Analysing Diversion Processes in German Secondary Education: School-Track Effects on Educational Aspirations

Felix Bittmann ⬤ · **Steffen Schindler** ⬤

Abstract Educational aspirations can be regarded as a predictor of final educational attainment, rendering this construct highly relevant for analysing the development of educational inequalities in panel data settings. In the context of the German tracked secondary school system, we analysed school-track effects on the development of educational aspirations. Using data from five consecutive waves of the National Educational Panel Study (NEPS), we selected a sample of high-performing students with initially high aspirations. Our results indicate that pupils in the nonacademic track or with a low social origin tend to lower their aspirations significantly more often than pupils in the academic track or pupils with a high social origin. With mediation analyses, we demonstrate that these differences can be attributed to learning environments at the school level. We also show that the downward adjustment of aspirations in the nonacademic track is less pronounced for students from highly educated families than for students from low-education family backgrounds.

Keywords Learning environments · Social inequality · Longitudinal analysis · Mediation analysis · NEPS

Felix Bittmann · Steffen Schindler
Otto-Friedrich-Universität Bamberg
Feldkirchenstraße 21, 96045 Bamberg, Germany
E-Mail: steffen.schindler@uni-bamberg.de

Felix Bittmann (✉)
Educational Decisions and Processes, Migration, Returns to Education, Leibniz-Institut für Bildungsverläufe e.V.
Wilhelmsplatz 3, 96047 Bamberg, Germany
E-Mail: felix.bittmann@lifbi.de

🄰 Springer

Ablenkungsprozesse im deutschen Sekundarschulsystem und die Effekte von Schulformen auf Bildungsaspirationen

Zusammenfassung Da Bildungsaspirationen als Prädiktoren der final erreichten Bildungsabschlüsse betrachtet werden können, erscheint dieses Konstrukt von größter Relevanz bei der Analyse der Entstehung von Bildungsungleichheiten im Längsschnitt. Im Kontext der deutschen Sekundarstufe analysieren wir den Effekt von Schularten auf Bildungsaspirationen. Dazu nutzen wir fünf konsekutive Befragungswellen des Nationalen Bildungspanels (NEPS) und untersuchen eine Subpopulation aus leistungsfähigen Schülerinnen und Schülern mit anfangs hohen Aspirationen. Die Ergebnisse belegen, dass insbesondere Schüler in nichtgymnasialen Schulformen oder solche aus benachteiligter sozialer Herkunft dazu neigen, hohe Bildungsaspirationen über die Zeit hinweg zu verlieren. Durch Mediationsanalysen zeigen wir, dass diese Effekte zum Teil durch die unterschiedlichen Lernumwelten der Schularten vermittelt werden. Darüber hinaus lässt sich nachweisen, dass sich die negativen Effekte nichtgymnasialer Schulformen vor allem auf sozial benachteiligte Kinder auswirken. Schüler privilegierter sozialer Herkunft sind weniger stark betroffen.

Schlüsselwörter Lernumwelten · Soziale Ungleichheit · Längsschnittanalyse · Mediationsanalyse · NEPS

1 Introduction

Fair access to education for all social classes is undoubtedly an ideal for most modern societies. In order to approach this goal, numerous educational reforms have been implemented over the past 50 years in western Germany to make its classic tripartite school system more inclusive and permeable (cf. Dudek and Tenorth 1994; von Friedeburg 1989). Particularly noteworthy is the introduction of new types of schools, which were designed to allow students who completed a lower-level educational track in secondary education to upgrade their credentials to the upper-secondary level. While the political intention behind the introduction of these sequential options was to open up pathways into higher education for students who otherwise would have been stuck in educational dead ends, recent research points out that the introduction of these options could also have led to unintended adverse effects (cf. Schindler 2014). In particular, high-performing but risk-averse students who otherwise would have opted for the more demanding academic route might be diverted into the less risky sequential alternative of starting in a lower track first and upgrading to upper-secondary education after reaching a first lower-level credential. This diversion process has adverse effects whenever attending a lower-level track instead of the academic track is connected to influences that cause the student to abandon the initial plan of attaining an upper-secondary credential.

For that reason, we wanted to analyse to what extent and why different school tracks actually influence the development of students' educational aspirations. We pay particular attention to patterns that are correlated with social background, since

one major aim of the reforms was to open up more educational opportunities for students of disadvantaged social backgrounds (cf. von Friedeburg 1989).

We believe that in order to understand how social inequality arises, these issues deserve more attention. If, in fact, a substantial number of children with initially high educational aspirations are systematically redirected into lower-level educational trajectories, it appears desirable to scrutinise the underlying mechanisms. By analysing school-track effects on changes in educational aspirations, our contribution is a first step in this direction, and we hope we can shed some light on the processes related to diversion in secondary education. The paper proceeds as follows: In the next section, we will describe the context of western German secondary education, outline our theoretical framework, and derive testable hypotheses. Furthermore, we summarise the current state of research. After that, we introduce data, operationalisation, and methods before we present the empirical analyses. The paper concludes with a discussion of our findings and their implications.

2 Theoretical Framework

2.1 Secondary Education in Germany

In contrast to the comprehensive secondary school system of the former German Democratic Republic, the classic view of the secondary education system in the former West Germany is that of a rigorous between-school tracking that starts as early as the age of 10 years. Based on their primary school achievement, pupils are sorted into one of three qualitatively different tracks. The 5-year lower secondary school track (Hauptschule) is the least demanding form and prepares pupils for low-skilled service or manual work. The 6-year intermediate track (Realschule) instructs pupils for vocational training in skilled white-collar or service occupations. The 8- or 9-year upper-secondary school (Gymnasium) awards pupils with the university entrance qualification (Abitur) and is regarded as the most prestigious track.

To increase the share of students in higher education, reforms were initiated in West Germany in the mid-1960s. Their aim was to dissolve the dead-end character of the tracked school system by creating new opportunities for upward track mobility (cf. von Friedeburg 1989). All federal states established additional upper-secondary schools in the vocational school system, where students with an intermediate degree could obtain eligibility for higher education in 2–3-year programs with a strong vocational focus. Thus, even students who start secondary education in one of the two lower tracks can, if they surpass certain performance thresholds, continue their education immediately afterwards and acquire a higher-education entrance qualification. Some federal states have introduced comprehensive schools in addition to the tracked tripartite school system. These comprehensive schools can be considered as another approach to make the secondary school system more permeable. While these schools offer all three school-leaving certificates of the traditional tripartite school system, students can subsequently continue from one to the next level given adequate performance. In a more recent development, most federal states

have merged the two lower school tracks due to a progressing marginalisation of the lowest track (Hurrelmann 2013).

Even though the permeability of the system has increased considerably over the past decades, the different tracks and trajectories still describe differential learning environments (Maaz et al. 2008). Learning environments comprise the total influence of all factors contributing to the track-specific teaching and learning situation. Two major aspects can be distinguished: 1) compositional effects and 2) institutional effects (Baumert et al. 2006; Neumann et al. 2007). The former are the consequence of the nonrandom selection into tracks. This selection is primarily based on prior performance but overlaps with additional factors, such as social and migration backgrounds. It results in different social classroom contexts, which can influence learning progress, educational ambitions, and values and attitudes. Institutional effects refer to all systematic influences associated with the educational tracks per se, such as differences in curricula and educational goals, teacher quality, and financial resources.

It is very likely that compositional and institutional effects influence the educational aspirations and educational goals of pupils. The academic track follows a dedicated academic curriculum, with the university entrance qualification as its target. The entire instruction provided is geared towards a student population aiming at higher education, and the composition of students is selective with regard to both above-average school performance and educationally and economically privileged social background (Hillebrand 2014). Teachers in the academic track are required to have completed more advanced-training programs than teachers in the other school tracks. The situation is different in the lower school tracks. Curricula are more practically oriented, learning progress is slower, requirements for teacher education are lower, and the student populations show lower average ability levels and a less academically oriented social composition. Hence, the academic track constitutes a learning environment that provides more stimulation for the development and maintenance of aspirations towards academic goals.

2.2 Diversion Processes in Secondary Education

As outlined above, the German secondary school system offers numerous opportunities for students to obtain a higher-education entrance qualification after completing a first lower-level school track. As a consequence of this institutional variety, especially high-performing but risk-averse students might choose the less risky sequential alternative of starting in a lower track first and upgrading to upper-secondary education after reaching a first lower-level credential. However, in these nonacademic tracks, those students are exposed to learning environments that do not support ambitious academic goals in the same way as would be the case in the academic track. First, as curricula tend to focus more on practical and nonacademic education, it can be assumed that any interest in more scientific and academic topics is not particularly encouraged (cf. Bayer 2020, p. 69–71). Second, because the social composition of the nonacademic tracks is dominated by students whose parents are not academically educated and work in manual or lower-level to mid-level service occupations, peer-group effects and significant others can be expected to influence

educational and occupational aspirations towards nonacademic spheres (cf. Sewell et al. 1969). Third, aspirations can also be influenced by teacher effects (van den Broeck et al. 2020). Teachers in nonacademic tracks may be less able to stimulate academic goals in gifted or interested pupils when the institutional context requires them to focus on practical and nonacademic skills.

