (2014) significant findings for the correlations between career aspirations, achievement-related variety, and ability self-concept.

School tracking in lower-secondary education

Lower-secondary education school track significantly predicts entry into a FVB2 program (Hänni et al. 2022). Advanced-track school leavers have a higher probability of beginning a FVB2 program than those in other school tracks. The rationale behind school tracking's effect on the probability of enrolling in a FVB2 program has not yet been empirically clarified. Therefore, in addition to school tracking's effects on lack of achievement-related variety, educational status aspiration in VET, and qualitative workload, we also assumed a direct effect on the probability of enrolling in a FVB2 program. We assumed effects on educational status aspiration in lower-secondary education based on study findings from Germany (Bittmann and Schindler 2021; Zeddies et al. 2025) and Switzerland (Ackermann and Benz 2023). The effect on educational status aspiration in VET was based on study findings from Basler and Kriesi (2019). Effect assumptions regarding anticipated PEF, the NSD measures and perceived cognitive overload in VET relied on study findings from Holtmann and Solga (2023). According to Holtmann and Solga (2023), students in lower tracks have to choose their training occupation from a limited number of options due to their status as low-track students, which makes (anticipated) problems concerning the fit between VET environment and personal preferences more likely.

Methods

Data sources

We tested our hypotheses using data from our multiwave research project "Effects of Tracking" (Neuenschwander et al., 2024), complemented with data from the multiwave research project "Longitudinal Analyses in the Education Sector" (Swiss Federal Statistical Office, 2024b). In both research projects, data contained information on the same individuals.

"Effects of Tracking"

In our multiwave research project, we asked adolescents from Switzerland to fill out questionnaires at multiple points in compulsory school and upper-secondary education to investigate transitions in the Swiss educational system. The research project started in autumn 2011, when the participants were in primary education (Grade 5; Wave 1). Three waves followed in compulsory school, with Wave 4 at the end of compulsory schooling, before the transition to upper-secondary education (Grade 9; spring 2016). In spring 2017, Wave 5 was conducted when most adolescents were at the end of their first year in upper-secondary education. Because Wave 4 covered adolescents' situation in lower-secondary education before the transition to upper-secondary education, and Wave 5 was the only wave providing ample information about adolescents' experiences at an early stage of company-based VET, Wave 4 and Wave 5 data were used in this study. In Wave 4 (Time 1 [T_1]), 2,376 adolescents participated. Wave 5 (Time 2 [T_2]) consisted of Wave 4 participants exclusively. In total, 808 adolescents who participated in Wave 4 also filled out the questionnaire in Wave 5.

As part of the sampling process to obtain the original study sample, schools in the Swiss Cantons of Aargau, Basel-Land, Berne, and Lucerne that had Grade 5 classes were invited at random to participate in the study. In total, 1,802 adolescents were approached, of whom 1,735 participated in Wave 1. The Wave 1 sample was representative of Grade

5 students from these four cantons. In subsequent waves, adolescents, or more precisely, their classes, were approached again and invited to participate in the study. If adolescents changed classes, all students in those classes were asked to participate in the study. Prior to Wave 4, a supplementary sample of 1,483 adolescents were added to the 893 adolescents who participated in prior survey waves. The supplementary sample was chosen from the same cantons at random and only included students in Grade 9.

In Wave 4, adolescents filled out paper questionnaires in their classrooms during school hours or they filled out an online questionnaire at home. In Wave 5, participants either filled out an online questionnaire at home ($n=698$) or provided information in a computer-assisted telephone interview ($n=110$). For participants who filled out the questionnaire in their classrooms, teachers supervised the survey after receiving a detailed manual. Participants who filled out the online questionnaire received a personalized password to access their online survey. Participants received a small incentive prior to Wave 5 study participation. The Wave 4 survey did not contain incentives. The study was conducted according to and in line with the guidelines of the institutional review board. Questionnaires met ethical standards. We obtained informed consent from the adolescents' parents prior to the Wave 4 survey. Adolescents explicitly and voluntarily agreed to participate. Refusal to participate in the study was not tied to any negative consequences.

Prior to both surveys, we pretested the questionnaires on same-aged adolescents and revised the questionnaires based on their feedback. Those adolescents did not subsequently take part in the actual surveys, and their data was deleted. For the Wave 4 survey, participants took an average of about 60 min to answer all questions. The average time to complete the Wave 5 survey was about 20 min. According to our research, at the time of publication, "Effects of Tracking" was the only school-based multiwave project in Switzerland that contained data on the education levels needed to conduct this study.

"Longitudinal Analyses in the Education Sector"

"Longitudinal Analyses in the Education Sector" was launched with the aim of reconstructing and contextualizing educational pathways in the Swiss education system (Swiss Federal Statistical Office, 2024b). It contains data from the "Statistics on vocational education and training", which were used in this study. The statistics include all people who are enrolled in upper-secondary vocational education and provide the type of training they are enrolled in. The statistics come from an annual full census. The Swiss Federal Statistical Office receives the data in electronic form from the cantonal VET offices, which are obliged to provide information by law. Data from this project were used because the project employs the only database in Switzerland that contains full information on individual educational pathways.

Data matching

Data from both research projects, "Effects of Tracking" and "Longitudinal Analyses in the Education Sector" were matched to one dataset using a pseudonymizing identifier. The matching was based on all 2,376 Wave 4 participants in "Effects of Tracking." Data matching was possible for 96% of Wave 4 participants ($n=2,279$) or 99% ($n=798$) of Wave 5 participants. Data from "Longitudinal Analyses in the Education Sector" provided full information about the educational situation for the period between August

2016 and December 2020. Data contained information on whether vocational learners started or even completed a FVB2 program after completing VET with a federal VET diploma for the period between August 2019 and December 2020 (Time 3 [T₃]).

Sample

Based on the full census data from “Longitudinal Analyses in the Education Sector”, we selected those individuals who were in company-based VET in Wave 5 and completed VET with a federal VET diploma (3- and 4-year VET program) within the first 4.5 years after graduating from compulsory school in 2016 (i.e., up to December 2020; $N=914$). We did not include vocational learners who completed VET with a federal VET certificate (2-year VET program) because this certificate does not allow admission for a FVB2 program. We also excluded federal VET diploma holders with FVB1 because they already have a federal vocational baccalaureate. Table 1 provides descriptive statistics on gender and age for the total study sample and for the different wave participation groups.

