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Heterogeneous Responses to School Track Choice: Evidence From the Repeal of Binding Track Recommendations

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Heterogeneous responses to school track choice: Evidence from the repeal of binding track recommendations

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Abstract

This paper studies heterogeneity in schooling decisions by socio-economic status (SES) in response to a repeal of achievement-based admissions requirements (i.e. binding track recommendations) in Germany's between-school tracking system. The main contribution is to show that while previously ineligible high-SES students are relatively more likely to enroll in the highest (academic) track than comparable low-SES students after the repeal, the SES gap in academic track enrollment does not increase. The reason is that low-SES students, who were already eligible for the academic track before the repeal, increase their probability of enrolling in the academic track. A key mechanism driving low-SES students' response appears to be lower preferences for the intermediate track due to concerns about the inflow of mostly low-achieving and low-SES students from the lowest (basic) track after the repeal.

Keywords: education; school choice; intergenerational mobility; inequality of opportunity; tracking

JEL Codes: I24, I28, J24, J62

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1 Introduction

Most OECD countries sort students into hierarchically ordered secondary school types which provide access to different postsecondary schooling and occupational career paths (e.g., access to university) (OECD, 2013). In these between-school tracking systems, students from more disadvantaged families often attend less demanding school types (henceforth tracks) compared to children from more advantaged backgrounds with similar measures of prior academic achievement.[1] These social differences in higher track attendance potentially reinforce educational inequality and prevent social mobility.

Track admission rules potentially play an important role in these observed educational inequalities. A key policy question is whether admission to more demanding tracks should be conditional on prior achievement or unrestricted. Due to potential social differences in educational aspirations, a common concern with free track choice is a widening of the gap in higher track attendance by socio-economic status (SES):[2] higher-SES parents might be more likely to choose a higher track for their child, irrespective of ability, relative to lower-SES parents.

This paper addresses this concern by studying whether introducing free track choice makes track decisions more dependent on social background. The context is Germany's early between-school tracking system, where children as young as 10 years old are allocated to different hierarchically ordered school tracks at the end of primary school. Specifically, I investigate the effects of abolishing binding track recommendations on track decisions. Binding track recommendations are based on student performance in the last grade of primary school and put an upper limit on track choice—students cannot attend a higher track than recommended but can always enroll in lower tracks. The analysis proceeds in two steps. In a first step, I examine the effect of free track choice on track decisions by SES and at different margins. The second step consists of an exploration of potential mechanisms.

The first part begins with a case study of the federal state Baden-Württemberg, which repealed binding track recommendations in 2012. The cohort transitioning to secondary school in that year was the first free to choose between the basic, intermediate, and academic track, regardless of the type of track recommendation. I obtained administrative school statistics on track transitions by type of recom-

[1] See, for example, Guyon and Huillery (2020) for evidence for France, Dumont et al. (2014) for a review of studies for Germany, and Carlana et al. (forthcoming) for Italy.

[2] See, for example, Ambler (1994); Checchi and Flabbi (2007); Jackson and Jonsson (2013).

mendation at the county level for the universe of transitions across the 44 counties in Baden-Württemberg for the school years 2005 through 2016. Based on these data I document that transitions into the highest (academic) school track evolve smoothly prior to the repeal. When the repeal goes into effect transitions into the academic track increase sharply and by roughly the same proportion across counties with very different average SES (as measured by the share of the adult population that holds an academic track qualification). In other words, free track choice did not widen the gap in academic track enrollment between higher- and lower-SES counties. However, this result masks disparate responses across counties at the two margins that students might find themselves at: Students without an academic track recommendation—who would have been ineligible prior to the repeal—are much more likely to enroll in the academic track after the repeal in higher-SES counties compared to lower-SES counties. But this does not increase the academic track enrollment gap because students in lower-SES counties with a recommendation for the academic track—who were already eligible pre-repeal but often enrolled in the intermediate track instead—become more likely to follow an academic track recommendation after the repeal. This pattern is not observed in the highest SES regions.

I replicate these results using student-level data from the National Assessment Study (NAS), which surveyed state-representative samples of around 25,000 fourth grade students, as well as their parents and teachers, across all German federal states in 2011 (pre-repeal) and 2016 (post-repeal). This allows to draw on other federal states, which did not change their track assignment rules, as a comparison group in a difference-in-differences design. Thus, I identify the effect of the repeal of binding track recommendation from relative changes between repeal and no-repeal states pre- and post-repeal. Classifying students into high- and low-SES by whether or not they have at least one parent with an academic track qualification, I again find that the SES gap in academic track enrollment does not widen after the repeal. Looking at transitions conditional on track recommendations also reveals similar patterns as the county-level analysis: high-SES students without an academic track recommendation are 20 percentage points (p.p.) more likely to enroll in the academic track after the repeal, while low-SES students without an academic track recommendation increase their academic track enrollment only by 8.4 p.p. At the other margin, low-SES students with an academic track recommendation are 11 p.p. more likely to enroll in the academic track after the repeal. There is no corre-

sponding change for high-SES students. Tracing out effects across the achievement distribution (measured by standardized test scores) confirms the asymmetry in responses across SES: low-achieving, high-SES students increase their academic track enrollment relative to comparable low-SES students. The reverse is true for average achieving, low-SES students relative to comparable high-SES students.

The second part explores potential mechanisms for the surprising finding that low-SES students with an academic track recommendation increasingly enroll in the academic track after the repeal despite the fact that their choice set did not expand. There is no evidence that this effect results from compositional changes. For instance, due to low-SES students becoming relatively less disadvantaged over time, or positive selection into the group of students with an academic track recommendation as a result of stricter grading requirements after the repeal. The effect is also not mechanical because of intermediate track schools potentially becoming oversubscribed after the repeal. This supports a behavioral response interpretation: low-SES students who would not choose the academic track, despite being eligible, when track choice is restricted, increase their academic track enrollment when track choice is free.

Further analyses suggest that this response to free track choice is, to a large extent, the result of concerns about the inflow of previously ineligible students into the intermediate track. I show that responses differ by whether or not free track choice is predicted to result in increased intermediate track enrollment of students with only a basic track recommendation. For example, in settings where the basic and intermediate track are combined within a single comprehensive track (i.e. where a shift of students from the basic into the intermediate track is ruled out), free track choice has no or only a small effect on low-SES students' compliance with academic track recommendations. Having more classmates with a basic track recommendation also mediates the effect of free track choice on academic track enrollment, but only for low-SES students with a recommendation for the academic track. These students increasingly comply with an academic track recommendation in response to free track choice if they are in a class with a higher share of students who would be ineligible for the intermediate track absent free track choice. Collectively, these patterns are consistent with concerns about the inflow of mostly low-achieving and low-SES students into the intermediate track explaining low-SES students increased academic track enrollment.

This study is related to several strands of literature. The first comprises research

on factors affecting educational decisions and socio-economic gaps in educational attainment. Most economic research in this area has looked at college enrollment decisions and degree completion (e.g., Bailey and Dynarski, 2011). In between-school tracking systems, where postsecondary education opportunities strongly depend on the secondary school track, consequential schooling decisions are made relatively earlier and to a much larger extent by parents. The theoretical literature on SES gaps in schooling decisions has emphasized the importance of educational aspirations in these contexts (Mookherjee et al., 2008; Dalton et al., 2016; Genicot and Ray, 2017). My contribution to this literature is twofold. First, the finding that academic track enrollment of previously ineligible students rises relatively more for high-SES compared to low-SES students under free track choice, provides causal revealed preference evidence for the role of social differences in educational aspirations as an explanation for educational attainment differences. Second, my results contribute to the literature by drawing attention to the malleability of disadvantaged households' schooling decisions. Low-SES students' increased compliance with academic track recommendations due to concerns about an inflow of low-achieving students into the intermediate track suggests the sensitivity of their schooling decisions to contextual factors.

This article also adds to the academic debate around school choice and its implications for educational segregation. Most work by economists has analyzed the effects of increased school choice (e.g., through voucher programs) in comprehensive school systems where school choice is typically restricted by place of residence due to school catchment areas (see Burgess and Greaves, 2021, for an overview).[3] Overall, the evidence for comprehensive school systems points towards more student sorting by ability or parental background when choice increases. In contrast, households in between-school tracking systems are generally free to choose any school as long as students qualify for the specific track offered at the school (i.e. there are no catchment areas). As a consequence, educational segregation in these systems is highest across school types and not across individual schools of a given type (see, e.g., Oosterbeek et al., 2021). I contribute to the literature on school choice by demonstrating that increased choice in between-school tracking systems does not necessarily result in more educational segregation by family background. Inequality exacerbating responses of high-SES households to increased school choice are

[3]See, for example, Brunner et al. (2010); Figlio et al. (2010); Chakrabarti (2013) for evidence for the US, Söderström and Uusitalo (2010); Böhlmark et al. (2016) for Sweden, Hsieh and Urquiola (2006) for Chile, Lucas and Mbiti (2012) for Kenya, and Gortazar et al. (2020) for Spain.

potentially offset by general equilibrium responses of low-SES households for whom choice does not increase.