All these factors should contribute to school-track effects, according to which the nonacademic tracks trigger downward adjustments of educational aspirations among students who initially aspired to a higher-education entrance qualification. Accordingly, we can deduct the following empirically testable hypotheses. We expect that

H1a   among the students who enter secondary education with aspirations for a higher-education entrance qualification, a larger share will adjust their aspirations to lower-level aims in the nonacademic tracks than in the academic track, and

H1b   this effect can be explained by the different learning environments.

These processes are also of great interest for the analysis of mechanisms behind the formation of social inequality. We know from previous research that socially disadvantaged pupils display higher levels of risk aversion (Breen et al. 2014; Barone et al. 2018; Tutic 2017). As the introduction of second-chance options in the education system opened up sequential and hence less risky pathways to higher education eligibility, we can assume that these trajectories are particularly attractive for pupils from disadvantaged social backgrounds. We therefore expect that they choose nonacademic school tracks more often than students of privileged social background at the beginning of secondary education, even if they aspire to a higher-education entrance qualification. This also means that substantial proportions of the students from disadvantaged social backgrounds who aspire to higher-education eligibility at the beginning of secondary education are exposed to the detrimental influences of the learning environments in the nonacademic school tracks. Conversely, students from privileged social backgrounds can be assumed to choose the academic track as a default. This follows from relative risk aversion theory (Breen and Goldthorpe 1997), which suggests that families pursue those educational trajectories that are most likely to help avoid social demotion. This means that they are less likely affected by the influences of nonacademic learning environments. Hence, we expect that

H2a   among all students who have aspirations for a higher-education entrance qualification at the beginning of secondary education, students of disadvantaged social background are more likely to adjust their aspirations to lower-level aims than students of privileged social backgrounds, and

H2b   this effect can again be explained by influences of the different learning environments.

Finally, we can also assume an interaction effect between learning environments and social background. Following the concept of compensatory advantage (Bernardi 2014), socially privileged families are more likely to compensate for negative educational experiences than are socially disadvantaged families. On the one hand, they have higher incentives for their children to reach higher-level educational outcomes. This derives from the core assumption of relative risk aversion theory (Breen and Goldthorpe 1997), which states that families usually want to avoid social demotion of their children. On the other hand, socially privileged families also possess more resources to realise those educational upgrading processes. Thus, it can be assumed that children from socially privileged families who start secondary education in a nonacademic track (for example, due to performance deficits at the end of primary school) are less affected by the influences of their learning environments. We expect that

H3   the negative effect of nonacademic school tracks on the development of aspirations for higher-education entrance qualification is less pronounced for students from privileged backgrounds than for students from disadvantaged backgrounds.

2.3   Previous Research

In general, it is well established that educational aspirations are predictors of future outcomes. Students with high aspirations have better outcomes, even net of other confounding factors (Marjoribanks 2005; Ou and Reynolds 2008; Messersmith and Schulenberg 2008). Apart from a few earlier studies that refer to diversion processes after attaining a university entrance qualification (Schindler 2014; Becker and Hecken 2008; Müller and Pollak 2004), the literature on diversion effects in the German educational system is very sparse. Between the lines, these existing studies might suggest that different pathways to higher-education eligibility do have some influence on subsequent education decisions. However, we are not aware of any study that explicitly deals with the adjustment of educational aspirations in secondary education (the study by Forster [2020] deals with the adaptation of parental expectations after unexpected school-track assignment, which has a different focus, though). There is some research on a related topic, namely the effect of school tracks on cognitive development. These studies conclude that the different learning environments associated with school tracks have a substantial influence on the achievement gains of their students (Maaz et al. 2008; Köller and Baumert 2002). Accordingly, learning progress is steeper in the more demanding school tracks, especially in the upper-secondary track. While these conclusions are seldom based on real causal research designs, it also remains unclear whether these findings on competences can be easily transferred to aspirations.

In a different country setting, two Danish studies deal with the influences of learning environments in a tracked school context. One analysis uses a counterfactual differences-in-differences approach to estimate the effects of different ability-groups in secondary education on educational preferences (Karlson 2015). The study finds that pupils indeed adjust their educational preferences according to the sig-

nals the school or track sends, which is in line with our assumptions. In another article, Karlson (2019) investigates the interaction of learning environments with social background. He concludes that pupils of low socioeconomic status react especially strongly to signals sent by the school or by performance indicators (Karlson 2019). This could mean that disadvantaged pupils are especially sensitive to adverse learning environments. Overall, however, it becomes obvious that there exists a considerable research gap regarding the interplay of school tracks, aspirations, and social inequality in the German context. We seek to address this gap with our analyses in the remainder of this article.

3 Data, Operationalisation, and Methods

3.1 Data and Sample

The data basis for all subsequent analyses is the Starting Cohort 3 of the National Educational Panel Study (NEPS), which comprises students who are surveyed once a year from the first grade of secondary school (grade 5) onwards (cf. Blossfeld et al. 2011). The available data cover the first 5 years of secondary education from grades 5 to 9, collected in a prospective panel design. Students' educational aspirations are recorded annually. In addition, the data provide comprehensive information on social background, which is obtained through separate parent questionnaires. These data, which are unique for Germany, thus offer an excellent basis for our research interest.

For all subsequent analyses, we imposed restrictions on the sample. First, only pupils who transferred to a regular secondary school form after primary school were included. Pupils at special-needs schools (Förderschulen) were excluded. Second, pupils who changed school types between grades 5 and 9 were also excluded, as track effects cannot be ascribed unequivocally in these cases. Third, we further restricted the sample based on performance. To be able to measure diversion effects among those who realistically should be able to reach higher-education eligibility, we limited the sample to an academically high-performing group. For this purpose, we used the comprehensive competence tests of the NEPS and excluded all students whose combined math and reading skills (composite score) in survey wave 1 (grade 5) were below the sample median. We also considered this step as crucial to reduce the likelihood that downward adjustments of aspirations were mere "regression-to-the-mean" effects. We assumed that, among high-performing students, it was less likely that their statement about academic aspirations in wave 1 was due to randomness rather than the true latent construct. Fourth, since we are concerned with downward adjustments of aspirations, we also excluded all students who did not have idealistic aspirations for higher-education eligibility in grade 5. In our analyses, we considered only students participating in all relevant waves (1, 2, and 5). We also removed all pupils who switched school tracks between grades 5 and 9 (this concerns 95 pupils), because for them, we cannot precisely relate the effects of tracks and mediator variables. Finally, we excluded all pupils with missing information in either of the relevant waves so that the sample is constant over all waves (listwise deletion). Note that the largest share of case exclusion due to missing information

concerns parental education (one of the main explanatory variables) and whether the parents live together or not. Since this information is available only from the parent questionnaires, even participating children with nonparticipating parents were excluded. This led to a final sample size of 1163 pupils who met all selection criteria and for whom full information was available on all relevant variables in all relevant waves (1, 2, and 5). In the matching analyses, this sample was further reduced to satisfy the common support requirement for the matching procedure. We provide figures on this sample selection in Table 5 in the online appendix.

3.2 Measurement

Our central dependent variable, idealistic educational aspirations, was deducted from the following survey question:

> Regardless of which school you go to and how good your grades are, what kind of school-leaving qualification would you like to have?

Possible answers were Hauptschulabschluss (lowest degree), Realschulabschluss/ Mittlere Reife (intermediate degree), Abitur (higher-education eligibility), and leaving school without any degree. We recoded these items into a binary variable, distinguishing aspirations for higher-education eligibility (1) from aspirations for any lower or no degree (0). We drew on idealistic aspirations, since these generally allow a statement about educational ideals. Compared to realistic aspirations, which are an assessment about the educational outcomes that will most likely be reached, idealistic aspirations are less prone to being influenced by external circumstances such as family resources or actual school performance. Hence, they provide a more conservative estimate of school-track effects. In other words, we expected our analyses to return smaller effects compared to analyses based on realistic aspirations (we provide more detailed information and empirical evidence in the discussion of robustness checks below).