We tested for missing response patterns between those who participated in T₁ and T₂ and those who only participated in T₂ by conducting a multivariate analysis of variance (MANOVA) and χ^2 tests with SPSS (Version 28.0.1.1) for all T₁ and T₃ items that we used in the study. A MANOVA with the anticipated PEF items found no significant differences between those who participated in T₁ and T₂ and those who participated in T₁ only, Pillai's Trace = 0.00, $F(5, 858)=0.53$, $p = .751$, $\eta^2 = 0.00$. The chi-square tests of independence found statistically significant but small associations between participation pattern and enrollment in a FVB2 program, $\chi^2(1, N=914)=13.13$, $p < .001$, $\phi=0.12$, participation pattern and school tracking, $\chi^2(1, N=891)=8.14$, $p = .005$, $\phi = -0.10$, and participation pattern and educational status aspiration at T₁, $\chi^2(1, N=873)=6.27$, $p = .013$, $\phi=0.09$. Enrollment was more common among those who participated in both T₁ and T₂ (22%) than among those who participated only in T₁ (13%), low-track students less frequently completed both T₁ and T₂ (21%) than intermediate- or high-track students (32%), and those who aspired the completion of VET without federal vocational baccalaureate, or lower, less frequently completed both T₁ and T₂ (25%) than those who aspired the completion of a [federal vocational] baccalaureate program or higher (33%). In addition, we tested if data are missing completely at random using Little's missing completely at random test in SPSS 28.0.1.1. The test was not significant, $\chi^2(79, n=914)=73.41$, $p = .656$, indicating no evidence against the assumption that data were missing completely at random. According to Graham (2009), structural equation models with a missing data feature (as applied in this study) may be used in conjunction with longitudinal data as long as missing-data procedures estimates without bias. Results from Little's missing completely at random test and the small effect sizes from

Table 1 Final Study Sample

Sample	<i>n</i> (total)	<i>n</i> (female)	<i>n</i> (male)	<i>n</i> (NGI)	Age at T ₁ (M)	Age at T ₁ (SD)
Total	914	391	521	2	15.7 years	0.6 years
T ₁ + T ₂	264	134	130	0	15.7 years	0.6 years
T ₁ only	650	257	391	2	15.7 years	0.6 years
T ₂ only	0	0	0	0	—	—

NGI=No gender indicated; T₁=Time 1 (Wave 4, spring 2016, last year of compulsory school, lower-secondary education), T₂=Time 2 (Wave 5, spring 2017, first year of company-based vocational education and training, upper-secondary education). For all 914 study participants, T₃ data was available

the missing response patterns' tests indicate that the estimation of missing values in conjunction with our longitudinal data produced reliable outcomes.

Instruments

We assessed lack of achievement-related variety, educational status aspiration (in lower-secondary education and at an early stage of company-based VET), qualitative workload, anticipated PEF, and school tracking in "Effects of Tracking." Information on the enrollment in a FVB2 program was taken from "Longitudinal Analyses in the Education Sector."

Enrollment in a FVB2 program

The enrollment in a FVB2 program was included in the analyses with one item. We checked whether federal VET diploma holders started or already completed a FVB2 program within the first 4.5 years after graduating from compulsory school, i.e., until December 2020 (T_3). We had information for all 914 study participants (missing values: $n = 0$, 0%). In a new categorical variable, we assigned study participants who started ($n = 23$) or already completed ($n = 119$) a FVB2 program the value 1 (*enrollment in FVB2 program*, $n = 142$ [16%]) and those study participants who did neither start nor have completed a FVB2 program the value 0 (*no enrollment in FVB2 program*, $n = 772$ [84%]).

Lack of achievement-related variety

The lack of achievement-related variety in the work environment was surveyed as a form of perceived discorrespondence between individual achievement-related needs and achievement-related supplies from the training company at the end of first year in company-based VET (T_2). Study participants completed a shortened version of the *Kurz-Fragebogen zur Arbeitsanalyse* ("Short Questionnaire F or Work Analysis"; Prümper et al. 1995) and responded to three items measuring the variety ("Vielseitigkeit") dimension on a 6-point Likert scale from 1 (*not true at all*) to 6 (*completely true*). They were asked to rate the extent they agreed with statements about their work in the training company. The item wording was slightly adapted from the original use to better grasp the achievement-related needs aspect and its correspondence to the achievement-related supplies at work. The items were: "I can make full use of my knowledge and skills at work," "My work is interesting," and "I can learn a lot at work." To measure discorrespondence, items were recoded (1 [*completely true*] to 6 [*not true at all*]) so that high values refer to a high achievement-related NSD. We labeled the concept "Lack of achievement-related variety T_2 ". In the survey, 227 individuals responded to the three items (missing values: $n = 687$, 75%; factor: $N = 227$, $M = 2.12$, $SD = 0.79$, $\alpha = 0.78$, range: 1.00–5.00). Prümper et al. (1995) assessed the variety scale with data from office workers and reported a Cronbach's alpha value of 0.73.

Educational status aspiration

We surveyed educational status aspirations as a form of perceived discorrespondence between individual status-related needs and status-related supplies from the current educational learning environment at the end of first year in company-based VET (T_2) and at the end of compulsory school in lower-secondary education (T_1). We asked study participants "What do you think is the highest level of education you will achieve in the

course of your life?”, and they chose one of the following options which represent graduation stages in the Swiss education system with differing educational status: 1 “completion of compulsory school”, 2 “completion of VET with a federal VET certificate (2-year VET program)”, 3 “completion of VET with a federal VET diploma (3- and 4-year VET program)”, 4 “federal vocational baccalaureate”, 5 “baccalaureate”, 6 “completion of a tertiary level B professional education and training program”, 7 “completion of studies at an university of applied sciences or university of teacher education”, 8 “completion of studies at an university or at a federal institute of technology”. In total, 873 individuals responded at T_1 (missing values: $n = 41$, 4%) and 248 individuals responded at T_2 (missing values: $n = 666$, 73%). In a new categorical variable for each of the two measurement waves, we assigned those study participants who answered with one of the first three options the value 0 (*aspired completion of VET without federal vocational baccalaureate or lower*, T_1 : $n = 367$ [42%], T_2 : $n = 63$ [25%]) and those participants who choose one of the remaining five options the value 1 (*aspired completion of [federal vocational] baccalaureate program or higher*, T_1 : $n = 506$ [58%], T_2 : $n = 185$ [75%]). Study participants with the value 1 had a high status-related NSD as they aspired to an educational status that exceeded the educational status provided by their current educational situation at an early stage of company-based VET. In the analyses, we labeled the concept “Educational status aspiration T_1 ” and “Educational status aspiration T_2 ” for T_1 and T_2 , respectively.