More narrowly, this article contributes to an expansive literature on the effects of free track choice on track decisions. The topic has been extensively studied, particularly in the German context, and primarily by sociologist. Previous work has reached conflicting conclusions about the effect of free track choice on the SES gap in academic track enrollment with effects ranging from positive to negative (see, e.g., Gresch et al., 2010; Neugebauer, 2010; Dollmann, 2011; Jähnen and Helbig, 2015; Roth and Siegert, 2015; Büchler, 2016; Roth and Siegert, 2016; Esser and Hoenig, 2018; Osikominu et al., 2021; Grewenig, 2021).[4] My study potentially solves a key puzzle in this literature which has eluded explanations thus far: high-SES parents generally report higher educational aspirations for their children than low-SES parents conditional on prior academic achievement (see, e.g. Ditton, 2007; Paulus and Blossfeld, 2007). This is difficult to reconcile with the ambiguous evidence on the effects of free track choice on the SES gap in academic track enrollment from previous studies. The tendency of eligible low-SES students to increase their academic track enrollment in response to free track choice could explain why an increase in academic track enrollment of previously ineligible high-SES students does not widen the SES gap in academic track enrollment.[5] As I show that responses to free track choice also depend on the structure of the tracking system further helps to explain why previous studies potentially reach such different results.

[4]Most are observational studies relying on between-state comparisons, limiting causal interpretations due to potential confounding by other differences across states (Gresch et al., 2010; Neugebauer, 2010; Büchler, 2016; Esser and Hoenig, 2018). In contrast, Dollmann (2011); Jähnen and Helbig (2015); Roth and Siegert (2015, 2016); Osikominu et al. (2021); Grewenig (2021) exploit changes in track recommendation rules over time differencing out state fixed effects. Except for Dollmann (2011) and Osikominu et al. (2021), none of the quasi-experimental studies find an increase in the SES gap in response to free track choice. Since the quasi-experimental studies lack data on students' track recommendation, they are unable to investigate heterogeneous responses by SES and type of recommendation, which is needed to uncover and understand the different responses to free track choice documented in this paper.

[5]Gresch et al. (2010) also find that low-SES students with an academic track recommendation are less likely to enroll in the academic track in binding relative to nonbinding states (Gresch et al., 2010, Figure 1). But since their finding is based on a between-state comparison, they do not interpret it causally. Instead, they attribute it to other potential differences between states (e.g., institutional or population-wise). I show that this effect is not an artifact of between-state differences, but causally associated with the track recommendation regime.

2 Institutional context

In this section, I will give a concise description of the German school system with a focus on those aspects that are most relevant for understanding the transition from primary to secondary school.

Figure 1 provides a stylized overview of primary and secondary education in Germany. Primary school covers grades 1 through 4, or in some federal states grades 1 to 6, and assignment is based on whether a student lives within a school's catchment area. At the end of primary school, students are allocated to different, hierarchically ordered school types, which I will refer to as school tracks. There are two types of tracking systems in Germany. The first is a 3-tiered system with *Hauptschule*, *Realschule*, and *Gymnasium*. I label these tracks 'basic', 'intermediate', and 'academic', respectively. These school tracks have different curricula and school-leaving qualifications. The basic and intermediate school-leaving qualifications qualify students for vocational education, whereas the qualification from the academic track (*Abitur*) is the formal prerequisite for university enrollment. Education in the academic track lasts eight to nine years (grades 5-12/13), whereas the basic and intermediate track lasts five (grades 5-9) and six years (grades 5-10), respectively. The second system is a 2-tiered system, where the basic and intermediate track are combined into one comprehensive school. In grades 5 and 6, students in comprehensive schools are not grouped by ability. However, some comprehensive schools form track-specific classes from grade 7 onward and offer the same school-leaving qualifications as the basic, intermediate, and academic track schools.

[Figure 1 about here]

The rules governing which track children can attend after primary school differ across states and have undergone sharp changes in the last decade. However, the basic structure is the same across states. In contrast to primary school, there are no catchment areas. There are also no formal exit exams at the end of primary school. Instead, the primary school issues a secondary school track recommendation for each student which is generally guided by the student's abilities and their performance in the last grade of primary school.[6] The main difference between states is whether this

[6]The factors determining recommendations differ across states. Bavaria and Saxony, for example, have specific GPA cutoffs, while other states do not specify the exact requirements to get a recommendation for a particular school. For more details on these rules see Helbig and Nikolai (2015). For a discussion of the factors teachers consider for their recommendations see Baumert et al. (2010).

recommendation is binding or not. While in some states students cannot attend a higher track than recommended,[7] other states allow parents to freely choose a secondary school track for their child regardless of the recommendation.[8] Table 1 in the appendix shows which states had binding track recommendations for the school years 2011/11-2016/17. In 6 out of 16 states, the school's recommendation was binding in 2011, however, of these seven states, two changed the rules between 2011 and 2013 and decided to give parents free school track choice.[9] These are Baden-Württemberg and Saxony-Anhalt.

[Table 1 about here]

3 Data

The empirical analysis is based on two main data sets: administrative school records from the state of Baden-Württemberg and survey and standardized test score data from the National Assessment Study (NAS). I describe each data set in turn.

3.1 Administrative school records

I obtained data on all transitions from primary school to each secondary school track by track recommendation at the county level for the school years 2005/06 to 2016/17 for the state Baden-Württemberg. These data are collected by the statistical office of Baden-Württemberg.[10] To these data I merge the fraction of the adult population (aged 30-59) with an academic track qualification at the county level based on data from the 2011 German Census.

3.2 National Assessment Study (NAS)

To investigate effects at the individual-student level, I use data from the National Assessment Study (NAS), which is designed to produce representative test score and

[7] In case of conflict between the recommendation and the parents' wishes, some states allow students to take a special test whose outcome determines whether a student is allowed to attend the higher track.

[8] Parents can always opt for a lower track than recommended, also in states with binding track recommendations.

[9] Note that even with free track choice, teachers still have to recommend tracks for each student. Therefore parents receive the same type of information on their children's academic achievement with or without free track choice.

[10] These data are not available for the other repeal state Saxony-Anhalt. Even if they were available, there is little variation in educational levels across Saxony-Anhalt's 14 counties, making it difficult to study responses by SES with only county level data in this state.

survey data for all 16 German federal states.[11] It is a repeated cross-section and was administered in 2011 and 2016, testing students at the end of grade 4 (between May and July) in math and German (reading and listening). Tests were administered by external staff to around 25,000 students in both years, with each state roughly contributing a similar number of students. Around 2,600 schools participated in both waves combined. In each wave, random samples of schools were drawn at the federal state level, and within each school, one class was randomly selected for testing. I use these test scores to study effects across the achievement distribution. Following the education literature, I compute percentiles ranks for each state and cohort of an achievement index (AI) created from the average standardized math, reading, and hearing test scores.

In addition to test score data, the NAS includes information collected through surveys of the participating students, their parents, teachers and school principals. While participation in the competence tests was mandatory in all sampled classes in public schools, completion of the student questionnaire was mandatory only in some states, and participation in the parent questionnaire was voluntary in all states. As a result, participation rates for the student and parent questionnaire (83% and 74%, respectively) are considerably lower than test participation, which is 98% and 94% for waves 2011 and 2016, respectively.

Information on students' track recommendation is collected via the teacher survey.[12] Information on school track choice comes from the parent survey. As the registration period for secondary school typically ends in March, this information should closely correspond with eventual track attendance.

As a measure of the socio-economic background of students, I classify students by parental education. Since the focus is on inequalities in secondary school track choice, a natural classification is whether or not at least one parent has a university entrance qualification (*Abitur*). This qualification is obtained by successfully completing the academic track. I will refer to students with at least one parent with an academic track qualification as high-SES, and students where neither parents has an academic track qualification as low-SES. Choosing this classification has several advantages. First, it allows for consistency across the aggregate county-level and the students-level analysis. While the student-level NAS data includes various socio-economic characteristics of parents (e.g., household income, occupational

[11] For more details on the NAS data, see Stanat et al. (2012, 2017).

