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Opportunities or new disadvantages? The long-term impact of curriculum modifications and accommodations on post-compulsory educational trajectories

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Abstract

This study examines the long-term effects of two different integrative school measures in lower secondary education — reduced individual learning objectives and accommodations — on post-compulsory educational trajectories in Switzerland. Based on data from the Bernese Longitudinal Study on Integrative School Measures (BELIMA; $N=2297$), this study examines how these measures influence students' transitions to upper secondary education, focusing on the level of academic demands and educational discontinuities (delayed entry and apprenticeship contract terminations). Through propensity score matching, students with and without integrative measures were compared while controlling for various factors including school type, academic performance, intelligence, and social background. Results show that students with reduced learning objectives were significantly more likely to enrol in educational programs with lower academic demands compared to similar students without this measure. However, they did not experience more discontinuous pathways. No effects were found for students with accommodations, neither regarding the level of academic demands nor educational discontinuities. These findings suggest that reduced learning objectives may limit educational opportunities beyond compulsory education, potentially due to their stigmatizing effects. This raises important questions about how integrative measures can be implemented to support students effectively while avoiding unintended negative consequences for their educational trajectories.

Keywords Integrative school measures, Reduced learning objectives, Accommodations, Special educational needs, Educational trajectories, Transition from lower to upper secondary education, Educational inequality

Introduction

In recent years, education has shifted from separation to inclusion. This shift has been driven by various international (UNESCO 1994; UN General Assembly 2006; UN 2015), and national (EDK 2007; UN-BRK 2014) initiatives and legal frameworks, along with



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research showing that inclusive school settings benefit both the social and academic outcomes of students with disabilities (Krämer et al. 2021; Dalgaard et al. 2022). Inclusive education means that all students, regardless of disability, gender, social or national origin, learn together in the same classroom environment and receive appropriate support (UN General Assembly 2006; Committee on the Rights of Persons with Disabilities 2016). The focus is on ensuring that all students can reach their full academic potential and achieve social participation. This requires both individualized and differentiated learning environments, as well as the promotion of social learning processes among students (Zurbriggen and Venetz 2016; Vock and Gronostaj 2017; Köpfer et al. 2021).

In line with this, over the last 15 years, Switzerland's rate of students educated in mainstream classes has increased from 94,7 to 97% (BFS 2020). This increase is primarily due to the closure of special classes within mainstream schools, while special schools for students with more severe disabilities have remained unaffected (BFS 2020). Consequently, more students with mild disabilities are now included in mainstream classes. To support their inclusion, various *integrative school measures* (ISM) have been introduced, such as *reduced individual learning objectives* (RILO), *accommodations* (AC) and *support from a special education teacher* (SET; Sahli Lozano et al. 2021; Bildungs- und Kulturdirektion des Kantons Bern 2024).

To date, no studies have longitudinally and comprehensively examined the long-term effects of ISM in a differentiated manner. The Bernese Longitudinal Study on Integrative School Measures (BELIMA; Sahli Lozano et al. 2022b) is the first to do so.

Empirical findings indicate that ISM are allocated with social and regional selectivity (Sahli Lozano et al. 2021, 2023c). In particular, the measure RILO has been found to have a negative impact on students' self-perception (Sahli Lozano et al. 2017), assessments of their performance potential (Sahli Lozano et al. 2022a), and academic development (Sahli Lozano et al. 2023a).

How these measures affect post-compulsory education remains largely unknown. The transition from lower to upper secondary education is a critical developmental task for adolescents, laying the foundation for their future career success and overall life trajectory (Blossfeld 1985; Glauser 2015). Disrupted transitions, such as delayed entry into post-compulsory education or a non-linear educational pathway, can reduce the opportunities of successfully completing upper secondary education (Stalder 2012; Gomensoro et al. 2017; Gomensoro and Meyer 2022). In addition to well-known influencing factors such as gender, social and national origin, and the type of school attended in lower secondary education (e.g. Glauser 2015; Becker and Glauser 2018; Gomensoro and Meyer 2022), various ISM could impact the transition to different extents due to their varying degrees of stigmatization potential similar to that observed in special educational measures. Previous studies have shown that, even when controlling for academic performance and socio-economic background, special class placement negatively affects students' transitions into post-compulsory education when compared to regular class placement (Sahli Lozano 2012; Holtmann et al. 2017). Based on these findings, the present study seeks to investigate whether in-class differentiation measures produce comparable effects and to determine whether various types of these measures differ in their impact on students' post-compulsory educational trajectories.

Integrative school measures in Switzerland

In the Swiss educational system, a distinction is made between low-threshold ISM for students with milder disabilities and more intensive interventions for those with more severe disabilities (EDK 2007). The present article focuses on two ISM applied in the low-threshold area, which include RILO and AC. How these measures are named, assigned and implemented varies between cantons in Switzerland (Sahli Lozano et al. 2021) and between countries. Nevertheless, these measures share common characteristics across different educational contexts (e.g. Gresch et al. 2017; Conderman et al. 2017; Sahli Lozano et al. 2021).

In the canton of Bern, RILO are given to students with low general cognitive ability, as assessed and determined by the teacher. The learning objectives in specific subjects are adjusted, meaning they are reduced for students who would not otherwise achieve the standard learning objectives. No diagnosis is required to award RILO unless the learning objectives are reduced in more than two subjects. Additionally, RILO are noted in the student's school report (Bildungs- und Kulturdirektion des Kantons Bern 2024).

AC in contrast are provided for students with average or above-average cognitive ability but a specific disability, for example attention deficit hyperactivity disorder, autism, or dyslexia. The student's learning objectives are not reduced; instead, the students work on the same content as their peers but are provided with specific aids, such as spell-checking software, extra time, and oral instead of written tasks. These accommodations are intended to compensate for the disadvantages posed by the disability. In most cases, a diagnosis is required to receive AC in the canton of Bern (Bildungs- und Kulturdirektion des Kantons Bern 2024). Unlike RILO, AC are not noted in the student's report. For this reason, the two measures are very different and, formally, RILO and AC cannot be awarded simultaneously.

RILO and AC can be implemented independently or in combination with SET (Bildungs- und Kulturdirektion des Kantons Bern 2024). A diagnosis is not required to receive SET, and it is not noted on the student's report. Furthermore, the students who benefit from SET represent a very heterogeneous group, particularly in terms of their performance characteristics (Sahli Lozano et al. 2023b). The implementation of SET varies considerably, both between cantons, within the same school district, and even from class to class. Variations can be observed in the number of lessons of SET and whether the support is provided on a one-to-one basis. This variability can be attributed to the high degree of autonomy granted to the regions in educational matters, as well as the lack of uniform guidelines (Sahli Lozano et al. 2023b). Consequently, it is difficult to isolate the impact of this measure and, for the reasons outlined above, SET is included in the analysis of this study as a potential confounding variable.

Overall, there is evidence to suggest that the various ISM may be exacerbating educational inequalities. In the BELIMA study, it was shown that these ISM are allocated based on social background (Sahli Lozano et al. 2023c). For instance, students from families with a lower socioeconomic status were more likely to receive measures such as RILO and SET. In contrast, students from families with higher socioeconomic status were more likely to benefit from AC, even when controlling for individual cognitive and academic performance characteristics (Sahli Lozano et al. 2023c). This is particularly relevant as negative effects were found for RILO, whereas no such effects were identified for AC. Students with RILO are perceived by teachers as lower achievers compared to

similar students without RILO, indicating a potential labelling bias (Greber et al. 2017; Sahli Lozano et al. 2022a). Additionally, these students tend to have lower self-evaluations of their abilities and tend to make less academic progress than their peers without RILO (Sahli Lozano et al. 2023a).

Transition from lower to upper secondary education: overview of the Swiss education system and current findings

To date, research on the long-term effects of ISM remains limited. Specifically, we know little about how ISM at lower secondary education influence students' transitions to upper secondary education and their subsequent educational trajectories. The transition from lower to upper secondary education is a key moment in young people's lives, shaping their future career opportunities and life paths (Blossfeld 1985; Gomensoro et al. 2017). The choices made here often have long-term consequences, as educational transitions create path dependencies by channelling students into disparate learning environments. This is particularly relevant in Switzerland's stratified upper secondary system, with its distinct academic and vocational tracks (Blossfeld 1988; Glauser 2015). For example, employment rates, unemployment risks, and median wages differ substantially and persistently across educational pathways and qualification levels (Gomensoro et al. 2017; Aepli et al. 2021).

However, this transition is not always smooth. Some adolescents experience delays in starting their post-compulsory education, while others may drop out or change the apprenticeship company. In Switzerland, approximately 20% of young people enter post-compulsory education with delays, and around 24% of vocational education and training (VET) students are affected by apprenticeship contract terminations (BFS 2023; Meyer et al. 2023). These non-linear pathways can have significant long-term implications, such as reducing the chances of later educational success and career advancement (Stalder 2012; Scharenberg et al. 2014; Sacchi and Meyer 2016; Gomensoro et al. 2017; Patzina and Wydra-Somaggio 2020; Rolfe and Rosén 2022; Gomensoro and Meyer 2022).

Ability grouping in lower secondary education into two tracks is central to the Swiss system, as it pre-empts students' transition into upper secondary education. Typically, students are placed into these tracks after sixth grade around the age of 12, with about one-third assigned to tracks with "basic requirements" and two-thirds to tracks with "advanced requirements" (BFS 2024). This early placement is pivotal in shaping the educational pathways available to them in upper secondary education. Students in advanced tracks generally have direct access to high-level academic options, such as baccalaureate schools, while those in basic tracks do not (Gomensoro et al. 2017; Becker and Glauser 2018; Meyer et al. 2023).

