ZEW policy brief

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Rethinking Tracking: Lessons from Hungary for German Education Reform

Educational tracking – separating students into different classes, tracks, or schools based on ability – is relatively commonplace worldwide, despite mixed evidence concerning how it affects student outcomes. Our new empirical analysis for secondary-school-aged children in Hungary provides causal evidence that students benefit from high-track attendance in terms of academic achievement and university aspirations. However, differential accession to the highest track conditional on socioeconomic background may exacerbate educational inequalities. Students from more deprived backgrounds are less likely to access the highest track, though we find they benefit at least as much from high-track attendance as their relatively better-off peers. Similarly, students with lower levels of prior achievement equally benefit from high-track attendance in terms of learning gains, and we find only minor evidence of academic peer spillovers. Overly restrictive tracking policies may therefore unnecessarily threaten educational equality goals, and in the German context, where tracking has been a cornerstone of the education system since the 19th century, particularly rigid and early tracking policies may further amplify these effects. Rethinking Germany's approach to tracking means re-centring discussions of equality in light of this new evidence for the efficiency-equity trade-off.

KEY MESSAGES

- New evidence suggests expanded high-track accession could improve equality in education provision
- High-track placement improves student performance across all socioeconomic groups and prior achievement levels
- Peer academic ability has a limited impact on student outcomes, challenging the traditional rationale for strict ability-based tracking
- Student behaviour has stronger positive peer effects than academic ability
- Current tracking systems may unnecessarily restrict educational opportunities
- Early tracking age in Germany (10) versus Hungary (14) may amplify the negative effects of premature selection

INEQUALITY OF TRACK ACCESSIONS AS A CHALLENGE FOR EDUCATION POLICY

Equity-efficiency trade-off in school tracking

School systems around the world face two major and interrelated challenges. The first is providing high-quality, pedagogically founded instruction tailored to the needs of students. The second is promoting social mobility, ensuring that access to educational opportunities is equitable. However, these two challenges are in part mutually exclusive, and the equity-efficiency trade-off in school tracking represents a fundamental tension in education policy.

Efficiency case: Ability grouping streamlines instruction and fast-tracks high achievers

Proponents of tracking argue that separating students by ability allows teachers to better tailor instruction to student needs. This instructional efficiency argument is particularly influential in Germany. Another key argument in favour of tracking is that it allows high-achieving students to progress more rapidly and reach higher academic levels. By grouping academically strong students, schools can maintain rigorous academic standards and push talented students to excel.

On the other hand, critics argue that tracking can entrench and exacerbate educational inequality. Early tracking decisions often reflect students' social background as much as their academic potential, with disadvantaged students disproportionately assigned to lower tracks. Once placed in lower tracks, students typically have limited opportunities to transfer upward, potentially limiting future education and career prospects.

Equity critique: Early socioeconomic sorting limits mobility, but evidence is mixed, and identification remains difficult

However, despite the prevalence of tracking policies, evidence on the academic consequences of tracking is mixed. Some previous studies find a positive effect (Carrell et al., 2018; Berkowitz & Hoekstra, 2011; Jackson, 2010; Hastings & Weinstein, 2008; Cullen et al., 2006), while others find no effect (Beuermann & Jackson, 2022; Barrow & de la Torre, 2020; Abdulkadiroğlu et al., 2014; Lucas & Mbiti, 2012). Further, there are concerns about the accuracy of early tracking decisions. Academic performance at age 10 or 11 may not reliably predict future potential, especially for students still developing English language skills or those from less academically supportive home environments (Buchmann & Park, 2009).

In the following, we reframe the debate regarding the equity-efficiency trade-off when it comes to tracking and contribute to an evidence-based foundation for education policy-making.