[12] Students generally receive their track recommendation with their mid-term reports in January and the NAS survey was conducted between May and July of the same school year.

prestige, immigration background), some of these measures are not available at the county level (e.g., occupational prestige). Second, children's educational attainment in Germany differs strongest by parental education, and not by household income or between native and migrant groups.[13]

3.3 Sample selection

The analysis sample from the NAS data has to be restricted in three ways. First, I to drop all observations for which the following key variables are missing: test scores, parental education, track recommendation, and track choice. I keep all observations with missing values for non-essential control variables such as gender, migration background, German spoken at home, and parents' highest International Socio-Economic Index of Occupation Status (HISEI, Ganzeboom et al., 1992).[14] Second, since for the states Schleswig-Holstein, Lower-Saxony, and Bremen track recommendation information is missing for the majority of students for the 2016 wave, I exclude these states from the difference-in-difference analysis, which compares track decisions between the 2011 and 2016 wave. However, I keep these states for analyses which only use the 2011 NAS wave. Third, I have to exclude the states Berlin, Brandenburg, and Mecklenburg-Western Pomerania because transitions to secondary school take place after grade 6 in these states (instead of grade 4). Hence, track recommendation and track choice cannot be observed for these states in the NAS data. The number of states in my main estimation sample is therefore 10. Table A.8 shows descriptive statistics for this sample by SES, repeal and no-repeal states, and pre- and post-repeal waves.

[13]For instance, the fraction of children obtaining an academic track qualification is roughly similar for children from parents without an academic track qualification in the top decile of the household income distribution and children of parents where at least one parents has an academic track qualification in the bottom decile of the household income distribution (Dodin et al., 2021, Figure 2). Educational inequalities between native and migrant students in Germany stem mostly from the lower socio-economic status of migrant families rather than their migration background (for a summary of the evidence, see Siegert and Olszenka, 2016).

[14]Missing values for these control variables are dealt with in following way: I create separate missing categories for all categorical variables (e.g., migration background). Missing values for the continuous HISEI variable are imputed by linear predictions based on parents' years of education.

4 Results

4.1 Baden-Württemberg case study

My analysis begins with an analysis of changes in transitions into the academic track by socio-economic background across the 44 counties in Baden-Württemberg in response to the repeal of binding track recommendation. I split the balanced panel of counties into four SES quartiles based on their share of the adult population with an academic track qualification. Figure 2 illustrates this source of variation. The share of the adult population with an academic track qualification ranges from 15% (*Neckar-Odenwald-Kreis*) to 55% (*Heidelberg*) across all counties in Baden-Württemberg. Table A.2 in the appendix provides further descriptive statistics for the pre-repeal (2005-2011) and the post-repeal (2012-2016) period by SES quartile groups.

Figure 3 shows the evolution of transitions into the academic track by SES quartiles. Panel (a) shows raw means. There are clear level differences between quartiles with a substantially higher share of students attending the academic track in higher-SES counties; in 2011, the last year prior to the repeal of binding track recommendations, around 50% of students in the top quartile entered the academic track compared to only 35% in the bottom quartile. To allow for an easier comparison of the change in transitions in response to the repeal across quartiles and to account for the fact that quartiles exhibt different trends prior to the repeal, Panel (b) plots transition rates for the top and bottom quartile that have been (i) normalized to 2011 levels and (ii) corrected for quartile-specific linear trends estimated over the pre-repeal period (2005-2011). The grey area shows the difference in academic track transitions between the top and bottom quartile. The bottom and top quartile regions experience similar increases in the year the repeal goes into effect. Academic track transitions sharply shift upwards and permanently remain 2 to 4 p.p. above their pre-repeal levels in subsequent years. If at all, the relative increase in academic track enrollment is larger for the bottom quartile, given its lower academic track transition rates prior to the repeal.

[Figure 3 about here]

This result is inconsistent with the hypothesis that free track choice increases inequality by SES. This hypothesis is based on the premise that high-SES parents are more likely to enroll their child in the academic track despite a non-academic

track recommendation when given free choice (see, e.g., Gresch et al., 2010). To test this premise, Figure 4 shows the evolution of academic track transitions for students who would not have been eligible for the academic track prior to the repeal. Panel (a) plots the likelihood to enrol in the academic track conditional on having an intermediate track recommendation by SES groups. Before 2012, this likelihood was less than 2.5% across all quartiles, reflecting the binding nature of recommendations during this period.[15] When track recommendations become nonbinding, the probability to enrol in the academic track for previously ineligible students increases substantially. I will refer to this behavior as *upward non-compliance*. Upward non-compliance is clearly higher in high-SES regions. In the top quartile between 20-25% of all students with only an intermediate track recommendation enter the academic track in the years following the repeal. Only about 13% do so in the bottom quartile. This corroborates earlier cross-sectional studies documenting large gaps in academic track enrollment by SES conditional on not having an academic track recommendations in states without binding recommendations (see, e.g., Bos et al., 2003; Harazd, 2007; Gresch et al., 2010; Esser and Hoenig, 2018).

It is a prior unclear whether the SES gap in upward non-compliance after the repeal documented in Panel (a) increases academic track enrollment of previously ineligible students differently by SES. Total academic track enrollment also depends on baseline differences in academic track recommendations by SES.[16] Table A.2 reports that during the pre-repeal period, students from the bottom quartile had a 10 p.p. lower probability of being recommended for the academic compared to the top quartile (a gap of 23% relative to the top quartile academic track recommendation share of 44%). This gap should mute the effect of upward non-compliance on the academic track enrollment gap and could in theory even reverse it. Despite these large baseline differences in academic track recommendations, Panel (b) shows that the change in academic track enrollment by previously ineligible students (as a share of all transitions) was around two percentage points higher in the top quartile

[15] Students who entered the academic track without an academic track recommendation prior to 2012 are those who passed an admissions test, which had very low success rates. For example, only 6% of all students participating in the admissions tests in 2008 passed it (Schwarz-Jung, 2009).

[16] Note that academic track enrollment for students without academic track recommendations as a share of all transitions can be expressed as

$$P(\text{track=Academic}, \text{rec.} \neq \text{Academic}) = P(\text{track=Academic}|\text{rec.} \neq \text{Academic}) \times P(\text{rec.} \neq \text{Academic})$$

where $P(\text{track=Academic})|\text{rec.} \neq \text{Academic})$ denotes the conditional likelihood to enroll in the academic track for students without academic track recommendations and $P(\text{rec.} \neq \text{Academic})$ is the share of students without an academic track recommendation.

relative to the bottom after the repeal.[17]

[Figure 4 about here]

Given the increase in the SES academic track enrollment gap of previously ineligible students after the repeal, why has the overall gap in academic track enrollment not increased? Figure 5 shows that this is due to a reduction in the tendency to enroll in non-academic tracks for students with academic track recommendations (*downward non-compliance*) in lower-SES regions. Panel (a) shows that prior to the repeal, downward non-compliance evolves very smoothly for each quartile, albeit with different trends. Downward non-compliance is clearly higher in lower-SES regions. For instance, 25% of all students with academic track recommendations in the bottom quartile enrolled in a lower school track in 2011, whereas only 10% did in the top quartile. With the introduction of free track choice downward non-compliance drops sharly in all quartiles except for the top. Panel (b) shows that when corrected for linear pre-trends, the likelihood for students with an academic track recommendation in the bottom quartile to enroll in any non-academic track decreases by 8 p.p. in the first year of free track choice. It continues to decrease to 12 p.p. by 2016. The corresponding change in the top quartile is much lower: There is an initial drop of 2 p.p., which decreases further to 4 p.p. by 2016. Both patterns combined result in a more than 4 p.p. increase in the downward non-compliance gap between the top and bottom quartile relative to pre-repeal levels. Students in low-SES regions, who were already eligible prior to the repeal, seem to converge in their academic track decisions towards those in the top SES quartile.

[Figure 5 about here]

The bottom Panel (c) and Panel (d) of Figure 5 show how these changes in downward non-compliance affect the enrollment of students with academic track recommendations as a share of all transitions. Panel (c) plots the raw time series of non-academic track enrollment for students with academic track recommendations by SES quartile. Panel (d) plots the same time series corrected for linear pre-trends normalized to 2011 levels. Panel (d) shows an increase in the non-academic track enrollment gap (or reduction in the academic track enrollment gap) for students

[17]Figure A.1 in the appendix further shows that this is not due to an increase in academic track recommendations in the bottom relative to the top quartile. If at all, the top-bottom quartile gap in academic track recommendations increases slightly immediately after the repeal and then returns to its pre-repeal level by 2015.

with academic track recommendations by more than 2 p.p. in the post-repeal period. This shift in the enrollment gap almost perfectly offsets the increase in the academic track enrollment gap due to upward non-compliance reported in Figure 4 Panel (b). The results is that the net effect of free track choice on the academic track enrollment gap is essentially zero, as shown above in Figure 3.