About 60% of the adolescents enter VET upon completing lower secondary education (BFS 2019; EDK 2022). The Swiss VET system offers programs for around 250 professions with different levels of academic demands and follows a dual model: Students combine practical apprenticeships at companies for three to four days a week with theoretical classes at vocational schools for one to two days. The length of these apprenticeships varies: Some programs last two years, while others extend to three or four years (Stalder 2011; EDK 2022). The two-year apprenticeships are specifically designed as a low-threshold VET program, providing standardized vocational training tailored for students with lower academic performance (Kammermann et al. 2011; EDK 2022). About

one-quarter of adolescents start baccalaureate schools, which prepare students for further education at the tertiary level (EDK 2022). Young adults who don't have a direct follow-up solution after compulsory education either start an interim solution in the first year of upper secondary education (e.g. 10th grade, preparatory courses for certain training programs) or do not start any formally certifying educational activity. A quarter of these individuals also remain in an interim solution in the second year or do not take up any certifying educational activities (Meyer 2003; Becker and Glauser 2018; EDK 2022; Gomensoro and Meyer 2022).

Such a delayed entry into post-compulsory education increases the risk of not completing upper secondary education or facing unemployment by age 30 (Sacchi and Meyer 2016; Gomensoro et al. 2017). In addition, other disruptions during post-compulsory education can further impair successful completion of upper secondary education (Stalder 2012). The termination of apprenticeship contracts, for example, can pose a significant risk for career progression (Patzina and Wydra-Somaggio 2020). However, some disruptions can also have positive long-term effects, as the experience of realigning educational pathways more closely to interests and abilities can lead to better outcomes despite initial challenges (Stalder and Schmid 2016). Nevertheless, compared to students with linear educational pathways, even when students move directly to another training program, they show lower satisfaction, higher intentions to quit, and lower completion rates when moving to a new training field (Stalder 2012; Wydra-Somaggio 2021). Generally, more such critical transitions tend to occur in education programs with lower academic demands and in specific sectors, such as the hospitality industry (Stalder 2012).

The way the transition to post-compulsory education unfolds can be influenced by a variety of factors. The type of school tracks attended at the lower secondary education, along with a student's achievement and aptitude, are key determinants of their educational trajectory (e.g. Becker and Glauser 2018). However, ascriptive characteristics like gender, national origin, and social background also play a significant role (Glauser 2015; Becker and Glauser 2018; Gomensoro and Meyer 2022). For instance, students from lower socio-economic backgrounds face additional challenges in upper secondary education outcomes, even when their academic performance and aptitude are comparable to their peers (Kronig 2007; Becker 2009; Stalder 2012; Becker and Zangger 2013; Becker and Glauser 2018). Gender differences further shape these transitions, with girls more likely to be placed in schools with advanced requirements, thereby opening up broader educational opportunities at the upper secondary education (Glauser 2015; Gomensoro and Meyer 2022).

Previous research has shown that having a disability (e.g. mental illness or learning disability) increases the likelihood for a critical transition (such as dropout and lower probability of completing their apprenticeship; Laporte and Mueller 2013; Gambin and Hogarth 2016; Holtmann et al. 2017; Böhn and Deutscher 2022; Lustenberger et al. 2023). Furthermore, students in special education classes are more likely to enter an education with lower academic demands and have more discontinuous educational trajectories at upper secondary education compared to their peers in mainstream classes (Sahli Lozano 2012).

The label "special class" may influence this transition, even when controlling for other factors such as individual cognitive and academic performance characteristics and social and national background. This is an indication that the *special education* labels may have

stigmatizing effects that affect a student's educational trajectory, potentially limiting their opportunities for further education regardless of their actual abilities (Spence 1973; Goffman 2009; Sahli Lozano 2012; Holtmann et al. 2017; Sahli Lozano et al. 2022b). Therefore, ISM could have similar effects on educational outcomes as the assignment to different school types at the lower secondary education or to special education classes (Sahli Lozano 2012; Sahli Lozano et al. 2022b).

How integrative school measures could impact the transition from lower to upper secondary education

Focusing on the transition from lower to upper secondary education, this section examines how ISM like RILO and AC may shape students' educational trajectories. The overview addresses the role of labelling and stigmatization linked to these measures and their potential impact on post-compulsory trajectories.

According to labelling and stigmatization theories (Fox and Stinnett 1996; Goffman 2009), students who are labelled as 'in need of special education' or 'underachieving' often face negative perceptions as a result of these labels. This stigma can lead to lowered expectations from teachers and peers, which in turn can lead to actual declines in academic performance (Fox and Stinnett 1996; Koonce et al. 2004; Goffman 2009; Gomolla and Radtke 2009; Ohan et al. 2011). Over time, these labels can become internalised, creating a self-fulfilling prophecy in which students begin to meet the lowered expectations placed upon them (Rosenthal and Jacobson 1968; Oakes 2005). As a result, students with such labels may develop reduced self-efficacy and be more inclined to choose educational or vocational pathways with lower levels of academic demand. Social cognitive career theory further explains this mechanism by suggesting that adolescents' learning experiences and interactions with key social figures shape their self-efficacy ("Can I do this?") and outcome expectations ("If I do this, what will happen?"). These, in turn, influence their aspirations and career goals (Lent et al. 1994; Lent 2002), which significantly impact their educational and career transitions (Schoon and Lyons-Amos 2016; Holtmann et al. 2017).

This aligns with rational choice theory, which suggests that students evaluate educational pathways based on subjective expected utility, considering outcomes like income, job security, and prestige (Breen and Goldthorpe 1997). Due to the potential lowered self-efficacy and outcome expectations resulting from labelling, students may perceive less utility in pursuing higher-demand pathways and thus opt for less demanding and lower-risk options. This rational calculation is further supported by the fact that the academic demands of a training program and wages don't always correlate proportionally. For example, in some sectors, the wage differences between two-year and three-year VET programs in Switzerland are only marginal, making less demanding programs even more attractive from a cost-benefit perspective (Amt für Wirtschaft des Kantons Zürich 2024). However, a special education label may not only affect the career paths that these students choose but also their chances of being considered for apprenticeships. According to signalling theory (Spence 1973), employers often rely on signals, such as school-leaving certificates, to assess a candidate's qualifications, as they cannot directly evaluate individual skills (Spence 1973; Bills 2003; Imdorf 2007; Neuenschwander 2021).

The cognitive abilities of students with RILO are often underestimated by teachers (Sahli Lozano et al. 2022a), which could significantly affect their outcome and

self-efficacy expectations (Lent et al. 1994; Lent 2002). As a result, these students may be more inclined to pursue career paths with lower levels of academic demand. Furthermore, due to this underestimation, they could be guided by their teachers toward educational pathways with lower levels of academic demand. Teachers' career expectations can influence students' transitions into VET, shaping the pathways they are encouraged to pursue (Nägele and Stalder 2017; Epp 2018; Neuenschwander 2021). This effect is further amplified by the fact that most students receive RILO during their first or second year of lower secondary education. This means that they spend most of their lower secondary education in less academically demanding learning environments, potentially limiting their educational development and career opportunities (Becker et al. 2006; Neumann et al. 2007).

Moreover, the RILO notation on a report could be perceived as a signal of low productivity, reinforcing negative stereotypes and leading potential employers to view the applicant as a risky investment (Spence 1973). This could reduce the affected individuals' chances of being considered for apprenticeships. These potentially more difficult conditions for securing an apprenticeship may also increase the likelihood of delayed entry, because enrolment in an interim solution is typically not a proactive choice, but rather an involuntary outcome of an unsuccessful apprenticeship search (Sacchi and Meyer 2016). Additionally, apprentices with lower educational qualifications (lower school leaving certificates and poorer grades; Michaelis and Richter 2022; Holtmann and Solga 2023) and disabilities face a higher risk of dropping out of upper secondary education (Böhn and Deutscher 2022; Russmann et al. 2024). As students with RILO tend to be more vulnerable to these risk factors, they may be at increased risk of dropping out.

Regarding AC, no labelling effect was found for teacher expectations in contrast to RILO (Sahli Lozano et al. 2022a). Furthermore, studies have shown that AC can enhance the self-efficacy of students with disabilities (Feldman et al. 2011; Lovett and Leja 2013). This increased self-efficacy can positively impact the students' career goals and choices (Lent et al. 1994; Lent 2002) and the transition to upper secondary education. It allows them to enter the apprenticeship search with more confidence and thus perceive more career options (Emirza et al. 2021; Blokker et al. 2023). As already described, AC are not noted in the student's report. This allows the affected students to apply without the signal appearing on their reports, potentially avoiding the negative implications that such signal could bring (Spence 1973).

Nevertheless, during the transition to upper secondary education, the continuity of AC often gets disrupted. Students must reapply for the AC at the upper secondary education, which requires a new diagnosis if they wish to receive it (SDBB 2015). This process requires the student's initiative and can take considerable time. As a result, a seamless transition of AC is often not achievable. Such interruptions can have serious consequences, as losing access to AC or facing delays in obtaining it during the transition to upper secondary education may negatively affect students' academic performance and overall success in their new educational environment (Parsons et al. 2021; Blasey et al. 2022). This, in addition to the challenges posed by disability, could lead to an increased risk of dropouts (Böhn and Deutscher 2022; Russmann et al. 2024).

Considering these findings, this study aims to explore whether the ISM RILO and AC in lower secondary education lead to an upper secondary education with lower academic demands and contribute to disrupted transitions to upper secondary education.

By examining whether these relationships remain stable when key influencing factors such as school type, academic performance, IQ, social and national background, and gender are controlled, this analysis aims to better understand the long-term impact of ISM on educational outcomes. The following hypotheses are proposed:

Hypotheses on delayed entry

H1 In comparison to comparable students without RILO, students with RILO are *more likely* to experience a *delayed entry* to upper secondary education.