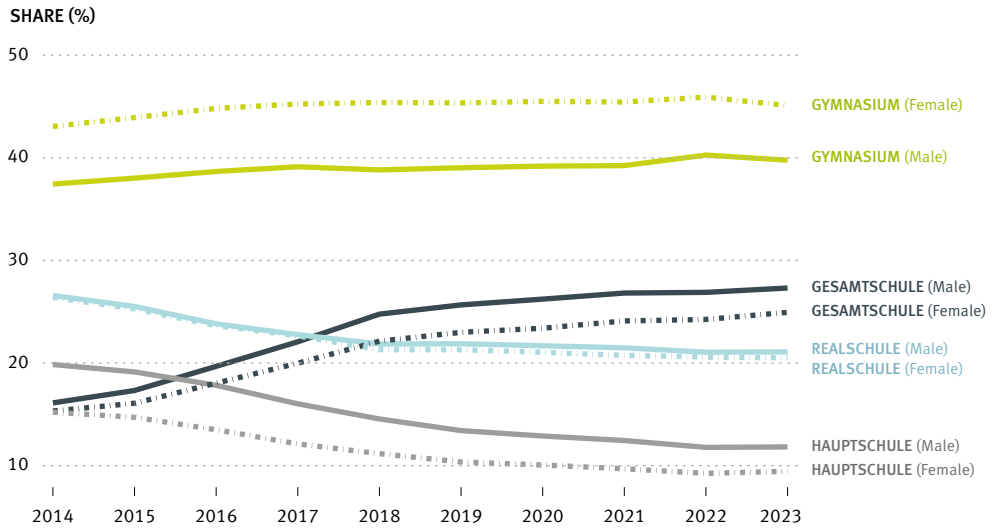
HOW DOES TRACKING IN HUNGARY AND GERMANY DIFFER?

Germany tracks early by school; Hungary later by programme

The tracking systems used in Germany and Hungary represent distinct approaches to student sorting and academic pathway determination, though both employ relatively early tracking compared to many other European nations.

The German tripartite system typically begins tracking students around age 10 (after the 4th grade), directing them into one of three main secondary school types: Gymnasium (academic track), Realschule (intermediate track), or Hauptschule (vocational track). A fourth option, the Gesamtschule, offers a comprehensive school model that combines elements of all three tracks, including access to the Abitur. Access to these tracks was historically determined by binding teacher recommendations at the primary school level. In recent years, several federal states have repealed the binding dimension, permitting students to enrol in a non-recommended track. However, in Baden-Württemberg (2025), Berlin (2024), and Saxony-Anhalt (2025), among others, legal reforms aimed at making the transition again more binding, transparent, and performance-based have recently been put in place. Based on DeStatis enrolment statistics, for students in the 9th grade – the last year for which schooling is compulsory in Germany – Figure 1 shows that approximately 40% of males and 45% of females were enrolled in the highest track as of the academic year 2023/2024. A further 27% of males and 25% of females were enrolled in a Gesamtschule, where the Abitur is technically accessible.

FIGURE 1: SCHOOL TRACK ENROLMENT IN GERMANY FOR 2023/2024



Centralised matching creates quasi-experimental variation, enabling market design insights

The Hungarian system implements tracking earlier than Germany for a small fraction of students, typically at age 10 with special ability classes, though for the majority of students, tracking occurs later, at age 14. They similarly use a tripartite system wherein students are sorted into one of three main tracks: Gimnázium (academic track), Szakgimnázium (vocational secondary), and Szakközépiskola (vocational training). A distinctive feature of the Hungarian system is that these tracks are not necessarily confined to separate schools. Similar to the German Gesamtschule, tracking occurs at the programme level via school-course combinations. Access to secondary school programmes, and thus to certain tracks, occurs via a centralized matching process via a national clearing house.