Corresponding estimates summarizing the graphical analyses in Figures 3-5 are provided in Table 2. Panel (a) reports estimates based on the time series of SES group aggregates from the following basic difference-in-differences (DiD) specification:

$$y_{g,t} = \alpha_t + \beta_s + \gamma \mathbb{1}(t \geq 2012) \times \mathbb{1}(g = 4) + \epsilon_{g_t} \tag{1}$$

where $g \in \{1, 4\}$ denotes the SES quartile (4. SES quartile versus 1. SES quartile), t denotes the year, α_t are year dummies, and β_g quartile dummies. The coefficient on the interaction term post-repeal times the top-SES quartile ($\mathbb{1}(t \geq 2012) \times \mathbb{1}(g = 4)$) is the coefficient of interest. Panel (b) reports estimates of the following dosage model using disaggregated data for all counties:

$$y_{c,t} = \alpha_t + \beta_r + \gamma \mathbb{1}(t \geq 2012) \times SES_c + \epsilon_{r_c} \tag{2}$$

where c denotes the county and SES is the share of the adult population with an academic degree in county c. The dosage model regressions are weighted by the yearly number of transitions per county. To account for the different pre-repeal time trends across counties documented above in Figure 3 and Figure 5, I estimate models (1) and (2) using data that are corrected for linear trends estimated over the pre-repeal period.[18]

The main identifying assumption of this approach is that, absent the repeal, track decisions within a county would have continued to evolve according their linear pre-repeal trends. The fact that transitions rates (unconditional and conditional on track recommendations) follow smooth and clearly linear trends over the pre-repeal period (see Figures 3-5) supports the plausibility of this assumption. To further check the validity of this approach, Appendix B reports placebo estimates obtained by backdating the repeal year.

[18]This is achieved by first regressing $y_{g,t}$ ($y_{c,t}$) on quartile (county) fixed effects and quartile-specific (county-specific) linear time trends for the pre-repeal period. These estimated time trends are then extrapolated into the post-repeal period and subtracted from $y_{g,t}$ ($y_{c,t}$). Estimating (1) and (2) including quartile- or county-specific linear trends yields virtually identical results (Table A.3, Panel (c)); Table A.4, Panel (c)).

To account for the fact that cluster-robust standard errors for the dosage model in (2) with 44 clusters might be biased downward, I also report p-values based on the wild cluster bootstrap method as suggested by Cameron et al. (2008).[19] For the DiD model in (1), which uses only the top and bottom quartile times series, there is no such remedy, and the reported robust standard errors are likely incorrect. However, the placebo estimates from the backdating exercise in Appendix B suggest that the DiD estimates are unlikely the result of random variation.

The DiD estimates in Table 2, Panel (a), are consistent with the graphical analysis. The dosage estimate in Panel (b), column 1, also confirms the finding of no increase in the top-bottom quartile academic enrollment gap using variation across all counties. If anything, the academic track enrollment gap is estimated to (not statistically significantly) decrease by 2.15 p.p. after the repeal between counties which differ by 10 p.p. in their share of the adult population with an academic track qualification. In contrast, estimates conditional on track recommendations (columns 2-5) are much larger in magnitude, statistically significant, and consistent with the heterogeneous responses by SES and track recommendation documented above. Appendix Figure A.4 further reports binscatter plots for the dosage model. These show that the estimated upward and downward non-compliance effects are linear in the SES share and not driven by individual counties.

[Table 2 about here]

One potential explanation for the increased compliance with academic track recommendations in lower-SES counties is a change in the composition of students who receive an academic track recommendation. Bach and Fischer (2020) show that binding track recommendations act as performance incentives and that students perform worse in their absence. As a result, the share of academic track recommendations declined after the repeal.[20] The potential distortion of the composition of students with a given recommendation could explain the change in track decisions conditional on track recommendation after the repeal. For example, a larger decline in academic track recommendations in lower-SES regions could result in the group of student with an academic track recommendation in low-SES regions to become more positively selected relative to high-SES regions. I conduct two tests to

[19] This is done by using the STATA program *boottest* (Roodman et al., 2018) using the default option, i.e. the restricted wild cluster bootstrap. Unrestricted wild cluster bootstrap p-values give almost identical results—a useful diagnostic check for their validity according to MacKinnon and Webb (2018).

[20] Figure A.1 shows the evolution of academic track recommendations by SES quartile for Baden-Württemberg.

check whether differential changes in track recommendations explain the observed changes in track decisions after the repeal. First, I investigate empirically whether the share of students with a specific recommendation changed differentially across higher- and lower-SES counties. Table A.10 presents results for the dosage model (equation (2)) with the share of basic, intermediate, and academic track recommendations as dependent variables in columns 1-3, respectively. The results show that all dosage estimates are small and statistically insignificant. Second, I test the sensitivity of the results in Table 2 to the inclusion of the share of academic track recommendations. These estimates are reported in Panel (b) of Table A.3 and A.4. The results are very similar to the baseline estimates in Table 2. Together, these results support the notion that there were no differential changes in the composition of students who received an academic track recommendation across higher- and lower-SES counties that could confound my estimates.

Another testable implication of different responses by SES, rather than changes in track recommendations, is increased mismatch between students and tracks. Recall that academic track enrollment increases similarly in higher- and lower-SES counties after the repeal. If this is driven by relatively higher-achieving students enrolling more often in the academic track in lower-SES regions, and lower-achieving students enrolling more often in higher-SES regions, as opposed to differential changes in track recommendation standards across counties, one would expect increased track mismatch in higher- relative to lower-SES counties. Evidence consistent with this is presented in Appendix **??**, where I show that grade repetition in the academic track increased more in higher- relative to lower-SES counties after the repeal.

Appendix Figure A.2 further shows that the closing of intermediate track schools can be ruled out as an explanation for the increased likelihood to comply with an academic track recommendation after the repeal. The number of intermediate track schools remained fairly constant in the years immediately leading up to and following the repeal. If at all, their number increased slightly during this period, which should increase their enrollment relative to the other tracks.

Appendix A also discusses the potential role of binding capacity constraints in intermediate track schools due to the inflow of students from the basic track after the repeal. Overall, I find no evidence that oversubscription in intermediate track schools increased after the repeal. Appendix A also discusses the gradual transformation of basic track schools into comprehensive schools in Baden-Württemberg

and why this is unlikely to explain the changes in academic track enrollment after the repeal.

4.2 Student-level results

To gain a better understanding for what type of students track decisions change in response to free track choice, I next turn to a student-level analysis using the NAS data. These data have several advantages over the county-level school records. First, students can be grouped by family background at the individual level, which allows for a more granular analysis. Second, effects can be traced out along the achievement distribution using the standardized test score data, a more objective measure of student achievement compared to teacher-assigned track recommendations. Third, the analysis can be expanded to include the repeal state Saxony-Anhalt, and draw on other states, which did not change their track recommendation system, as a control group. This allows to account for any secular changes in school track decisions over time that differ by parental background.

I first use the NAS data to replicate the unconditional effect of the repeal on academic track transitions by SES at the individual-student level. The effect of the repeal is identified from a change in the academic track enrollment between the pre- and post-repeal cohort in the two repeal states Baden-Württemberg and Saxony-Anhalt relative to states which did not change their track recommendation system. Table 3 reports these results. All regressions are weighted by the student weights provided by the NAS and include state and year fixed effects, as well as indicators for free track choice (i.e. repeal of binding track recommendations), high-SES, and their interaction. The main identifying assumption is that, in the absence of the repeal, the across-cohorts academic track decisions would have been similar in repeal and no-repeal states.[21]

Since track recommendation rules differ at the state level and the total number of states and those which repeal binding track recommendations is small (10 and 2, respectively), cluster-robust standard errors with clustering at the state level likely result in over-rejection (Cameron et al., 2008). For this reason, I always report permutation based p-values for the NAS results as well (MacKinnon and Webb, 2020).[22]

[21]The 2011 wave is the only pre-repeal wave of the NAS, which rules out tests for pre-trends. The predecessor to the NAS is PIRLS 2006 (Progress in International Reading Literacy Study), which did not elicit track recommendation information from teachers.

[22]These are obtained by reassigning repeal status for the post-repeal cohort to all possible

In the baseline specification free track choice is estimated to increase academic track enrollment for low-SES students by 5.5 p.p. (column 1). The interaction coefficient suggests no change in the SES academic track enrollment gap. Column 2 shows that the inclusion of further student-level controls (migration background, German spoken at home, HISEI, highest years of parental education, and gender) yields virtually the same estimates, suggesting that changes in the the composition of students between repeal and no-repeal states over time do not explain these effects. Column 3 shows that conditional on students' standardized test scores, free track choice increases academic track enrollment for low-SES students even more by 6.3 p.p. and that the SES gap is reduced by 2.4 p.p. (although not statistically significantly).