H2 In comparison to comparable students without AC, students with AC are *less likely* to experience a *delayed entry* to upper secondary education.

Hypotheses on level of academic demand

H3 The students with RILO who are in a certifying education at upper secondary education are in an *education program with a lower level of academic demand* than comparable students without RILO.

H4 The students with AC who are in a certifying education at upper secondary education are in an *education program with a higher level of academic demand* than comparable students without AC.

Hypotheses on apprenticeship contract termination

H5 The students with RILO who are in VET in upper secondary education are *more likely to have their apprenticeship contract terminated* than comparable students without RILO.

H6 The students with AC who are in VET in upper secondary education are *more likely to have their apprenticeship contract terminated* than comparable students without AC.

Methods

Sampling procedures

The present study draws on data from the second and third waves of the Bernese Longitudinal Study on Integrative School Measures (BELIMA; Sahli Lozano et al. 2022b). This study was approved by the institutional ethics committee and informed consent was obtained from all participants. The BELIMA study comprises three waves so far: primary school students (2015), lower secondary school students (2018), and upper secondary school students (2022). In the second wave (t2), 2228 students from 110 classes in grades 7 to 9 (lower secondary education) participated, representing all German-speaking administrative districts of the Canton of Bern. Due to the transition from primary to secondary school, students were distributed across multiple classes and schools, making it impractical to track all students from t1. Therefore, the longitudinal follow-up focused specifically on students who had received ISM, and they were identified their new secondary school classes for continued observation.

The third wave (t3) was conducted as an online survey when participants were in upper secondary education. For t3, we not only followed up with t2 participants but also invited individuals who had received ISM in t1 but had not participated in t2. Of 2297

invited individuals, 1384 young adults participated in t3, representing a response rate of 60%. Participants' mean age was 14.8 years ($SD = 0.85$) at t2 and 19.1 years ($SD = 0.86$) at t3. For the analyses presented in this article, we focused on data from waves t2 and t3.

This dataset was enhanced through cantonal administrative records, which were granted provided by the cantonal administration for research purposes. These records served two purposes: (1) completing missing educational trajectories ($n = 824$) and (2) incorporating additional relevant variables (e.g. apprenticeship contract termination). Attrition analyses (detailed in OSF Appendix A19: https://osf.io/47uwh/?view_only=e176fbc747db4be9a9a0a15b6ad39f23) confirmed that typical predictors of survey dropout (e.g., migration background, socioeconomic status) were associated with missing data. However, potential biases due to selective dropouts were largely mitigated by the addition of cantonal administrative records.

The final dataset for this study includes all students invited to participate in t3, totaling 2297 individuals (RILO: $n = 79$, AC: $n = 77$). Remaining gaps in educational trajectories were addressed through imputation ($n = 89$; see section on missing data).

Measures

Integrative school measures at t2

At t2, teachers reported whether students were currently receiving RILO or AC. At t3, participants were retrospectively asked if they had received any ISM during lower secondary education, which led to the identification of additional cases. To validate these reports, all students with AC and RILO were contacted by phone. During the calls, the name of the specific measure was not mentioned to avoid biasing their responses. Instead, participants were asked to describe how the measure had been implemented. From this information, the dichotomous variables AC and RILO (0 = no, 1 = yes) were generated.

Criterion variables at t3

Delayed entry into upper secondary education

The dichotomous variable *Delayed entry* measures whether a person experienced delayed entry during their time in upper secondary education. For each year of upper secondary education, participants reported whether they were in an interim solution or not engaged in a certifying educational program. The variable was coded as follows: 0 = participants who were continuously enrolled in certifying educational programs throughout all their reported years; 1 = participants who reported being in an interim solution or not in education in any of their reported years.

Level of academic demand of upper secondary education

At t3, participants reported their educational activities during upper secondary education. Since participants were at different stages of their education, with some in their third year and others in their second year, they were asked about their educational path for each completed year in upper secondary education. Based on categorization by Eckhart et al. (2011) and Stalder (2011), these responses were classified into an ordinal variable *Level of academic demand* using five categories: (1) Training programs with a low level of academic demand, such as a two-year training program to become a construction practitioner; (2) training programs with a low to medium level of academic demand,

such as a three-year training program to become a baker; (3) training programs with a medium level of academic demand, such as a three-year training program to become a retail specialist; (4) training programs with a medium to high level of academic demand, such as a four-year training program to become a mediamatician; and (5) training programs with a high level of academic demand, such as baccalaureate schools.

For each participant, the final *Level of academic demand* score was assigned based on their most recent year of education. The variable was coded using a hierarchical approach: if a participant was in their third year of education, that year's level was used; if not, then their second year level was used; if neither was available, their first year level was used.

Termination of apprenticeship contract

The dichotomous variable *termination of the apprenticeship contract* was added from the cantonal data set. This variable indicates whether students in vocational education at upper secondary education experienced an apprenticeship contract termination at any point during the education period (0 = no, 1 = yes).

Potential confounders at t2

On the basis of previous empirical studies (e.g. Becker 2009; Glauser 2015; Gomensoro and Meyer 2022; Lustenberger et al. 2023), fifteen possible confounding factors for the educational trajectories have been identified, all of which are related to circumstances during lower secondary education. The identified student characteristics variables were: *age*, *gender* (dummy-coded), and *school type at lower secondary education* (dummy-coded). Furthermore, *intelligence* was measured using the Cultural Fair Intelligence Test (CFT-20; Weiss, 2006), an age-normed, culture-fair, language-free test assessing fluid intelligence with strong psychometric properties (internal consistency 0.86 – 0.96 across all test parts, test-retest reliability > 0.80; Gruber and Tausch 2016). Academic performance in mathematics and German was assessed using the adaptive Stellwerk test (Moser, 2006), a computer-based adaptive testing system that uses Item Response Theory (Rasch model) to assess academic competencies. Both intelligence and academic performance measures were administered during lower secondary education.

Furthermore, at t3, participants were asked retrospectively whether they had received a diagnosis of *anxiety disorder* (dummy-coded) or *depression* (dummy-coded) from a physician or psychologist during lower secondary education. The variables that relate to the family context are: *socioeconomic status*, which indicates the highest ranked occupational status of the legal guardians according to Ganzeboom (2010), *educational level*, which indicates whether at least one of the legal guardians had a tertiary education (dummy-coded), *spoken language at home*, which indicates whether German or another language was spoken at home (dummy-coded), and *migration background*, which indicates whether the young adults, or at least one of their legal guardians, were born in a country recognized by the OECD as eligible for official development assistance (OECD 2020), or in one of the primary countries from which Switzerland received immigrants during its “second wave of migration,” including Portugal, Sri Lanka, and the Balkan states (Beck and Jäpel 2019; dummy-coded). This approach follows established Swiss migration research, which recognizes that individuals' cultural resources and value orientations are strongly shaped by the societal structures of their countries of origin.

Simple dichotomizations (domestic/foreign, German-speaking/foreign-language) cannot adequately capture this heterogeneity when explaining differences in educational decision-making behavior (Beck and Jäpel 2019).

Additionally, ISM other than the focal predictor were included as confounding variables (e.g., when the focal predictor was RILO, AC was included as a confounding variable, and vice versa; SET was always included as a confounding variable). All continuous confounding variables were z-standardized, with intelligence and school performance being standardized relative to the reference sample.

Missing values and data preparation

For 5.1% of the individuals, information on whether they received ISM during lower secondary education is lacking. There are two possible reasons for this: (a) these individuals received RILO or AC at t1 and did not participate in t2 or t3 (b) they participated in t2, but their teacher did not provide information about the ISM, and they did not participate in t3.

The missing information for the criterion variables was largely supplemented using cantonal data, but for some individuals this was not possible due to incomplete or inaccessible records. Missing data remained for the three base variables that were later used to generate the combined variables *Level of academic demand* and *Delayed entry*: educational program type and activity in the 1st year (8.7%), 2nd year (7.2%), and 3rd year (8.5%). For the variable *Apprenticeship contract termination*, 10% of data remained missing.

For the potential confounding variables, there was a significantly higher rate of missing values. At t2, the variable with the highest rate of missing data was German academic performance (25.1%), while at t3, the diagnosis of anxiety/depression had the highest rate of missing values (39.9%).

The missing data were imputed using the R package Multiple Imputation by Chained Equations (mice; van Buuren and Groothuis-Oudshoorn 2011). Missing data imputation was performed for both independent and dependent variables to maximize the use of available information and maintain statistical power while preserving the relationships between variables (Enders 2022). Seven auxiliary variables from t1 (primary school; intelligence, academic performance in mathematics and German, SET, RILO, and AC) and three auxiliary variables from t2 (lower secondary education: teachers' estimation of students' cognitive ability and academic performance in mathematics and German) were included in the imputation model to improve its accuracy. Using predictive mean matching (PMM), we generated 100 imputed datasets, analysed each individually, and pooled the results following standard multiple imputation procedures (Graham et al. 2007).

Statistical analysis

Randomized controlled trials are typically the gold standard for determining causal effects of interventions. However, for some research questions, assigning participants to intervention or control groups may not be feasible due to ethical or practical constraints. In such cases, a propensity score matching (PSM) approach is appropriate (Rosenbaum 2002), which is similar to a case-control study. In this study, we used PSM to examine the effects of RILO or AC at lower secondary education on post-compulsory educational trajectories. By comparing young adults with and without RILO/AC who are matched

on confounding variables, we aimed to isolate the effect of the ISM at lower secondary education (Rosenbaum 2002).

