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Schools as Differential Environments for Students' Development: How Tracking and School Composition Affect Students' Transition After the End of Compulsory Education

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Abstract: Tracking leads to differential developmental environments resulting in educational inequalities. We investigated whether tracking and school composition affect students' transition to post-compulsory education. Based on data of two Swiss school-leavers' cohorts (2000/2016), multilevel analyses show that the social and achievement-related school composition and track affiliation predict transitions beyond students' individual characteristics. Compositional effects were in part differentially predictive depending on students' track affiliation.

Keywords: Transition, tracking, school composition, differential environments for students' development

Schulen als differenzielle Entwicklungsmilieus: Wie schulische Bildungsgänge und Schulkomposition den Übergang nach Ende der Pflichtschulzeit beeinflussen

Zusammenfassung: Schulformen mit unterschiedlichen Anforderungsniveaus sind differenzielle Entwicklungsmilieus, die zu Bildungsungleichheiten führen. Der Beitrag untersucht Effekte der Schulformzugehörigkeit und Schulzusammensetzung auf den Übergang nach der Pflichtschulzeit. Mehrebenenanalysen basierend auf Daten zweier Schweizer Schulabgängerkohorten (2000/2016) zeigen, dass die soziale und leistungsbezogene Schulzusammensetzung und der besuchte Bildungsgang über Individualmerkmale hinaus bedeutsam sind. Kompositionseffekte waren z. T. bildungsgangspezifisch.

Schlüsselwörter: Übergang, Schulform, Schulformgliederung, Komposition, differenzielle Entwicklungsmilieus

Les écoles en tant que milieux de développement différenciés : comment les types d'école et la composition des écoles influencent la transition après la fin de la scolarité obligatoire

Résumé : Les types d'école sont des milieux de développement différenciés qui entraînent des inégalités scolaires. Nous étudions l'impact des types et de la composition des écoles sur la transition après la scolarité obligatoire. Basées sur les données de deux cohortes de jeunes suisses en fin de scolarité (2000/2016), les analyses multi-niveaux montrent que la composition sociale, les performances scolaires et les types d'école étaient significatifs au-delà des traits individuels. Les effets de composition étaient en partie spécifiques au type d'école.

Mots-clés : Transition, types d'école, composition des écoles, milieux de développement différenciés

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1 Introduction: School Contexts as Differential Environments for Students' Learning and Development[1]

Sociology of education (e. g., Coleman 1986; Mayer 1990; Becker and Schulze 2013) holds that individuals are embedded in different social contexts defined as the material, institutional, or cultural environments which inevitably and continuously shape individuals' development throughout their lives. In childhood and adolescence, the education system is considered as the major environmental context apart from the family (e. g., Bornstein 2015), as it constitutes the relevant institutional context for students' development, which not only sets the course for lifelong learning, but also structures their opportunities for transitions into other social contexts such as employment or higher education (e. g., Müller and Jacob 2008; Blossfeld and von Maurice 2011).

Empirical findings repeatedly show that the structure of the formal education system and the respective institutional school context can have an independent, but also cumulative effect on, e. g., students' school performance and educational attainment beyond the effects of the home learning environment, and can thus contribute to social and migration-related inequalities, especially at the transition points within the education system (e. g., Kristen and Dollmann 2010; Neugebauer and Schindler 2012). Such findings contradict not only the meritocratic principle, but also show that institutional contexts are likely to contribute to unequal chances of educational outcomes.

From an international perspective, many OECD countries apply between-school tracking in secondary education (OECD 2022). In (lower) secondary education systems, the aim of tracking is to create homogenous learning environments in terms of students' academic achievement (e. g., Oakes 1985; Slavin 1990; Rosenbaum 2000) and prepare them for different educational and vocational pathways after compulsory education. Tracking intends to create comparable learning conditions with regard to teaching and learning efficiency: It is held that learning contents and formats in tracked settings can be geared more specifically to students' needs and abilities so that they can be optimally supported according to their individual learning requirements (Oakes 1985; Slavin 1990; Rosenbaum 2000).

At the individual level, however, academic achievement is persistently and closely related to students' social origin (Weis et al. 2019). As a consequence, the intended achievement-related homogenization of the student body due to external differentiation and track placement after primary education (Becker et al. 2012) leads to social stratification in secondary education (Baumert et al. 2006). If we consider students' sociocultural background (e. g., percentage of students with immigrant

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background), performance-related characteristics (e. g., average school achievement or cognitive ability level) and their educational biography (e. g., percentage of students with discontinuous educational pathways) as indicators of the student body composition – and hence as factors that influence a school's learning environment –, a combination of several of these compositional characteristics may lead to cumulative advantages or disadvantages in certain schools (Baumert et al. 2006, 97). Especially lower-track schools are often characterized by a socially less privileged student body composition and lower availability of educational resources (Trautwein et al. 2007). Accordingly, tracks represent socio-ecologically largely different school environments (Baumert et al. 2006, 98). Their compositional profiles also reflect the residential social segregation of a school's catchment area (Ditton and Krüsken 2006b, 154).

2 Theoretical Framework Model and Empirical Evidence

School environments, especially with respect to differences between school tracks, are assumed to constitute *differential environments for learning and development*: Students are offered different, track-specific developmental opportunities independent of and in addition to their individual sociocultural, economic, and intellectual resources (Baumert et al. 2006, 99).

According to the theoretical framework model on mediation processes of contextual effects of the school learning environment as proposed by Baumert et al. (2006, 126), achievement gaps are mainly due to

a) students' *differential individual achievement trajectories* depending on their prior knowledge and on the availability of resources provided by parents and peers;
b) *institutional effects*, i. e., track-specific differences in institutionalized learning opportunities regarding educational programs, curricula, teaching and learning culture as well as track-specific traditions of teacher education;
c) *compositional effects* with respect to track-specific differences regarding the achievement-related and sociocultural student body composition.