AN EMPIRICAL ESTIMATION OF THE EFFECTS OF TRACKING ON ACHIEVEMENT AND ASPIRATIONS

Design: We use national admissions data to identify causal effects on achievement and aspirations

Based on nationwide admissions data for all Hungarian students in 2015, in Bach et al. (2025), we estimate the effects of admissions to the highest track on student outcomes two years after school assignment, focusing on two potential channels. First, we estimate the causal effect of high-track enrolment on university aspirations and performance in standardised tests for mathematics and reading. Second, we investigate how peer quality in high-track schools affects one's own achievement via the mechanisms of peer ability, behaviour, and diligence as a proxy for grit. We also investigate how the development of competences in mathematics and reading differ according to family background, gender, and prior achievement during primary school.

Measuring the true effect of school tracking has always been difficult. Students in different tracks typically differ in many ways – their prior academic performance, their family background, and their intrinsic motivations. This makes it hard to determine whether better outcomes for students in more rigorous academic tracks are caused by the tracking itself or simply arise due to pre-existing differences. In order to estimate school-track-related learning gains, we exploit data from the centralised matching process where students in the 8th grade are matched to programmes (school-course specific combinations) for the 9th grade onward. Students submit their list of preferences over schools, and schools similarly rank the student applicants. Students and programmes are then matched using the Deferred Acceptance algorithm.

This procedure creates natural experiments. Some students are barely admitted to the highest track, while others just miss out on a place, despite being virtually identical in their qualifications. We focus on these barely-admitted and barely-missed students.

Local cut-off design reveals heterogeneity across the ability spectrum

Further, individual programmes set their own admissions criteria and student numbers, and there is not one universal cut-off for admission. In fact, acceptance thresholds at individual programmes exist across almost the entire distribution of prior achievement. This allows us to separately estimate the track-related learning gains for individuals at different points on the achievement distribution.

MEASURING LEARNING OUTCOMES IN THE 10TH GRADE

National competency tests enable comparison of learning gains across tracks

We estimate the learning gain in terms of basic competences, i.e., mathematics and reading, based on student performance in standardised national exams completed in the 8th and 10th grade, pre- and post-track assignment.

The data comes from the 2015 and 2017 waves of the NABC, or the National Assessment of Basic Competencies, which measures the abilities of students in reading and mathematical literacy. These exams are not designed to measure student performance according to a specific curriculum; rather, they are similar to the core components of the PISA test. Tasks are relevant to everyday life and are designed to directly test students' skills in solving labour-market-relevant problems in, e.g., retrieving, analysing, and reflecting on information, or reading tables and graphs, and computing a balance sheet.

This is important, because during the first two years of secondary schooling in Hungary, students in both the highest and the intermediate track follow a common academic curriculum that aims to prepare them to take the maturity exam (érettségi vizsga) at the end of 12th grade, though it is not mandatory for intermediate track students. Students in intermediate track programmes are only introduced to a vocationally-oriented area of study in the 11th and 12th grades. Thus, for this two-year period in the 9th and 10th grades, curriculum differences should be minimal if students in both tracks are being adequately prepared for the 12th-grade maturity examination.