The matching process was based on propensity scores, which represent the likelihood of receiving the treatment based on the observed covariates (Rosenbaum 2002). To generate these propensity scores, we used genetic matching with a population size of 1000, implemented via the MatchIt package in R (Ho et al. 2007). Genetic matching extends propensity score matching by using an evolutionary algorithm to determine optimal weights for both the propensity score and individual covariates, achieving better balance between treatment and control groups than standard propensity score matching (Zhao et al. 2021). This matching method took into account 13 potential confounding variables. Additionally, exact matching was applied to ensure that cases and controls were enrolled in the same school type (basic and advanced requirements in mathematics and German). A 1:3 matching ratio was applied, where each student with RILO or AC was matched with three control students.

We performed propensity score matching twice once with the full sample, and a second matching was performed exclusively within the VET subsample for the analysis of apprenticeship contract terminations, to avoid pairing VET and general education students who cannot experience these terminations. Table 1 outlines the sample sizes before and after matching for both analyses. As shown in Table 2, student groups differed significantly across covariates prior to matching.

To assess covariate balance after matching, we estimated standardized mean differences (continuous variables) and correlation mass (dichotomous variables) between cases and controls (Zhao et al. 2021). Figure 1 presents these balance statistics for both samples. While initial imbalances between students with and without ISM were substantial, matching significantly reduced these differences. Remaining disparities were minimal, indicating only small effects at most (Cohen's $d < 0.21$, $\phi < 0.13$). This consistent improvement across both analytical samples confirms our matching procedure effectively created comparable groups for subsequent analyses.

After matching, regression models were used to estimate the effects of RILO and AC on educational outcomes. For H3 and H4 (level of academic demand), ordinal logistic regression was applied since the dependent variable had ordered categories. Following Agresti and Tarantola (2018), marginal effects were calculated to show probability changes separately for each education level while accounting for their ordered nature. Binary logistic regressions were used for H1 and H2 (delayed entry) and H5 and H6 (apprenticeship contract termination). For these models, average marginal effects were

Table 1 Sample and subsample sizes before and after 1:3 matching

	Non matched samples	Matched samples			
		RILO	RILO Controls	AC	AC Controls
Samples	<i>N</i>	<i>n</i>	<i>n</i>	<i>n</i>	<i>n</i>
<i>Full sample</i>					
Analyses: delayed entry and level of academic demand	2297	85	255	77	231
<i>Subsample: individuals in Vocational Education and Training (VET)</i>					
Analyses: apprenticeship contract termination	2039	85	255	72	216

Notes. RILO = reduced learning objectives lower secondary education. AC = accommodations lower secondary education

Table 2 Descriptive statistics of covariates

	Total	No RILO/AC	RILO	AC
	N = 2297 (100%)	n = 2135 (92.95%)	n = 85 (3.7%)	n = 77 (3.35%)
Potential confounders	M (SD) / %	M (SD) / %	M (SD) / %	M (SD) / %
Students' characteristics				
Sex (female)	48.02% -	48.74% -	43.70% -	32.89% -
Age _{zstd}	0.00 (1.00)	-0.02 (0.99)	0.33 (1.11)	0.16 (1.03)
Intelligence _{std}	0.08 (1.01)	0.14 (0.99)	-0.94 (0.90)	-0.19 (1.09)
Schooltype German (advanced requirements)	59.58% -	61.77% -	7.00% -	57.06% -
Schooltype Maths (advanced requirements)	54.83% -	56.86% -	3.36% -	55.54% -
Academic performance Maths _{std}	-0.49 (1.15)	-0.43 (1.13)	-1.97 (0.84)	-0.64 (1.07)
Academic performance German _{std}	-0.40 (1.23)	-0.33 (1.21)	-1.69 (0.94)	-0.92 (1.23)
Anxiety disorder (yes)	4.29% -	3.73% -	14.04% -	9.10% -
Depression disorder (yes)	7.24% -	6.66% -	23.94% -	5.03% -
Family context				
Socioeconomic status _{zstd}	0.00 (1.00)	0.01 (1.00)	-0.38 (0.88)	0.10 (1.04)
Education level (tertiary)	25.15% -	24.93% -	15.72% -	41.69% -
Immigration background (yes)	22.99% -	23.18% -	27.60% -	12.82% -
Language spoken at home (German)	80.50% -	80.73% -	69.63% -	86.08% -
Integrative school measures				
Support by SET (yes)	8.55%	6.13%	44.29%	36.12%

Notes. RILO=reduced learning objectives lower secondary education. AC=accommodations lower secondary education. SET=support of a special education teacher. M(SD)=mean and standard deviation. zstd=z-standardized. std=standardized relative to the reference sample. All values are pooled over 100 imputed datasets

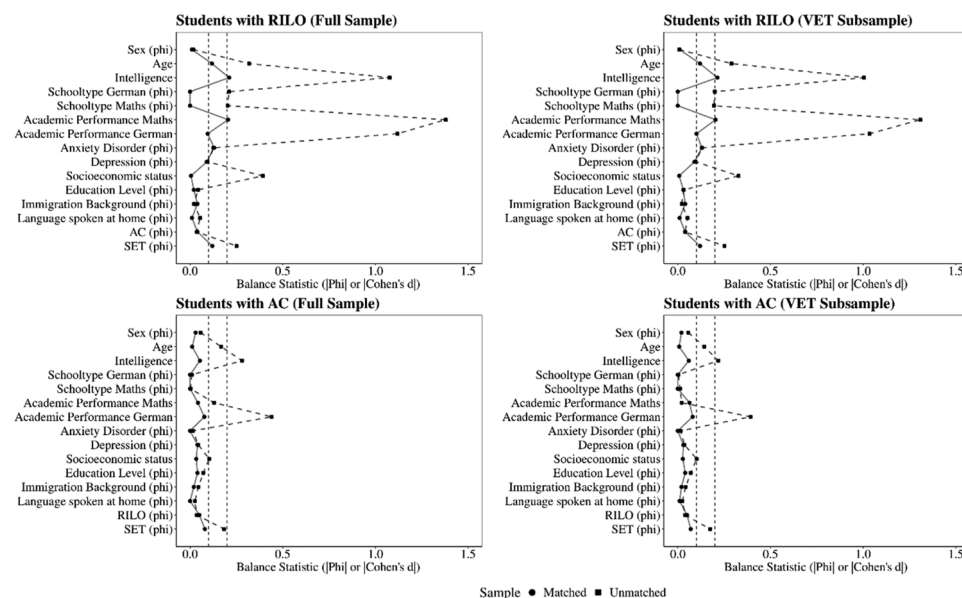


Fig. 1 Covariate balance before and after propensity score matching. Standardized mean differences (phi coefficients for binary variables, Cohen's d for continuous variables). Solid circles = matched sample. Dashed circles = unmatched sample. Dashed vertical lines indicate small effect size thresholds (phi = 0.1, Cohen's d = 0.2). Matching performed separately for RILO (top) and AC (bottom) across full sample (left) and VET subsample (right). RILO = reduced learning objectives in lower secondary education. AC = accommodations in lower secondary education. SET = support of a special education teacher

calculated because they provide a more intuitive interpretation than log odds ratios by directly showing the average change in probability of an outcome when a predictor changes by one unit (Best and Wolf 2012). All models controlled for potential confounding variables identified in previous research (Nguyen et al. 2017).

Results

Descriptive statistics

Descriptive statistics indicated that students with ISM on lower secondary education tend to be enrolled in upper secondary education educational programs with lower academic demands compared to their peers without ISM. Specifically, students receiving RILO were more frequently found in two-year apprenticeship programs. For instance, 35% of students with RILO (see Fig. 2B) were in their second year in upper secondary education in a two-year apprenticeship, compared to 8% of students with AC (see Fig. 2C) and only 4.4% of students without any ISM (see Fig. 2A). Differences were also noted between treatment and control groups, with students with RILO appearing to have higher proportions in non-certifying programs, interim solutions, and two-year apprenticeships when compared to their matched controls (see Fig. 2B). These

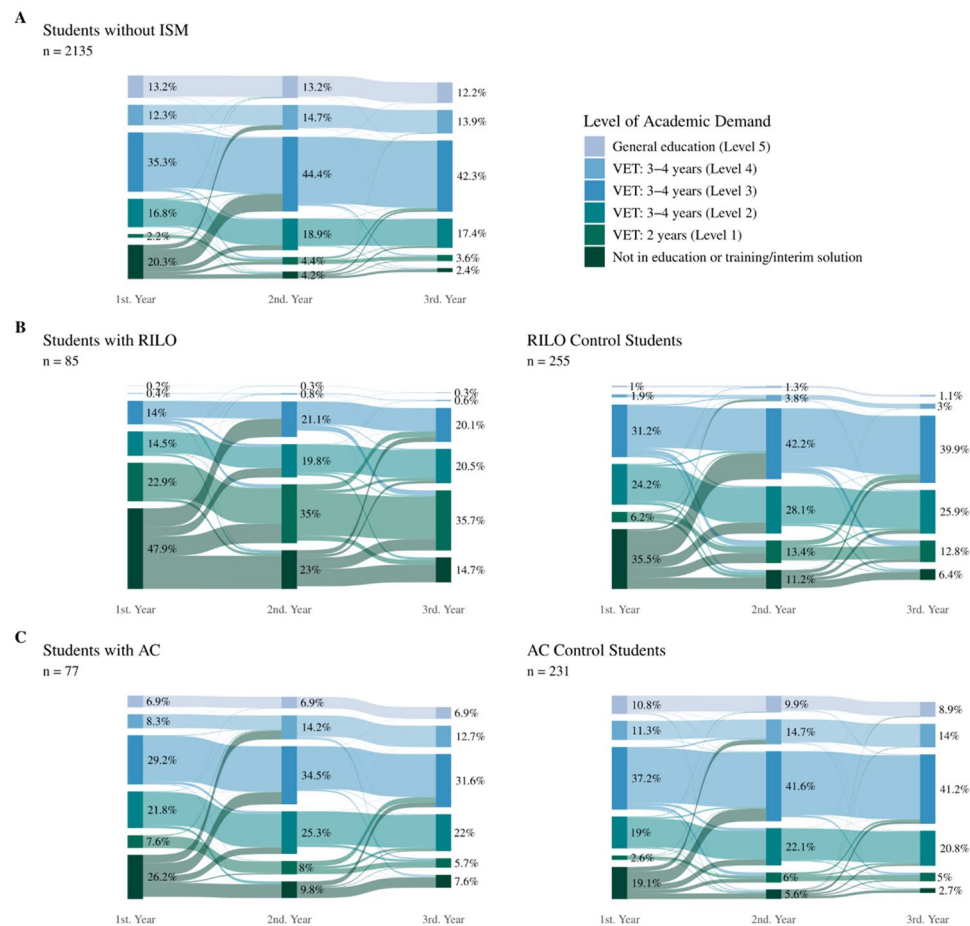


Fig. 2 Sankey diagrams showing educational trajectories across three consecutive years in upper secondary education for students without integrative school measures (ISM), with reduced individual learning objectives (RILO), and with accommodations (AC). For RILO and AC groups, matched control students from propensity score matching are shown for comparison. Flow widths represent student proportions, percentages indicate relative sizes of educational categories. Percentages calculated across 100 imputed datasets