Whereas predictors of trajectories such as students' social origin and their prior knowledge relate to the individual level, institutional and compositional effects arise due to differences in school-level characteristics. Tracking alone, however, does not necessarily evoke pronounced differences in students' learning and achievement (Hattie 2002). As has been frequently discussed in research on ability grouping (e. g., Gamoran 1992; Ireson and Hallam 2001), tracking effects are, according to Baumert et al. (2006, 126), mediated by various processes relating to

a) pedagogical responses to student groups of different achievement or ability levels (e. g., instructional organization and teacher expectations, curricular standards, differences in didactics and instructional quality),

b) differences in parents' normative values (e. g., parental expectations regarding achievement and behavior),
c) differences in the normative values of the peer group (e. g., norms for achievement and success),
d) social comparison processes at student level.

Based on the model of Baumert et al. (2006), an extended theoretical framework model of mediation processes of school-contextual effects was presented by Scharenberg (2019), who proposed

1. to consider not only achievement-related outputs as criterion, but also to take into account multi-criterial goals of school and instruction,
2. to include further aspects of students' heterogeneity (e. g., gender, cognitive skills) and
3. to consider longer-term outcomes such as educational pathways, transitions into other educational or vocational contexts and educational attainment, that is, to extend the temporal dimension of the mediation model beyond compulsory schooling.

2.1 Previous Research

Against the background of the theoretical model on mediation processes of institutional effects as proposed by Baumert et al. (2006), empirical studies repeatedly showed that differential environments have an impact on students' academic achievement. For Germany, there is empirical evidence that school composition and track affiliation are associated with math and reading achievement gaps that widen throughout secondary education between basic tracks (*Hauptschule*) and academic tracks (*Gymnasium*). The evidence also highlights advantages for students in schools with a more privileged composition, even when controlling for prior knowledge (Baumert et al. 2006; Gröhlich et al. 2010).

Becker et al. (2012) found that students attending the academic track had significantly larger increases in psychometric intelligence between grades 7 and 10, compared to a matched sample of students in non-academic tracks and controlling for relevant psychological and social background variables. Similar results were provided by Guill et al. (2017) based on a larger and more heterogeneous sample. Scharenberg et al. (2014) investigated the domain-specificity of track-specific developments at the beginning of secondary school (grades 5 and 6) and compared students' development in subject-related skills (reading, mathematics) and reasoning skills: They reported significant advantages after two years in secondary school for students in academic tracks and those with higher-performing schoolmates. Yet, although there were unique effects of school composition and tracking, they were highly confounded.

2.2 The Swiss Context and Research Interest

The Swiss education system at lower-secondary level is characterized by achievement-based grouping into tracks with different academic requirements (Swiss Education Server 2021). Tracking at lower-secondary level starts in grade 7, when students are aged approximately 12-13. Depending on cantonal and communal regulations, lower-secondary education is organized in different structural models: The streamed model (two to four tracks in separate schools with different educational requirements in all subjects) is the most common structural model in Switzerland, but it offers little permeability (EURYDICE 2021). However, in some cantons, students with different track affiliations are taught in "mixed-track" classes in all or some school subjects. In other cantons, students are entirely separated by track (for further information see the website of the Swiss Conference of Cantonal Ministers of Education [EDK], www.edk.ch).

At the transition from lower- to upper-secondary education, adolescents in Switzerland have to make a decision between general education and vocational education and training (VET) (e. g., Jüttler et al. 2021). This transition is often described as a "bottleneck" which young adults have to pass on their way to post-compulsory certification. In fact, a significant proportion of students fails to make this transition without any delay: For example, analyses of the TREE study show that after the first year following the end of compulsory education, about 20 percent of adolescents have not yet successfully managed the transition into a certifying general education or VET program at upper-secondary level (Keller et al. 2010; Scharenberg et al. 2016; Gomensoro and Meyer 2021). Such discontinuities at the entry into post-compulsory education may also represent a risk factor for further discontinuities in the educational pathway and for the acquisition of a post-compulsory certificate (e. g., Scharenberg et al. 2016). Thus, managing this transition is a central phase in young adults' lives and an important developmental task in (young) adulthood (Havighurst 1972).

With regard to previous research evidence for the Switzerland, Felouzis and Charmillot (2013) compared school tracking effects on educational inequality in 12 cantons. Drawing on data from the Swiss PISA 2003 sample, they found that the official structure of tracks is less important for explaining educational inequality than the way how tracking is actually implemented in schools (e. g., in terms of the degree of segregation). According to their analyses, some cantonal tracks are more unequal than others, with significant variation of the factors predicting inequality. Educational inequality was especially pronounced in tracks with basic requirements. Finally, multi-level analyses showed that tracking effects are closely linked to compositional effects of the student population within tracks.

Angelone (2019) analyzed track-specific achievement gains for students in the canton of Zurich from the end of primary education (grade 6) to the end of lower-secondary education (grade 9). In Zurich's three-track lower secondary system,

Angelone observed increasing track-related disparities of achievement (net of skills and individual social background) in German, with significant advantages for students in tracks with high requirements (*Gymnasium*) compared to a matched sample of students in tracks with extended (i. e., medium) requirements. Moreover, students in tracks with extended requirements achieved higher in German and mathematics than those attending tracks with basic requirements. Effect sizes for the differences between the three tracks were small, but meaningful ($d = 0.21–0.34$).

Neumann et al. (2007) found for a student sample in the German-speaking parts of the cantons of Valais and Fribourg that students' achievement development in French as a foreign language within one school year (grade 8) was significantly higher in tracks with extended academic requirements than in basic tracks, even when controlling for intake characteristics (including prior knowledge) at individual level. The study also provided evidence of advantages for students' achievement development due to a higher performing and socially more privileged school composition. However, these effects were confounded with institutional tracking effects.

When interpreting these research findings, we have to bear in mind that track-specific differences in students' development accumulate throughout the entire school career and across different school contexts and may continue to affect students' development even if they have already left a certain learning environment (Goldstein and Sammons 1997; Ditton 2013).

