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Education, Competence Development and Career Trajectories

Analysing Data of the National Educational Panel Study (NEPS)

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Chapter 9
Alternative Routes to Higher Education Eligibility: Inclusion, Diversion and Social Inequality on the Way to Higher Education

Steffen Schindler and Felix Bittmann

Abstract This chapter summarizes key findings from the research project *Alternative Routes to Higher Education Eligibility (ARtHEE)*. Based on data from the German National Educational Panel Study (NEPS), we show that the expansion of alternative routes to higher education eligibility, which has followed from reforms in the 1960s, has been largely ineffective in reducing social inequality in access to higher education. We argue that this is due partly to unintended effects of this expansion of alternative pathways that resulted in diversion processes among students of disadvantaged social origin. These diversion effects channel such students into non-academic secondary school tracks and expose them to learning environments that differ from that of the academic school track. We provide empirical evidence suggesting that exposure to these learning environments affects students' educational aspirations and cognitive development in a way that eventually lowers their chances of staying on a trajectory leading into higher education.

9.1 Introduction and Background

The German education system consists of several important branching points on the way to higher education. One of these is higher education eligibility—a formal certification allowing students to access universities or universities of applied sciences. The traditional form of higher education eligibility is the *Abitur* that students obtain when successfully completing the academic stream (*Gymnasium*) of the tracked secondary education system. Because, historically, social inequality in access to higher education was very pronounced in Germany, an obvious

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explanation for this was that large shares of the students from disadvantaged social origins do not even reach eligibility for higher education because they attend one of the non-academic secondary education tracks (cf. Neugebauer & Schindler, 2012). As a reaction to this, designed to increase overall participation in upper secondary and higher education, Germany initiated a series of reforms in the 1960s (cf. Schindler, 2014). While maintaining the tracked secondary school system, reforms were directed at establishing various options for second-chance education. By introducing add-on upper secondary schools and other institutions of further education, students could reach higher education eligibility even if they did not attend the academic track in lower secondary education.

Previous studies evaluating the influence of these second-chance options are quite reluctant to conclude that they actually have contributed to an actual decrease of social inequality in access to higher levels of education (Hillmert & Jacob, 2010; Schindler, 2014; Buchholz & Schier, 2015; Kurz & Böhner-Taute, 2016). Whereas alternative pathways to higher education eligibility do indeed seem to be particularly attractive to students of disadvantaged social origin (Schindler, 2014; Buchholz & Pratter, 2017), one striking observation is that these pathways are also connected to very low transition rates to higher education compared to the transition rates among students with the traditional *Abitur* (Schindler, 2014; Schneider & Franke, 2014). It has been suggested that this pattern could follow from the fact that enhanced competition for vocational training programmes requires students to possess an upper secondary educational credential that can be achieved most easily via alternative routes (Müller & Pollak, 2004; Schindler, 2014). Because these students do not intend to enter the higher education system, alternative routes might be more influential in raising higher education eligibility rates than in raising higher education attainment rates. However, the causal mechanism behind this pattern would be related to competition for training opportunities and not result from the introduction of alternative routes as such. Whether or not the introduction of second-chance options in itself contributed to an overall decrease of social inequality in higher education eligibility and higher education attainment rates has yet to be answered with sufficient empirical evidence from rigour counterfactual analytical approaches. In addition, whereas theoretical arguments about the social mechanisms triggered by the reforms have been suggested (Schindler, 2014), empirical tests have not been conducted so far.

These research desiderata constituted the starting point for the research project *Alternative Routes to Higher Education Eligibility (ARtHEE)*. As part of the DFG Priority Programme 1646 *Education as a Lifelong Process*, the project sought to take advantage of the newly established data infrastructure of the German National Educational Panel Study (NEPS) in order to address the research gaps outlined above. The project pursued two overarching targets:

1. To evaluate whether the introduction of alternative pathways contributed to an overall reduction of social inequality in higher education eligibility and higher education attainment

2. To spell out which social mechanisms have been stimulated by the introduction of alternative routes to higher education eligibility and provide empirical evidence for them

This chapter provides a summary of the project's outcomes and findings. To provide a frame of reference, we start by giving a brief overview of the changes in the educational system brought about by the reforms. Then, we sketch our main theoretical arguments as to how these reforms can be expected to interfere with the generating factors behind social inequalities on the way to higher education. We provide a short description of the NEPS data that form the basis for all our empirical analyses before summarizing our main findings and conclusions with respect to the two targets outlined above.

9.2 The Context: Reforms and Alternative Routes to Higher Education Eligibility

The traditional German secondary education system begins with Grade 5 and comprises three hierarchical school tracks: the 5-year lower secondary school track (*Hauptschule*), the 6-year intermediate track (*Realschule*), and the 9-year academic track (*Gymnasium*). The latter is the only track that awards higher education eligibility (*Abitur*). Before the reforms, only few institutionalized options existed to upgrade school-leaving certificates to a higher level credential, and upward mobility between tracks was difficult. Hence, it was very uncommon for students who did not start secondary education in the academic track to reach higher education eligibility later on (Schindler, 2017).