Qualitative workload

We surveyed qualitative workload as a form of perceived cognitive overload at the end of first year in company-based VET (T_2). From the *Kurz-Fragebogen zur Arbeitsanalyse* (“Short Questionnaire For Work Analysis”; Prümper et al. 1995), individuals in company-based VET responded to two items measuring qualitative workload on a 6-point Likert scale from 1 (*not true at all*) to 6 (*completely true*). Study participants were asked to rate the extent they agreed with statements about their work in the training company. Due to the low internal consistency value reported by Prümper et al. (1995), one item formulation was slightly adapted, and one item was replaced with a simplified version. Items used in the study were: “I feel overwhelmed at work.” and “I have to do things that are too complicated for me.” In the analyses, we labeled the concept “Qualitative workload T_2 ”. High values in qualitative workload refer to high perceptions of cognitive overload. Between 226 and 227 study participants responded to the two items (missing values: $n = 687$ – 688 , 75%; factor: $N = 227$, $M = 2.29$, $SD = 0.90$, $\alpha = 0.79$, range: 1.00–5.00). Prümper et al. (1995) assessed the Qualitative Workload Scale with data from office workers and reported internal consistency information for their items with a correlation coefficient of 0.40.

Anticipated PEF

Study participants reported their anticipated PEF as an indicator of successful career choice when they were in the last year of compulsory school in lower-secondary education (T_1). They completed the Anticipated Person–Job Fit Scale (Neuenschwander & Hofmann, 2022). All items started with “My post-compulsory/upper-secondary educational program...” and study participants were asked to rate five items on a 6-point Likert scale from 1 (*not true at all*) to 6 (*completely true*). Items were: “... is the best solution for me at the moment,” “... fits my academic abilities,” “... fits my vocational abilities,” “... fits

my personal interests,” and “... fits my personality”. High values in this variable referred to a high level of anticipated PEF. Between 879 and 884 study participants responded to the five items (missing values: $n = 30\text{--}35$, 3–4%; factor: $N = 884$, $M = 5.30$, $SD = 0.63$, $\alpha = 0.86$, range: 1.00–6.00). Nägele and Neuenschwander (2014) used a similar scale with Swiss data from a longitudinal sample of young people at the transition from compulsory school to VET. They reported Cronbach’s alpha value of 0.72.

School tracking

Individuals reported their school level in lower-secondary education with one item at the end of compulsory school (T_1). They were asked to answer the question “What school level are you attending now?” with response options differing depending on the canton. In total, 891 individuals provided information on their school level (missing values: $n = 23$, 3%). Responses were grouped into three categories: 1 (low track, $n = 203$), 2 (intermediate track, $n = 547$), and 3 (high track, $n = 141$). For this study, we dummy coded responses into a new variable as 0 (intermediate or high track, $n = 688$ [77%]) or 1 (low track, $n = 203$ [23%]).

Analytical procedure

We examined the research model using structural equation modeling (SEM) in Mplus (Version 8.1). SEM allows for latent variable estimation which builds on the use of multiple indicators that contain measurement errors. Latent variables are thus corrected for measurement errors which makes SEM a highly reliable analytical method. SEM enables researchers to analyze complex variable relationships (Skrondal and Rabe-Hesketh 2004). Using a simultaneous confirmatory factor analysis (SCFA), we tested measurement models for configural invariance. Configural invariance indicates a fit between the theoretical model and data and is required for SEM. We determined configural invariance using various model fit indices: the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). $CFI \geq 0.90$, $RMSEA < 0.08$ and $SRMR \leq 0.10$ are considered indications of an acceptable fit (Kline 2005). As a preliminary analysis, we then calculated bivariate correlations for each pair of variables in separate models in Mplus. Anticipated PEF, qualitative workload and lack of achievement-related variety were treated as latent variables with the measurement models from the SCFA. In SEM, we applied measurement models from the invariance test, and we specified paths in accordance with the proposed research model. We specified correlations between same-wave variables (Bollen and Noble 2011). Mediation hypotheses for anticipated PEF were tested under the mediation-only assumption after comparing a partially with a fully mediated model. We conducted a model comparison using a pooled Wald test of the constrained direct paths from anticipated PEF and from educational status aspiration in lower-secondary education to FVB2 program enrollment within the partial mediation model. The pooled Wald test indicated that the direct paths were not statistically significant, $\chi^2(2) = 4.01$, $p = .134$. The direct path from anticipated PEF to FVB2 program enrollment was $\beta = -0.13$, 95% CI $[-0.25, 0.00]$, $p = .051$, indicating a negligible effect; the direct path from educational status aspiration in lower-secondary education to FVB2 program enrollment was $\beta = 0.13$, 95% CI $[-0.15, 0.42]$, $p = .363$, also indicating a negligible effect. Given the non-significant Wald test and the negligible magnitude of the direct path estimate, the more parsimonious full mediation

model was retained as the final model. Consequently, we constrained the direct paths from anticipated PEF and from educational status aspiration in lower-secondary education to enrollment in a FVB2 program at zero. We used the weighted least square mean and variance adjusted estimation with theta parametrization to estimate SEM parameters. For the SCFA and bivariate correlation analyses, we used Mplus' default maximum likelihood estimator. To deal with missing values, we imputed data 20 times in R using the MICE package. All study variables were entered at the item level in the imputation model; no auxiliary variables were included. All analyses were based on these imputed data. The direct estimation of missing values in Mplus would have resulted in a smaller analytical sample due to cases with missings on predictor variables. We used the same index criteria to determine model fit for SEM as we did for the configural invariance test. Indirect effects were tested in Mplus with the "model indirect" feature. We reported all correlation and regression coefficients with two-tailed p values.