[Table 3 about here]

Table 4 analyzes the effect of free track choice on academic track enrollment by track recommendation and parental background. It shows free track choice effects estimated separately for the four group of students. The results of the baseline specification in column 1 confirm the previous results based on the school statistics from Baden-Württemberg: low-SES students with an academic track recommendation are 12.2 p.p. more likely to enroll in the academic track when recommendation are not binding (Panel (b)). There is no change in academic track enrollment for high-SES students with an academic track recommendation (Panel (a)). However, high-SES students without an academic track recommendation are 21.7 p.p. more likely to enter the academic track when track recommendations are not binding (Panel (c)) while low-SES students without academic track recommendations enroll only 8.2 p.p. more often (Panel (d)). These results are robust to the inclusion of student demographics (column 2) and standardized test scores controls (column 3). The similarity in results across specifications suggests that changes in the composition of students do not explain these enrollment differences in response to free track choice. Note that, whether one bases inference on cluster-robust standard errors or randomization inference, leads to similar conclusions: effects in Panels (b)-(c) are

permutations of pairs of no-repeal states. Since there are 28 possible permutations ($\frac{8!}{(8!-2!)2!}$), p-values are only set-identified. In case a coefficient's p-value estimate falls into the lowest set, I always report its upper limit, which is 0.036 ($= \frac{1}{28}$). I also report wild cluster bootstrap p-values for the NAS results in Tables A.11 and A.12. However, MacKinnon and Webb (2018) show that this procedure can fail dramatically when there are only few treated clusters in DiD settings. Tests based on the restricted wild cluster bootstrap can under-reject severely, and tests based on the unrestricted version can over-reject severely. When both procedures lead to very different p-values neither can be trusted. Appendix Tables A.11 and A.12 show that this is the case in my setting.

significant at the 1% level according to cluster-robust standard errors, and they are the largest effects across all possible permutations of the data.[23]

[Table 4 about here]

Figure 6 shows how academic track enrollment changes across the achievement distribution and by parental background in repeal states. Panel (a) and Panel (b) show enrollment shares for the full AI distribution smoothed across percentiles for the pre- and post-repeal cohorts for high- and low-SES students, respectively. Comparing Panel (a) and Panel (b) reveals substantial SES gaps in academic track enrollment before the repeal. At the median of the achievement distribution, low-SES students were less than half as likely to enroll in the academic track (30%) than high-SES students (70%). When track recommendations become nonbinding, the change in the likelihood to enroll in the academic track across the achievement distribution clearly differs by parental background. This can be seen more clearly in Panel (c), which plots the change in the academic track enrollment gap between high- and low-SES students by AI percentile over time. While low-SES students in the middle of the distribution (between the 30th and 90 percentile) become relatively more likely to enroll in the academic track than high-SES students compared to before the repeal, the reverse is true for students in the bottom quartile of the achievement distribution. The dashed line shows that a similar pattern emerges when comparing the changes in the SES gap in repeal states to those in no-repeal states. These results confirm the asymmetric responses documented in Figure 4 and 5. Low-achieving, high-SES students are more likely to enter the academic track when track choice is free and average-achieving, low-SES students appear more likely to comply with a recommendation for the academic track when track choice is free. These heterogeneous responses highlight the importance of analyzing the effect of free track choice for students with different educational achievement, given that we find no overall effect on inequalities in track decisions by parental background.

[Figure 6 about here]

5 Mechanisms

The positive effect of free track choice on low-SES students' decision to comply with a recommendation for the academic track is surprising since their choice set did not

[23] Hence the p-value of 0.036 ($= \frac{1}{28}$).

expand after the repeal. I next assess in more detail one potential key mechanism that might explain this response: changes in the perceived value of the alternative to the academic track due to the repeal of binding recommendations. The considerable share of low-SES students who attends a lower track than recommended indicates that disadvantaged households trade off the perceived benefits of the academic track against other considerations (e.g., the fear of failure in the higher track). High-SES households, in contrast, seem to have sufficiently strong preferences for the academic track, as indicated by their high compliance with academic track recommendations, making this trade off less relevant. This heterogeneity in school preferences renders low-SES households' track decisions potentially more malleable to slight changes in the different tracks.

A major change as a result of the repeal was a shift of students from the basic to the intermediate track in Baden-Württemberg. Figure A.5 documents a dramatic increase in intermediate track enrollment of students with only a basic track recommendation after the repeal. This can make the intermediate track less attractive for two reasons: (i) peer preferences and (ii) changes in the expected value of an intermediate qualification. First, the inflow of students recommended for the basic track lowers average achievement and average SES in the intermediate track. Preferences for good peer groups (in terms of achievement or socio-economic background) therefore reduce the perceived quality of the intermediate track after the repeal. Second, the upward cascade of students from lower into higher tracks (both into the intermediate and the academic track) could raise fears of qualification inflation due to an increase in graduates with more than a basic qualification, and hence stronger competition for jobs requiring at least an intermediate qualification. This could decrease the expected value of an intermediate relative to an academic track qualification.

5.1 Between-state differences in tracking systems

To investigate whether the inflow of basic track students into the intermediate track after the repeal can explain the increase in academic transitions for low-SES students with an academic track recommendation, I first exploit differences in the institutional setup of the tracking systems across states. While some states have 3-tiered tracking systems (with separate schools for the basic, intermediate, and academic track), others have a 2-tiered systems, where the basic and intermediate track are combined within one comprehensive school. Since comprehensive schools

accept all students regardless of their recommendation, concerns about the inflow of low achieving students with a basic track recommendation when track recommendations become nonbinding should not matter in a 2-tiered system. A test for whether concerns about the inflow of low-achieving students can explain low-SES students' behavior thus amounts to a comparison of the effect of repealing binding track recommendations in states with 2-tiered (Saxony-Anhalt) and 3-tiered (Baden-Württemberg) systems. Unfortunately, I cannot perform such a test in a difference-in-differences design with a pre- and post-repeal comparison. This is because there are only two repeal states in the NAS data and it is prohibited to report results which allow the identification of results for a single state (i.e. the NAS only allows to report results for groups of at least two states).[24] Instead, I draw on the pre-repeal NAS cohort and leverage between-state variation. For the pre-repeal cohort, all states can be classified into 2-tiered and 3-tiered systems with binding or nonbinding track recommendations and the four resulting groups all contain at least two states.[25] Across these four group of states I test for differences in compliance with academic track recommendations, with the caveat that this is a purely cross-sectional analysis that is potentially subject to bias from unobserved between-state differences.

Figure 7 provides a visual illustration for the mediating role of the tracking system for the relationship between binding recommendations and compliance with academic track recommendations. The figure reports the likelihood to enroll in the academic track conditional on an academic track recommendation by whether or not track recommendations are binding, 2-tiered and 3-tiered tracking systems, and parental background. Low-SES students (dark bars) clearly exhibit different compliance with an academic track recommendation depending on the school system. Within 3-tiered systems, compliance is much higher when track recommendations are binding (85%) than when they are not (68%), while in 2-tiered systems, compli-

[24]The fact that Baden-Württemberg, which initially had a 3-tiered system when the pre-repeal cohort transitioned to secondary school, moved to a hybrid system (i.e. there was an expansion of comprehensive track schools starting in 2012) further limits the possibility to perform such a test with the NAS data. The other repeal state, Saxony-Anhalt, does not collect data on track decisions by track recommendations, ruling out analyses of track decision of students conditional on academic track recommendations.

[25]By the time the post-repeal cohort transitioned to secondary school, almost all states had adopted a 2-tiered systems or hybrid version (with basic, intermediate, comprehensive and academic tracks), which does not allow for a clear classification into 2-tiered and 3-tiered systems for this cohort. In contrast to the sample above (Table 3 and Table 4), however, I include the states Schleswig-Holstein, Lower-Saxony, and Bremen in this analysis. These states had to be dropped for the DiD analyses above because the track recommendation information is missing for the majority of students for the post-repeal cohort (but not the pre-repeal cohort).

ance rates for non-academic background students do not differ much between binding and nonbinding systems (78% versus 81%). In contrast, high-SES students' compliance (grey bars) is similar across all four systems and always high (above 89%). If at all, the pattern for high-SES students in 3-tiered systems is the reverse of that for the low-SES group with higher compliance when track recommendation are binding. These results provide a first hint that the potential inflow of low-achieving students into the intermediate track in 3-tiered systems explain low-SES students' increased academic track enrollment when track recommendation become nonbinding.