Regarding the operationalisation of the school tracks, we decided to dichotomise the type of school attended: academic track (1) vs. any other type of school (0). There are several reasons for this. First, this appears to be a logical separation, since only the academic track (Gymnasium) directly leads to higher-education eligibility (Abitur); for all other school forms, at least one further school-leaving qualification must be obtained. We assigned comprehensive schools to the nonacademic forms even though some comprehensive schools can lead to the Abitur directly. However, since the learning environments in comprehensive schools are more similar to those in nonacademic tracks, we opted for this solution. The second important reason is the number of cases. Since more than 42% of all pupils nowadays transfer to the Gymnasium (Autorengruppe Bildungsberichterstattung 2020, p. 110), and because some school types have already been abolished or merged in some federal states, the case numbers are often very low, so that a few hundred data points are spread over five survey waves. Subgroup analyses, such as analysis according to social background, are therefore no longer realistically possible. In this respect, we opted for a rather coarse structure at this point in order to be able to estimate at least the difference between the academic and nonacademic learning environments.

We measured students' social background based on parents' education. We distinguish three categories: (1) less than upper-secondary education (CASMIN 1a–2a), (2) upper-secondary education (Abitur, CASMIN 2c), and (3) any higher-education degree (CASMIN 3ab). When information was available for both parents, we considered the highest certificate. While much of the theoretical literature on social reproduction refers to social class as a concept of social background, we opted for parents' education because it provides a more straightforward link to educational aspirations. Sensitivity analyses with parents' social class as a measure of social background revealed similar patterns (available on request).

To avoid spurious correlations, we included the following control variables in the propensity score models: gender, age at the time of the interview, and migration background (none vs. one parent vs. both parents born abroad, as well as place of residence [western vs. eastern Germany] and whether the parents were living together). Furthermore, we added four measurements of competence that are tested by the NEPS in the classroom context. These are competences in math and reading as well as a general test on cognitive ability. This ability test follows the theoretical concept of Baltes et al. (1999) and comprises two different scores. The first dimension is the overall cognitive reasoning score, and the second dimension measures the perceptual speed score (NEPS information on competence testing 2018). Taken together, these scores should reflect the overall cognitive ability of a child in grade 5. Note that the competence tests were conducted after the transition to secondary education, as students were sampled in grade 5. However, the tests were conducted only a few months after the start of the school year (from October 2010 to February 2011), so competences in grade 5 can be considered a close approximation of pretreatment competences.

To test our mediation hypotheses, we drew on a set of variables that are all measured as aggregated variables at the school level in wave 1. Since there are cases with only a few pupils available per class, which could lead to aggregated results that are driven by outliers, we decided to use variables aggregated at the school level. Hence, these variables also comprise information from other school classes with the same age level. As there is usually only little segregation within schools, this should not severely bias our results. We included the information from wave 1 as time-constant measures also for the analyses in subsequent waves. The school-level measures suffer from heavy nonresponse in later waves, which can lead to larger bias. Assuming that the student compositions remain rather stable for the majority of schools, we considered this approach as the lesser evil compared to time-varying measurements. These aggregated variables comprise (1) the share of pupils with aspirations for higher-education eligibility, (2) the share of pupils with highly educated parents (higher education), and finally (3) the average academic competences (derived from composite individual-level indicators that are based on math and reading competences). Following our theoretical arguments, these measures provide indicators for the influence of peer effects. Following the Wisconsin model (Sewell et al. 1969), we expected a positive influence on individual aspirations through exposure to academically oriented peers. Unfortunately, the data do not provide information on curricula or relevant teacher characteristics. Hence, we could not measure the role of these mechanisms in our analyses.

3.3 Analytical Strategy

In order to quantify the effect of school tracks on idealistic aspirations (H1a), we considered it crucial to control for all factors that influence the process of selection into tracks. Only if we considered this properly it will be possible to estimate a track effect that is independent from selection (and, therefore, social background, academic performance in primary education, etc.). To achieve this, we utilized a matching design that allowed us to model this process explicitly and to inspect the quality of the results. Since there are only two tracks in our design (academic track or any other track), we computed a binary logistic regression to model selection into tracks depending on relevant preselection factors. After considering these, we could predict, individually for each pupil, the propensity to enter the academic track. Based on the distribution of these propensities within both tracks, we selected a region of common support. If we included only pupils from the areas of common support in the subsequent analyses, we could assume to rely on a comparable sample of pupils from both tracks. As outlined above, only pupils who complied with our initial sample selection criteria were considered in the analyses. To test for school-track effects on the adjustment of aspirations (H1a), we predicted aspirations with our school-track indicator controlling for propensity scores. To test our mediation hypothesis (H1b), we conducted a mediation analysis to scrutinise whether the effect of school tracks on aspirations could be explained by our school-level measures of learning environment characteristics. Since our outcome variable is binary (aspirations for higher-education eligibility), we applied logistic regressions. To conduct the mediation analysis, we relied on the KHB method (Kohler et al. 2011; Karlson et al. 2012) and its implementation in Stata through the ado-file *khb*.[1] Since coefficients from nested logistic models are not comparable due to scaling effects, the KHB method provides a rescaling procedure so that we could determine the relative reduction of a coefficient after adding additional variables to the model. That way, we could determine to what extent our school-level measures accounted for the influences of school tracks on aspirations. We present two separate models. The first model refers to the differences in aspirations in grade 6, and the second model refers to differences in aspirations in grade 9. This way, we estimated how the effects change over the course of secondary education.

To analyse the differences in the adjustment of aspirations by social background (H2a and H2b), we no longer relied on a causal analytical framework. Because we did not want to conceptualise social background as a "treatment," our analyses followed a more descriptive design. Hence, in contrast to the matching procedure applied for the analyses related to hypotheses H1a and H1b, we did not further restrict the sample based on the common support criterion, but we controlled for the same variables that we used in our matching models. To account for the differences in the adjustment of aspirations between pupils of different social background, we again conducted mediation analyses with the KHB method. In a first step, we tested to what extent track attendance could explain the differences. In a second step, we also included our school-level measures to test whether they explained parts of the

---

[1] https://ideas.repec.org/c/boc/bocode/s457215.html (accessed 18 May 2021)

differences in addition to track attendance. Finally, we tested our hypotheses H3 on interaction effects by comparing the track effects on the development of aspirations separately by social background.

We show results that are based on a sample for which we did not impute missing data. Since the program *khb* is not able to compute all relevant statistics with imputed data, we decided to report results based on a sample after listwise deletion. We conducted sensitivity analyses based on imputed data, which we discuss below, among other robustness checks to validate our findings.

4 Results

4.1 Descriptive Statistics

We present basic descriptive statistics for all variables in wave 1 (grade 5) in Table 1.

Because of the sample-selection process, which we outlined above, our analysis sample comprised a specific subpopulation of the initial sample. This is reflected in the reduced number of cases, and it produces a very selective sample with regard to some key aspects. For example, the average parental education is rather high; almost half of all children have parents with a higher education degree. Only 27% of the children have parents with a degree lower than upper-secondary education, and 84% of the children attend the academic track.

The last two columns of Table 1 display the mean values of each variable separately by school track. The differences in these values indicate that the individual characteristics of the students in the two tracks differ somewhat, which can also cause differences in the patterns related to the adjustment of aspirations. To adjust for these compositional differences, we applied propensity score matching to isolate school-track effects. The table also highlights the differences in the three school-level variables, which we used as mediators to explain potential differences between the two tracks. They show that the different tracks indeed provide different learning environments with regard to social and cognitive environments. The share of highly educated parents, the share of students with aspirations for a higher-education degree, and the average competences are clearly higher in the academic track.

4.2 Effects of School Tracks

First, we calculated a propensity-score model to match pupils in grade 5. With this logistic model, we estimated for each pupil the propensity to attend the academic track as a function of the model's covariates (cf. Table 6 in the appendix). As covariates, we included the pretreatment control variables described in Sect. 3.2. Based on the propensity scores, we identified a region of common support that comprises highly comparable pupils in different school tracks. Figure 1 displays the distributions of the propensity scores by school track.