Results

Test of configural invariance

We tested the measurement models for configural invariance using SCFA. The baseline model fit the data, $\chi^2(32, N=914)=91.26$, $p < .001$, CFI=0.95, RMSEA=0.05, SRMR=0.04, which indicates configural invariance.

Bivariate correlations

Table 2 reports bivariate correlations for study variables. The enrollment in a FVB2 program had a statistically significant correlation with all study variables except for anticipated PEF, $r(912) = -0.05$, $p = .165$. Positive correlations occurred with lack of achievement-related variety, $r(912) = 0.16$, $p = .022$; educational status aspiration T_2 , $r(912) = 0.21$, $p < .001$; and educational status aspiration T_1 , $r(912) = 0.21$, $p < .001$. Negative correlations occurred with qualitative workload, $r(912) = -0.13$, $p = .021$, and school tracking, $r(912) = -0.21$, $p < .001$.

Testing the research model with SEM

We fit the structural equation model to the data, $\chi^2(62, N=914)=373.97$, CFI = 0.91, RMSEA = 0.07, SRMR = 0.06. Figure 1 shows the model results.

Table 2 Correlations for Study Variables

Variable	1	2	3	4	5	6
1. Enrollment in a FVB2 program T_3^a	—					
2. Lack of achievement-related variety T_2	0.16*	—				
3. Educational status aspiration T_2^b	0.21***	0.12	—			
4. Qualitative workload T_2	-0.13*	0.17*	-0.04	—		
5. Anticipated PEF T_1	-0.05	-0.27***	0.11*	-0.19**	—	
6. Educational status aspiration T_1^b	0.21***	-0.09	0.43***	-0.02	0.05	—
7. School tracking T_1^c	-0.21***	-0.13	-0.19***	-0.09	-0.01	-0.22***

^a 0=no enrolling and 1=enrolling, ^b 0=aspired completion of VET program without federal vocational baccalaureate or lower and 1=aspired completion of (federal vocational) baccalaureate program or higher, ^c 0=intermediate or high track and 1=low track. FVB2=consecutive federal vocational baccalaureate, PEF=person-environment fit, T_1 =Time 1 (spring 2016, end of last year in compulsory school, lower-secondary education), T_2 =Time 2 (spring 2017, end of first year in company-based VET, upper-secondary education), T_3 =Time 3 (between August 2019 and December 2020, upper-secondary education). $N=914$. Variables are metrically scaled unless otherwise stated

* $p < .05$ (two-tailed), ** $p < .01$ (two-tailed), *** $p < .001$ (two-tailed)

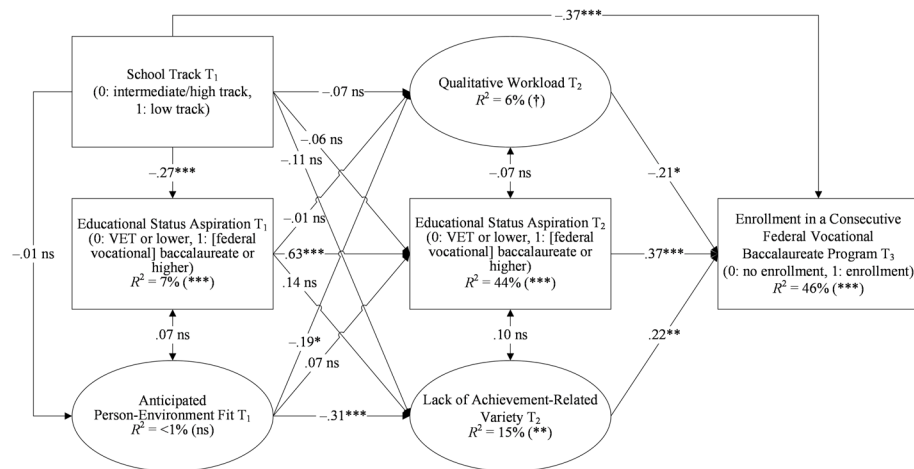


Fig. 1 SEM to Predict the Enrollment in a FVB2 Program. Note. Standardized coefficients; measurement models and one correlation (qualitative workload T₂ with lack of achievement-related variety T₂, $-.013$ ns) are not illustrated for better readability. $N = 914$; T₁ = Time 1 (spring 2016, end of last year in compulsory school, lower-secondary education), T₂ = Time 2 (spring 2017, end of first year in company-based VET, upper-secondary education), T₃ = Time 3 (between August 2019 and December 2020, upper-secondary education). R² = explained variance. † $p < .10$ (two-tailed), * $p < .05$ (two-tailed), ** $p < .01$ (two-tailed), *** $p < .001$ (two-tailed)