[Figure 7 about here]

Table 5 tests more formally in a regression framework whether free track choice has different effects in the presence of comprehensive schools versus two separate non-academic tracks. The sample is the same as in Figure 7 (i.e. only students with academic track recommendations) and the dependent variable is academic track enrollment. All specifications include the following baseline student-level controls to account for potential differences in the composition of students across states and SES groups: averge test scores, gender, and migration background.[26]

[Table 5 about here]

Column 1 reports results for the low-SES sample in 3-tiered systems. Low-SES students with a recommendation for the academic track are 17.2 p.p. more likely to enroll in the academic track when recommendations are nonbinding compared to when they they are not. Column 3 shows that the corresponding difference in 2-tiered systems is with 4.4 p.p. much smaller and not statistically significant. Columns 2 and 4 draw on high-SES students as a further comparison group and test for differences in the SES academic track enrollment gap by binding and non-binding track recommendations within the two tracking systems. By including state fixed effects, any systematic compliance differences between states that are constant across SES groups are differenced out in these specifications. The interaction coefficient for free track choice and high-SES gives the change in the SES academic track

[26]Table A.9 reports results without these controls, which yields very similar estimates for the effect of the mediating role of the tracking system. Note that I do not control for HISEI and years of parental education in these models as doing so would change the interpretation of the high-SES coefficient. However, including these variables to control for potential differences within the low- and high-SES group between states does not affect the free track choice coefficient and its interactions.

enrollment gap associated with free track choice conditional on having an academic track recommendation. These interaction coefficients yield very similar results to those obtained from the low-SES samples: in 3-tiered systems (column 3), the SES gap is 20.4 p.p. smaller when track recommendation are nonbinding; a difference which almost equates to the SES compliance gap of 24.7 p.p. in binding states. In 2-tiered systems (column 4), the SES gap is only 6.6 p.p. smaller when track recommendation are not binding (however, the SES gap in 2-tiered systems with binding recommendations is also smaller with 16.8 p.p.).

Columns 5 and 6 provide results for partially interacted models, pooling the 3-tiered and 2-tiered samples in columns 1 and 3 and 2 and 4, respectively. The coefficient for free track choice and 3-tiered interaction term in column 5 is the academic track enrollment difference for low-SES students between binding and nonbinding systems in a 3-tiered relative to a 2-tiered system. The triple interaction coefficient (Free track choice $\times$ 3-tiered $\times$ high-SES) in column 6 is the difference in the SES enrollment gap between binding and nonbinding systems in a 3-tiered relative to a 2-tiered system. Again, the results are similar to those from the separate regressions in columns 1 through 4. Together, the results in Table 5 suggest that the inflow of basic track students into the intermediate track under nonbinding recommendations can account for a substantial portion of the increased academic track enrollment of low-SES students.

5.2 Comprehensive schools in Baden-Württemberg

The context in Baden-Württemberg facilitates a second test for the hypothesis that concerns about the inflow of basic track students can explain low-SES students' response to free track choice. Prior to the repeal, Baden-Württemberg had a traditional 3-tiered tracking system. However, across the entire state there are three municipalities, which had, in addition to the traditional three tracks, comprehensive schools (*Schulen besonderer Art*), where students are taught jointly and can attain all three track-specific qualifications. These are Freiburg, Heidelberg, and Mannheim. Students with a basic track recommendation in these cities could already avoid the lowest track by attending a comprehensive school before the repeal. Furthermore, these comprehensive schools are located in more disadvantaged neighborhoods but have mixed student compositions in terms of track recommendations (with a considerable share of students with basic and academic track recommenda-

tions).[27] Hence, these schools likely cater to those high-achieving, low-SES students for whom the trade off between the intermediate and academic track is relevant and who would have opted for the intermediate track absent comprehensive schools and nonbinding track recommendations. The lower degree of tracking in these cities should thus mute potential concerns about the inflow of low-achieving students due to the repeal of binding track recommendations.

Figure 8 tests whether downward non-compliance responses to free track choice differ across regions with and without comprehensive schools within Baden-Württemberg. The three cities with comprehensive schools are large urban districts with county rights (*Stadtkreise*) and have, on average, a more educated populations. Thus, I restrict the comparison group to urban cities with counties rights without comprehensive schools from the top SES quartile in Baden-Württemberg.[28] The figure shows the evolution of the probability to attend the intermediate track conditional on receiving an academic track recommendation for the two group of cities.[29] Relative to regions with comprehensive schools, students in regions with stricter tracking systems are clearly less likely to enroll in the intermediate track after the repeal conditional on having an academic track recommendation. This is consistent with a "push" explanation for low-SES students' behavior: low-SES students, who were already eligible for the academic track before the repeal, revise their decision for the intermediate track when track recommendations become nonbinding. They enroll in the academic track to avoid the potential inflow of low-achieving students into the intermediate track.

[Figure 8 about here]

[27]For instance, the share of students in comprehensive schools with a recommendation for the basic, intermediate, and academic track in Mannheim is 42%, 32,9%, and 24,8%, respectively (Table D12web, Mannheim, 2018). In Heidelberg, more than 30% of the students in comprehensive schools have an academic track recommendation (Figure 71, Heidelberg, 2017).

[28]Since the three counties with comprehensive schools are in the top-SES quartile, this could potentially explain why downward non-compliance for the top quartile changed differentialy after the repeal compared to the lower three quartiles, independent of SES. To test this, Panel (d) in Tables A.3 and A.4 reports corresponding estimates for the main results in Table 2, where these three counties are excluded. The results are very similar to my baseline estimates. Furthermore, binscatter plots for the dosage model (A.4) show that results are linear in the SES measure and not driven by individual counties. Together, this suggests that the presence of comprehensive schools in three counties in the top-SES quartile do not confound my estimates.

[29]For brevity, I only report times series normalized to 2011 values and corrected for linear trends, estimated over the pre-repeal period. Figure A.3 reports raw means.

5.3 The role of classmates with a recommendation for the basic track

A third approach to study the role of concerns about the inflow of students with basic track recommendations is to test whether the effect of free track choice differs by the number of classmates with a basic track recommendation. The idea is that the inflow of students with basic track recommendations into the intermediate track should be proportional to their share in class—a test similar to a shift-share design (Bartik, 1991).

Table 6 presents the results of this approach using the student-level NAS data. The specification is the same DiD as in Table 4 but further includes the leave-own-out class-level share of basic track recommendations and its interaction with free track choice. I normalize the class-level share to have mean zero to ensure that coefficients on non-interacted variables measure effects for the average class. While the number of students in a class with a recommendation for the basic track is most likely not random, I also control for it non-interacted. That way, I control for potential omitted variable bias as long as classes with the same share of basic track recommendations are comparable pre- and post-repeal. Column 1 reports estimates of the baseline specification without any further student-level controls. The effect of free track choice on academic track enrollment of low-SES students with academic track recommendations is reduced from 12.3 p.p. (Table 4, column 1) to 9 p.p. with the inclusion of the class-level information—a clear sign for the mediating role of the number of students recommended for the basic track. The interaction coefficient for the share of basic track recommendations for low-SES students with academic track recommendations is positive but only marginally significant in the specification with full controls. The estimate implies that a 10 p.p. increase in the share of students with a basic track recommendation in class increases the effect of free track choice on low-SES students' compliance with an academic track recommendation by 4.5 p.p. The interaction coefficients for the remaining three groups of students are all much smaller in magnitude (at least by a factor of 2) and non-significant—a useful falsification check. Including further student-level controls leaves the coefficients virtually unaffected.

[Table 6 about here]

Collectively, the evidence based on these three approach provides consistent evidence for the role of concerns about the inflow of students with basic track rec-

ommendations into the intermediate track for low-SES students' increased academic track enrollment after the repeal

6 Conclusion

This paper shows how school track decisions by family background change in response to the repeal of binding track recommendations. The context is Germany's early between-school tracking system, where students are sorted into hierarchically ordered school tracks at the end of primary school. Across two data sets, exploiting the repeal of binding track recommendation in two federal states, I find that free track choice does not increase the SES gap in academic track enrollment (the highest track). However, this null effect underlie very different responses by parental background at two margins: for students without an academic track recommendation—who were previously ineligible for the academic track—the SES gap in academic track enrollment increases by more than 10 p.p. after the repeal. This is due to high noncompliance with non-academic track recommendations by high-SES students of around 20 p.p. This effect is offset by low-SES students with an academic track recommendation—who were already eligible for the academic track prior to the repeal. These students are 12.3 p.p. more likely to comply with an academic track recommendation after the repeal. No similar effect was found for previously eligible high-SES students, for whom compliance was already high before the repeal.

The increase in academic track enrollment of previously ineligible students under free track choice is not surprising and the larger effect for high-SES students confirms previous evidence for social differences in educational aspirations. However, the effect for previously eligible low-SES students presents a puzzle. Evidence from three different approaches suggests that this type of response can be partly explained by concerns about the inflow of low-achieving students from the lowest (basic) into the intermediate track under free track choice.