MEASURING SOCIOECONOMIC STATUS

The SES index allows analysis of distributional equity

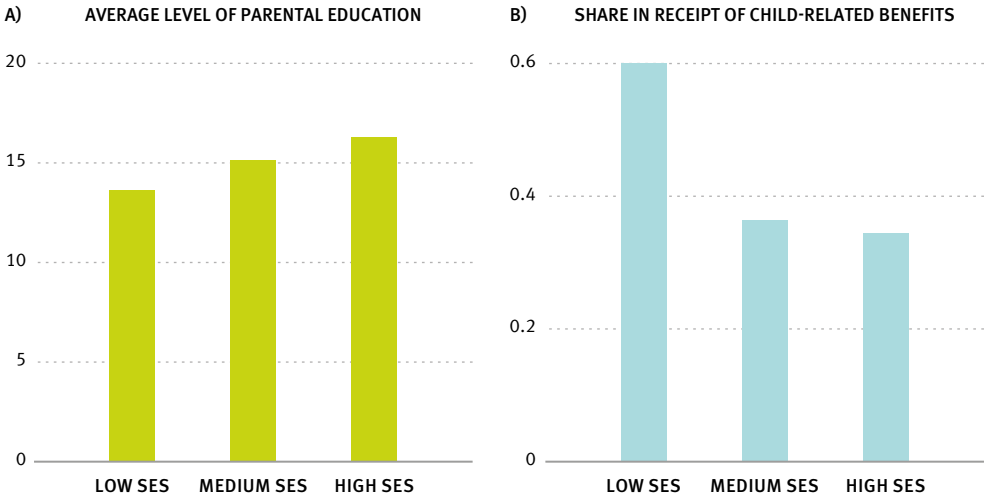
The socioeconomic family environment (SES) is measured using a one-dimensional index of relative deprivation, constructed by the Hungarian Office of Education based on a range of indicators relating to the student, their parents, and the family environment. For the analysis of SES in both Bach et al. (2025) and in the following, the distribution of this index is divided into three equally sized groups (terciles).

Figure 2 illustrates how SES relates to factors relevant to schooling, including the average level of parental education (panel a) and the share of those in receipt of child-related benefits (panel b).

Pre-tracking SES gaps necessitate compensatory policies

Parental education varies on a scale from 11 (didn't finish primary school) to 17 (master's degree). Figure 2a shows that the average level of parental education for students in the lowest tercile of SES is 13.64 (which roughly corresponds to a secondary vocational qualification in Germany), while it is 16.28 (university degree) for students in the highest tercile. Child-related benefits include discounted dining or free school lunch, free textbooks, or regular child protection support from the government. Figure 2b shows a large concentration of those in receipt of child-specific benefits in the lower tercile of our SES measure. There are, therefore, significant differences between the terciles of SES that are contextually important when thinking about children's educational outcomes and aspirations. While the link between SES and student achievement is a well-documented phenomenon, existing evidence suggests students from disadvantaged backgrounds are also more likely to have lower aspirations, independent of ability.

FIGURE 2: SES AND SCHOOLING-RELATED FACTORS



DIFFERENCES IN ABILITY AND ASPIRATIONS BY SOCIOECONOMIC BACKGROUND PRE-TRACK ASSIGNMENT

Pre-tracking SES gaps are stark, highlighting the need for compensatory policy

In order to contextualise the learning gains from assignment to the highest track, which are similar across terciles of SES and prior achievement, we first illustrate the differences in mathematics and reading competences and teacher assessments in the 8th grade, pre-track assignment, for children from different socioeconomic backgrounds. To better illustrate these differences, we standardise grades at the national level, wherein the mean value is subtracted from the original values, and the variance is normalised to one.