descriptive differences between cases and controls were less pronounced for students receiving AC (see Fig. 2C).

In terms of apprenticeship contract termination, 19.32% of students without ISM experienced an apprenticeship contract termination during their vocational education, whereas the rate was higher for students with RILO (38.89%) and AC (26.11%).

Main results

Delayed entry (H1 & H2)

Students with RILO didn't have a significantly different probability of experiencing a delayed entry during their upper secondary education ($AME = 0.084$, $SE = 0.69$, $p = .225$) compared to students without RILO, and H1 was rejected. The same was found for students with AC ($AME = 0.084$, $SE = 0.060$, $p = .168$), and H2 was also rejected (see Fig. 3).

Level of academic demand (H3 & H4)

RILO showed significant differences in the distribution across levels of academic demand in upper secondary education. The examination of marginal effects across different levels of academic demand revealed substantial variation (Fig. 4): Students with RILO were significantly more likely to be enrolled in VET programs with the lowest academic demand (Level 1: $ME = 0.202$, $SE = 0.067$, $p = .004$) and programs with the second lowest academic demand (Level 2: $ME = 0.059$, $SE = 0.027$, $p = .038$). Conversely, these students were significantly less likely to enrol in programs with medium academic demand (Level 3: $ME = -0.237$, $SE = 0.063$, $p < .001$). For VET programs with higher academic demand (Level 4) and the highest academic demand (Level 5), no significant differences were found ($ME = -0.018$, $SE = 0.009$, $p = .056$ and $ME = -0.006$, $SE = 0.005$, $p = .185$, respectively). These findings support H3. No significant differences were observed between students with and without AC across any level of academic demand in upper secondary education, leading to rejection of H4 (marginal effects and their confidence intervals are displayed in Fig. 4).

Apprenticeship contract termination (H5 & H6)

Students with RILO did not show a significantly different probability of experiencing an apprenticeship contract termination ($AME = 0.024$, $SE = 0.080$, $p = .761$) compared to students without RILO, thus H5 was not supported. Similarly, no significant differences

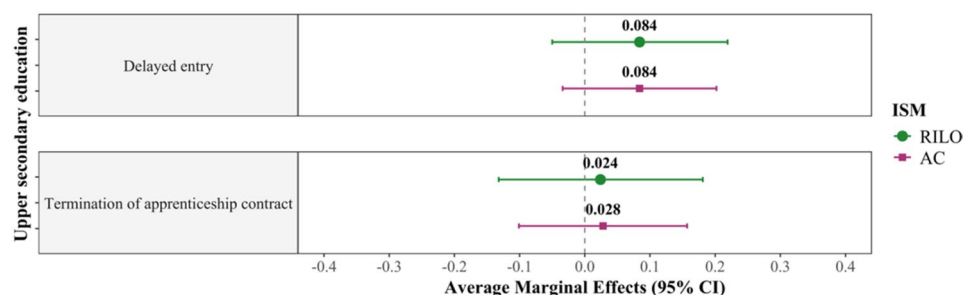


Fig. 3 Average marginal effects of RILO and AC on delayed entry and termination of apprenticeship contract in upper secondary education. The figure shows average marginal effects with 95% confidence intervals based on the matched sample. ISM = Integrative school measures. RILO = reduced individual learning objectives (dots). AC = accommodations (squares). Positive values indicate an increase in the probability of the respective outcome. Values are displayed for each effect estimate

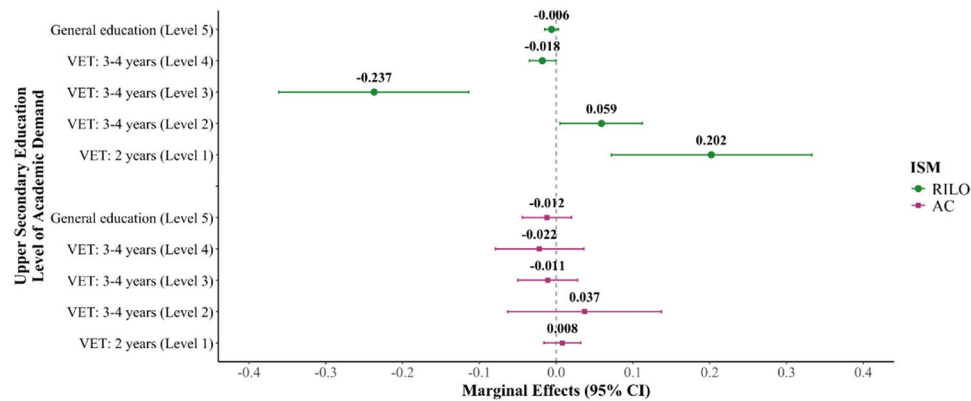


Fig. 4 Marginal effects of RILO and AC on levels of academic demand of upper secondary education. The figure displays marginal effects with 95% confidence intervals for students with RILO (dots) and AC (squares) compared to students without these measures across different levels of academic demands in upper secondary education based on the matched sample. ISM = Integrative school measures. RILO = reduced individual learning objectives. AC = accommodations. VET = Vocational Education and Training. Level = Level of academic demand, ranging from 1 (lowest) to 5 (highest)

were found for students with AC ($AME = 0.028$, $SE = 0.066$, $p = .673$), leading to the rejection of H6 (see Fig. 2).

Sensitivity analyses

To assess robustness, we conducted hierarchical regression models without matching samples on both imputed and non-imputed datasets, and alternative matching specifications using nearest neighbor instead of genetic matching. Results remained largely consistent across all sensitivity analyses. Complete results are available on OSF [https://osf.io/47uwh/?view_only=e176fbc747db4be9a9a0a15b6ad39f23].

Discussion

This study examined how the two different integrative school measures (ISM) reduced individual learning objectives (RILO) and accommodations (AC) in lower secondary education influence the transition to post-compulsory education. Specifically, the investigation focused on whether these measures lead students towards educational programs with lower academic demands and contribute to discontinuous educational pathways, which represent critical transitions. The findings provide valuable insights into the long-term effects of these ISM on students' educational trajectories, with important implications for policy and practice.

Overall, our findings suggest that students with RILO were significantly more likely to enrol in educational programs with lower academic demands compared to similar students without this measure. Despite this, RILO was not associated with more discontinuous pathways, such as delayed entry or apprenticeship contract terminations. However, AC showed no associations with either the level of academic demands or educational discontinuities. These findings align with results from lower secondary education, where negative associations were observed for RILO, but not for AC (Sahli Lozano et al. 2017, 2022a, 2023a).

The higher probability of RILO students enrolling in programs with lower academic demands aligns with research showing that special education labels can lead to lower levels of academic demand in post-compulsory education (e.g. Sahli Lozano 2012;

Holtmann et al. 2017). These effects can be explained through multiple theoretical lenses. Labelling and stigmatization theories (Fox and Stinnett 1996; Goffman 2009) and cognitive career theory (Lent et al. 1994; Lent 2002) suggest that such labels might reduce self-efficacy and outcome expectations. This can happen through mechanisms like lower external performance assessment and internalized stigma. Ultimately, these factors influence students' career goals (Rosenthal and Jacobson 1968; Gomolla and Radtke 2009; Ohan et al. 2011). Teachers' tendency to underestimate these students could lead to recommendations for less demanding programs, reinforcing this pattern (Nägele and Stalder 2017; Epp 2018; Neuenschwander 2021; Sahli Lozano et al. 2022a). Additionally, according to rational choice theory (Breen and Goldthorpe 1997), students with potentially lowered self-efficacy may rationally opt for less demanding pathways. They evaluate the cost-benefit ratio, considering both higher employment prospects and the fact that wages, depending on the sector, are not necessarily much lower despite reduced academic demands.

The descriptive statistics on the type of education at upper secondary education reveal that a large proportion of students with RILO are enrolled in two-year apprenticeship programs. These programs are specifically designed for students with lower academic performance, potentially including those with RILO (Kammermann et al. 2011). This does not mean that the two-year apprenticeship itself is problematic, but rather that students with RILO have a higher likelihood of entering such programs compared to comparable students without RILO. As a result, the RILO label, independent of actual academic performance, can limit access to more demanding educational pathways, thereby disadvantaging the affected students. This could also have long-term effects on career trajectories, income, and life opportunities. It has been shown that two-year apprenticeships have been relatively successful in terms of their integrative function, with two thirds of graduates entering the labour market and about one third continuing their education and training in more demanding three or four year apprenticeships (Kammermann et al. 2011; Schmid et al. 2021). However, students who complete a two-year apprenticeship still face more challenging conditions when entering the labour market (Fitzli et al. 2016). The higher proportion of two-year apprenticeships in this study might explain why RILO was not associated with a delayed entry into upper secondary education. By not applying for more demanding programs, students might avoid delays from unsuccessful searches, thus preventing delayed entry or interim solutions.