As expected, high propensities to attend the academic track are more common among pupils who actually attend the academic track. However, we do find high propensity scores even among the students attending the nonacademic track. We

Table 1 Descriptive statistics for wave 1 (grade 5), entire sample and by type of track

	Total (N = 1163)				Nonacademic (N = 185)	Academic (N = 978)
	Min.	Max.	Mean	SD	Mean	Mean
Idealistic aspirations for higher-education eligibility	1.0	1.0	1.00	0.00	1.0	1.0
Parental education						
Less than upper-secondary Education	0.0	1.0	0.27	0.44	0.41	0.24
Upper-secondary education	0.0	1.0	0.24	0.43	0.21	0.25
Higher education	0.0	1.0	0.49	0.50	0.38	0.51
Attending the academic track	0.0	1.0	0.84	0.37	0.00	1.00
Female	0.0	1.0	0.49	0.50	0.46	0.50
Age in 2011	8.6	12.5	10.89	0.40	11.03	10.86
Competence measurements (wave 1)						
Math competence	−1.3	4.0	0.98	0.84	0.52	1.07
Reading competence	−0.9	4.0	1.03	0.91	0.91	1.06
Reasoning score	0.0	12.0	8.27	2.15	7.51	8.41
Perceptual speed score	4.0	93.0	45.90	12.56	45.29	46.02
Living in eastern Germany	0.0	1.0	0.09	0.29	0.06	0.10
Parents living together	0.0	1.0	0.84	0.37	0.76	0.85
Migration background						
Both parents born in Germany	0.0	1.0	0.85	0.36	0.85	0.84
One parent born abroad	0.0	1.0	0.10	0.30	0.11	0.10
Both parents born abroad	0.0	1.0	0.06	0.23	0.03	0.06
School-level mediators (wave 1)						
Average share of parents With higher education	0.0	0.9	0.45	0.18	0.28	0.48
Average share of pupils With high aspirations	0.2	1.0	0.93	0.15	0.65	0.98
Average competences	−1.3	1.3	0.57	0.41	−0.12	0.70

SD standard deviation. Source: NEPS SC3

selected a region of common support to ensure that enough observations with similar propensity scores from each comparison group entered the analysis. A simple numerical rule is to use the overlap between the treatment and the control groups. However, if the range of propensity scores is similar but the shapes of the distributions strongly differ between the two groups, regions can exist with very weak common support. To avoid this, we selected only propensity scores that would ensure a density exceeding 3% in both distributions. Through restricting the region of common support, we made sure that the two groups were actual comparable and that pupils without any "matches" in the other group were removed. The selected region of common support is indicated by the dashed vertical lines in Fig. 1. Pupils falling outside that range were not included in the subsequent analyses on school-track effects. For this part of the analyses, this left us with an analytical sample of 1063 observations.
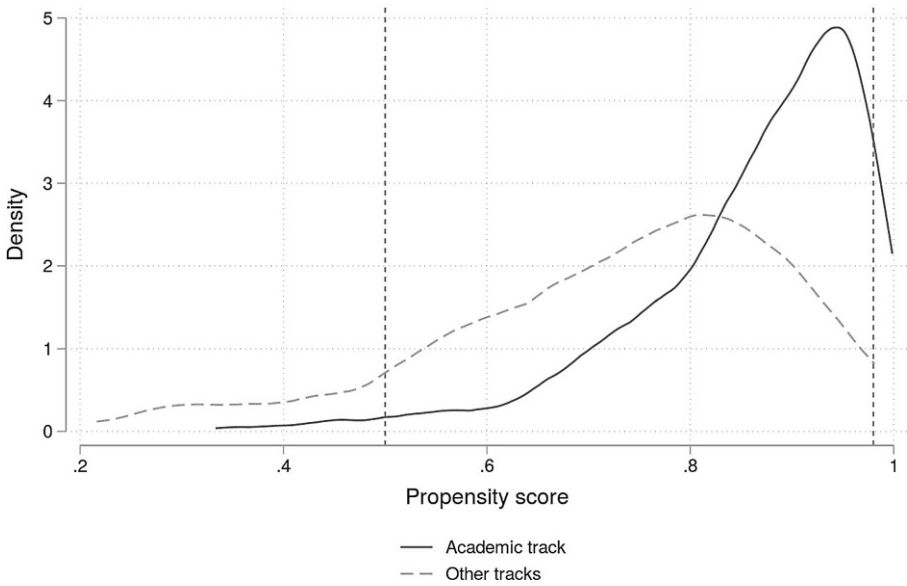
Fig. 1 Distribution of propensity scores for attending the academic track in grade 5. The region of common support is depicted by the *vertical dashed lines*. Source: NEPS SC3
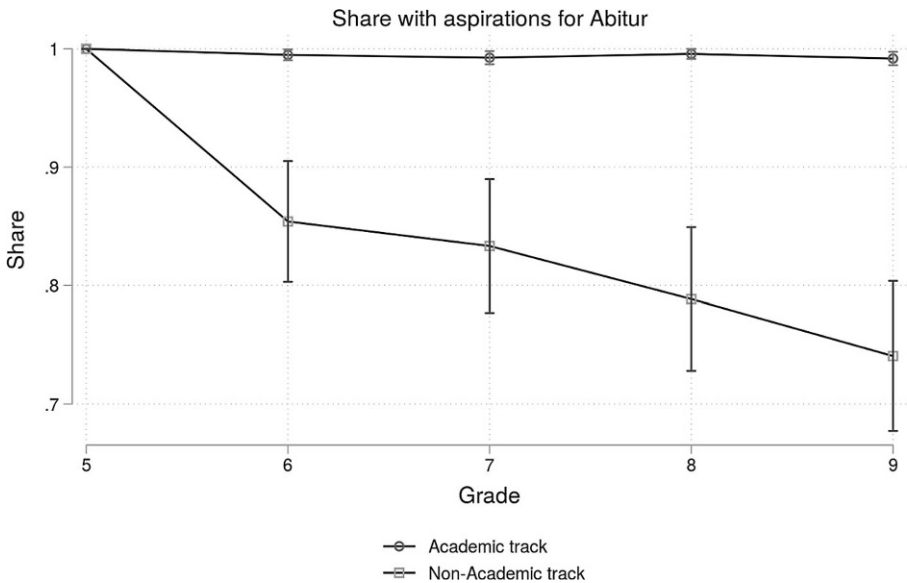

Fig. 2 Development of idealistic aspirations by school track; 95% confidence bars depicted. Source: NEPS SC3
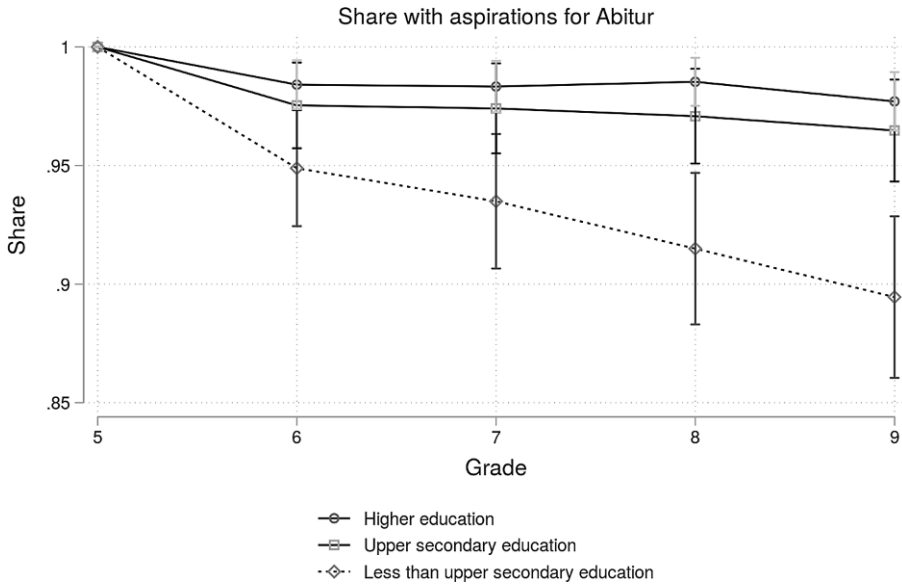
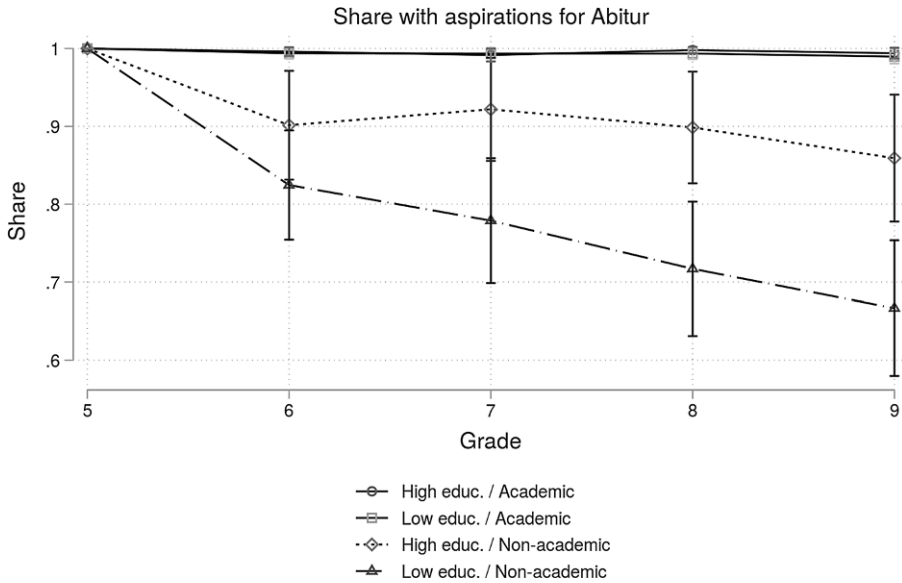**Fig. 3** Development of idealistic aspirations by social background; 95% confidence bars depicted. Source: NEPS SC3