FIGURE 3: AVERAGE STANDARDISED ACHIEVEMENT IN 8TH GRADE BY SES

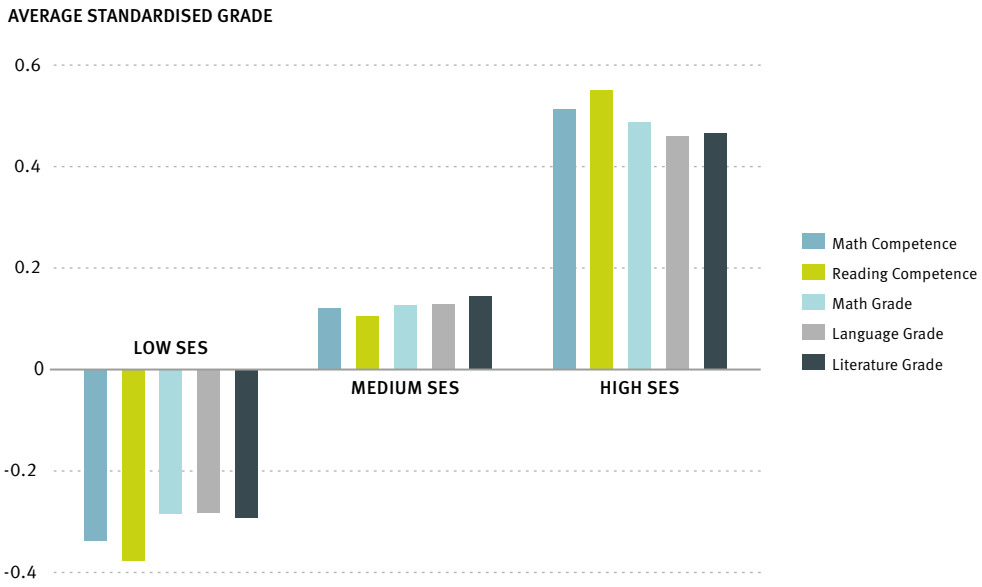


Figure 3 clearly shows substantial differences in average test scores and teacher assessments by SES. Inequalities in learning outcomes are therefore considerable, conditional on a student's family environment before track assignment, which is consistent with existing findings for Germany (e.g., Blomeyer et al., 2009, 2013). Tracking may only amplify these gaps, given that differential accession to the highest tracks has long-term implications for children's educational and career trajectories. If equality in education is a goal of education policymakers, it is thus important to consider the need for compensatory investments in education.

LEARNING GAINS FROM HIGH-TRACK ASSIGNMENT ARE INDEPENDENT OF PRIOR ABILITY AND SES

High-track attendance boosts test scores and university aspirations across SES and ability levels, especially for girls

How do competences develop during the first two years post-track assignment? In Bach et al. (2025), we find that attending high-track schools improves standardised test scores by 0.11 standard deviations overall, with particularly strong effects in mathematics (0.14 standard deviations). Figure 4 further illustrates the estimated learning gains for students in the 10th grade, conditional on assignment to the highest track, by baseline achievement, SES, parental education, and gender, while Figure 5 shows the effects on university aspirations.