Another interesting finding was that students with RILO weren't more likely to have their apprenticeship contracts terminated compared to similar students without RILO, despite potentially being at greater risk due to their lower educational qualifications and disability (Böhn and Deutscher 2022; Michaelis and Richter 2022). Research indicates that low-achieving school leavers are at a higher risk of dropout, making this a central risk factor (Elffers 2011; Holtmann et al. 2017; Patzina and Wydra-Somaggio 2020; Michaelis and Richter 2022). In the present study, comparable students with and without ISM were matched based on academic performance and school type among other measures. This suggest that the RILO label may have a less significant effect when performance is taken into account, even though the descriptive statistics show that students with RILO have higher rates of apprenticeship contract terminations (38.8%) compared to those with AC (26.1%) or no ISM (19.3%).

This study found no differences between comparable students with and without AC, neither in terms of academic demands in upper secondary education nor regarding discontinuities such as delayed entry or apprenticeship contract terminations. Contrary to expectations, AC show no positive associations with the level of academic demand or the direct entrance in upper secondary education. Previous research suggests positive effects of AC on self-efficacy (Feldman et al. 2011; Lovett and Leja 2013), potentially indicating benefits for the transition to upper secondary education (Lent et al. 1994; Lent 2002). However, studies also indicate that the way AC are implemented can have varying effects. For some students, AC may raise concerns about being perceived differently by their peers or that their achievements are solely attributable to AC (Lovett and Leja 2013; Kiene and Lau 2017). Such experiences could reduce the positive effects of AC on self-efficacy.

With regard to the termination of apprenticeship contracts, it was hypothesized that the lack of continuity of AC in upper secondary education could carry over to overall academic success in their new educational environment, potentially increasing the likelihood of dropout (Parsons et al. 2021; Böhn and Deutscher 2022; Blasey et al. 2022). However, students with AC did not have a higher likelihood of terminating their apprenticeship contracts relative to comparable students without AC in the present study. It is important to note that, based on the present study, we do not know whether and when the students with AC received AC in post-compulsory education. Furthermore, dropouts may be influenced more by the disability itself rather than AC. Studies have shown that mental disabilities, in particular, can increase the likelihood of dropouts (Lustenberger et al. 2023; Russmann et al. 2024). Additionally, academic integration and the availability of personal resources emerged as critical factors in explaining the disability-related differences in dropout intentions (Russmann et al. 2024).

Limitations

Some important limitations should be considered when interpreting the findings of this study. First, regarding methodological aspects, endogeneity considerations need to be addressed, as there might be unobserved processes influencing the relationship between independent and dependent variables. For example, receipt of RILO or AC could hamper students' achievement gains, leading to inferior school-leaving certificates. Additionally, while our sample contained relatively few students with RILO or AC, reflecting typical prevalence rates, this smaller subsample may limit statistical power for certain subgroup analyses and the detection of smaller effects.

Second, our study faces several data limitations. Regarding the implementation of ISM in lower secondary education, detailed information about the specific implementation of RILO and AC is not available. This lack of implementation data limits our understanding of which components have which effects and under which circumstances. Furthermore, at the time of data collection, information about students' graduation status was not yet available, preventing us from drawing conclusions about the impact of these measures on successful upper secondary education completion. We also lack data on detailed supplementary support measures students may have received during upper secondary education, which could have influenced their educational trajectories.

Third, regarding conceptual limitations, although we employ an established ordinal hierarchy of educational programs based on academic demand (Stalder 2011), this

framework may oversimplify the complexity of various educational pathways. Important dimensions such as person-education-fit, student interests, and broader well-being outcomes are not captured in our analysis.

Finally, concerning contextual factors, economic conditions significantly impact the apprenticeship market and the availability of training positions. Our analysis does not account for these macro-level factors, which may have affected students' educational opportunities and choices independently of the support measures. As the study takes place in the canton of Bern, the results of the study can be transferred to other cantons or educational systems that implement the measures in a comparable way.

Conclusion

This study analyses the long-term effects of reduced individual learning objectives (RILO) and accommodations (AC) in lower-level secondary education on post-compulsory educational trajectories in the Canton of Bern, Switzerland. The findings indicate that while ISM aim to support students with specific needs, their impact on educational pathways is complex and multifaceted.

Despite the positive intent behind these measures, such as promoting inclusion and equitable access to education, the results suggest that especially RILO requires critical examination. Due to its potentially stigmatizing character, students with RILO are more likely to enrol in programs with lower academic demands. This trend raises concerns about their future opportunities, as such educational pathways may limit their career prospects and academic advancement. Instead of achieving the intended equity of opportunity, this measure may inadvertently exacerbate educational inequalities. Policy-makers and educators should collaborate to refine these measures, ensuring they serve to empower rather than limit students, ultimately facilitating successful transitions to post-compulsory education and beyond.

Author contributions

SL performed the statistical analysis and wrote the first draft of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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Data availability

The dataset, R code and supplementary materials supporting the conclusions of this article are available in the Open Science Framework repository (OSF), https://osf.io/47uwh/?view_only=e176fbc747db4be9a9a0a15b6ad39f23.

Declarations

Declaration of generative AI in scientific writing

During the preparation of this manuscript, the authors utilized Claude (an AI assistant by Anthropic) to enhance the readability and conciseness of certain sections. All AI-generated content was carefully reviewed and edited by the authors, who take full responsibility for the entire content of the publication.

Competing interests

The authors declare no competing interests.

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References

Aeppli M, Kuhn A, Schweri J (2021) Der Wert von Ausbildungen auf dem Schweizer Arbeitsmarkt. Staatssekretariat für Wirtschaft SECO, Bern, Schweiz.