The aim of the reforms in the 1960s was to reduce the dead-end character of the tracked school system by establishing more opportunities for upward track mobility (Schindler 2014). All federal states introduced new add-on upper secondary schools at which students could go on from an intermediate school leaving degree (*Mittlere Reife*) to obtain eligibility for higher education. Usually, these schools comprise 2- to 3-year programmes with a strong vocational focus.

The reforms also introduced a differentiation of higher education eligibility. Most vocational schools award a restricted version of the higher education entrance qualification (*Fachhochschulreife*). This qualification provides access to universities of applied sciences (*Fachhochschulen*) that have been established as a vocationally oriented second tier of the higher education system. It does not provide access to the traditional universities.

In addition to these second-chance options in the vocational school sector, some federal states have introduced comprehensive schools next to the traditional tracked tripartite school system. Figure 9.1 displays how the relative importance of different pathways to higher education eligibility changed for different school-leaving cohorts between 1967 and 2017. School-leaving cohorts of the mid-1970s were the first to

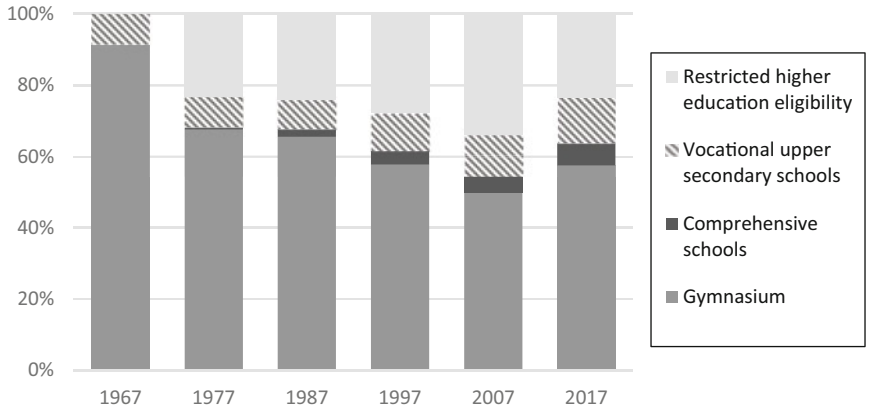

Fig. 9.1 Routes to higher education eligibility—school-leaver cohorts 1967–2017. (Source: Statistisches Bundesamt (1967, 1979a, b, 1989a, b, 2019a, b). West Germany only. The increase in the Gymnasium share 2017 partly results from a change of classification in official statistics)

display substantive fractions of students who received their higher education eligibility via the newly established alternative routes.

9.3 Social Mechanisms: Intended and Unintended Consequences of the Reforms

In this section, we want to describe the social mechanisms that can be expected to follow from the reforms. We argue that the reforms' influence on social inequalities in higher education eligibility and attainment results from both intended and unintended consequences. We shall only summarize the main lines of argumentation here, and provide a more detailed and formalized account in Schindler and Bittmann (2021).

Conceptually, we can divide the pathway to higher education completion into two important sequences: the first is the attainment of higher education eligibility; the second, the completion of higher education, given eligibility. Equation (9.1) differentiates the role of (a) traditional and (b) alternative routes to higher education eligibility in this process.

$$P^o_{he} = \underbrace{P^o_{gym} * P^o_{he|gym}}_{\text{a}} + \underbrace{P^o_{alt} * P^o_{he|alt}}_{\text{b}} + \underbrace{P^o_{non} * 0}_{\text{c}} \tag{9.1}$$

P^o_{he} describes the propensity to attain a higher education degree in a given population of social origin o. The term a refers to the stream through the traditional academic track (*Gymnasium*): the product of the propensity to reach higher education

eligibility at the *Gymnasium* P^o_{gym} and the propensity to attain a higher education degree, given that eligibility has been attained at the *Gymnasium* $P^o_{he|gym}$. The term *b* refers to alternative streams: attaining higher education eligibility through any alternative route P^o_{alt} and the respective conditional propensity to attain a higher education degree $P^o_{he|alt}$. The term *c* describes the propensity not to reach higher education eligibility P^o_{non} and, relatedly, not to reach a higher education degree. Adding up P^o_{gym}, P^o_{alt}, and P^o_{non} results in the full population of students from social origin *o*. Differences in the higher education attainment rates P^o_{he} between students of different social origins are a function of the differences in the single parameters on the right-hand side of Eq. (9.1).

The intended consequences of the reforms were to increase the *b term* at the expense of the *c term*: students who otherwise would not have reached higher education eligibility in the absence of alternative pathways might now take advantage of these new opportunities. We refer to this process as *inclusion*. If we consider participation in upper secondary education as the result of a cost–benefit assessment as suggested by the standard rational choice frameworks (Erikson & Jonsson, 1996; Breen & Goldthorpe, 1997), we can conceive of alternative pathways as a less costly or less demanding option compared to the standard route through the traditional *Gymnasium*. This might be particularly appealing for students of disadvantaged origin. In this group, a substantial number of students might prefer option *b* over option *c*, while preferring option *c* over option *a*.

On the other hand, the availability of alternative pathways might also create inclusion for students of privileged social origin who—for whatever reason—did not manage to reach higher education eligibility directly through the academic track. This group of students should have particularly high incentives to reach higher educational levels due to status maintenance pressures (Breen & Goldthorpe, 1997). Hence, the inclusion mechanism works in favour of a reduction of inequalities in access to higher education eligibility and attainment only if it creates more inclusion for students of disadvantaged than of privileged origin.