FIGURE 4: THE EFFECT OF HIGH-TRACK ENROLMENT ON LEARNING GAINS

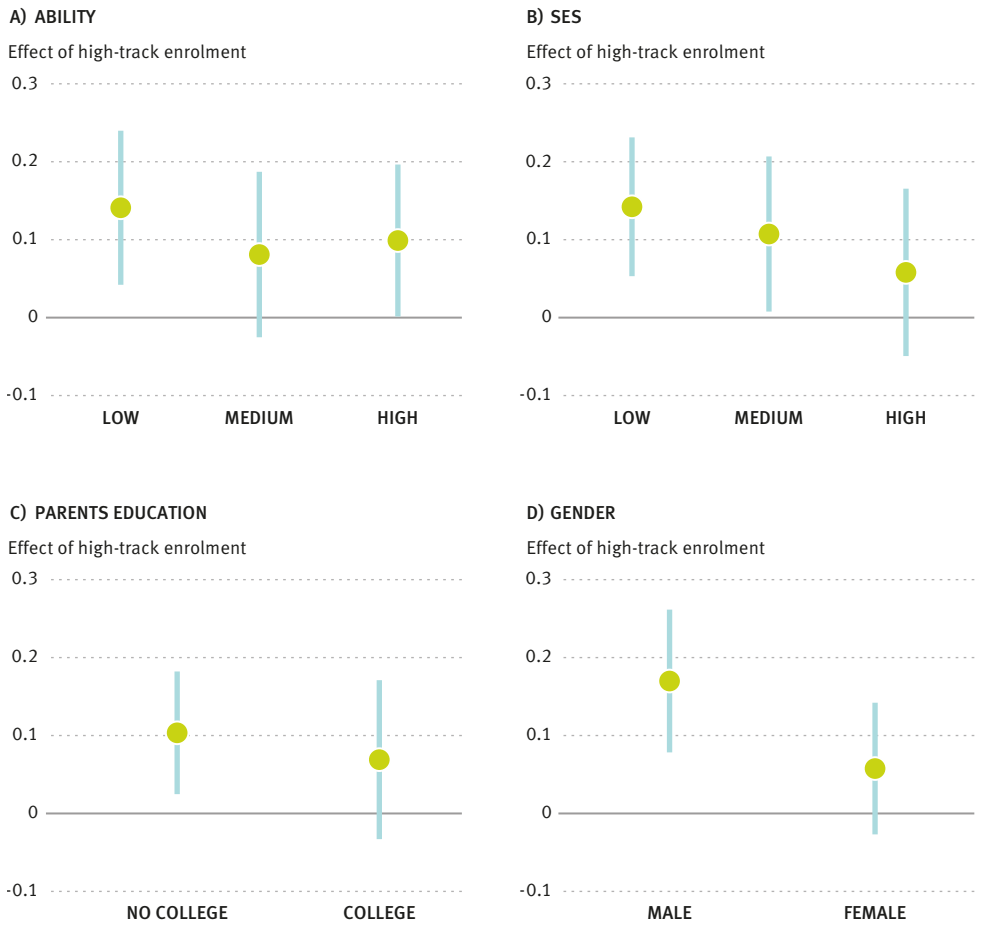
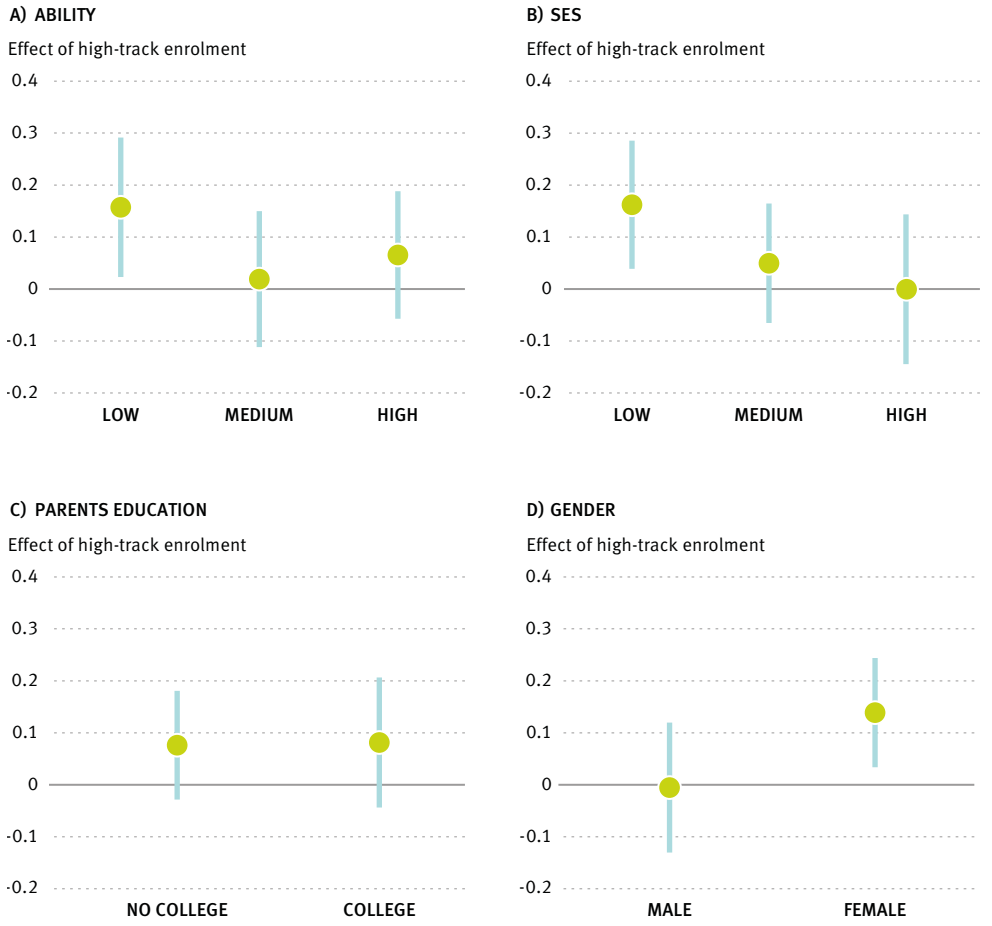