The latter finding implies that track decisions of low-SES households are sensitive to contextual factors and hence potentially malleable to policy interventions. This also helps to explain why social programs, such as mentoring (Carlana et al., forthcoming; Falk et al., 2020), can have large positive effects on disadvantaged students' schooling decisions net of their potential achievement effects.

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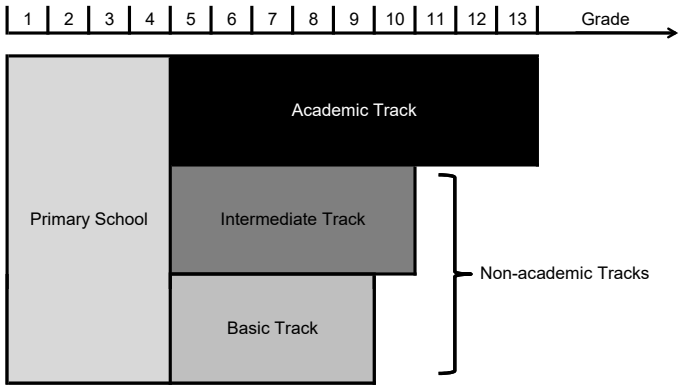
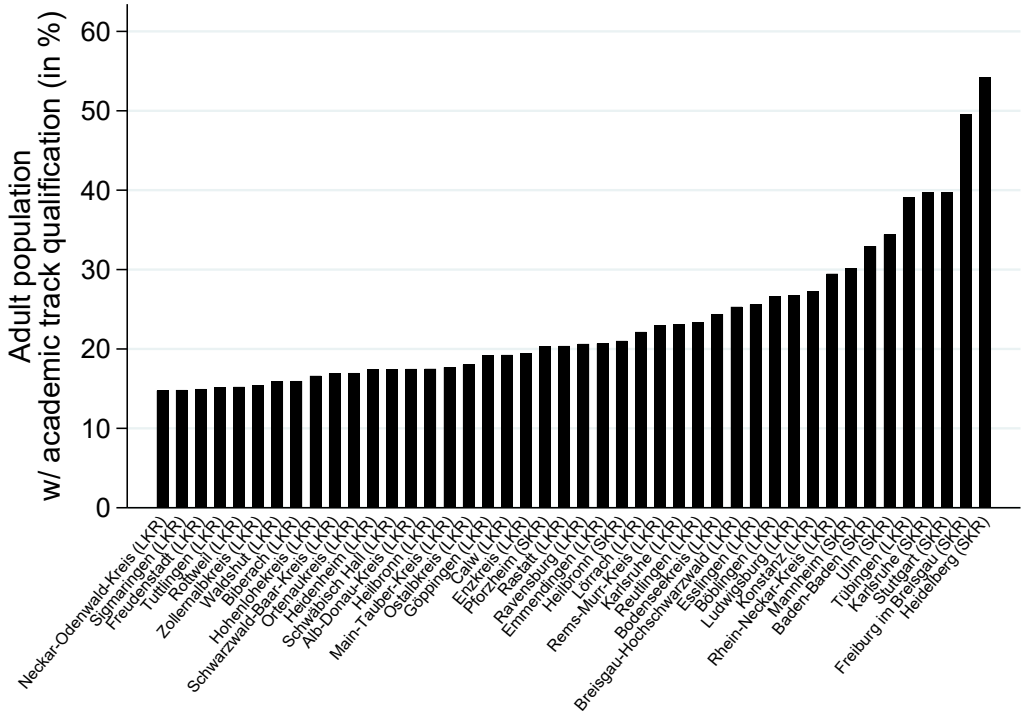
Figures and tables

Figure 1: SCHEMATIC OVERVIEW OF THE TRACKING SYSTEM IN GERMANY



Notes: Figure adapted from Matthewes (2020). Academic track = *Gymnasium*, Intermediate track = *Realschule*, Basic track = *Hauptschule*.

Figure 2: VARIATION IN EDUCATIONAL BACKGROUND ACROSS COUNTIES

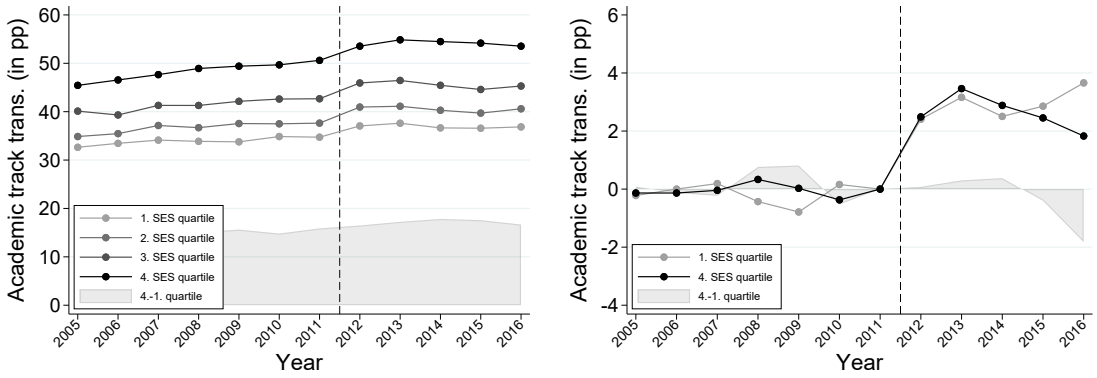


Notes: The figure plots the share of the adult population (age 30-59) with an academic track qualification for each county in Baden-Württemberg.
Source: Own calculation based on data from the 2011 German Census: `https://ergebnisse2011.zensus2022.de/datenbank//online?operation=table&code=2000S-3070&bypass=true&levelindex=0&levelid=1632990924660#abreadcrumb` (Retrieved: 01/18/2021).

Figure 3: ACADEMIC TRACK TRANSITIONS BY SES QUARTILES

Panel (a): All quartiles, raw means

Panel (b): Bottom and top quartile corrected for linear pre-trends

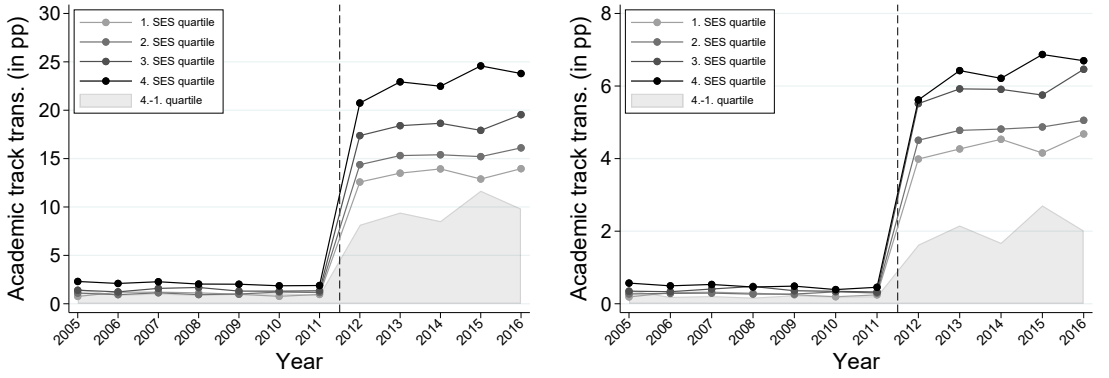


Notes: Panel (a) plots transitions rates into the academic track for all counties in Baden-Württemberg by quartiles based on the share of the adult population with an academic track qualification within a county. Panel (b) plots transition rates for the bottom and top quartile normalized to 2011 levels and corrected for linear trends estimated over the period 2005-2011. The grey area plots the difference between the top and bottom quartile. *Source:* Own calculations based on data from the Statistical Office of Baden-Württemberg.