Fig. 4 Development of idealistic aspirations by track attendance and social background; 95% confidence bars depicted. Source: NEPS SC3
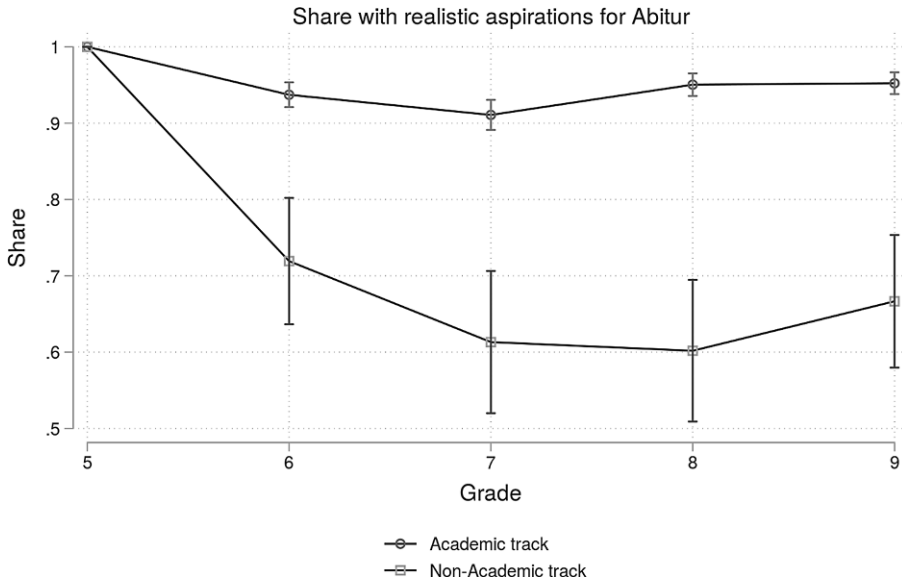
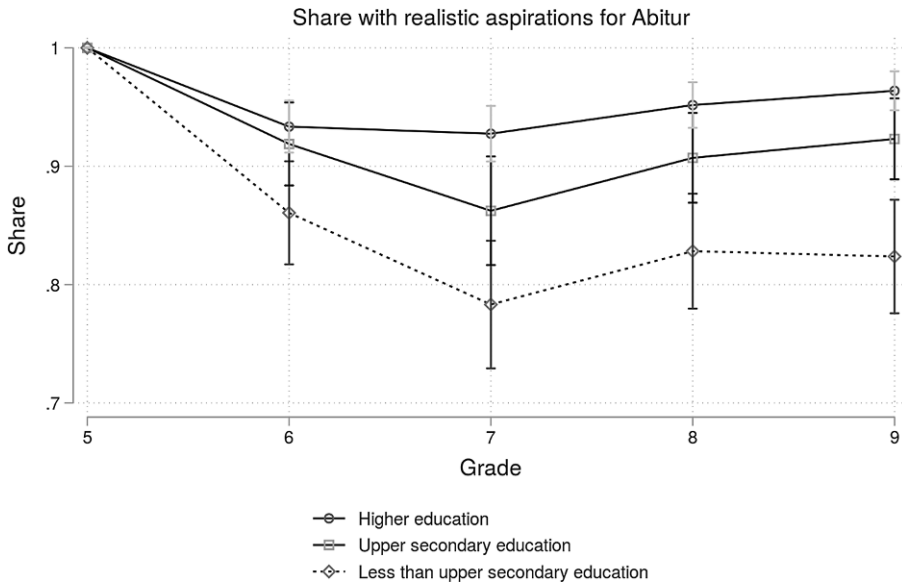**Fig. 5** Development of realistic aspirations by school track; 95% confidence bars depicted. Source: NEPS SC3

Fig. 6 Development of realistic aspirations by social background over time; 95% confidence bars depicted. Source: NEPS SC3

Table 2 Logistic regression of aspirations for higher-education eligibility on school track and mediators (grade 6)

	Grade 6 (N = 1063)			Grade 9 (N = 1063)		
–	*Overall model comparison*					
–	M0 (Reduced)	M1 (Full)	Difference	M0 (Reduced)	M1 (Full)	Difference
Academic school track	0.074*** (0.018)	0.016 (0.014)	0.058 (–)	0.174*** (0.032)	0.087* (0.035)	0.087 (–)
–	–	–	78.9%	–	–	49.7%
–	*Separate contribution of the mediating variables*					
Average share of parents with higher education	–	0.003 (0.005)	7.9%	–	0.015 (0.001)	23.0%
Average share of pupils with high aspirations	–	0.014 (0.008)	31.4%	–	0.026 (0.012)	39.7%
Average competences	–	0.017 (0.009)	39.6%	–	–0.008 (0.014)	–13.0%

Reported are average partial effects (APEs). Standard errors clustered within schools. Standard errors are not available for APE difference statistics. Source: NEPS SC3

$^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

As a first descriptive analysis, we compared the development of aspirations over time between the two school tracks for all pupils within the selected range of common support. Figure 2 displays the percentages of pupils with aspirations for higher-education eligibility across the five survey waves from grades 5 to 9, including 95% confidence intervals. There are no further control variables or adjustments for any of the following figures (Figs. 2, 3, 4, 5, and 6), as they should demonstrate the purely descriptive development of aspirations from grades 5 to 9.

We see that the trajectories clearly differ between tracks. While aspirations for higher-education eligibility are constantly high in the academic track, the share drops significantly even just 1 year after entrance into secondary education in the nonacademic track (about 15 percentage points). This downward trend continues over the following years and is about 24 percentage points lower in grade 9. Since the confidence bars never overlap, we can assume that this difference is statistically significant. This descriptive finding is in accord with hypothesis H1a. However, as we pointed out above, the result can be partially driven by differences in the compositions of individual student characteristics between the two tracks, which is why we now turn to models that are adjusted by the propensity scores.

In addition to the descriptive analyses shown in Fig. 2, we included the propensity scores as a sole control variable to take into account the differences between the two comparison groups. Table 2 presents the results in the columns labelled M0. Since the dependent variable is binary and we computed logistic models, we report average partial effects (APEs), which facilitate a clear interpretation (therefore, no constant is computed). Even after controlling for the propensity scores (M0), we observe that significantly more pupils in the academic track than in the nonacademic track report aspirations for higher-education eligibility in grades 6 and 9. In grade 6, the APE is 0.074. This means that pupils in the academic track have a 7.4–percentage point higher probability to hold aspirations for higher-education eligibility than pupils in

other school tracks. In grade 9, the respective value amounts to 17.4 percentage points. This again supports hypothesis H1a. If the propensity scores were able to account for all pretreatment differences between these pupils, one could refer to this as the causal effect of tracking on aspirations. However, since we were able to control only for observable characteristics, we consider it an approximation to a causal effect.

In a next step, we were interested to what extent the differences between the tracks were due to differences in learning environments. For that reason, we added the school-level mediators to the models (share of students with high aspirations and share of students with highly educated parents and average academic competences). To estimate the extent to which those variables would be able to account for the differences between the two tracks, we proceeded as follows: We started from the reduced model (M0) without any of the mediating variables and then compared it to a model that includes the mediators (M1). For linear models (for example, OLS regressions), this procedure is straightforward, and coefficients can be compared across models to assess the degree of mediation, which is reflected in the relative change of the coefficient of the treatment variable (in our case, the school track attended). However, in nonlinear binary models, this is not possible in the same way since the coefficients can also change across models due to scaling effects, even in the absence of any "true" mediation. This can lead to false conclusions. This issue is taken care of by the KHB decomposition technique (Karlson et al. 2012). We applied this method using the Stata package *khb* to compute the degree of mediation (Kohler et al. 2011). We present a reduced and a full model and display the difference between their academic-track coefficients. When this difference is statistically significant, our mediators can be considered to account for the differences between the school tracks. In addition, we decomposed the total mediation, which allows us to assess the influence of all mediators separately. We present mediation analyses for differences in aspirations in grades 6 and 9. The standard errors are clustered by school. The results are shown in Table 2.