Both lack of achievement-related variety and educational status aspiration T₂ had a statistically significant positive direct effect on enrolling in a FVB2 program ($\beta = 0.22$, 95% CI [0.06, 0.39], $p = .009$ and $\beta = 0.37$, 95% CI [0.19, 0.54], $p < .001$, respectively; Hypotheses 1 and 2 are supported). Qualitative workload had a statistically significant negative direct effect on enrolling in a FVB2 program ($\beta = -0.21$, 95% CI $[-0.38, -0.04]$, $p = .018$; Hypothesis 3 is supported). Anticipated PEF had a statistically significant negative direct effect on lack of achievement-related variety ($\beta = -0.31$, 95% CI $[-0.45, -0.18]$, $p < .001$; Hypothesis 4a is supported) but did not have a statistically significant positive direct effect on educational status aspiration T₂ ($\beta = 0.07$, 95% CI $[-0.05, 0.19]$, $p = .257$; Hypothesis 4b is rejected). In line with Hypothesis 4c, anticipated PEF had a statistically significant negative direct effect on qualitative workload ($\beta = -0.19$, 95% CI $[-0.35, -0.02]$, $p = .027$). Anticipated PEF had a statistically significant negative indirect effect on enrolling in a FVB2 program, simply mediated by lack of achievement-related variety ($\beta_{\text{Ind}} = -0.07$, 95% CI $[-0.13, -0.01]$, $p = .028$; Hypothesis 5a is supported), but did not have a statistically significant positive indirect effect on enrolling in a FVB2 program, simply mediated by educational status aspiration T₂ ($\beta_{\text{Ind}} = 0.03$, 95% CI $[-0.02, 0.07]$, $p = .270$; Hypothesis 5b is rejected), and simply mediated by qualitative workload ($\beta_{\text{Ind}} = 0.04$, 95% CI $[-0.01, 0.08]$, $p = .131$; Hypothesis 5c is rejected). Of the two control variables in lower-secondary education, educational status aspiration T₁ had a statistically significant positive direct effect on educational status aspiration T₂ ($\beta = 0.63$, 95% CI [0.48, 0.78], $p < .001$) but did not have a statistically significant effect on lack of achievement-related variety and qualitative workload ($\beta = 0.14$, 95% CI $[-0.06, 0.34]$, $p = .165$ and $\beta = -0.01$, 95% CI $[-0.20, 0.19]$, $p = .974$, respectively). School tracking in lower-secondary education had a statistically significant negative direct effect on enrolling in a FVB2 program ($\beta = -0.37$, 95% CI $[-0.53, -0.21]$, $p < .001$): Compared to intermediate and high track students, low-track students in lower-secondary education were less likely to enroll in a FVB2 program. There was a statistically significant negative direct effect of school tracking on educational status aspiration T₁ ($\beta = -0.27$, 95% CI

$[-0.35, -0.19]$, $p < .001$) but not on anticipated PEF, lack of achievement-related variety, educational status aspiration T_2 and qualitative workload ($\beta = -0.01$, 95% CI $[-0.08, 0.06]$, $p = .797$, $\beta = -0.11$, 95% CI $[-0.29, 0.07]$, $p = .243$, $\beta = -0.06$, 95% CI $[-0.19, 0.07]$, $p = .330$, and $\beta = -0.07$, 95% CI $[-0.26, 0.12]$, $p = .459$, respectively). Overall, the explained variance in enrollment in a FVB2 program was 46%.

Discussion

Summary and interpretation

FVB2 programs not only offer an important pathway for vocational learners to enter a university of applied sciences and obtain unique vocational training at the tertiary level. They also give vocational learners the opportunity to make a desired career adjustment and achieve a federal vocational baccalaureate. In the present study, we investigated the probability of enrolling in a FVB2 program within the first 4.5 years after the completion of compulsory school among federal VET graduates. Two research questions guided the endeavor: (1) To what extent do determinants at an early stage of company-based VET predict the probability of enrolling in a FVB2 program?, and (2) To what extent does successful career choice in lower-secondary education predict the probability of enrolling in a FVB2 program? By pursuing those two research questions, this study made two important contributions: First, it added to the scarce research on FVB2 program enrollment with determinants measured at an early stage of company-based VET. Second, it advanced transition research by linking the career choice process with subsequent career adjustments through the inclusion of a subjective indicator of successful career choice.

Overall, our model worked well with an explained variance of 46% in FVB2 program enrollment using four predictors. Findings have shown positive effects of lack of achievement-related variety at the workplace and educational status aspiration in VET on FVB2 program enrollment; a negative effect occurred for qualitative workload. Regarding our first research question, both NSD measures and cognitive overload were relevant determinants at an early stage of company-based VET for our career adjustment variable. In addition, as anticipated PEF had a significant negative indirect effect, simply mediated by lack of achievement-related variety, successful career choice in lower-secondary education also was a relevant factor for enrolling in a FVB2 program. This finding relates to our second research question which links career adjustment with career choice in lower-secondary education. Overall, results highlight that the enrollment in a FVB2 program is prepared well in advance.

The significant effects of NSD measures on FVB2 program enrollment are in line with previous research. Investigating occupational change and undertaking further education as forms of career adjustment, Medici et al. (2020) and Hofmann et al. (2014), respectively, have indicated positive effects of NSD measures as well. Regarding the negative effect of qualitative workload on FVB2 program enrollment, previous studies have reported similar findings: Investigating emotional exhaustion, Diestel and Schmidt (2009) outlined positive correlations between emotional exhaustion and qualitative workload. NSD measures and cognitive overload have been shown to be important determinants of career adjustment despite our exclusion of VET dropouts from the study sample. NSD measures and cognitive overload are likely associated with dropout, which means that effect sizes are potentially higher in reality than found in this study.

Concerning our findings related to successful career choice in lower-secondary education, only one of the three tested mediation hypotheses has been supported. In line with findings from Hofmann et al. (2021), there was a significant negative indirect effect of anticipated PEF on FVB2 program enrollment via lack of achievement-related variety: Those with high levels of anticipated PEF were less likely to report high levels of NSD in the form of lack of achievement-related variety which in turn positively affected career adjustment behavior. However, this mechanism was not found for the status-related NSD, measured by educational status aspiration. There was no significant direct effect of anticipated PEF on educational status aspiration at an early stage of company-based VET, and, there was no positive indirect effect of anticipated PEF on the probability of enrolling in a FVB2 program. Based on our bivariate correlation results indicating a significantly positive interrelationship between anticipated PEF and educational status aspiration at an early stage of company-based VET, we attribute the insignificant indirect effect in the SEM to the limited effect size of the path from anticipated PEF to educational status aspiration at an early stage of company-based VET. Regarding the insignificant indirect effect of anticipated PEF on FVB2 program enrollment via qualitative workload, providing explanations is more challenging. Anticipated PEF significantly predicted qualitative workload which in turn affected the enrollment in a FVB2 program, with both effects pointing in the expected direction. Despite support for our hypothesis from previous research (e.g., Findeisen et al., 2022), our finding suggests that anticipated PEF might be a better predictor for discrepancies regarding needs–supplies than vocational learners’ ability assessment in relation to the performance prerequisites of the VET environment. Replacing the PEF scale may result in effects that are more consistent with expectations. This study employed a 5-item scale which comprised three items on needs–supplies (dis)correspondence and two items on ability–ability requirement (mis)fit. Using a fit measure in lower-secondary education that more directly captures ability–ability requirement discrepancies has the potential to result in significant indirect effects of anticipated PEF on FVB2 program enrollment.