- Agresti A, Tarantola C (2018) Simple ways to interpret effects in modeling ordinal categorical data. *Statistica Neerlandica* 72:210–223. <https://doi.org/10.1111/stan.12130>
- Amt für Wirtschaft des Kantons Zürich (2024) Lohnbuch Schweiz: 2024. Orell Füssli, Zürich.
- Beck M, Jäpel F (2019) Migration und Bildungsarmut: Übertrittsrisiken im Schweizer Bildungssystem. In: Quenzel G, Hurrelmann K (eds) *Handbuch Bildungsarmut*. Springer, Wiesbaden, pp 491–522.
- Becker R (2009) Entstehung und reproduktion dauerhafter Bildungsungleichheiten. In: Becker R (ed) *Lehrbuch der Bildungssoziologie*. VS Verlag für Sozialwissenschaften, Wiesbaden, S. 89–150.
- Becker R, Glauser D (2018) Berufsausbildung, Berufsmaturität oder Mittelschule? Soziale Selektivität beim Übergang in die Sekundarstufe II in der Deutschschweiz. *Schweizerische Zeitschrift für Soziologie* 44:9–33. <https://doi.org/10.1515/sjs-2018-0002>
- Becker R, Zangger C (2013) Die Bildungsexpansion in der Schweiz und ihre Folgen: Eine empirische Analyse des Wandels der Bildungsbeteiligung und Bildungsungleichheiten mit den Daten der Schweizer Volkszählungen 1970, 1980, 1990 und 2000. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 65:423–449. <https://doi.org/10.1007/s11577-013-0209-6>
- Becker M, Lüdtke O, Trautwein U, Baumert J (2006) Leistungszuwachs in Mathematik: Evidenz für einen Schereneffekt im mehrgliedrigen Schulsystem? *Zeitschrift für Pädagogische Psychologie* 20:233–242. <https://doi.org/10.1024/1010-0652.20.4.233>
- Best H, Wolf C (2012) Modellvergleich und Ergebnisinterpretation in Logit- und Probit-Regressionen. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 64:377–395. <https://doi.org/10.1007/s11577-012-0167-4>
- BFS (2019) Personen in Ausbildung - Ausgabe 2019. Bundesamt für Statistik (BFS), Neuchâtel.
- BFS (2020) Statistik der Sonderpädagogik. Schuljahr 2018/19. Bundesamt für Statistik (BFS), Neuchâtel.
- BFS (2023) Lehrvertragsauflösung, Wiedereinstieg, Zertifikationsstatus. Bundesamt für Statistik (BFS), Neuchâtel.
- BFS (2024) Sekundarstufe I: Selektion. Bundesamt für Statistik (BFS), Neuchâtel.
- Bildungs- und Kulturdirektion des Kantons Bern (2024) Leitfaden Massnahmen in der Regelschule (MR). Regelung der einfachen sonderpädagogischen und unterstützenden Massnahmen im Regelschulangebot des Kantons Bern für Lehrpersonen. Bildungs- und Kulturdirektion des Kantons Bern, Bern.
- Bills DB (2003) Credentials, signals, and screens: Explaining the relationship between schooling and job assignment. *Review of Educational Research* 73:441–469. <https://doi.org/10.3102/00346543073004441>
- Blasey J, Wang C, Blasey R (2022) Accommodation use and academic outcomes for college students with disabilities. *Psychological Report*. <https://doi.org/10.1177/00332941221078011>
- Blokker R, Akkermans J, Marciniak J et al (2023) Organizing school-to-work transition research from a sustainable career perspective: A review and research agenda. *Work Aging Retirement* 9:239–261. <https://doi.org/10.1093/workar/waad012>
- Blossfeld H-P (1985) Berufseintritt und Berufsverlauf. *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung* 18:177–197.
- Blossfeld H-P (1988) Sensible Phasen im Bildungsverlauf. Eine Längsschnittdanalyse über die Prägung von Bildungskarrieren durch den gesellschaftlichen Wandel. *Zeitschrift für Pädagogik* 34:45–63.
- Böhn S, Deutscher V (2022) Dropout from initial vocational training – A meta-synthesis of reasons from the apprentice's point of view. *Educational Research Review* 35:100414.
- Breen R, Goldthorpe JH (1997) Explaining educational differentials: towards a formal rational action theory. *Rationality and Society* 9:275–305. <https://doi.org/10.1177/104346397009003002>
- Committee on the Rights of Persons with Disabilities (2016) General Comment No. 4 on Article 24 - the right to inclusive education.
- Conderman G, Liberty L, DeSpain S (2017) Understanding accommodations, modifications, and interventions. *Kappa Delta Pi Record* 53:70–75. <https://doi.org/10.1080/00228958.2017.1299545>
- Dalgaard NT, Bondebjerg A, Viinholt BCA, Filges T (2022) The effects of inclusion on academic achievement, socioemotional development and wellbeing of children with special educational needs. *Campbell Systematic Review* 18:1–44. <https://doi.org/10.1002/cl2.1291>
- Eckhart M, Haeberlin U, Sahli Lozano C, Blanc P (2011) Langzeitwirkungen der schulischen Integration. Eine empirische Studie zur Bedeutung von Integrationserfahrungen in der Schulzeit für die soziale und berufliche Situation im jungen Erwachsenenalter, 1. Aufl. Haupt, Bern.
- EDK (2022) Nachobligatorische Bildung. In: *Bildungssystem Schweiz*. Accessed 28 Feb 2023. <https://www.edk.ch/de/bildungssystem-ch/nachobligatorium>
- EDK (2007) Einheitliche Terminologie für den Bereich der Sonderpädagogik von der EDK am 25. Oktober 2007 verabschiedet gemäss der interkantonalen Vereinbarung über die Zusammenarbeit im Bereich der Sonderpädagogik.
- Elffers L (2011) The transition to post-secondary vocational education: students' entrance, experiences, and attainment. Ipskamp drukkers.
- Emirza S, Öztürk EB, Şengönül AS (2021) The quality of international mobility experiences, general self-efficacy and job search self-efficacy: A time-lagged investigation. *Current Psychology* 40:1580–1591. <https://doi.org/10.1007/s12144-021-01394-3>
- Enders CK (2022) *Applied missing data analysis*. Guilford Publications.
- Epp A (2018) Subjektive Theorien von Lehrkräften über ungünstige Faktoren in der Bildungsbiografie von Schülerinnen und Schülern – Wie konstruieren Lehrkräfte den Übergang von der Schule in die Berufsausbildung? *Zeitschrift für Erziehungswissenschaft* 21:973–990. <https://doi.org/10.1007/s11618-018-0814-2>
- Feldman E, Kim J-S, Elliott SN (2011) The effects of accommodations on adolescents' self-efficacy and test performance. *The Journal of Special Education* 45:77–88. <https://doi.org/10.1177/0022466909353791>
- Fitzli D, Grütter M, Fontana M-C et al (2016) Evaluation der Arbeitsmarktsituation und Weiterbildungsperspektive von Absolventen und Absolventinnen mit eidgenössischem Berufsattest (EBA). econcept AG und Link Institut, Zürich.
- Fox JD, Stinnett TA (1996) The effects of labeling bias on prognostic outlook for children as a function of diagnostic label and profession. *Psychology in the Schools* 33:143–152. [https://doi.org/10.1002/\(SICI\)1520-6807\(199604\)33:2<143::AID-PITS7-3.0.CO;2-5](https://doi.org/10.1002/(SICI)1520-6807(199604)33:2<143::AID-PITS7-3.0.CO;2-5)
- Gambin L, Hogarth T (2016) Factors affecting completion of apprenticeship training in England. *Journal of Education and Work*. <https://doi.org/10.1080/13639080.2014.997679>
- Ganzeboom HBG (2010) International standard classification of occupations (ISCO-08) with ISEI-08 scores.
- Glauser D (2015) Berufsausbildung oder Allgemeinbildung: soziale Ungleichheiten beim Übergang in die Sekundarstufe II in der Schweiz. Springer VS, Wiesbaden.

- Goffman E (2009) Stigma notes on the management of spoiled identity. Touchstone, New York.
- Gomensoro A, Meyer T (2022) Ergebnisse zu TREE2: Die ersten zwei Jahre. TREE.
- Gomensoro A, Meyer T, Hupka-Brunner S et al (2017) Erwerbsituation im Alter von dreissig Jahren. Ergebnis-Update der Schweizer Längsschnittstudie TREE. <https://doi.org/10.7892/BORIS.112562>
- Gomolla M, Radtke F-O (2009) Institutionelle Diskriminierung. In: Gomolla M, Radtke F-O (eds) Institutionelle Diskriminierung: Die Herstellung ethnischer Differenz in der Schule. VS Verlag für Sozialwissenschaften, Wiesbaden, pp 35–58.
- Graham JW, Olchowski AE, Gilreath TD (2007) How many imputations are really needed? Some practical clarifications of multiple imputation theory. *Prevention Science: The Official Journal of the Society for Prevention Research* 8:206–213. <https://doi.org/10.1007/s1121-007-0070-9>
- Greber L, Sahli Lozano C, Steiner F (2017) Lehrpersoneneinschätzungen von Kindern mit integrativen schulischen Massnahmen. *Empirische Pädagogik* 31:303–322.
- Gresch C, Kölm J, Kocaj A (2017) Amtlich festgestellter sonderpädagogischer Förderbedarf und sonderpädagogische Förderung. In: Stanat P, Schipolowski S, Rjosk C, (eds) IQB-Bildungstrend 2016. Kompetenzen in den Fächern Deutsch und Mathematik am Ende der 4. Jahrgangsstufe im zweiten Ländervergleich., 1. Auflage. Waxmann, Münster, pp 282–290.
- Gruber N, Tausch A (2016) TBS-TK-Rezension. *Psychologische Rundschau*.
- Ho DE, Imai K, King G, Stuart EA (2007) Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. *Political Analysis* 15:199–236. <https://doi.org/10.1093/pan/mpl013>
- Holtmann AC, Solga H (2023) Dropping or stopping out of apprenticeships: the role of performance- and integration-related risk factors. *Zeitschrift für Erziehungswissenschaft* 26:469–494. <https://doi.org/10.1007/s11618-023-01151-1>
- Holtmann AC, Menze L, Solga H (2017) Persistent disadvantages or new opportunities? The role of agency and structural constraints for low-achieving adolescents' school-to-work transitions. *J Youth Adolescence* 46:2091–2113. <https://doi.org/10.1007/s10964-017-0719-z>
- Imdorf C (2007) Individuelle oder organisationale Ressourcen als Determinanten des Bildungserfolgs?: Organisatorischer Problemlösungsbedarf als Motor sozialer Ungleichheit. *Schweizerische Zeitschrift für Soziologie* 3:407–423. <https://doi.org/10.5451/UNIBAS-EP11018>
- Kammermann M, Stalder BE, Hättich A (2011) Two-year apprenticeships—a successful model of training? In: Fuller A, Unwin L (eds) *Contemporary Apprenticeship. International Perspectives on an Evolving Model of Learning*, 1st edition. Routledge, London, pp 150–169.
- Kiene A, Lau R (2017) Nachteilsausgleich und Selbstwirksamkeitserfahrungen in einer (perspektivisch) inklusiven Oberstufe. Führt die Gewährung von Nachteilsausgleichsmassnahmen zur Bildungsgerechtigkeit? In: Lütje-Klose B, Textor A (eds) *Leistung inklusive? Inklusion in der Leistungsgesellschaft*. Verlag Julius Klinkhardt, Bad Heilbrunn, pp 173–180.
- Koonce DA, Cruce MK, Aldridge JO et al (2004) The ADHD label, analogue methodology, and participants' geographic location on judgments of social and attentional skills. *Psychology in the Schools* 41:221–234. <https://doi.org/10.1002/pits.10150>
- Köpfer A, Powell JJW, Zahnd R (eds) (2021) *Handbuch Inklusion international: globale, nationale und lokale Perspektiven auf Inklusive Bildung*. Verlag Barbara Budrich, Berlin.
- Krämer S, Möller J, Zimmermann F (2021) Inclusive education of students with general learning difficulties: A meta-analysis. *Review of Educational Research* 91:432–478. <https://doi.org/10.3102/0034654321998072>
- Kronig W (2007) Die systematische Zufälligkeit des Bildungserfolgs: theoretische Erklärungen und empirische Untersuchungen zur Lernentwicklung und zur Leistungsbewertung in unterschiedlichen Schulklassen, 1st edn. Haupt, Bern
- Laporte C, Mueller RE (2013) The completion behaviour of registered apprentices in canada: who continues, who quits, and who completes programs? *Empirical Research in Vocational Education and Training* 5:1–30. <https://doi.org/10.1186/1877-6345-5-1>
- Lent RW (2002) Social cognitive career theory. In: *Career choice and development*, 4th edition. Jossey-Bass, San Francisco, pp 255–307
- Lent RW, Brown SD, Hackett G (1994) Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of vocational behavior* 45:79–122. <https://doi.org/10.1006/jvbe.1994.1027>
- Lovett BJ, Leja AM (2013) Students' perceptions of testing accommodations: what we know, what we need to know, and why it matters. *Journal of vocational behavior* 29:72–89. <https://doi.org/10.1080/15377903.2013.751477>
- Lustenberger S, Wicki M, Brandenberg K, et al (2023) Transition von der Sekundarstufe 1 in die Sekundarstufe 2: Einfluss einer diagnostizierten Angststörung oder Depression im Jugendalter auf nachobligatorische Ausbildungsverläufe. *Empirische Sonderpädagogik* 3:275–293. <https://doi.org/10.2440/003-0011>
- Meyer T (2003) Zwischenlösung – Notlösung? Bundesamt für Statistik (BFS), Neuchâtel.
- Meyer T, Gomensoro A, Hupka-Brunner S (2023) Nachobligatorische Ausbildungschancen im Spiegel der TREE-Studie: Persistente Ungleichheiten im Kohortenvergleich. <https://doi.org/10.48350/182870>
- Michaelis C, Richter M (2022) Discontinuities in vocational education and training: the influence of early-risk factors and personality constructs on premature training termination and subsequent trajectories. *Empirical Research in Vocational Education and Training* 14:7. <https://doi.org/10.1186/s40461-022-00135-5>
- Moser U (2006) *Stellwerk: ein computergestütztes adaptives Testsystem. Testtheoretische Grundlagen und erste Erfahrungen*. Institut für Bildungsevaluation der Universität Zürich, Zürich.
- Nägele C, Stalder B (2017) Übergänge in die Berufsbildung – Ein Arbeitsmodell. In: Neuenschwander MP, Nägele C (eds) *Bildungsverläufe von der Einschulung bis in den ersten Arbeitsmarkt*. Springer Fachmedien Wiesbaden, Wiesbaden, pp 21–36.
- Neuenschwander MP (2021) Schule und Beruf. In: Hascher T, Idel T-S, Helsper W (eds) *Handbuch Schulforschung*. Springer Fachmedien, Wiesbaden, pp 1–19.
- Neumann M, Schnyder I, Trautwein U et al (2007) Schulformen als differenzielle Lernmilieus. *Zeitschrift für Erziehungswissenschaft* 10:399–420. <https://doi.org/10.1007/s11618-007-0043-6>
- Nguyen T-L, Collins GS, Spence J et al (2017) Double-adjustment in propensity score matching analysis: choosing a threshold for considering residual imbalance. *BMC Medical Research Methodology* 17:78. <https://doi.org/10.1186/s12874-017-0338-0>
- Oakes J (2005) *Keeping track: how schools structure inequality*. Yale University Press.
- OECD (2020) DAC list of ODA recipients.