The creation of alternative pathways might not only lead to shifts from the *c term* to the *b term* of Eq. (9.1), but also stimulate shifts from the *a term* to the *b term*. We refer to this latter process as *diversion*. Whereas such diversion processes do not necessarily alter the overall higher education eligibility rates as such, they might have implications for the subsequent transition to higher education. Diversion means that students who—in the absence of alternative pathways—would have obtained a traditional *Abitur* at the *Gymnasium* now start secondary education in a lower-level track and obtain their higher education eligibility via second-chance education, most of which is located in the vocational education sector. It follows that these students are exposed to substantially different learning environments. This relates to various influences such as teacher quality, peer group compositions, or curricula. These factors can influence a student's cognitive development and occupational and educational aspirations—both of which are important determinants for the transition to higher education. In addition, if the alternative route leads to a restricted higher education entrance qualification, it also creates barriers to university enrolment and

the related fields-of-study choice set. If we again consider the choice between the direct route through the *Gymnasium* and alternative routes as the outcome of a cost–benefit assessment, the latter option appears as the less demanding and less risky option due to its sequential trajectory (intermediate school degree plus add-on higher education eligibility). Taking into account that students of disadvantaged social origin tend to be more risk-averse than students of privileged social origin (Breen et al., 2014; Barone et al., 2018), it is plausible to assume that diversion processes will be less common in the latter group. Hence, an unintended consequence of introducing alternative routes to higher education eligibility could have been that the reforms stimulated diversion processes that are more pronounced among students of disadvanteged than privileged origin. This mechanism works in favour of reinforcing social inequalities in access to higher education.

The remainder of this chapter will describe empirical findings from the ARtHEE project that correspond to these theoretical considerations. We shall present two sets of analyses: the first set seeks to answer the question whether the mechanisms outlined above—in total—have led to a significant reduction (or amplification) of social inequalities in higher education eligibility and higher education attainment. The findings stem from simulation analyses that we undertook to detect the likelihood that the reforms did indeed have an attenuating (or amplifying) effect on the levels of social inequalities. The second set is devoted to the implications of the diversion mechanism. We seek to identify whether and to what extent students who can be considered as being diverted into alternative pathways differ from students in the academic track with respect to their cognitive development and the adjustment of their educational goals.

9.4 Data

Like all contributions in this volume, our analyses are based on data from the German National Educational Panel Study (NEPS, Blossfeld & Rossbach, 2019). To evaluate whether the expansion of alternative routes to higher education eligibility led to an overall reduction of social inequalities, we draw on NEPS Starting Cohort 6 (SC6). SC6 is a sample of adults born between 1944 and 1986 and contains longitudinal information on their complete educational and occupational histories. This information was collected retrospectively in the first wave, which took place in 2009/2010, and has been updated annually in a subsequent panel design.[1] Apart from the longitudinal information on education and employment, the data also contain rich sociodemographic information and various indicators of social origin.

[1] A subsample of an identical precursor study (Arbeiten und Lernen im Wandel—ALWA) conducted in 2007/2008 has been integrated into the first wave of the NEPS SC6. An additional refreshment sample was drawn in 2011/2012. See also https://www.neps-data.de/Data-Center/Data-and-Documentation/Start-Cohort-Adults

For our analyses, we restrict the sample further to synchronize it with our research interests. We shall display the sample selection criteria next to the description of the results below.

To test our expectations that the different learning environments associated with alternative routes to higher education eligibility have a differential influence on the individual development of cognitive competencies and aspirations, we focus on the sequence of lower secondary education that begins with 5th grade in Germany. For this purpose, we draw on NEPS Starting Cohort 3 (SC3). SC3 comprises a sample of students in Grade 5 who were surveyed in the autumn or winter of 2010.[2] The students have been followed up annually in a prospective panel design. The data contain repeated measurements of educational aspirations and cognitive competencies in different domains. In our analyses, we are able to draw on five consecutive waves until Grade 9. Like all NEPS data sets, SC3 contains rich information on social background collected via parent questionnaires.

9.5 Alternative Routes and Overall Social Inequality

In this section, we report our main findings on whether the expansion of alternative routes to higher education eligibility contributes to a reduction (or reinforcement) of social inequalities in access to higher education eligibility and attainment. The full set of analyses can be found in Schindler & Bittmann (2021).

For the purpose of this study, we have to restrict the NEPS SC6 sample further. We consider only two birth cohorts to identify the reform effect: 1944–1950 and 1965–1980. The former cohort was largely unaffected by the educational reforms, whereas students born in the second cohort had access to the full range of alternative routes to higher education eligibility. For the sake of simplicity, we compare only two social classes as indicators of social origin: the working and the salariat class, following the EGP class approach and based on the highest class among parents (cf. Erikson, 1984). Table 9.1 summarizes these and all further sample restrictions.