Strengths and limitations

In the present study, we combined multiwave data from two Swiss studies to ensure an adequate sample size to apply SEM. Despite these strengths, there are some limitations.

First, we have used the TWA as a theoretical foundation which postulates rather immediate career adjustment behaviors after the occurrence of discrepancies. In the present study, at least 2 years passed between the measurement of determinants and career adjustment in the form of FVB2 program enrollment. We reason that the perceived discrepancies in VET are less a direct cause of career adjustment but rather mark the beginning of a reflective process about one’s career plans. Future studies may extend the TWA and include planned enrollment as a form of intended career adjustment behavior to disentangle the mechanisms that lead to FVB2 program entries.

Second, some hypotheses relied on a small number of prior studies, and some of those studies were only partially linked to the hypotheses. Hypotheses that are based on limited prior evidence carry some replication concerns and have a risk to produce findings with reduced generalizability. By including those hypotheses and testing them, we aimed at addressing the limited state of research in this area.

Third, since we only observed FVB2 enrollment up to December 2020 (i.e., 4.5 years after leaving compulsory school), one of our sample selection criteria—VET completers only—excluded vocational learners who were still in VET in December 2020 because they did not transition directly from lower- to upper-secondary education. Those vocational learners potentially enrolled in a FVB2 program after December 2020. Hofmann et al. (2025) have shown that lower-track adolescents are more likely to have a delayed VET entry. Given the finding of this study that students at lower tracks are less likely to enroll in a FVB2 program, the enrollment rate might be slightly skewed upward. However, also related to sample selection, it is more likely that our study sample consisted of VET completers from a 3-year VET program than from a 4-year VET program. VET programs with a duration of 4 years often place high academic requirements, and Hänni et al. (2022) have shown that learning a profession with high academic requirements increases the likelihood of enrolling in a FVB2 program. The underrepresentation of VET completers from a 4-year VET program in our sample may have biased the number of enrollments in a FVB2 program towards the lower end. Future longitudinal studies should collect data that cover a longer period of time between the completion of compulsory schooling and enrollment in a FVB2 program to avoid biases of these kinds.

Fourth, the study did not rely on instruments that are situated within the theoretical tradition of the TWA. To improve construct validity, researchers may consider the use of instruments that are more closely aligned with the TWA like the Minnesota Importance Questionnaire or Super's Work Values Inventory (Swanson and Schneider 2020).

Fifth, related to variable inclusion, future studies may include personality traits like flexibility. According to TWA, flexibility moderates the relationship between perceived NSD and individual career adjustment (Swanson and Schneider 2020). Also, we did not control for the cantonal admission requirements to enroll in a FVB2 program despite evidence of its relevance in Hänni et al. (2022). The reason for excluding this variable was that adolescents spread across twelve different cantons of residence at the time of VET completion, with some cantons only being represented by a few adolescents. A larger sample size would have been necessary to include this variable in the analyses. The inclusion of cantonal admission requirements in the analytical model would have improved the explained variance in FVB2 program enrollment.

Sixth, a substantial proportion of participants did not provide data at the second measurement point, resulting in considerable missingness for the T_2 predictors. Although we used multiple imputation to address missing data, the validity of this approach depends on the assumption that the missingness can be adequately explained by the variables included in the imputation model. The missing response patterns test indicated statistically significant effects for some study variables. Although these effects were small, the findings involving T_2 predictors should be interpreted with some caution.

Implications

This study demonstrated the importance of NSD and perceived cognitive overload at an early stage of company-based VET for the enrollment in a FVB2 program. Although the enrollment in a FVB2 program may not yet be irrevocably decided at an early phase of VET, the foundations for the final decision are already laid at this stage. Therefore, we recommend that career counselors and workplace trainers support learners in realistically assessing their abilities and needs as well as the requirements and supplies of their

vocational settings. Those actions help ensure that the most suitable vocational learners enroll in a FVB2 program.

Analyses further evidenced the predictive effects of successful career choice in lower-secondary education in the form of anticipated PEF. Anticipated PEF reduced the probability of perceived achievement-related NSD and cognitive overload in VET, and also indirectly affected FVB2 program enrollment. To foster anticipated PEF, previous research pointed to the effectiveness of career-related parental support (Neuenschwander & Hofmann, 2022) and positive student–teacher relationships in lower-secondary education (Findeisen et al., 2022). Accordingly, both parents and teachers can help to strengthen the anticipated PEF among compulsory school students and, in consequence, minimize perceived discrepancies in VET.

Although only used as a control variable, it has been shown that school tracking in lower-secondary education has direct consequences for FVB2 program enrollment. The selection process at the transition from primary to lower-secondary education (at around the age of 12) predicts the likelihood of FVB2 program enrollment about seven years later. The selection process is thus of great importance and all people involved (e.g., parents, teachers, students) are urged to do their part to enable a fair process (Neuenschwander, 2013).

Conclusions

Upon entering a FVB2 program, vocational learners experience a marked increase in both academic and vocational demands compared to their prior VET programs. When vocational learners perceive, at an early stage of company-based VET, that their workplace does not offer the level of academic or vocational challenge they seek, enrollment in a FVB2 program may serve as a meaningful career adjustment to address perceived discrepancies. By contrast, learners who made successful career choices and who perceived high levels of anticipated PEF during lower-secondary education are less likely to experience a lack of achievement-related variety in the VET workplace and, consequently, are less likely to consider enrollment in a FVB2 program. Status-related NSD in VET, perceived cognitive overload at the workplace, and tracking at the lower-secondary school level also determine the enrollment in a FVB2 program.

Author contributions

J.H. was a major contributor in making methodological decisions, conducting formal analyses, and writing the original draft. M.N. managed project administration and funding acquisition. All authors contributed to the conceptualization of the study and helped review and edit the manuscript. All authors read and approved the final manuscript.