- Ohan JL, Visser TAW, Strain MC, Allen L (2011) Teachers' and education students' perceptions of and reactions to children with and without the diagnostic label ADHD. *Journal of School Psychology* 49:81–105. <https://doi.org/10.1016/j.jsp.2010.10.001>
- Parsons J, McColl MA, Martin AK, Rynard DW (2021) Accommodations and academic performance: First-year university students with disabilities. *Canadian Journal of Higher Education* 51:41–56. <https://doi.org/10.47678/cjhe.vi0.188985>
- Patzina A, Wydra-Somaggio G (2020) Early careers of dropouts from vocational training: signals, human capital formation, and training firms. *European Sociological Review* 36:741–759. <https://doi.org/10.1093/esr/jcaa011>
- Rolfe V, Rosén M (2022) Delays and dropouts: identifying risks of suboptimal post-compulsory educational pathways in Sweden. *Studia Paedagogica* 27:45–77. <https://doi.org/10.5817/SP2022-4-2>
- Rosenbaum PR (2002) *Observational studies*, 2nd ed. Springer Science and Business Media, New York.
- Rosenthal R, Jacobson L (1968) Pygmalion in the classroom. *The Urban Review* 3:16–20. <https://doi.org/10.1007/BF02322211>
- Russmann M, Netz N, Lörz M (2024) Dropout intent of students with disabilities. *Higher Education* 88:183–208. <https://doi.org/10.1007/s10734-023-01111-y>
- Sacchi S, Meyer T (2016) Übergangslösungen beim Eintritt in die Schweizer Berufsbildung: Brückenschlag oder Sackgasse? *Swiss Journal of Sociology* 42:8–40. <https://doi.org/10.1515/sjs-2016-0002>
- Sahli Lozano C (2012) *Schulische Selektion und berufliche Integration: Theorien, Positionen und Ergebnisse einer Längsschnittstudie zu den Wirkungen integrativer und separativer Schulformen auf Ausbildungszugänge und -wege*. Dissertation, Universität Freiburg, Philosophische Fakultät.
- Sahli Lozano C, Brandenburg K, Ganz AS, Wüthrich S (2022a) Accommodations, modifications, and special education interventions: influence on teacher expectations. *Educational Research and Evaluation* 27:396–419. <https://doi.org/10.1080/13803611.2022.2103571>
- Sahli Lozano C, Brandenburg K, Lustenberger S, et al (2022b) Aktuelle Forschungsprojekte: Langfristige Bildungsverläufe von ehemaligen Regelschüler/innen mit integrativen schulischen Maßnahmen (LABIRINT). *Vierteljahresschrift für Heilpädagogik und ihre Nachbargebiete* 91:157–159. <https://doi.org/10.2378/vhn2022.art18d>
- Sahli Lozano C, Cramer S, Gosteli DA (2021) *Integrative und separative schulische Massnahmen in der Schweiz (InSeMa). Kantonale Vergabe und Umsetzungsrichtlinien*. Edition SZH/CSPS, Bern.
- Sahli Lozano C, Greber L, Wüthrich S (2017) Subjektiv wahrgenommenes Integriertsein von Kindern in Schulsystemen mit integrativen Massnahmen. *Empirische Pädagogik* 31:284–302.
- Sahli Lozano C, Brandenburg K, Wicki M, et al (2023a) The effects of accommodations and curriculum modifications on academic performance and perceived inclusion: A prospective longitudinal study among students in Switzerland. *European Journal of Special Needs Education* 39:1–16. <https://doi.org/10.1080/08856257.2023.2227527>
- Sahli Lozano C, Setz F, Wüthrich S, Wicki M (2023b) Integrative Förderung für Lernende mit besonderem Bildungsbedarf - Inter- und intrakantonale Heterogenität bezüglich Zielgruppe und Umsetzung. *Swiss Journal of Educational Research* 45:320–334. <https://doi.org/10.24452/sjer.45.3.8>
- Sahli Lozano C, Wüthrich S, Wicki M, Brandenburg K (2023c) Soziale Selektivität bei der Vergabe der integrativen schulischen Massnahmen reduzierte individuelle Lernziele, Nachteilsausgleich und integrative Förderung. *Zeitschrift für Erziehungswissenschaft* 26:997–1027. <https://doi.org/10.1007/s11618-023-01173-9>
- Scharenberg K, Rudin M, Müller B et al (2014) *Ausbildungsverläufe von der obligatorischen Schule ins junge Erwachsenenalter: die ersten zehn Jahre. Ergebnisübersicht der Schweizer Längsschnittstudie TREE, Teil I*. <https://doi.org/10.7892/BORIS.131056>
- Schmid E, Scharnhorst U, Kammermann M (2021) Developing two-year apprenticeships in Norway and Switzerland. *Vocations and Learn* 14:55–74. <https://doi.org/10.1007/s12186-020-09254-0>
- Schoon I, Lyons-Amos M (2016) Diverse pathways in becoming an adult: the role of structure, agency and context. *Research in Social Stratification and Mobility* 46:11–20. <https://doi.org/10.1016/j.rssm.2016.02.008>
- SDBB (2015) *Nachteilsausgleich für Menschen mit Behinderung in der Berufsbildung*.
- Spence M (1973) Job market signaling. *Q J Econ* 87:355–374. <https://doi.org/10.2307/1882010>
- Stalder B (2011) The intellectual demands of initial vocational education and training in Switzerland. Ratings for the period 1999–2005. <https://doi.org/10.7892/BORIS.131086>
- Stalder B (2012) *Kritische Transitionen in der beruflichen Grundbildung: Wenn Ausbildungswege nicht der Norm entsprechen*. 1:90–106
- Stalder B, Schmid E (2016) *Lehrvertragsauflösung und Ausbildungserfolg - kein Widerspruch: Wege und Umwege zum Berufsabschluss*. hep Verlag, Bern.
- UN (2015) *The 2030 Agenda for Sustainable Development*.
- UN General Assembly (2006) *Convention on the Rights of Persons with Disabilities*.
- UN-BRK (2014) Übereinkommen vom 13. Dezember 2006 über die Rechte von Menschen mit Behinderungen.
- UNESCO (1994) *The Salamanca statement and framework for action on special needs education: adopted by the world conference on special needs education: Access and quality*. Salamanca, Spain, 7–10 June 1994. UNESCO, Paris.
- van Buuren S, Groothuis-Oudshoorn K (2011) mice: multivariate imputation by chained equations in R. *Journal of Statistical Software* 45. <https://doi.org/10.18637/jss.v045.i03>
- Vock M, Gronostaj A (2017) *Umgang mit Heterogenität in Schule und Unterricht*. Friedrich-Ebert-Stiftung, Abt. Studienförderung, Berlin.
- Weiss RH (2006) *Culture Fair Intelligence Test Scale 2—Revision (CFT 20—R)*. Hogrefe, Göttingen.
- Wydra-Somaggio G (2021) Early termination of vocational training: dropout or stopout? *Empirical Research in Vocational Education and Training* 13:5. <https://doi.org/10.1186/s40461-021-00109-z>
- Zhao Q-Y, Luo J-C, Su Y et al (2021) Propensity score matching with R: conventional methods and new features. *Annals of Translational Medicine* 9:812–851. <https://doi.org/10.21037/atm-20-3998>
- Zurbriggen C, Venetz M (2016) Soziale Partizipation und aktuelles Erleben im gemeinsamen Unterricht. *Empirische Pädagogik* 30:98–112.

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