The above-mentioned findings notwithstanding, tracking effects on students' development have not yet been investigated as extensively for the Swiss context as for Germany (Angelone 2019). In fact, the focus of the existing studies in this field available to date is mostly on school performance. A deeper understanding of the interaction of tracking and school composition as well as their effects on other outputs or on *longer-term outcomes* therefore remains a substantial research gap. The present contribution therefore examines for Switzerland how differences in school contexts due to tracking as well as school composition affect students' transition after the end of compulsory education and may contribute to unequal educational opportunities in this crucial phase of adolescence.

3 Research Questions

Following the theoretical approach of Baumert et al. (2006) as outlined above, we conceptualize school contexts as differential institutional environments for students' development that – presumably – influence not only students' learning and achievement development at school, but also set the course for transitions into post-compulsory education, the labor market and the workplace (as suggested in the extended mediation model of school-contextual effects by Scharenberg 2019). Based on the aforementioned theoretical considerations and the review of research

literature, the aim of the present paper is to extend previous research by investigating effects of tracking and student body composition. As most of the above-mentioned research focused on achievement outputs, the present study addresses a research gap by examining the transition from lower- to upper-secondary education (and in the Swiss case: from compulsory to post-compulsory education) as an indicator of educational outcomes. With reference to the theoretical framework model (Baumert et al. 2006; Scharenberg 2019), our analytical focus is at the level of the institutional school context, where we strive to assess how school-level characteristics, i. e., differences in school composition resulting from tracking measures, affect students' individual post-compulsory pathways as educational outcome. We address the following three research questions (RQ):

1. Does students' lower-secondary track affiliation affect their probability of successful transition to post-compulsory education – over and beyond the effects of other student characteristics at individual level?
2. Are differences in lower-secondary school composition related to students' probability of successful transition to post-compulsory education?
3. Are there interaction effects between school composition in lower-secondary education and students' track affiliation?

4 Data and Methods

4.1 Data and Sample

We use data from the Swiss TREE panel survey (Transitions from Education to Employment). TREE is a multi-disciplinary large-scale panel survey in Switzerland that follows up on educational and occupational pathways of youths from the end of compulsory school (at an approximate age of 15 to 16) to young and middle adulthood, with panel waves at yearly intervals up to the age of 22–23 years, and at longer intervals thereafter (Hupka-Brunner et al. 2021).

TREE is a multi-cohort study with two cohorts: The first cohort (TREE1; TREE 2016b) draws on a baseline sample of $n = 6{,}343$ students who participated in PISA (Programme for International Student Assessment) 2000 and left compulsory education in the same year (TREE 2016a). In 2016, a second, comparable cohort study (TREE2; TREE 2021) was launched with a sample of students ($n = 9{,}762$) who had left compulsory education in 2016 (Hupka-Brunner et al. 2021). As its baseline survey, TREE2 draws on the Assessment of the Attainment of Educational Standards conducted in 2016 (AES 2016; for the complex survey structure see Verner and Helbling 2019). Both cohorts are nationally and regionally representative of almost 80,000 school-leavers in their last year of compulsory education (Hupka-Brunner et al. 2021).

With regard to our analysis sample, we first excluded students who had not participated in the first follow-up survey (cohort 1: year 2001, cohort 2: year 2017). Second, since our research questions relate, among other things, to the importance of lower-secondary tracking for the transition after compulsory education, we excluded students who had attended lower-secondary schools with no formal tracking. Third, we excluded schools with less than 10 participating students, as lower sample sizes at aggregate level are expected to lower reliability of the schools' average-based institutional variables. Applying these selection criteria resulted in an analysis sample of $n = 4{,}707$ students in 208 schools (cohort 1) and $n = 5{,}239$ students in 316 schools (cohort 2).

For both cohorts, analyses were based on weighted data (Sacchi 2013; forthcoming) to compensate for biases resulting from students' unequal selection probabilities due to disproportional baseline sampling and selective sample attrition, which is a common source of missing data in longitudinal studies (Little and Rubin 2020).

4.2 Measurements

Our *dependent variable* is students' successful (coded as 1) or unsuccessful transition (coded as 0) into certifying upper-secondary general education or VET programs within the first year after the end of compulsory education. In line with previous analyses based on TREE1 data (e. g., Keller et al. 2010), we considered transitions as successful if students experienced no delays or interruptions of any kind in their educational pathways between lower- and upper-secondary education (e. g., gap years, other "intermediate solutions" or the absence of any educational activity whatsoever; on the issue of delayed transitions see also Sacchi and Meyer 2016).

In our analyses, we follow an explanatory approach based on between-school differences, taking into account characteristics of the school context resulting from the sociocultural segregation between schools. When analyzing compositional aggregates, we accounted for the nested data structure (Hox et al. 2018). The respective individual characteristics that were used to generate these aggregates were also included in the estimation models as recommended by Harker and Tymms (2004).

Educational disadvantages due to different socialization and learning processes in the family and neighborhood context depending on the availability of economic, social, and cultural resources are well known (e. g., Ditton and Krüsken 2006a; Kristen and Dollmann 2010; Becker 2011; Angelone and Ramseier 2012). For the present study, we therefore relied on various student characteristics that are also elements of the theoretical framework model for the mediation of institutional effects (Baumert et al. 2006; Scharenberg 2019 – see Section 2).