Funding

The Swiss State Secretariat for Education, Research, and Innovation (Grant ID: 1315000504) funded this research.

Data availability

Data from the research project “Effects of Tracking” were deposited into the Swissbase repository under accession number 12206 and are available at the following URL: <https://www.swissbase.ch/en/catalogue/studies/12206/15953/overview>. Data from the research project “Longitudinal Analyses in the Education Sector” that support the findings of this study are available from the Swiss Federal Statistical Office, but restrictions apply to the availability of these data, which were used under license for the current study and so are not publicly available.

Declarations

Ethics approval and consent to participate

This study was reviewed by the Institutional Review Board of the University of Applied Sciences and Arts Northwestern Switzerland and was granted exempt status as minimal-risk research. The study was conducted in accordance with the ethical principles outlined by the institutional review board. Although the study qualified for exemption, written informed consent was obtained from all participants prior to their inclusion in the study.

Competing interests

The authors declare no competing interests.

Received: 19 January 2026 / Accepted: 7 September 2026

Published online: 21 September 2026

References

- Ackermann T, Benz R (2023) Diverging Educational Aspirations Among Compulsory School-Leavers in Switzerland. *Swiss J Sociol* 49(2):339–366. <https://doi.org/10.2478/sjs-2023-0018>
- Basler A, Kriesi I (2019) Adolescents' development of occupational aspirations in a tracked and vocation-oriented educational system. *J Vocat Behav* 115:1–14. <https://doi.org/10.1016/j.jvb.2019.103330>
- Bittmann F, Schindler S (2021) Analysing Diversion Processes in German Secondary Education: School-Track Effects on Educational Aspirations. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 73:231–257. <https://doi.org/10.1007/s11577-021-00789-1>
- Bollen KA, Noble MD (2011) Structural equation models and the quantification of behavior. *Proc Natl Acad Sci* 108(3):15639–15646. <https://doi.org/10.1073/pnas.1010661108>
- Bosset I, Hofmann C, Duc B, Lamamra N, Krauss A (2022) Premature interruption of training in Swiss 2-year apprenticeship through the lens of fit. *Schweizerische Z für Bildungswissenschaften* 44(2):277–290. <https://doi.org/10.25656/01:25423>
- Dawis RV, Lofquist LH (1984) *A Psychological Theory of Work Adjustment: An Individual-differences Model and Its Applications*. University of Minnesota Press
- Dette DE, Abele AE, Renner O (2004) Zur Definition und Messung von Berufserfolg: Theoretische Überlegungen und meta-analytische Befunde zum Zusammenhang von externen und internen Laufbahnerfolgsmaßen [On the definition and measurement of career success: Theoretical considerations and meta-analytical findings on the relationship between external and internal measures of career success]. *Z für Personalpsychologie* 3(4):170–183. <https://doi.org/10.1026/1617-6391.3.4.170>
- Diestel S, Schmidt KH (2009) Mediator and moderator effects of demands on self-control in the relationship between work load and indicators of job strain. *Work Stress* 23(1):60–79. <https://doi.org/10.1080/02678370902846686>
- Findeisen, S., Jüttler, A., Neuenschwander, M. P., & Schumann, S. (2022). Transition from School to Work – Explaining Persistence Intention in Vocational Education and Training in Switzerland. *Vocations and Learning*, 15, 129–154. <https://doi.org/10.1007/s12186-021-09282-4>
- Gonon P (2017) Quality Doubts as a Driver for Vocational Education and Training (VET) Reforms – Switzerland's Way to a Highly Regarded Apprenticeship System. In M. Pilz (Ed.), *Vocational Education and Training in Times of Economic Crisis. Technical and Vocational Education and Training: Issues, Concerns and Prospects* (pp. 341–354). Springer. https://doi.org/10.1007/978-3-319-47856-2_18
- Graham JW (2009) Missing data analysis: making it work in the real world. *Ann Rev Psychol* 60:549–576. <https://doi.org/10.1146/annurev.psych.58.110405.085530>
- Hänni M, Kriesi I, Neumann J (2022) Entry into and Completion of Vocational Baccalaureate School in Switzerland: Do Differences in Regional Admission Regulations Matter? *Educ Sci* 12(3):1–19. <https://doi.org/10.3390/educsci12030188>
- Neuenschwander, M. P, Hofmann, J., & Ramseier, L. (2024) WiSel. Research Project Website. www.wisel-studie.ch. Accessed 19 January 2026.
- Hofmann C, Stalder BE, Tschan F, Häfeli K (2014) Support from teachers and trainers in Vocational education and training: The pathways to career aspirations and further career development. *Int J Res Vocat Educ Train* 1(1):1–20. <https://doi.org/10.13152/IJRVET.1.1.5>
- Hofmann C, Häfeli K, Müller X, Krauss A (2021) Transition From Low-Threshold Vocational Education and Training to Work in Switzerland: Factors Influencing Objective and Subjective Career Success. *Int J Res Vocat Educ Train* 8(2):136–159. <https://doi.org/10.13152/IJRVET.8.2.1>
- Hofmann, J., Neuenschwander, M. P. & Ramseier, L. (2025). Lacking a vocational upper-secondary diploma: motivational and proximal contextual predictors in primary and lower-secondary education. *Empirical Research in Vocational Education and Training*, 17(2), 1–25. <https://doi.org/10.1186/s40461-025-00177-5>
- Holtmann AC, Solga H (2023) Dropping or stopping out of apprenticeships: the role of performance- and integration-related risk factors. *Z für Erziehungswissenschaft* 26:469–494. <https://doi.org/10.1007/s11618-023-01151-1>
- Kline RB (2005) *Principles and practice of structural equation modeling*, 2nd edn. The Guilford Press
- Kristof-Brown A, Guay RP (2011) Person–environment fit. In S. Zedeck (Ed.), *APA handbook of industrial and organizational psychology, Vol. 3. Maintaining, expanding, and contracting the organization* (pp. 3–50). American Psychological Association. <https://doi.org/10.1037/12171-001>
- Medici G, Tschopp C, Grote G, Hirschi A (2020) Grass roots of occupational change: Understanding mobility in vocational careers. *J Vocat Behav* 122:1–14. <https://doi.org/10.1016/j.jvb.2020.103480>
- Nägele, C., & Neuenschwander, M. P. (2014). Adjustment processes and fit perceptions as predictors of organizational commitment and occupational commitment of young workers. *Journal of Vocational Behavior*, 85(3), 385–393. <https://doi.org/10.1016/j.jvb.2014.08.011>
- Neuenschwander, M. P., & Hofmann, J. (2022). Career Decision, Work Adjustment, and Person–Job Fit of Adolescents: Moderating Effects of Parental Support. *Journal of Career Development*, 49(1), 76–89. <https://doi.org/10.1177/0894845321995960>
- Neuenschwander, M. P. (2013). Selektion beim Übergang in die Sekundarstufe I und in den Arbeitsmarkt im Vergleich [Comparison of selection at the transition to lower secondary education and to the labor market]. In M. P. Neuenschwander (Hrsg.), *Selektion in Schule und Arbeitsmarkt* (S. 63–97). Rüegger.
- Ng TWH, Feldman DC (2014) Subjective career success: A meta-analytic review. *J Vocat Behav* 85(2):169–179. <https://doi.org/10.1016/j.jvb.2014.06.001>
- Ng TWH, Eby LT, Sorensen KL, Feldman DC (2005) Predictors of objective and subjective career success. A meta-analysis. *Pers Psychol* 58(2):367–408. <https://doi.org/10.1111/j.1744-6570.2005.00515.x>