After the addition of the mediator variables in the full model (M1), the coefficient of the academic school track decreases from 7.4 to about 1.6 percentage points in grade 6 (also note that the statistical significance of the effect vanishes). By comparing the coefficients between models M0 and M1, we can calculate the relative reduction. Together, the three mediators account for about 79% of the difference in aspirations between the school tracks. When we consider the separate contributions of the mediators in the bottom part of the table, we see that, in particular, average competences and aspirations account for the differences between tracks, while the percentage of highly educated parents contributes little in addition.

In grade 9, the mediators account for only about 50% of the differences in aspirations between the two tracks. While the school-level aspirations again explain a large fraction of the difference, the contributions of the other two mediators are different from the grade 6 analysis. The percentage of highly educated parents now accounts for a substantial fraction of the gap, while average academic competences at the school level do not contribute at all to the explanation. Recall, however, that the mediators were measured in grade 5. It might be possible that the results are influenced by changes in the learning environments that we did not fully capture with

our measurement. Yet, because our indicators of learning environments' characteristics account (at least partially) for the differences in the development of aspirations between school tracks, we find support for our hypothesis H1b.

4.3 Association Between Social Background and Aspirations

For the following analyses, we employed a different design than before. We started again with a descriptive analysis to visualise how aspirations develop for pupils of different social background over time. Figure 3 pictures this development without any controls. Social background refers to parents' highest educational degrees. Especially for the least educated group, aspirations drop significantly over time. In this group, the share of pupils with aspirations for higher-education eligibility decreases from 100% in grade 5 to about 89% in grade 9. Because the confidence intervals do not overlap with those of the other groups, we can assume that the differences are statistically significant. This conforms to our hypothesis H2a. The differences between the two other groups are rather small and not statistically significant.

In the next step, we computed the mediation models. We considered the same school-level mediators as before, but we also included the track (academic track or any nonacademic track) as an additional binary mediator. Since we did not rely on a matching model, we included control variables (because we did not apply any common support restrictions, the case numbers are slightly larger). The control variables are the same that we used for the assignment model in our matching analysis, except for place of residence (east/west) due to empty cells.[2] We employed a nested design to trace the explanatory contributions of different sets of variables. The first model only includes parents' education. The second model adds all control variables. The third model adds the school-track variable. The fourth and final model adds the three school-level mediators. Table 3 displays the results for grade 6, and Table 4 displays the results for grade 9. In addition, the last column of the tables displays the relative contribution of each variable from model 4 to the explanation of the aspiration gap between students with parents with less than higher-education eligibility and students with parents with a higher-education degree.

Note that in this analysis, parents with a higher-education degree are the reference group. Considering the differences in aspirations in grade 6, model 1 just mirrors the results from Fig. 3. We see that the aspirations for higher-education eligibility in grade 6 are 1.8 percentage points lower for students from low-educated families compared with students from highly educated families. However, this difference in the drop of aspirations is not statistically significant. Yet, adding control variables and the mediators for tracks and learning environments both contribute to a reduction of the coefficient. The variables in model 4 account for 79% of the initial difference, of which about 46 percentage points are due to influences of the tracks and learning environments. While the differences in grade 6 are small and not statistically significant, the situation is different in grade 9. Table 4 presents the findings.

---

[2] Detailed inspections reveal that due to the overall much smaller number of pupils in the East ($< 10\%$ after sample selection), some empty cells emerge with no pupils with low aspirations available at all in waves 2 and 5.

Table 3 Logistic regression of aspirations for higher-education eligibility on parents' education and mediators (grade 6)

Grade 6 ($N=1163$)	M1	M2	M3	M4	Share mediated
Parental education level					
– Higher education	Ref	Ref	Ref	Ref	–
– Upper-secondary education	–0.009 (0.012)	–0.002 (0.012)	–0.003 (0.013)	–0.002 (0.013)	–
– Less than upper-secondary education	–0.018 (0.010)	–0.010 (0.010)	–0.005 (0.009)	–0.004 (0.010)	79.2% (Total)
Control variables	–	–	–	–	33.6% (Subtotal)
Female	–	0.019[*] (0.008)	0.017[*] (0.008)	0.016 (0.009)	3.4%
Math competence	–	0.015 (0.008)	0.009 (0.007)	0.008 (0.007)	7.7%
Reading competence	–	0.007 (0.005)	0.007 (0.005)	0.006 (0.005)	7.3%
Reasoning score	–	0.005[*] (0.002)	0.004[*] (0.002)	0.004[*] (0.002)	3.1%
Perceptual speed score	–	0.001 (0.000)	0.001 (0.000)	(0.001) (0.000)	–5.1%
Migration status					
– Both parents born in Germany	–	Ref	Ref	Ref	–
– One parent born abroad	–	0.003 (0.012)	0.003 (0.012)	0.004 (0.012)	0.7%
– Both parents born abroad	–	–0.025 (0.024)	–0.034 (0.012)	–0.030 (0.025)	6.0%
Age in years	–	–0.012 (0.010)	–0.006 (0.010)	–0.005 (0.010)	3.6%
Parents living together	–	0.024[*] (0.011)	0.019 (0.011)	0.018 (0.011)	6.9%
School-level mediators	–	–	–	–	45.6% (Subtotal)
Attending the academic school track	–	–	0.082[***] (0.016)	0.031 (0.016)	19.9%
Average share of parents with higher education	–	–	–	–0.006 (0.030)	–5.6%
Average share of pupils with high aspirations	–	–	–	0.044 (0.023)	16.6%
Average competences	–	–	–	0.020 (0.014)	14.7%

Reported are average partial effects. The mediated share refers to the comparison of the two most extreme parental education levels (lower than upper-secondary education vs. higher education) between M1 and M4. Standard errors clustered within schools. Source: NEPS SC3

[*]$p<0.05$, [**]$p<0.01$, [***]$p<0.001$

Table 4 Logistic regression of aspirations for higher-education eligibility on parents' education and mediators (grade 9)

Grade 9 (N = 1163)	M1	M2	M3	M4	Share mediated
Parental education level					
– Higher education	Ref	Ref	Ref	Ref	–
– Upper-secondary education	–0.011 (0.011)	–0.010 (0.011)	–0.010 (0.011)	–0.008 (0.013)	–
– Less than upper-secondary education	–0.056*** (0.014)	–0.046*** (0.013)	–0.037** (0.013)	–0.031* (0.013)	44.6% (Total)
Control variables	–	–	–	–	10.6 (Subtotal)
Female	–	0.027* (0.011)	0.023* (0.011)	0.022* (0.011)	1.7%
Math competence	–	0.010 (0.007)	0.001 (0.007)	0.002 (0.007)	0.6%
Reading competence	–	0.003 (0.005)	0.003 (0.005)	0.004 (0.005)	1.5%
Reasoning score	–	0.007* (0.003)	0.006* (0.003)	0.006* (0.003)	1.8%
Perceptual speed score	–	0.001* (0.001)	0.001* (0.001)	0.001 (0.001)	–4.4%
Migration status					
– Both parents born in Germany	–	Ref	Ref	Ref	–
– One parent born abroad	–	0.022 (0.016)	0.022 (0.016)	0.022 (0.016)	1.5%
– Both parents born abroad	–	0.037** (0.013)	0.033* (0.015)	0.032* (0.015)	–4.2%
Age in years	–	–0.038* (0.013)	–0.028* (0.014)	–0.027 (0.014)	8.1%
Parents living together	–	0.034* (0.014)	0.026 (0.013)	0.026 (0.013)	4.0%
School-level mediators	–	–	–	–	33.9% (Subtotal)
Attending the academic school track	–	–	0.153*** (0.027)	0.124*** (0.047)	21.0%
Average share of parents with higher education	–	–	–	0.026 (0.042)	8.8%
Average share of pupils with high aspirations	–	–	–	0.074* (0.032)	10.7%
Average competences	–	–	–	–0.023 (0.019)	–6.6%

Reported are average partial effects. The mediated share refers to the comparison of the two most extreme parental education levels (lower than upper-secondary education vs. higher education) between M1 and M4. Standard errors clustered within schools. Source: NEPS SC3

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

First, we see a statistically significant effect between parents with higher education and parents with less than upper-secondary education in model 1. Children in the latter group have a 5.6–percentage point lower probability to hold high aspirations in grade 9 than children from academically educated parents. This gap in aspirations still amounts to 4.6 percentage points when control variables in model 2 are added. Introducing the track variable in model 3 leads to a further reduction of the coefficient to 3.7 percentage points. This means that participation in different school tracks provides a partial explanation of why children of low educated families adjust their aspirations more often in a downward direction than do children of academically educated families. Adding the three school-level mediators in model 4 does not lead to a substantial further reduction of the coefficient. Our model is not able to account for the remaining gap of 3.1 percentage points. In total, model 4 accounts for about 45% of the difference in aspirations between students from low and highly educated families, 34 percentage points of which are due to influences of school tracks and our measures of school-level learning environments. Note that, in model 4, the school-track variable still accounts for 21% of the gap. This means that our measures of learning environment do not fully capture the differences between the tracks. On the other hand, these school-level factors also account for differences within tracks.