As *predictor variables at individual level*, we included the following variables: Gender was used as a dummy-coded variable (reference: *male*). Students' cultural background was operationalized as the correspondence of the teaching language at school and the language mainly spoken at home (reference: *the teaching language*

Table 1 Description of Analysis Samples

	Cohort 1[a]		Cohort 2[b]	
	M	*(SD)*	*M*	*(SD)*
SES[c]	49.57	(16.09)	51.81	(16.38)
Math test score[d]	536.97	(94.12)	0.17	(1.39)
Gender (Girls)	50.7 %		49.2 %	
Teaching language mainly spoken at home	79.9 %		75.9 %	
Not in upper-secondary certifying education or training[e] in first post-compulsory year	22.9 %		19.1 %	
Track affiliation: extended requirements[f]	74.0 %		74.1 %	

Note. Descriptive statistics based on imputed ($m = 5$) and weighted data.
[a]School-leavers in 2000 (students: $n = 4{,}707$; schools: $n = 208$).
[b]School-leavers in 2016 (students: $n = 5{,}239$; schools: $n = 316$).
[c]Highest International Socioeconomic Index of Occupational Status (ISEI-88; Ganzeboom et al. 1992).
[d]Standardized achievement test in mathematics. Cohort 1: Mathematical literacy in PISA 2000. Cohort 2: Assessment of the Attainment of Educational Standards (AES) 2016 in mathematics, Weighted Likelihood Estimates (WLE).
[e]Percentage of youths not being in a certifying upper-secondary educational program, i.e., programs leading to a degree at ISCED level 3 (e.g., not pursuing any education or training at all or being in interim solutions such as internships, additional 10th year of schooling etc.).
[f]Attending lower-secondary tracks with high or advanced requirements at the end of compulsory school (grade 9).

does not match the language mostly spoken at home). This was used as an indicator of students' cultural proximity or distance to the cantonal education system, their opportunities for participation and involvement in school lessons as well as for personal exchange and communication with teachers and schoolmates. Social background was operationalized by means of the Highest International Socio-Economic Index of Occupational Status (HISEI; Ganzeboom et al. 1992). For reasons of comparability of both cohorts, we used the ISEI-88 classification, ranging from 16 (e.g., cleaner, unskilled farmworker) to 90 (e.g., courtroom judge).

As indicators of students' achievement and schools' differential intake selectivity, we controlled for students' PISA 2000 literacy test scores in the case of TREE1 (Adams and Wu 2002) and AES 2016 test scores in the case of TREE2 (Angelone and Keller 2019), respectively. We focused on students' test scores in mathematics, as this domain was assessed in both cohorts and allows comparability of the results obtained.

Regarding students' lower-secondary track affiliation at individual level, we distinguished between students attending tracks with basic (coded as 0) vs. extended requirements (i.e., high or advanced requirements, jointly coded as 1). Students attending schools with no formal tracking were excluded from our analyses. We handled students' track affiliation as an individual-level variable, as some cantons do not only apply between-school tracking, but also separate students by track within the same school (see Section 2). Descriptive information on key variables of both cohorts can be found in Table 1.

Table 2 Correlations of Analysis Variables

	(1)	(2)	(3)	(4)	(5)	(6)
Student level						
(1) Successful transition[a]	–	–0.06***	0.13***	0.13***	0.31***	0.32***
(2) Gender[b]	–0.13***	–	0.01†	0.00	–0.07***	0.05***
(3) Language[c]	0.14***	0.00	–	0.25***	0.22***	0.16***
(4) SES[d]	0.20***	0.01	0.19***	–	0.29***	0.29***
(5) Math test score[e]	0.32***	–0.12***	0.26***	0.29***	–	0.55***
(6) Track affiliation[f]	0.23***	0.08***	0.13***	0.27***	0.46***	–
	(7)	(8)	(9)	(10)	(11)	
School level						
(7) Successful transition[g]	–	–0.02	0.36***	0.30***	0.52***	
(8) Gender[h]	–0.07	–	0.05	0.04	0.08	
(9) Laguage[i]	0.12†	0.23**	–	0.28***	0.41***	
(10) SES[j]	0.56***	0.14*	0.30***	–	0.49***	
(11) Math test score[j]	0.49***	0.09	0.55***	0.66***	–	

Note. Correlations for cohort 1 (below diagonals) and cohort 2 (above diagonals). Correlations based on imputed ($m = 5$) and weighted data (school level: aggregation of weighted data).
[a] Successful transitions to upper-secondary education.
[b] Reference: male.
[c] Teaching language mainly spoken at home. Reference: foreign language.
[d] HISEI, z-standardized at student level.
[e] Standardized achievement test in mathematics, z-standardized at student level. Cohort 1: PISA 2000, cohort 2: AES 2016.
[f] Reference: basic academic requirements.
[g] Percentage of students at school level with successful transitions to upper-secondary education.
[h] Percentage of girls.
[i] Percentage of students mainly speaking the teaching language at home.
[j] Averages of standardized achievement test in mathematics. Cohort 1: PISA 2000, cohort 2: AES 2016.
***$p < .001$; **$p < .01$; *$p < .05$; †$p < .10$.

As *predictors at aggregate level*, we controlled for the schools' average social and achievement-related student body composition (aggregated by the school mean of math achievement and SES) as well as for ethnic school composition (percentage of students mainly speaking the teaching language at home). Before aggregating for multilevel analyses, HISEI and Math test scores were z-standardized ($M = 0$, $SD = 1$) to the grand mean of the respective cohort.

The intercorrelations of predictors on individual and aggregate level (see Table 2) were of an acceptable magnitude (see, e. g., Shieh and Fouladi 2003), so that the risk of multicollinearity is negligible.

4.3 Methodological Approach of Multilevel Analyses

Multilevel logistic regression analyses were performed with the software HLM (Raudenbush et al. 2019a; version 8.2.2.1) and specified at individual and aggregate level. Results are presented as odds ratios (OR). We chose a stepwise model specifi-

cation approach (Hox et al. 2018): First, in an unconditional model, we examined the variance decomposition of the dependent variable to estimate how much of the variance in students' probability of a successful transition to post-compulsory level was attributable to differences between students and between schools. Second, we simultaneously added student characteristics and their lower-secondary track affiliation as predictors at individual level (Model 1 relating to RQ1). Third, we estimated a fully specified model at aggregate level with all school composition characteristics (Model 2 relating to RQ2). Finally, we ran three different models with cross-level interactions between school-level variables and students' individual track affiliation to examine whether school composition effects were equally evident for students from tracks with basic and extended requirements or whether there were differential effects (Models 3–5 relating to RQ3). We do not report a fully specified model that simultaneously integrates all three interaction effects because the results did not lead to a meaningful interpretation. Comparisons of differently specified models were conducted by likelihood ratio (LR) tests implemented in HLM (Raudenbush et al. 2019a).