FIGURE 5: THE EFFECT OF HIGH-TRACK ENROLMENT ON UNIVERSITY ASPIRATIONS



As the figures show, learning gains vary only slightly by SES and baseline achievement, and those from low SES backgrounds benefit at least as much from assignment to the highest track. Female students do benefit much more than males, however, when it comes to university aspirations. We also find that students' relative rank among their peer group at the class level moderates the effects of high-track placement: those who entered the track ranked lower among their peers experienced the largest learning gains, particularly in mathematics. Notably, the benefits of tracking are especially pronounced for lower-ranked female students, with no evidence that comparatively lower-ranked students are harmed by high-track assignment.

THE ROLE OF PEERS

Peer behaviour outweighs ability – selection should go beyond test scores

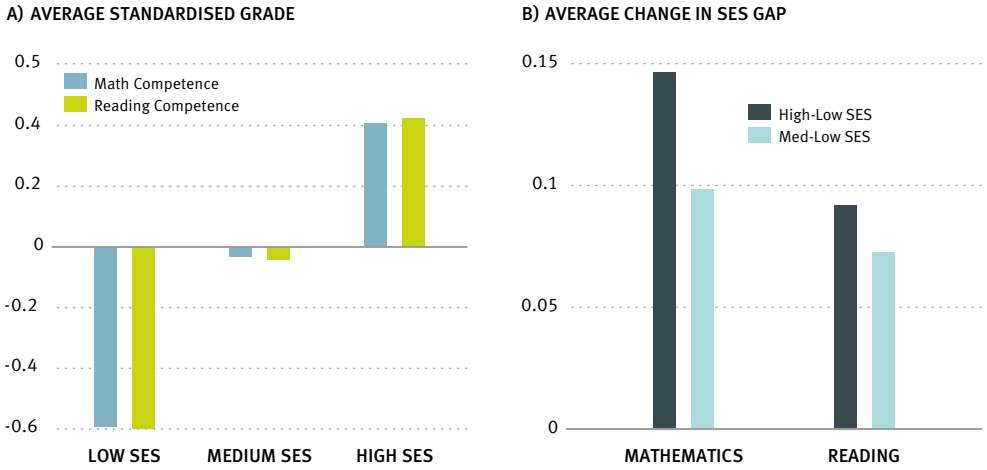
Perhaps most surprisingly, we find little evidence that these learning gains are driven by peer effects in terms of academic achievement, the common argument that high-achieving students benefit from being grouped together. Instead, student behaviour emerges as a more important factor in generating positive peer effects than academic ability (0.11 standard deviations), particularly for girls' mathematics scores (0.15 standard deviations). Insomuch as positive behaviour and performance on structured tests do not necessarily go hand in hand, these findings suggest that current tracking practices may, on the one hand, prevent students from accessing educational opportunities that would benefit them, and on the other, well-behaved students, if admitted, may confer a positive effect on their peers.

INCREASED INEQUALITY TWO YEARS AFTER TRACK ASSIGNMENT

Limited access widens SES gaps by 10th grade – inequality grows despite equal gains

Our analysis demonstrates that the learning gains associated with admission to the highest track are independent of family background or prior achievement. Access to the highest track can therefore contribute to a reduction in inequality in education outcomes and aspirations toward higher education. However, due to differential rates of accession to the highest track, these potential learning gains are not realised for students from relatively more deprived backgrounds. As a consequence, Figure 6 shows that not only are there substantial differences in average standardised test scores two years post-track assignment (panel a), but the gap in standardised test performance by SES actually increases before and after tracking (panel b).