The height of the bars in Fig. 9.2 indicates the higher education eligibility rates by cohort and social origin. The light grey areas represent the traditional *Abitur* obtained at a *Gymnasium* whereas the dark grey areas represent alternative routes

Table 9.1 Sample selection criteria (1)

Birth cohorts	1944–1950 ($N = 1045$) and 1965–1980 ($N = 2765$)
Social origin	EGP I + II (salariat) and EGP IIIb + VI + VII (working class)
Place of birth	West Germany
Immigration status	Born in Germany or immigrated before age 6
Handling of missing data	Listwise deletion

[2] See also https://www.neps-data.de/Data-Center/Data-and-Documentation/Start-Cohort-Grade-5

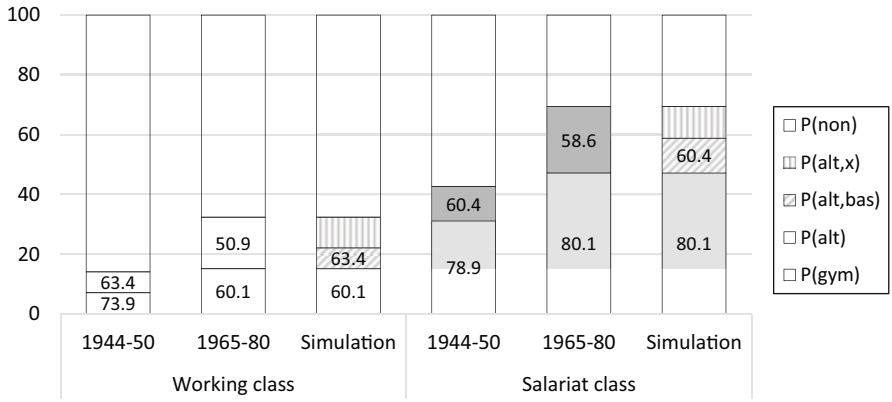

Fig. 9.2 Eligibility rates and conditional higher education graduation rates by pathways to eligibility—factual and simulated. (Source: Own illustration based on Schindler and Bittmann (2021). Numbers in bars indicate conditional higher education attainment rates)

to higher education eligibility. We can make the following observations: first, the eligibility rates in the older cohort differ dramatically by social origin. Whereas, for both groups, the eligibility rates have expanded in the younger cohort, there are still very pronounced differences between them. Second, alternative routes to higher education eligibility are visible even in the older cohort. In relative terms, they have been more important for students with a working-class background than for students from salariat-class families. However, between the older and the younger cohort, alternative routes have expanded more than the traditional pathway. For students from the working class, they have become slightly more important than the traditional pathway; whereas for students from the salariat class, the traditional pathway is still the predominant way of reaching eligibility for higher education

The numbers in the bars indicate the conditional higher education attainment rates. For example, among working-class students born in the 1965–1980 cohort who obtained their higher education eligibility through alternative routes, 50.9 per cent attained a higher education degree. We can observe the following patterns: first, the conditional transition rates tend to be larger for salariat-class students than for working-class students—except for the alternative routes in the older cohort. Second, differences have become larger in the younger cohort. This is true for both the traditional and the alternative pathways. This can be attributed to decreasing transition rates among working-class students, whereas the rates of the salariat-class students have remained quite stable

The bars labelled 'simulation' exemplify the assumptions that we have to make for our simulation analyses. We consider a counterfactual situation, in which the reforms introducing new alternative routes would not have been implemented. We assume that this would not affect the baseline rates of students in the traditional pathway (P_{gym}) and their conditional higher education attainment rates. However, this certainly would reduce the rates of students obtaining higher education

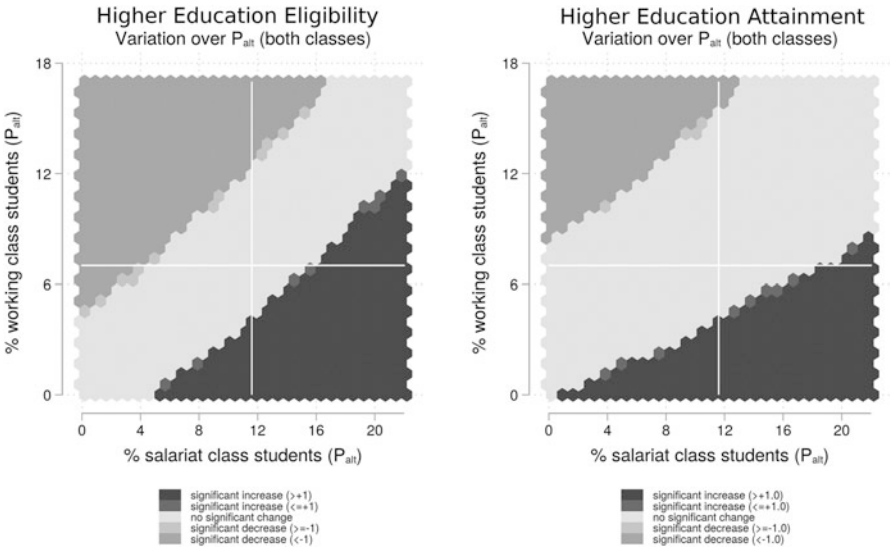

Fig. 9.3 Simulated changes in odds ratios compared to factual situation. (Source: Own illustration based on Schindler and Bittmann (2021))

eligibility through alternative routes. Because some alternative routes already existed before the reforms, we assume that the respective rates in the counterfactual situation are equal to those from the older cohort ($P_{alt,bas}$). We also assume that the conditional higher education attainment rates in this category are identical to those from the older cohort.