4.4 Missing Data

Regarding the independent variables gender and track affiliation, answers were complete for all students in the analysis sample in both cohorts. Single missing values regarding other student characteristics were estimated with a multiple imputation approach in SPSS 28 ($m = 5$ imputations). School composition characteristics were then calculated for each imputed data set after imputation. In the imputation model, we used all student characteristics that were later included as predictors in the outcome model. In addition, we used students' test scores in reading literacy as a predictor for imputation of cohort 1 data as – by design in the PISA 2000 baseline survey – math test scores were available for about only half of the cohort (55.6%) because the focus of PISA 2000 was on reading achievement. For other student characteristics, the proportions of missing data in cohort 1 were comparatively small (teaching language mainly spoken at home: 0.3 %) and somewhat higher for SES (7.5 %). In cohort 2, the proportions of missing values were generally low (between 0.1 and 1.8 %). Estimates from the 5 data sets resulting from multiple imputation were appropriately combined in HLM when conducting multilevel analyses.

5 Results

5.1 Transition Rates, Students' Social Background and Achievement

Analyses of transition rates (data weighted and imputed) show that 22.9 % of the cohort 1 school-leavers in our analysis sample failed to directly enter certifying upper-secondary education. Young women (71.9 %) were significantly less likely to

successfully manage this transition than men (82.4 %; $\chi^2 = 66.46$, $df = 1$, $p < .001$). Students mainly speaking the teaching language at home showed significantly higher transition rates (79.9 %) than those mainly speaking another language at home (65.8 %; $\chi^2 = 77.57$, $df = 1$, $p < .001$). Students who made a direct transition to upper-secondary level are substantially more privileged in terms of social background ($M = 51.29$ for parental HISEI, $SD = 16.17$) than those who failed to do so ($M = 43.76$, $SD = 14.42$; $t(1379) = 13.50$, $p < .001$). Regarding achievement indicators, students with successful transitions achieved significantly higher math test scores ($M = 553.15$, $SD = 89.07$) than their unsuccessful counterparts ($M = 482.49$, $SD = 90.13$; $t(4237) = -11.82$, $p < .001$). Markedly unequal transition patterns were also observed depending on students' lower-secondary track affiliation: 39.4 % of basic-track students failed to directly enter certifying education programs at upper-secondary level, while this share is less than half as high (17.1 %) among those from tracks with extended requirements ($\chi^2 = 228.92$, $df = 1$, $p < .001$).

As regards cohort 2 leaving compulsory school in 2016, 80.9 % succeeded in directly entering a certifying upper-secondary level program, whereas 19.1 % failed to do so. The percentage of unsuccessful transitions was significantly higher among young women (21.6 %) than among men (16.6 %; $\chi^2 = 169.69$, $df = 1$, $p < .001$). Students mainly speaking the teaching language at home were significantly more successful (83.7 %) at this transition point than those mainly speaking other languages (72.0 %; $\chi^2 = 654.53$, $df = 1$, $p < .001$). As in cohort 1, the average parental socioeconomic index among those making a successful transition is significantly higher ($M = 52.84$, $SD = 16.37$) than among those failing to do so ($M = 47.43$, $SD = 15.70$; $t(51) = -22.67$, $p < .001$). Regarding school achievement indicators, students with successful transitions had significantly higher math test scores ($M = 0.38$, $SD = 1.34$) than those with unsuccessful transitions ($M = -0.71$, $SD = 1.27$; $t(248) = -63.58$, $p < .001$). With regard to the track attended at lower-secondary level and compared to cohort 1, the disparities proved to be even more accentuated: While 40.6 % of basic-track students failed to directly enter certifying education programs at upper-secondary level, the respective share among students from tracks with extended requirements was almost four times lower (11.5 %; $\chi^2 = 4{,}376.47$, $df = 1$, $p < .001$).

5.2 Decomposition of Variance

The variance decomposition of the dependent variable revealed significant variance components for both the first ($\tau_{00} = 0.91$) and the second cohort ($\tau_{00} = 0.48$). Accordingly, the intraclass correlations (ICC; for the ICC calculation for dichotomous variables, see Snijders and Bosker 2012) were $\rho = 0.217$ (cohort 1) and $\rho = 0.128$ (cohort 2), respectively (each $p < .001$). Thus, students' probability of successful transition significantly varied between schools. ICCs of this magnitude indicate the need for multilevel analyses. Therefore, it seemed justified to account for the

hierarchically nested data structure and to predict transition probabilities by both individual and aggregate-level characteristics.

5.3 Multilevel Analyses

The results of the multilevel analyses described below focus on the effects that relate to our aforementioned research questions. For both cohort 1 (Table 3) and cohort 2 (Table 4), our models confirm individual-level effects of socio-demographic and achievement-related characteristics that had been reported in previous research: At student level and controlling for the other individual characteristics in Model 1, we observe significantly lower transition rates for girls (cohort 1: OR = 0.59, $p < .001$; cohort 2: OR = 0.60, $p < .001$). As regards social origin, cohort 1 students with a higher SES were more likely to make a successful transition (OR = 1.25, $p < .001$), while the effect of (mainly) speaking the teaching language at home was insignificant. Interestingly, the opposite is true for cohort 2 (teaching language: OR = 1.22, $p = .022$; SES: OR = 1.00, n. s., respectively). With regard to math skills and lower-secondary track attendance – and for both cohorts –, the odds of a successful transition are significantly higher among students with higher math test scores (cohort 1: OR = 1.64, $p < .001$; cohort 2: OR = 1.61, $p < .001$) and for those having attended tracks with extended requirements (OR = 1.87, $p < .001$; OR = 2.96, $p < .001$). Including individual characteristics at student level significantly improved the goodness of fit compared to the unconditional model.

In the next step, the school composition effects were analyzed (Model 2) estimating the common effect of the school-level aggregates.