In support of our hypothesis H2b, these results indicate that the more pronounced downward adjustment of educational aspirations that we observe for students from less educated families is at least partially attributable to their more frequent exposure to learning environments that are assumed to provide less simulation for academic ambitions.

4.4 Heterogeneous School-Track Effects

To complete our analyses, we considered whether the school-track effects on aspirations differ by social background. We display the development of aspirations for four groups, which were created from the interaction between track attended (academic or nonacademic) and parents' education. To simplify the interpretation, we omitted the group of pupils with parents with upper-secondary education as their highest level of education. For each grade, we computed arithmetic means and 95% confidence bands. No control variables or restrictions were imposed for these descriptive analyses. The results are depicted in Fig. 4.

In support of our hypothesis H3, the figure displays a clear interaction effect. While pupils attending the academic track have consistently high aspirations, regardless of their social background, we see pronounced social differences within the nonacademic track. Even though both social groups show declining rates of aspirations for higher-education eligibility, the decline is much more pronounced for pupils with low-educated parents. While among the pupils with highly educated parents about 88% still hold aspirations for higher-education eligibility in grade 9, the respective share is as low as 67% for pupils with low-educated parents. Since the confidence bands do not overlap, we can assume that this difference is statistically significant at the 5% level.

To corroborate the robustness of our findings, we conducted a large number of additional sensitivity checks. First, we repeated our analyses with imputed data us-

ing multiple imputation with chained equations (Azur et al. 2011). While we cannot reproduce all statistics because the *khb* command is not fully compatible with imputed data, the main patterns of our findings are highly similar and lead to the same conclusions. In the imputed models, we always observe a strong reduction of the main effects through the mediators, just as in the nonimputed models. Hence, we believe that selective dropout of students is not a main driver behind our findings. Second, we tested whether the *change* of individual competences is another confounder. Because of the nature of the data, we can add this variable only in the wave 5 models since there are no test data available in wave 2. For these models, we computed the relative change in ability ranks for each pupil. For example, if a pupil has a relative rank of percentile 70 in wave 1 and a percentile of 75 in wave 5, we can conclude that this pupil has improved his or her relative rank over time. However, adding this variable as a further control variable does not affect the results or conclusions in any substantive way.

Finally, when we focus on *realistic* instead of idealistic aspirations, we argued above that the effects might be even stronger. Our empirical tests (cf. Figs. 5 and 6) are in line with this expectation. When repeating the analyses from Table 2 (left panel, grade 6), we observed a difference of 27 percentage points before adding the mediators and a difference of 1.6 percentage points afterwards. This is a reduction of about 94%, which underscores that effects become more pronounced when realistic aspirations are investigated instead of realistic ones.

5 Discussion and Conclusions

We started from the educational reforms that established more opportunities for second-chance education in the German secondary education system. The rationale behind these reforms was to open up channels into higher levels of education even for those pupils who do not transition into the academic pathway at the beginning of secondary education right away. In particular, these reforms targeted disadvantaged social groups that are known to be underrepresented in academic tracks and higher education. Our concern was that—although these measures were intended to reduce the level of social inequality in educational attainment—they could have produced some unintended side effects that work to counter this behaviour target and contribute to the maintenance of inequalities instead. By taking into account behavioural patterns and, in particular, the role of risk aversion in educational choices, we argued that the introduction of alternative, sequential pathways to higher-education eligibility might divert students of disadvantaged backgrounds away from the academic tracks that lead there directly. While we have shown empirical evidence for these diversion patterns elsewhere (Schindler and Bittmann 2021), the aim of this paper was to inquire about the consequences for further educational trajectories. We argued that pupils who attend nonacademic school tracks despite above-average cognitive competences and high educational ambitions might be exposed to learning environments that influence their educational aspirations in a downward direction. By comparing students with similar characteristics and with aspirations for higher-education eligibility that transition into different tracks of the German

secondary school system, we find clear support for our expectations. Learning environments appear to have a severe impact on educational ambitions. This also means that pupils with initially high educational aspirations who opt for the risk-averse alternative of starting secondary education in a nonacademic track are likely to adjust their educational goals and eventually end up without a higher-level educational degree.

Because we know from previous research that these diversion processes primarily concern students of disadvantaged family backgrounds, these mechanisms have implications for the formation of social inequality in educational attainment. It means that the formal provision of opportunities for second-chance education is less effective than initially thought if the unintended behavioural consequences are considered. Our findings contribute two insights in this respect. First, we were able to show that the more frequent downward adjustment of educational aspirations that can be observed for students from disadvantaged family backgrounds can be at least partially attributed to their more frequent exposure to nonacademic tracks and thus to learning environments that are detrimental to higher-level educational ambitions. Hence, since many of those students appear to be diverted from the academic into the nonacademic tracks, the related exposure effects effectively counteract the goal of raising their participation rates in higher education that was initially intended by the reforms. Second, these exposure effects seem to be less consequential for pupils of privileged social background who—for whatever reason—do not attend the academic track right away. Because this group does not adjust their educational aspirations in the same way, second-chance education indeed seems to provide avenues into higher education for them, thereby contributing to a reinforcement of educational inequality.

Our analyses focused on idealistic aspirations, as we wanted to provide a conservative estimate of the track effects. One could argue that realistic aspirations provide a more accurate measure of students' perceptions of further educational trajectories that are realistically open to them. Our additional analyses confirm our initial expectations that—when considering realistic aspirations—the school-track influences are even more pronounced.

As a final remark, we may stress that our findings in this paper relate only to the influences of learning environments on the individual-level development of educational aspirations. This might be interesting in itself. However, it might have become clear in our discussion that if we embed our results in the broader context of educational inequality and educational reforms, the implications are much wider. They suggest that neglecting socially selective behavioural incentives in the design of policy measures can limit their effectiveness or, at worst, make them ineffective.

Appendix

Table 5 Sample selection process

	Original sample	Above median perfor- mance	Aspirations for higher-education eligibility in wave 1	Participation in waves 1, 2, and 5	Complete informa- tion
Total	4812 (100%)	2403 (50%)	2038 (42%)	1535 (32%)	1163 (24%)
–	*By school track*				
Nonacademic	2577 (100%)	717 (28%)	404 (16%)	279 (11%)	185 (7%)
Academic	2235 (100%)	1686 (75%)	1634 (73%)	1256 (56%)	978 (44%)
–	*By parents' education*				
Less than up- per-secondary education	1602 (100%)	617 (39%)	460 (29%)	374 (23%)	313 (20%)
Upper-sec- ondary educa- tion	795 (100%)	446 (56)	390 (49%)	306 (38%)	284 (36%)
Higher educa- tion	1177 (100%)	863 (73%)	809 (69%)	603 (51%)	566 (48%)
No information	1238 (100%)	477 (39%)	379 (31%)	279 (23%)	0 (0%)

Calculations for survey wave 1 (grade 5). "Original sample" refers to all participating pupils in wave 1 in regular schools, excluding special-needs pupils and pupils still in elementary schools. Source: NEPS SC3

Table 6 Propensity score assignment model (logistic regression)

	Attending the academic track
Female	1.489[*]
	(0.265)
Parental education	
Less than upper-secondary education	Ref
Upper-secondary education	1.900[**]
	(0.444)
Higher education	1.943[***]
	(0.390)
Age in 2011	0.398[***]
	(0.0909)
Math competence	2.626[***]
	(0.369)
Reading competence	1.079
	(0.114)
Reasoning score	1.083
	(0.0439)
Perceptual speed score	1.000
	(0.00702)
East	2.522[*]
	(0.910)
Parents living together	1.770[**]
	(0.384)
Migration status	
Both parents born in Germany	Ref
One parent born abroad	1.113
	(0.310)
Both parents born abroad	2.687[*]
	(1.250)
Observations	1163
R-squared	0.14

Exponentiated coefficients (odds ratios); standard errors in parentheses. Dependent variable: attending the academic track (1) or not (0). Standard errors clustered within schools
[*]$p < 0.05$, [**]$p < 0.01$, [***]$p < 0.001$

References

Autorengruppe Bildungsberichterstattung. 2020. Bildung in Deutschland 2020. Ein indikatorengestützter Bericht mit einer Analyse zu Bildung in einer digitalisierten Welt. https://www.bildungsbericht.de/de/bildungsberichte-seit-2006/bildungsbericht-2020/pdf-dateien-2020/bildungsbericht-2020-barrierefrei.pdf (Accessed: 14. April 2021).