Whereas these assumptions can be made rather plausibly, it is less straightforward to come up with assumptions about the rates in the area of the bars denoted with $P_{alt,x}$. This area represents the combination of students who—in the factual situation—are either diverted from the traditional pathway or obtain the higher education eligibility as a result of the inclusion mechanism. In the counterfactual scenario, this would mean that students affected by the inclusion mechanism would not obtain higher education eligibility, whereas students affected by the diversion mechanism would obtain higher education eligibility through the traditional pathways on top of those denoted by P_{gym}. Hence, we have to identify the percentage of students in each group that is affected by the latter mechanism if we want to calculate counterfactual higher education eligibility rates. However, it is not possible to determine these shares analytically. We only know that, theoretically, it can be as high as the part of the bar denoted by $P_{alt,x}$ (10.3 percentage points for the working class and 10.6 percentage points for the salariat). Note that this maximum value reflects a rather unrealistic factual situation in which the reforms cause only diversion and no inclusion.

Based on these considerations, the left-hand panel of Fig. 9.3 simulates how inequalities in higher education eligibility rates (as indicated by the odds ratio) change compared to the factual situation if we vary the percentages of working-

and salariat-class students in alternative routes. The shaded areas indicate whether the respective combination of percentages leads to significant changes in the level of inequality in higher education eligibility rates compared to the factual situation (as indicated by the odds ratio). We indicate both whether the change is statistically significant and whether it is substantial (a change in the odds ratio larger or smaller than 1). The lower left-hand corner indicates a situation in which all students who obtain their eligibility via alternative routes in the factual situation would not obtain any higher education eligibility at all in the counterfactual scenario. The upper right corner is identical to the factual situation. The white lines indicate our assumed values for $P_{alt,bas}$, namely the percentages of students who would obtain their eligibility via alternative routes even in the absence of reforms

This means that we can conceive of the upper right-hand quadrant as an area representing the $P_{alt,x}$ from Fig. 9.2. We can use this area to simulate changes in the odds ratio that result from different combinations of diversion rates between working- and salariat-class students: the more we move to the right, the more diversion (and less inclusion) we assume for salariat-class students; the more we move up, the more diversion (and less inclusion) we assume for working-class students. Among the different combinations in this quadrant, we see a broad corridor indicating no significant change in the odds ratio. The counterfactual scenario is connected to a substantial and statistically significant increase in inequalities in access to higher education eligibility only if there is much diversion among the salariat-class students and much inclusion among working-class students (lower right-hand corner of the quadrant). This scenario would mean that the reforms were successful in reducing social inequality in access to higher education eligibility. Likewise, the reforms increased the level of inequality if they led to much diversion among working-class students and much inclusion among salariat-class students (upper left-hand corner of the quadrant). Whereas we consider it rather unlikely that the reforms had such pronounced differential implications for students of different social backgrounds (cf. our theoretical arguments above) and because the areas indicating significant changes are rather small, we tend to conclude that, overall, it is very unlikely that the reforms had a substantial causal influence on the level of social inequalities in higher education eligibility rates.

The right-hand panel of Fig. 9.3 repeats the same exercise for social inequalities in higher education attainment. The simulation works in a quite similar way to the one presented above. We just have to make additional assumptions about the conditional higher education attainment rates as indicated in Fig. 9.2.[3] We can see that the corridor indicating no significant change is even broader than in the previous analysis. In the upper right-hand quadrant, significant changes occur only for very small and extreme combinations. Hence, with regard to higher education attainment,

[3] For students in the diversion category, we make the assumption of a linear decrease of the conditional attainment rate (from 63.4 to 50.9 for the working class and from 60.4 to 58.6 for the salariat) as $P_{alt,x}$ increases in our simulation.

we conclude that it is very unlikely that the reforms led to changes in the level of social inequality.

9.6 Diversion Mechanisms

In the second part of our project, we were concerned with the social mechanisms stimulated by the reforms. In particular, we wanted to take a closer look at students who are affected by the diversion mechanism—namely, those who would have attended the traditional pathway in the absence of the reforms, but now want to acquire higher education eligibility via alternative routes. Whereas it is not possible to identify what students would have done in a counterfactual world, we tried to identify certain characteristics that can be assumed to be typical for students who could have attended the *Gymnasium* but chose to attend a lower level track in lower secondary education. We shall summarize the results from two analyses that sought to investigate the consequences of attending a lower level track instead of the *Gymnasium* with respect to educational aspirations and the development of cognitive competencies.

9.6.1 Aspirations

In this section, we report our main findings on whether attending a non-academic school track in secondary education has different consequences for the further development of idealistic educational aspirations than attending *Gymnasium*. Following our theoretical arguments from above, we expect that learning environments in alternative routes (here: non-academic lower secondary education) will have adverse effects on the maintenance of aspirations for higher education eligibility. The full set of analyses can be found in Bittmann and Schindler (2021).

This study is based on NEPS SC3. We have to restrict the sample further for the purpose of our analyses. To come as close as possible to an approximation of students that can be considered as diverted, our sample contains only students who attended the same secondary school track throughout our whole observation window, who show academic performance that would have allowed them to complete the *Gymnasium* successfully, and who stated idealistic aspirations for a higher education eligibility at Grade 5. Table 9.2 summarizes these and all further sample restrictions and lists the variables used in the analyses.