As regards cohort 1 (Table 3), Model 2 shows a surprising result: The odds of a successful transition are substantially lower in schools with a larger share of students who mainly speak the teaching language at home (OR = 0.12, $p = .001$). This result is by no means supported by the bivariate correlations conducted prior to the multi-level analyses (see Table 2). In-depth analyses revealed that the mentioned level-2 effect only occurred when math test scores and track affiliation were included as level-1 predictors in the model. The data at hand does not allow us to present a viable explanation for this level-2 effect, but it might be due to a subgroup of schools with both a high share of students speaking a language other than the teaching language at home and a high rate of successful transitions to post-compulsory education. A high proportion of students speaking other languages may also be an indicator of schools in urban areas, where the share of students entering VET is lower than in rural areas. When controlling for the other variables in the model (especially math test scores), it may be easier for students in urban areas to successfully manage this transition because general education programs are more readily available to them.[2]

2 It should be noted that delayed entries into certifying upper-secondary education largely occur in the course of transitions to VET programs.

Table 3 Results from Multilevel Analyses Predicting Transition into Post-Compulsory Education by Student Background Characteristics, Track Affiliation and School Composition Variables (Cohort 1)

	Model 1		Model 2		Model 3		Model 4		Model 5	
	OR	CI[g]	OR	CI[g]	OR	CI[g]	OR	CI[g]	OR	CI[g]
Intercept	4.88***	(3.59, 6.62)	27.83***	(9.79, 79.06)	30.24***	(9.93, 92.03)	27.36***	(9.58, 78.11)	33.49***	(11.55, 97.06)
Student level										
Gender[a]	0.59***	(0.50, 0.69)	0.58***	(0.49, 0.69)	0.58***	(0.49, 0.69)	0.58***	(0.50, 0.69)	0.58***	(0.49, 0.69)
Language[b]	1.19	(0.96, 1.47)	1.29*	(1.04, 1.61)	1.30*	(1.04, 1.63)	1.30*	(1.04, 1.63)	1.30*	(1.04, 1.63)
SES	1.25***	(1.12, 1.39)	1.19**	(1.07, 1.33)	1.19**	(1.07, 1.32)	1.18**	(1.07, 1.32)	1.19**	(1.07, 1.32)
Math test score[c]	1.64***	(1.46, 1.84)	1.62***	(1.45, 1.82)	1.62***	(1.44, 1.82)	1.62***	(1.44, 1.82)	1.63***	(1.45, 1.83)
Track affiliation[d]	1.87***	(1.50, 2.34)	1.67***	(1.33, 2.10)	1.67	(0.49, 5.70)	1.80***	(1.36, 2.39)	1.58**	(1.19, 2.11)
School level										
% Students speaking the teaching language			0.12***	(0.04, 0.44)	0.11**	(0.03, 0.45)	0.12***	(0.03, 0.41)	0.11***	(0.03, 0.39)
SES (*M*)			3.21***	(1.85, 5.56)	3.07***	(1.79, 5.26)	2.53**	(1.29, 4.98)	3.08***	(1.79, 5.30)
Math test score *(M)*			1.20	(0.72, 1.99)	1.26	(0.76, 2.10)	1.24	(0.74, 2.07)	1.52	(0.80, 2.90)
Cross level interactions:										
track affiliation…										
…* % students speaking the teaching language					1.01	(0.23, 4.57)				
…* SES (*M*)							1.40	(0.67, 2.92)		
…* Math test score *(M)*									0.76	(0.39, 1.48)
Model comparison										
Deviance (-2LL)	12 448.92		12 407.94		12 403.55		12 401.62		12 402.84	
N parameters[e]	7		10		13		13		13	
Reference model	Empty model		Model 1		Model 2		Model 2		Model 2	
LR test *(df)*	309.44 (5)		40.98 (3)		4.39 (3)		6.32 (3)		5.10 (3)	
Significance[f]	< .001		< .001		.222		.150		.164	

Note: Estimation of odds ratios (OR). Continuous predictors on student level z-standardized. $n_{L1} = 4\,707$; $n_{L2} = 208$. Data weighted and imputed ($m = 5$).
[a]Reference: male. [b]Language: Teaching language mainly spoken at home. Reference: Other language mainly spoken at home. [c]Standardized achievement test in mathematics (Programme of International Student Assessment, PISA 2000). [d]Basic requirements.
[e]Number of estimated parameters.
[f]Significant improvement of model fit compared to reference model. Empty model: ICC = 0.217, $p < .001$; Deviance (-2LL): 12 758.37, $df = 2$.
[g]Confidence interval (lower bound, upper bound).
***$p < .001$, **$p < .01$, *$p < .05$. †$p < .10$.

A socially more privileged school composition proved to be advantageous for this transition in cohort 1: If the average HISEI at a school was above the average, there was a strong increase in students' likelihood of a successful transition (OR = 3.21, $p < .001$). The effect of attending schools with a higher-performing student body composition was insignificant (OR = 1.20, $p = .482$). Model 2 showed a higher goodness of fit compared to Model 1 ($p < .001$).

Finally, Models 3–5 examine, by means of the cross-level interactions, whether school composition effects on successful transitions vary by students' individual lower-secondary track affiliation. For cohort 1, for none of the examined school composition characteristics can we detect significant school-specific effects. Thus, the goodness of fit of each of these models is not improved compared to Model 2.

For cohort 2 (Table 4), we also observe segregation effects at school level: When taking into account all three compositional characteristics simultaneously (Model 2), only the achievement composition was a significant predictor (OR = 1.33, $p = .042$). However, the effects of the schools' sociocultural composition were insignificant in cohort 2 (percentage of students speaking the teaching language at home: OR = 1.58, $p = .294$; average SES: OR = 1.28, $p = .106$). Yet, this model led to a significant improvement of the goodness of fit compared to Model 1 ($p = .001$).