FIGURE 6: POST-TRACKING DIFFERENCES IN STANDARDISED ACHIEVEMENT BY SES



This growth in educational inequality between the lowest and highest terciles of SES, particularly in regard to mathematics, can in part be ascribed to differences in track accession by socioeconomic background.

DISCUSSION

Expanding high-track access enhances equity without compromising efficiency

In sum, we find compelling evidence that challenges core assumptions about ability-based school tracking. We demonstrate significant positive effects of high-track placement on student achievement and university aspirations several years post-assignment, regardless of prior academic performance or socioeconomic background. Nevertheless, inequalities in track accessions mean that for students from more deprived backgrounds, potential learning gains are less likely to be realised. This drives growth in inequality in student outcomes pre- and post-assignment.

These findings have important implications for the equality-efficiency trade-off that dominates the debate on school tracking, given that we find that said learning gains are not driven by peer ability spillovers in terms of prior achievement, though peer behaviour does appear to be important. Our results imply that improvements in equality via expanded access are possible without sacrificing efficiency.

IMPLICATIONS FOR GERMANY'S THREE-TIER SYSTEM

Germany's early, rigid tracking may heighten inequality – later, flexible Gymnasium entry could help

Germany tracks students into different secondary schools at age 10, among the earliest in Europe. This system assumes that high-achieving students benefit from selective peer groups and that early separation optimises instruction for different ability levels. It logically follows that academic track expansion would harm high achievers. However, Germany's early tracking and rigid three-tier system (Gymnasium, Realschule, Hauptschule) may be unnecessarily amplifying educational inequalities.

This new evidence suggests that more inclusive high-track admission policies could benefit lower-achieving students without harming high achievers, and that behavioural criteria might be more relevant than strictly academic performance for tracking decisions. A rethinking of tracking in the German context, with the potential for reforms that enhance educational equality without compromising academic excellence, could help the education to better fulfil its dual mandate of developing talent and promoting social mobility.

EDUCATION POLICY: RETHINKING SCHOOL TRACKING

Policy levers: Delay tracking, facilitate mobility, and balance recommendation bias with behaviour and aptitude

In recent years, the academic debate on tracking in the German context has focused on biases in track recommendations that arise from subjective judgment in grading and student abilities (see, e.g., Bonefeld & Dickhäuser, 2018), and the repeal of binding track recommendations (see, e.g., Holtmann et al., 2024; Bach, 2023). From the authors' perspective, however, an equally important consideration are the bases upon which these recommendations are constructed.

While completely eliminating tracking may not be feasible or desirable, the evidence supports making academic tracks more accessible and creating more flexible pathways between tracks. We therefore suggest that, rather than viewing tracking as a binary choice between rigid separation and complete mixing, policymakers should consider more nuanced approaches that preserve the benefits of differentiated instruction while reducing unnecessary barriers to academic opportunity. This might include later tracking ages, regular opportunities for track mobility, and broader criteria for academic track admission.

For example, the criteria for Gymnasium admission could be broadened to include behavioural considerations alongside academic performance. Current Gymnasium admission rules rely heavily on primary school classroom grades and teacher recommendations. Adding behavioural considerations and standardised aptitude testing could identify capable students who may otherwise underperform due to environmental factors. This could particularly benefit immigrant students and those from disadvantaged backgrounds, who often receive lower teacher recommendations despite similar abilities (Diehl et al., 2024; Bonefeld & Dickhäuser, 2018; Dudas, 2014).

When it comes to tracking in Germany, the stakes are high, given that tracking decisions significantly affect students' future educational and career opportunities. These findings suggest that Germany's current approach may be unnecessarily limiting students' potential while reinforcing social inequalities. Although reforming such an established system would undoubtedly face challenges, this new evidence supports the idea that more inclusive tracking practices could improve educational outcomes without sacrificing academic excellence.

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