Figure 9.4 presents a descriptive overview of how idealistic aspirations develop across successive school years between Grades 5 and 9 for different school tracks. Whereas almost none of the students in the academic track change their initial aspirations for higher education eligibility, we observe a substantial drop for students in the non-academic tracks. In Grade 9, fewer than 80 per cent of these students report idealistic aspirations for higher education eligibility

Table 9.2 Sample selection criteria and variables (2)

Excluded from sample	Students attending special needs schools Students who switched tracks between Grades 5 and 9 Students whose combined math and reading competencies (composite score) in survey wave 1 (Grade 5) are below the sample median Students who do not state idealistic aspirations for higher education eligibility in Grade 5 Observations outside common support (as derived from propensity score matching models)
Independent variable	School track: Non-academic ($N = 185$) vs academic ($N = 978$)
School-level mediators	Share of students with aspirations for higher education eligibility Share of students with academically educated parents Average academic competencies (based on composite score)
Control variables (propensity score models)	Gender, age at time of interview, migration background (none vs one parent vs both parents born abroad), parents' education (below upper secondary vs upper secondary vs higher education), competence measures (math performance, reading performance, reasoning score, perceptual speed score), whether the parents are living together, place of residence (West vs East Germany)
Handling of missing data	Listwise deletion

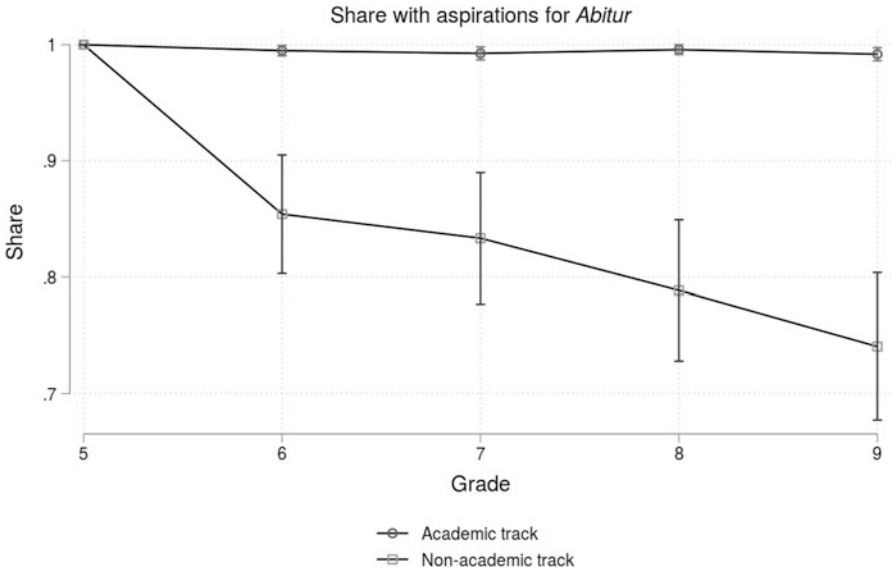

Fig. 9.4 Development of idealistic aspirations by track attendance and social origin. (Source: Own illustration based on Bittmann and Schindler (2021). 95% confidence bands depicted)

To control for selection into school tracks, we draw on propensity score matching. The propensity scores are predicted from the variables listed in Table 9.2. The results of the matching analyses are displayed in Table 9.3. The

Table 9.3 Logistic regression of aspirations for higher education eligibility on school track attendance and mediators (Grade 9)

	M0 (Reduced)	M1 (Full)	Diff
Academic school track	0.174*** (0.032)	0.087* (0.035)	0.086 (−)
			49.7%
Average share of parents with higher education		0.015 (0.001)	23.0%
Average share of students with high aspirations		0.026 (0.012)	39.7%
Average competencies		−0.008 (0.014)	−13.0%

Source: Bittmann and Schindler (2021)
N = 1063. Average partial effects (standard errors in parentheses). Models controlling for propensity scores
Standard errors clustered within school
*p < 0.05, **p < 0.01, ***p < 0.001

analysis relates to the difference in aspirations for higher education eligibility between students in the academic and the non-academic track. Model 1 controls only for the propensity scores. The positive and statistically significant coefficient for the academic track replicates the gap found in the descriptive analyses in Fig. 9.4. In Model 2, we add a set of school-level variables that we assume will explain why students in non-academic tracks lose their aspirations for higher education eligibility more often than students in the academic track (cf. Table 9.2). We calculate the contribution of these mediators in explaining the gap between tracks by drawing on the method suggested by Karlson et al. (2012).[4] In total, these mediators are able to account for about 50 per cent of the gap in aspirations between tracks in Grade 9. However, the largest contribution (40 per cent) comes from the variable indicating the school composition of students with aspirations for higher education eligibility. Another contribution (23 per cent) comes from the variable indicating the school-level percentage of academically educated parents. The third school-level indicator (average academic competencies) does not contribute to explaining the gap

Our analyses show that learning environments make a difference. With our sample restriction criteria and the propensity score matching procedure, we sought to approximate a comparison of students who enter lower secondary education with aspirations for higher education eligibility and who are otherwise similar except for in their school tracks. Our results suggest that exposure to non-academic learning environments, which is a consequence of the diversion mechanism stimulated by the reforms, can cause students to abandon their initial educational goals. In that sense, we can provide empirical evidence for one of the unintended consequences of the reforms that we have outlined in our theoretical discussion above.