Finally, we examined differential school composition effects for students with different lower-secondary track affiliations. In contrast to the first cohort, Model 4 shows that the probability of successful transitions in schools with a higher average SES is higher for students from tracks with extended requirements than for those having attended tracks with basic requirements (OR = 2.11, $p = .001$), leading to a significantly higher overall goodness of fit than Model 2 (Δ-2LL = 9.31, $df = 3$, $p = .025$). In Model 5, significant track-specific effects emerge for the achievement-related school composition: The effect of having attended a higher-performing school was larger for students from tracks with extended requirements than for those from tracks with basic requirements (OR = 1.47, $p = .032$). Yet, this cross-level interaction effect between students' individual track affiliation and the achievement-related school composition did not yield a significant improvement of the model fit compared to Model 2 (Δ-2LL = 3.96, $df = 3$, $p = .266$), as the main achievement composition effect became insignificant (OR = 1.02, $p = .936$).

6 Discussion and Conclusion

A successful transition from lower- to upper-secondary education is one of the crucial milestones in setting the course for adolescents' future educational and professional biography (cf. Meyer 2003; Trautwein et al. 2008). A better understanding of individual and school-related factors fostering or hampering the success of this transition is an important element for the evaluation and improvement of

Table 4 Results from Multilevel Analyses Predicting Transition into Post-Compulsory Education by Student Background Characteristics, Track Affiliation and School Composition Variables (Cohort 2)

	Model 1		Model 2		Model 3		Model 4		Model 5	
	OR	CI[g]	OR	CI[g]	OR	CI[g]	OR	CI[g]	OR	CI[g]
Intercept	3.03***	(2.42, 3.79)	2.28*	(1.14, 4.56)	1.78	(0.82, 3.88)	1.99 †	(1.00, 3.97)	1.98 †	(0.98, 3.99)
Student level										
Gender[a]	0.60***	(0.52, 0.70)	0.59***	(0.51, 0.69)	0.95***	(0.51, 0.69)	0.60***	(0.51, 0.70)	0.59***	(0.41, 0.69)
Language[b]	1.00*	(1.03, 1.44)	1.17 †	(0.98, 1.40)	1.17 †	(0.98, 1.40)	1.17 †	(0.98, 1.41)	1.17 †	(0.98, 1.41)
SES	1.61***	(0.92, 1.09)	0.98	(0.90 1.07)	0.98	(0.89, 1.07)	0.98	(0.90, 1.07)	0.98	(0.90, 1.07)
Math test score[c]	2.96***	(1.46, 1.77)	1.52***	(1.36, 1.69)	1.52***	(1.36, 1.70)	1.51***	(1.35, 1.68)	1.51***	(1.35, 1.69)
Track affiliation[d]	1.87***	(2.50, 3.52)	2.91***	(2.44, 3.47)	4.71***	(2.32, 9.59)	3.22***	(2.67, 3.88)	3.18***	(2.62, 3.87)
School level										
% Students speaking the teaching language			0.12***	(0.67, 3.70)	2.19	(0.81, 5.93)	1.64	(0.70, 3.82)	1.68	(0.72, 3.91)
SES (*M*)			3.21***	(0.95, 1.73)	1.29 †	(0.96, 1.74)	0.81	(0.52, 1.25)	1.25	(0.93, 1.69)
Math test score *(M)*			1.20	(1.01, 1.75)	1.33*	(1.01, 1.76)	1.28 †	(0.98, 1.68)	1.02	(0.70, 1.48)
Cross level interactions:										
track affiliation…										
…* % students speaking the teaching language					0.53	(0.21, 1.34)				
…* SES (*M*)							2.11**	(1.35, 3.32)		
…* Math test score *(M)*									1.47*	(1.03, 2.10)
Model comparison										
Deviance (-2LL)	14 069.34		14 051.97		14 050.69		14 042.66		14 048.01	
N parameters[e]	7		10		13		13		13	
Reference model	Empty model		Model 1		Model 2		Model 2		Model 2	
LR test *(df)*	524.79 (5)		17.37 (3)		1.27 (3)		9.31 (3)		3.96 (3)	
Significance[f]	< .001		.001		.735		.025		.266	

Note: Estimation of odds ratios (OR). Continuous predictors on student level z-standardized. $n_{L1} = 5\,239$; $n_{L2} = 316$. Data weighted and imputed ($m = 5$).
[a]Reference: male. [b]Language: Teaching language mainly spoken at home. Reference: Other language mainly spoken at home. [c]Standardized achievement test in mathematics (Assessment of the Attainment of Educational Standards, AES 2016). [d]Basic requirements.
[e]Number of estimated parameters.
[f]Significant improvement of model fit compared to reference model. Empty model: ICC = 0.128, $p < .001$; Deviance (-2LL): 14 594.13, $df = 2$.
[g]Confidence interval (lower bound, upper bound).
***$p < .001$, **$p < .01$, *$p < .05$. †$p < .10$.

education systems. In this sense, the data of two representative cohorts of the Swiss TREE panel survey (Hupka-Brunner et al. 2021; TREE 2016a), which the present article draws on, provide a highly valuable resource for the further development of the Swiss education system.

The TREE data show that the percentage of school-leavers failing to gain direct, undelayed access to certifying upper-secondary level education dropped considerably (from 22.9 % to 19.1 %). However, the trend is not as progressive as could have been expected taking into account the 16-year time lag between 2000 and 2016, the changes in major context factors between the two cohorts (e. g., a better overall ratio of supply and demand in the VET market) as well as the further efforts undertaken to provide a higher level of VET promotion and structural measures (Gomensoro and Meyer 2021).

The analyses of the covariance structure of the two data sets (Tables 3 and 4) indicate a considerable link between students' individual characteristics and their probability to successfully manage the transition. Female students, students with lower math test scores and those speaking a language other than the teaching language at home showed a lower chance to succeed. This was also true for students having attended tracks with low academic requirements at lower-secondary level. The four mentioned effects occur independently of each other and therefore the associated disadvantages may cumulate for certain students. Addressing RQ1, students' lower-secondary track affiliation indeed affects their probability of successful transitions to upper-secondary level education beyond the effects of other individual characteristics considered at student level.