- Patton W, Creed P (2007) The Relationship Between Career Variables and Occupational Aspirations and Expectations for Australian High School Adolescents. *J Career Dev* 34(2):127–148. <https://doi.org/10.1177/0894845307307471>
- Prümper J, Hartmannsgruber K, Frese M (1995) KFZA – Kurzfragebogen zur Arbeitsanalyse [KFZA – Short questionnaire on work analysis]. *Z für Arbeits- und Organisationspsychologie* 39:125–132
- Skrondal A, Rabe-Hesketh S (2004) Generalized Latent Variable Modeling: Multilevel, Longitudinal, and Structural Equation Models. Chapman and Hall/CRC. <https://doi.org/10.1201/9780203489437>
- Swanson JL, Schneider M (2020) The theory of work adjustment. In S. D. Brown & R. W. Lent (Eds.), *Career development and counseling: Putting theory and research to work* (3rd ed., pp. 33–60). Wiley. <https://doi.org/10.1002/9781394258994.ch2>
- Swiss Conference of Cantonal Ministers of Education (2024) Upper secondary level. Swiss Conference of Cantonal Ministers of Education. https://www.edk.ch/en/education-system-ch/post-compulsory/upper-secondary?set_language=en Accessed 19 January 2026
- Swiss Conference of Cantonal Ministers of Education (2025) Tertiary level. Swiss Conference of Cantonal Ministers of Education. https://www.edk.ch/en/education-system-ch/post-compulsory/tertiary?set_language=en Accessed 19 January 2026
- Swiss Federal Statistical Office (2024a) Die Schweiz in Zahlen – Statistisches Jahrbuch 2024 [Switzerland in figures – Statistical Yearbook 2024]. Swiss Federal Statistical Office. <https://dam-api.bfs.admin.ch/hub/api/dam/assets/32906018/master> Accessed 19 January 2026
- Swiss Federal Statistical Office (2024b). Längsschnitanalysen im Bildungsbereich [Longitudinal Analyses in the Education Sector]. Research Project Website. Accessed 19 January 2026 <https://www>
- Swiss Federal Statistical Office (2025a) Erwerbseinkommen [Earned income]. Swiss Federal Statistical Office. <https://www.bfs.admin.ch/bfs/de/home/statistiken/bildung-wissenschaft/eintritt-arbeitsmarkt/tertiaerstupe-hochschulen/erwerbseinkommen.html> Accessed 19 January 2026
- Swiss Federal Statistical Office (2025b) Relatives Erwerbseinkommen [Relative earned income]. Swiss Federal Statistical Office. <https://www.bfs.admin.ch/bfs/de/home/statistiken/bildung-wissenschaft/bildungsindikatoren/indicators/erwerbseinkommen.html> Accessed 19 January 2026
- Swiss Federal Statistical Office (2026) Statistik der Berufsmaturitätsabschlüsse 2025 [Statistics on Federal Vocational Baccalaureate Diplomas 2025]. Swiss Federal Statistical Office. <https://www.bfs.admin.ch/bfs/en/home/news/whats-new.assetdetail.36665062.html> Accessed 21 August 2026
- Swiss State Secretariat for Education, Research and Innovation (2022) Vocational and Professional Education and Training in Switzerland. Facts and Figs. 2022. Swiss State Secretariat for Education, Research and Innovation. https://edudoc.ch/record/224873/files/fakten_zahlen_bb_e.pdf Accessed 21 August 2026
- Trede I, Hänni M, Leumann S, Neumann J, Gehret A, Schweri J, Kriesi I (2020) Berufsmaturität. Bildungsverläufe, Herausforderungen und Potenziale. OBS EHB Trendbericht 4 [Vocational baccalaureate. Educational pathways, challenges, and potential. OBS EHB Trend Report 4]. Eidgenössisches Hochschulinstitut für Berufsbildung EHB. https://www.ehb.swiss/sites/default/files/trendbericht_4_de_v1-web.pdf Accessed 19 January 2026
- Wright TA, Cropanzano R (1998) Emotional exhaustion as a predictor of job performance and voluntary turnover. *J Appl Psychol* 83(3):486–493. <https://doi.org/10.1037/0021-9010.83.3.486>
- Zeddies V, Daniel A, Kühne S, Maaz K (2025) Herkunft, Schulform, Wunschberuf – Wie sich berufliche Aspirationen in Abhängigkeit von Sozialstatus und Schulkontext entwickeln [Origin, type of school, desired occupation – How career aspirations develop depending on social status and school context]. *Z für Erziehungswissenschaft* 28(1):125–149. <https://doi.org/10.1007/s11618-024-01280-1>

Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.