[4] Our calculations are based on the *khb* package for Stata (Kohler et al., 2011).

Table 9.4 Sample selection criteria and variables (3)

Excluded from sample	Not participating in first wave of survey Not in same school from Wave 1 to 5 Not attending the academic (*Gymnasium*) or intermediate track (*Realschule*) Students in classes with fewer than 10 responding students Students with special needs or dyslexia or dyscalculia
Independent variable	School track: non-academic ($N = 475$) vs. academic ($N = 1143$)
Classroom-level mediators	Instructional quality index Share of students with academically educated parents Share of students with migrant background Average mathematics/reading competence
Control variables (entropy balancing) Individual-level controls	Gender, age at Wave 1, highest parental educational qualification, highest parental ISEI, migrant background, number of books in household, parents living together, number of siblings, time child spends reading, reasoning score, perceptual speed score, grade repetition, federal state school system (binary) Individual mathematics/reading competence of the previous wave
Handling of missing data	Multiple imputation (20 complete datasets)

9.6.2 Competence Development

In this section, we report our main findings regarding whether attending a non-academic school track in secondary education has different consequences for the further development of academic competencies than attending *Gymnasium*. The results presented here stem from a collaboration with Claudia Traini and Corinna Kleinert (Traini et al., 2021). Similar to our arguments related to aspirations, we expect that the differential learning environments in academic and non-academic lower secondary tracks will create differences in the development of students' cognitive competencies. This study is again based on NEPS SC3. We summarize all sample restrictions and variables in Table 9.4.

In this study, missing information in the data is imputed using multiple imputation with chained equations to account for selective dropout and to reduce bias. This generated 20 complete datasets. To account for the selection into tracks, we apply a statistical matching procedure based on entropy balancing. This procedure achieves comparability of students in the different tracks through the assignment of individual student weights. These weights are computed by predicting track allocation with the control variables listed in Table 9.4. Further details about the method can be found in Traini et al. (2021)

The analyses comprise two dependent variables: competencies in math and competencies in reading—each measured in Grade 7 and Grade 9. Figure 9.5 displays the differences between the school tracks represented by coefficients from a linear regression model. The coefficients refer to attending the *Gymnasium* instead of the non-academic track. Model 1 depicts the gross differences in average student competencies. Students at the *Gymnasium* show statistically significantly higher

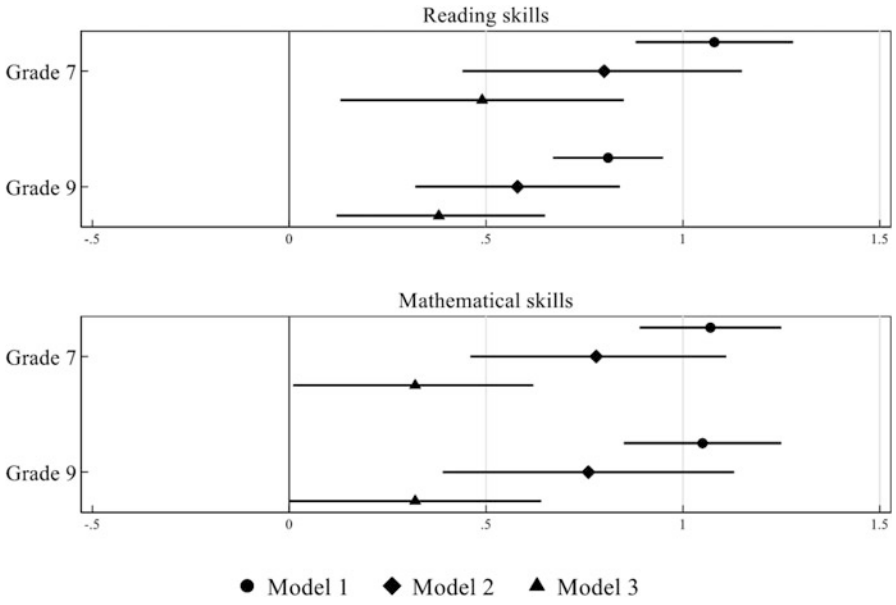

Fig. 9.5 Competence advantages in the Gymnasium (reading and math), by school grade. (Source: Own illustration based on Traini et al. (2021). Coefficients for the academic track (vs. non-academic tracks) with 95% confidence bars from linear regression models. Model 1: no adjustment, Model 2: controlling for initial performance, Model 3: controlling for initial performance and applying matching weights)

academic competencies in both math and reading and also regardless of whether competencies are measured in Grade 7 or 9. This result is to be expected, because students select into the different school tracks based on their cognitive ability. To see whether differences between tracks persist that are independent from selection into tracks, Model 2 controls for the respective competencies in Grade 5; and Model 3 additionally applies the entropy balancing matching. Both subsequent steps of accounting for selection into school tracks reduce differences. However, statistically significant differences in competence levels remain even in the matching model. This means that learning progress between Grade 5 and 9 appears to be steeper in the *Gymnasium* than in the non-academic tracks—even after adjusting for initial differences among the students.