Interestingly, the comparison of the fully specified multivariate models across cohorts (Model 2 in Tables 3 and 4) suggests that the role of socioeconomic background at student level is less prominent in cohort 2 than in cohort 1, whereas the importance of having attended a lower-secondary track with extended requirements seems to have risen. This interpretation is supported by the pattern of bivariate correlations conducted prior to the multilevel analyses (Table 2) as well as by the descriptive average SES differences between students with successful transitions compared to those with unsuccessful transitions at this point (see section 5.1).

As mentioned above, transition rates to post-compulsory general or vocational education systematically vary between schools in both cohorts, and a significant and meaningful variance proportion could be linked to indicators of the student body composition, answering RQ2. Yet, the pattern of results suggests that the relative importance of the indicators taken into account at school level changed across this time period. As displayed in Tables 3 and 4, students' advantages in their transition to upper-secondary education due to a socioeconomically more privileged student body composition decreased in cohort 2 compared to the earlier cohort (Model 2). This finding reflects a decreased dependence of transition rates on the social composition of schools within the Swiss education system.

With regard to the impact of students' individual track affiliation, the analysis of cross-level interactions revealed two interesting results for cohort 2: In schools with a socioeconomically more privileged student composition (Model 4) as well as in schools with a higher average math performance (Model 5), students' transition into post-compulsory education was more closely associated with their individual track affiliation. In the latter model, the positive school-level effect of higher average math test scores (as previously shown in Model 2) became insignificant. Therefore, the positive results that were ascertained for schools with a higher performing student composition seem to be only due to those students attending tracks with extended requirements. Beyond these two cross-level effects, we observed no differential effects for cohort 1 or 2. So overall and addressing RQ3, between-school differences regarding school composition can indeed have the potential to affect the relationship between students' individual track affiliation and their probability of successful transitions, but this was observed for only two of the six examined cross-level interactions and only for cohort 2.

As mentioned above, the percentage of students of cohort 2 who failed to gain direct, undelayed access to upper-secondary education remained rather high. Taking into account individual and societal costs, the implementation of additional measures to support and mentor the transition process at this threshold as well as during the critical first year after leaving compulsory schooling seems advisable. Furthermore, we found that the rates of successful transitions considerably differed between schools and were related to the student body composition. These findings indicate that measures to compensate for the schools' differences in transition rates and disadvantaged compositional profiles would be appropriate to provide students with more equal chances of successful transitions. At the same time, our results demonstrate that students with certain individual characteristics face a substantially higher risk of a delayed or failed transition. This is particularly true when such individual risk factors accumulate, like being a girl, growing up in a home where the language mainly spoken is not the teaching language, showing lower school achievement and being affiliated to a school track with lower educational requirements. Therefore, students exhibiting combinations of such risk factors would be a rewarding target group for individual interventions that aim at increasing their chances of a successful transition into post-compulsory education.

With the present study, we certainly face some limitations: In our analyses, we only consider whether the transition appears to be successful one year after the end of compulsory education. We did not consider whether the transition finally led to a post-compulsory degree or whether students who failed to make the transition in the first year were successful at a later point in time. Furthermore, we neither distinguished between general education and VET, nor between the largely varying levels of (academic) requirements within VET. For further analyses, we plan to address these distinctions. Beyond this, we used a relevant, yet rather limited set

of indicators of school composition characteristics, as we drew on the theoretical framework model on mediation processes of school-contextual effects (Baumert et al. 2006; extended model by Scharenberg 2019), which aims at conceptualizing educational contexts as differential environments for learning and development.

In this sense, the present paper is an important attempt to apply this framework model to outcomes other than school achievement and to examine its relevance for post-compulsory educational and vocational trajectories. However, further variables associated with (successful) transitions, such as students' non-cognitive characteristics (e. g., learning motivation or academic self-concept) as well as information on the school culture and characteristics of their catchment area should be part of subsequent in-depth analyses, as transitions are complex and multi-factorial processes. Moreover, the comparability of the two cohorts is limited by differences in the study design and sampling, so that differences in the results cannot be unequivocally attributed to changes in the Swiss education system. Finally, when interpreting our results, one has to bear in mind that, for methodological reasons, we conceptualized lower-secondary tracking as an individual-level variable in our multilevel analyses (representing students' individual track affiliation).

Future research perspectives based on the present paper may relate to the question of how students in cohort 2 proceed on their further educational or vocational pathways. For upcoming TREE 2 panel waves, we plan to use the present analytical framework to study lagging effects of individual characteristics, tracking and school composition on students who have finished their post-compulsory education and obtained an upper-secondary certificate. We thus strive to identify individual and school-level risk factors that might hamper Swiss youths' educational progress and success.

In conclusion, our analyses extend the so far existing empirical knowledge on differential environments for learning and development by examining a key indicator of students' educational biography as outcome variable. Our findings underscore the importance of compositional and institutional characteristics for students' developmental trajectories into (young) adulthood as well as the need for educational and policy measures to counterbalance school-related risk factors.

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Toni Ricciardi

Eine kurze Geschichte der italienischen Migration in der Schweiz

Reihe
Gegenwart und Geschichte

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Während der Fussballweltmeisterschaft in Brasilien im Jahr 2014 war die Schweiz, gemessen an den Herkunftsländern der Spieler, das internationalste Team. Nur wenige Monate vorher wurde die SVP-Initiative «Gegen Masseneinwanderung» angenommen. Dieses Buch geht anhand der Geschichte der italienischen Migration in die Schweiz auf Spurensuche und versucht, vorderhand widersprüchliche Dynamiken aufeinander zu beziehen.

Im letzten Jahrhundert war die Schweiz das Land in Europa mit dem höchsten Ausländeranteil. Nach dem Zweiten Weltkrieg nahm sie fast die Hälfte aller aus Italien Migrierenden auf. Gleichzeitig war die Schweiz aber auch das erste Land der Welt, das sich mit einer umfangreichen Gesetzgebung zur Steuerung der Einwanderung ausstattete.

Die Geschichte der italienischen Migration in die Schweiz zeigt, wie eng das Schicksal der Schweiz mit demjenigen dieser Migrierenden verbunden war.

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Mit einem Vorwort von **Sandro Cattacin**

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