Azur, Melissa J., Elizabeth A. Stuart, Constantine Frangakis and Philip J. Leaf. 2011. Multiple imputation by chained equations: what is it and how does it work? *International Journal of Methods in Psychiatric Research* 20:40–49.

Baltes, Paul B., Ursula M. Staudinger and Ulman Lindenberger. 1999. Lifespan psychology: Theory and application to intellectual functioning. *Annual Review of Psychology* 50:471–507.

Barone, Carlo, Moris Triventi and Giulia Assirelli. 2018. Explaining social inequalities in access to university: a test of rational choice mechanisms in Italy. *European Sociological Review* 34:554–569.

Baumert, Jürgen et al. 2006. *Herkunftsbedingte Disparitäten im Bildungswesen: Differenzielle Bildungsprozesse und Probleme der Verteilungsgerechtigkeit.* Wiesbaden: VS Verlag für Sozialwissenschaften.

Bayer, Sonja. 2020. Mathematikunterricht im Vergleich zwischen den Schularten. In *Empirische Erziehungswissenschaft 76*, Eds. Becker, Rolf, Sigrid Blömeke, Wilfried Bos, Hartmut Ditton, Cornelia Gräsel, Eckhard Klieme, Kai Maaz, Thomas Rauschenbach, Hans-Günther Roßbach, Knut Schwippert, Ludwig Stecher, Christian Tarnai, Rudolf Tippelt, Rainer Watermann and Horst Weishaupt. Münster: Waxmann.

Becker, Rolf, and Anna Etta Hecken. 2008. Warum werden Arbeiterkinder vom Studium an Universitäten abgelenkt? Eine empirische Überprüfung der „Ablenkungsthese" von Müller und Pollak (2007) und ihrer Erweiterung durch Hillmert und Jacob (2003). *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie* 60:7–33.

Bernardi, Fabrizio. 2014. Compensatory Advantage as a Mechanism of Educational Inequality: A Regression Discontinuity Based on Month of Birth. *Sociology of Education* 87:74–88.

Blossfeld, Hans-Peter, Hans-Günther Roßbach and Jutta von Maurice, Eds. 2011. *Education as a Lifelong Process: The German National Educational Panel Study (NEPS).* Wiesbaden: VS Verlag für Sozialwissenschaften.

Breen, Richard, and John H. Goldthorpe. 1997. Explaining Educational Differentials: Towards a Formal Rational Action Theory. *Rationality and Society* 9:275–305.

Breen, Richard, Herman G van de Werfhorst and Mads Meier Jæger. 2014. Deciding under doubt: A theory of risk aversion, time discounting preferences, and educational decision-making. *European Sociological Review* 30:258–270.

Dudek, Peter, and Heinz-Elmar Tenorth, Eds. 1994. Transformationen der deutschen Bildungslandschaft. Lernprozeß mit ungewissem Ausgang. Weinheim/Basel: Beltz.

Forster, Andrea. 2020. Navigating Educational Institutions. Mechanisms of Educational Inequality and Social Mobility in Different Educational Systems. Dissertation, University of Amsterdam.

von Friedeburg, Ludwig. 1989. *Bildungsreform in Deutschland.* Frankfurt a. M.: Suhrkamp.

Hillebrand, Annika. 2014. *Selektion im Gymnasium: Eine Ursachenanalyse auf Grundlage amtlicher schulstatistischer Daten und einer Lehrerbefragung.* Münster: Waxmann Verlag.

Hurrelmann, Klaus. 2013. Das Schulsystem in Deutschland: Das „Zwei-Wege-Modell" setzt sich durch. *Zeitschrift für Pädagogik* 59:455–468.

Karlson, Kristian Bernt. 2015. Expectations on Track? High School Tracking and Adolescent Educational Expectations. *Social Forces* 94:115–141.

Karlson, Kristian Bernt. 2019. College as equalizer? Testing the selectivity hypothesis. *Social Science Research* 80:216–229.

Karlson, Kristian Bernt, Anders Holm and Richard Breen. 2012. Comparing regression coefficients between same-sample nested models using logit and probit: A new method. *Sociological methodology* 42: 286–313.

Kohler, Ulrich, Kristian Bernt Karlson and Anders Holm. 2011. Comparing coefficients of nested nonlinear probability models. *The Stata Journal* 11:420–438.

Köller, Olaf, and Jürgen Baumert. 2002. Entwicklung schulischer Leistungen. In *Entwicklungspsychologie*, Eds. Rolf Oerter and Leo Montada, 756–786. Weinheim: Beltz.

Maaz, Kai, Ulrich Trautwein, Oliver Lüdtke and Jürgen Baumert. 2008. Educational Transitions and Differential Learning Environments: How Explicit Between-School Tracking Contributes to Social Inequality in Educational Outcomes. *Child Development Perspectives* 2:99–106.

Marjoribanks, Kevin. 2005. Family Background, Academic Achievement, and Educational Aspirations as Predictors of Australian Young Adults' Educational Attainment. *Psychological Reports* 96:751–754.

Messersmith, Emily E., and John E. Schulenberg. 2008. When Can We Expect the Unexpected? Predicting Educational Attainment When it Differs from Previous Expectations. *Journal of Social Issues* 64:195–211.

Müller, Walter, and Reinhard Pollak. 2004. Weshalb gibt es so wenige Arbeiterkinder in Deutschlands Universitäten? In *Bildung als Privileg? Erklärungen und Befunde zu den Ursachen der Bildungsungleichheit*, Eds. Rolf Becker and Wolfgang Lauterbach, 311–352. Wiesbaden: VS Verlag für Sozialwissenschaften.

NEPS. 2018. Information on Competence Testing. NEPS Starting Cohort 3—Grade 5. Paths Through Lower Secondary School—Educational Pathways of Students in Grade 5 and Higher. https://www.neps-data.de/Portals/0/NEPS/Datenzentrum/Forschungsdaten/SC3/1-0-0/NEPS_SC3_Competences_W1_en.pdf

Neumann, Marko, Inge Schnyder, Ulrich Trautwein, Alois Niggli, Oliver Lüdtke and Rico Cathomas. 2007. Schulformen als differenzielle Lernmilieus. *Zeitschrift für Erziehungswissenschaft* 10:399–422.

Ou, Suh-Ruu, and Arthur J. Reynolds. 2008. Predictors of educational attainment in the Chicago Longitudinal Study. *School Psychology Quarterly* 23:199–229.

Schindler, Steffen. 2014. *Wege zur Studienberechtigung – Wege ins Studium?: Eine Analyse sozialer Inklusions- und Ablenkungsprozesse.* Wiesbaden: VS Verlag für Sozialwissenschaften.

Schindler, Steffen and Felix Bittmann. 2021. Diversion or inclusion? Alternative routes to higher education eligibility and inequality in educational attainment in Germany. *European Sociological Review* (accepted for publication).

Sewell, William H., Archibald O. Haller and Alejandro Portes. 1969. The educational and early occupational attainment process. *American sociological review* 82–92.

Tutić, Andreas. 2017. Revisiting the Breen—Goldthorpe Model of educational stratification. *Rationality and Society* 29:389–407.

Van den Broeck, Laura, Jannick Demanet and Mieke Van Houtte. 2020. The forgotten role of teachers in students' educational aspirations: school composition effects and the buffering capacity of teachers' expectations culture. *Teaching and Teacher Education* 90.

Felix Bittmann 1991, M. A., Research Assistant, Leibniz Institute for Educational Trajectories (LIfBi), Bamberg. Fields of research: social inequality, sociology of education, aspirations. Publications: When Choice Excels Obligation. About the Effects of Mandatory and Voluntary Internships on Labour Market Outcomes for University Graduates: Higher Education 2019 (with V. S. Zorn); Stata—A Really Short Introduction. Berlin 2019.

Steffen Schindler 1977, Dr. rer. soc., Professor at Otto-Friedrich-University Bamberg. Fields of research: social structure and inequality, sociology of education and the labour market. Publications: Educational Upgrading, Career Advancement, and Social Inequality Development from a Life-Course Perspective in Germany. Research in Social Stratification and Mobility 2019 (with S. Virdia); Soziale Ungleichheit im Bildungsverlauf—alte Befunde und neue Schlüsse? Kölner Zeitschrift für Soziologie und Sozialpsychologie 2015.