To analyse whether the steeper learning progress in the *Gymnasium* can be ascribed to more supportive learning environments, the following analyses add a series of classroom-level variables to the models to account for contextual influences. The following mediators are selected as indicators of learning environments: instructional quality index (a composite measure of students' ratings regarding the quality of instruction), social background composition (the share of parents with at least one higher education degree), the share of students with a migrant background, and the average classroom-level competencies (derived from a composite measure of math and reading).

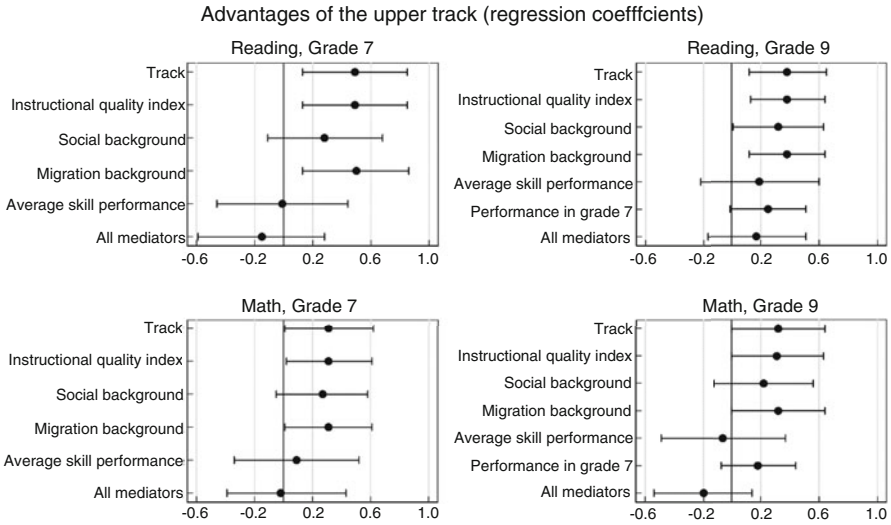

Fig. 9.6 Accounting for competence advantages in the Gymnasium (reading and math) by school grade. (Source: Own illustration based on Traini et al. (2021). Coefficients for the academic track (vs. non-academic tracks) with 95% confidence bars from linear regression models, controlling for mediator variables as indicated in the graph)

Fig. 9.6 summarizes the results of the mediation analyses. The first line in each sub-graph displays the coefficient associated with attending *Gymnasium* instead of the non-academic tracks. This coefficient corresponds to the one from Model 3 in Fig. 9.5 that controls for Grade-5 cognitive competencies and is based on entropy balancing matching. The subsequent rows indicate how this coefficient changes when single mediators are added to the model. The final row displays the coefficient from a model controlling for all mediators jointly. For the Grade 9 models, this also includes controlling for Grade 7 competencies. As can be deducted from the figure, the only classroom-level mediator that substantively and significantly accounts for the differences between school tracks is the average level of students' competencies, whereas the other mediators contribute less to the explanation of the gap. Among these other mediators, social background (measured through parents' education) appears to make the largest contribution. Together, the classroom-level indicators fully account for the differences in cognitive development between *Gymnasium* the non-academic tracks.

9.7 Conclusions

The aim of this chapter was to provide empirical evidence on two research questions that arose out of a concern that the expansion of alternative pathways to higher education eligibility might have led to unintended consequences

regarding the inclusion of students with disadvantaged social backgrounds in higher education.

The first question simply targeted on an assessment of the leverage of these alternative routes in reducing social inequality in access to higher education. Previous research already expressed doubts as to whether an expansion of alternative pathways to higher education eligibility is a suitable measure to reduce social inequality in a sustainable way, and the findings from our *ARtHEE* project further corroborate these doubts. By providing more rigorous evidence with our simulation analyses, we can only conclude that it is very unlikely that the expansion of alternative routes has caused any meaningful reduction in the level of social inequality in access to higher education. It appears that the reforms have not even contributed much to a reduction of inequalities in access to higher education eligibility.

The second question was directed towards explanations for why the expansion of alternative routes did not have an effect on the level of inequality. We argued that the reforms triggered unintended diversion processes that ran counter to the initially intended inclusion effects. A consequence of these diversion processes is that students are exposed to learning environments that can affect both their educational or occupational goals and their cognitive development. We have provided empirical evidence for either mechanism. First, students in non-academic secondary school tracks are more likely than students in the academic track to adjust their educational aspirations in a downward direction. Second, the development of cognitive competencies in the former group clearly falls behind that of the latter group. We have done our best to be able to ascribe those differences to influences of the school track net of all variation in the characteristics of their students. We also found evidence that these differences are routed in contextual factors and influences of the different learning environments that the school tracks represent.

Taken together, the findings of our project clearly indicate that one goal that has been associated with the educational reforms—namely, opening up access routes to higher education for students of disadvantaged origin and thus reducing social inequalities in higher education attainment—has not been reached. Our theoretical explanations and the empirical evidence we found for them showed that policy measures that do not take into account socially selective behavioural incentives can suffer from serious limitations in their effectiveness.

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