Figure 4: ACADEMIC TRACK TRANSITIONS CONDITIONAL ON NON-ACADEMIC TRACK RECOMMENDATION BY SES QUARTILE

Panel (a): Transition likelihood conditional on intermediate track recommendation

Panel (b): Transitions by students w/ intermediate track recommendations

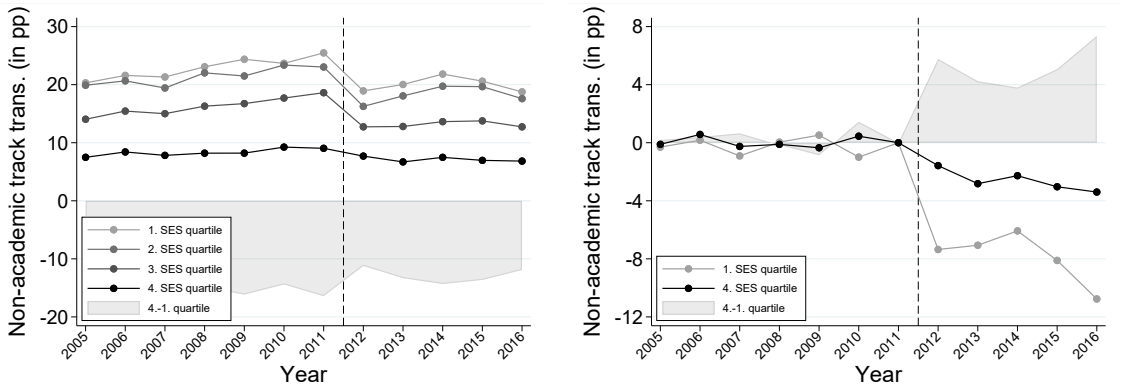


Notes: Panel (a) plots the probability to enrol in the academic track for students with intermediate track recommendations (i.e. $P(\text{track} = \text{Academic}|\text{rec.} = \text{Intermediate})$). Panel (b) plots the fraction of students who enter the academic track without an academic track recommendation (i.e., $P(\text{track} = \text{Academic}, \text{rec.} \neq \text{Academic})$). The grey area plots the difference between the top and bottom quartile. SES quartiles refer to all counties of Baden-Württemberg split into four quartiles based on the share of the adult population with an academic track qualification within a county.
Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Figure 5: NON-ACADEMIC TRACK TRANSITIONS CONDITIONAL ON ACADEMIC TRACK RECOMMENDATION BY SES QUARTILE

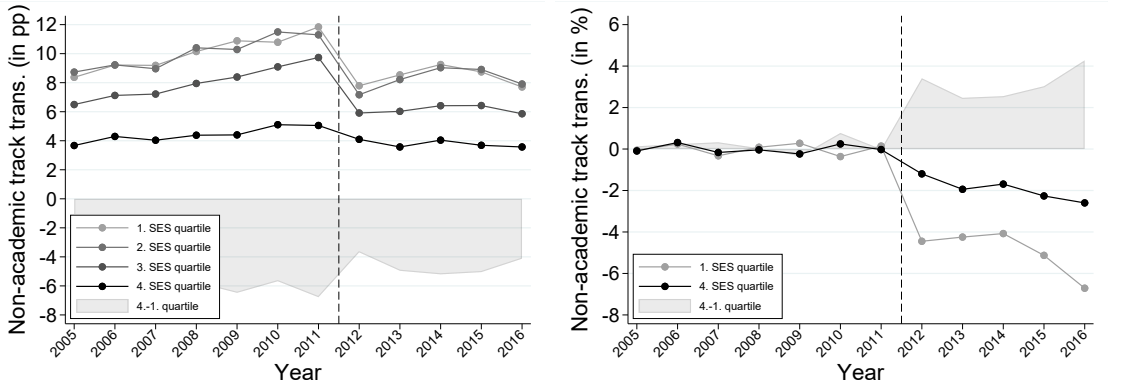
Panel (a): Transition likelihood conditional on academic track recommendation, raw means

Panel (b): Transition likelihood conditional on academic track recommendation corrected for linear pre-trends



Panel (c): Transitions by students w/ academic track recommendations, raw means

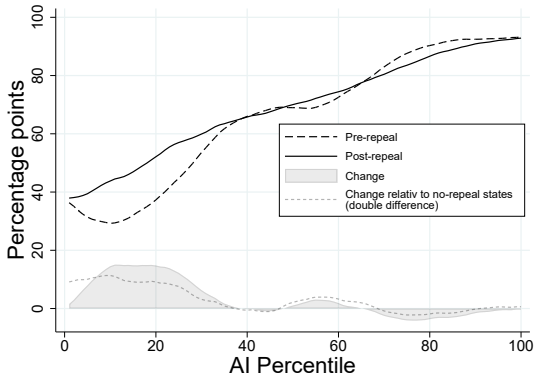
Panel (d): Transitions by students w/ academic track recommendations corrected for linear pre-trends



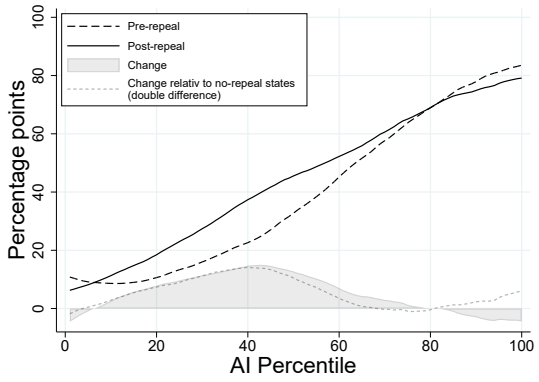
Notes: Panel (a) plots transition rates into non-academic tracks for students with academic track recommendations (i.e. $P(\text{track} \neq \text{Academic}|\text{rec.} = \text{Academic})$). Panel (b) plots the same transition rates for the bottom and top quartile normalized to 2011 levels and corrected for linear trends estimated over the period 2005-2011. Panel (c) plots the fraction of students who enter a non-academic track with an academic track recommendation (i.e., $P(\text{track} \neq \text{Academic}, \text{rec.} = \text{Academic})$). Panel (d) plots the same times series for the bottom and top quartile normalized to 2011 levels and corrected for linear trends estimated over the period 2005-2011. The grey area plots the difference between the top and bottom quartile. SES quartiles refer to all counties of Baden-Wurttemberg split into four quartiles based on the share of the adult population with an academic track qualification within a county.
Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Figure 6: ACADEMIC TRACK TRANSITIONS BEFORE AND AFTER THE REPEAL BY ACADEMIC ACHIEVEMENT

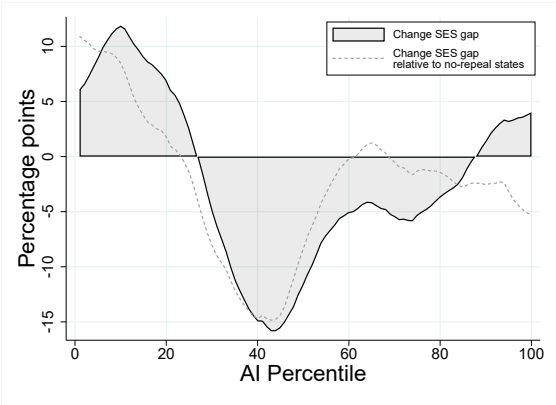
Panel (a): High-SES



Panel (b): Low-SES

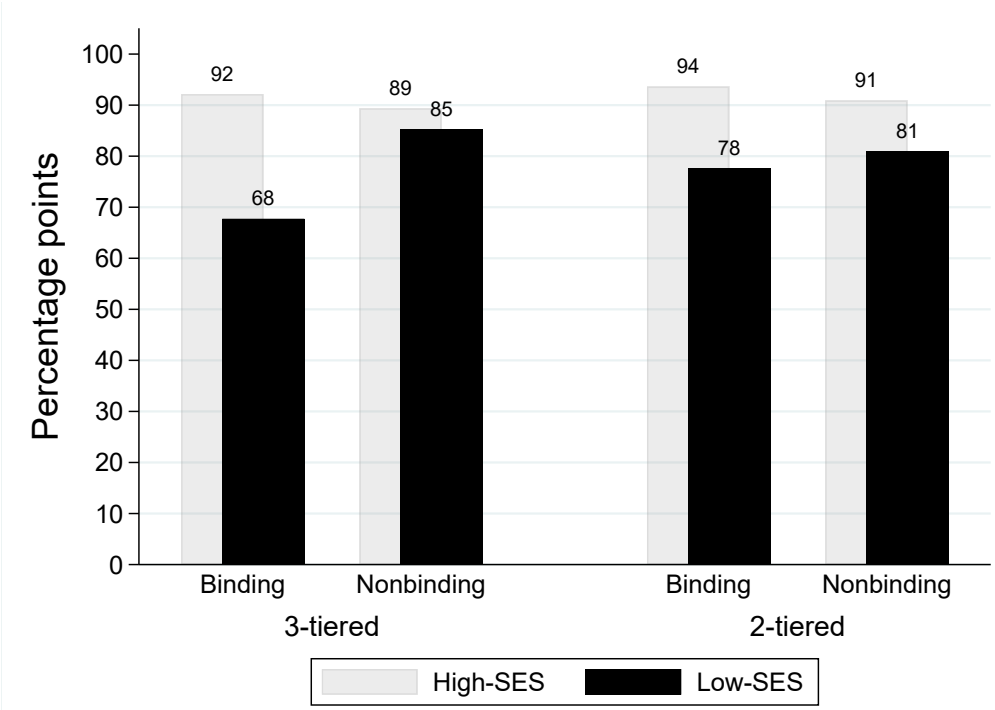


Panel (c): Changes in the SES gap



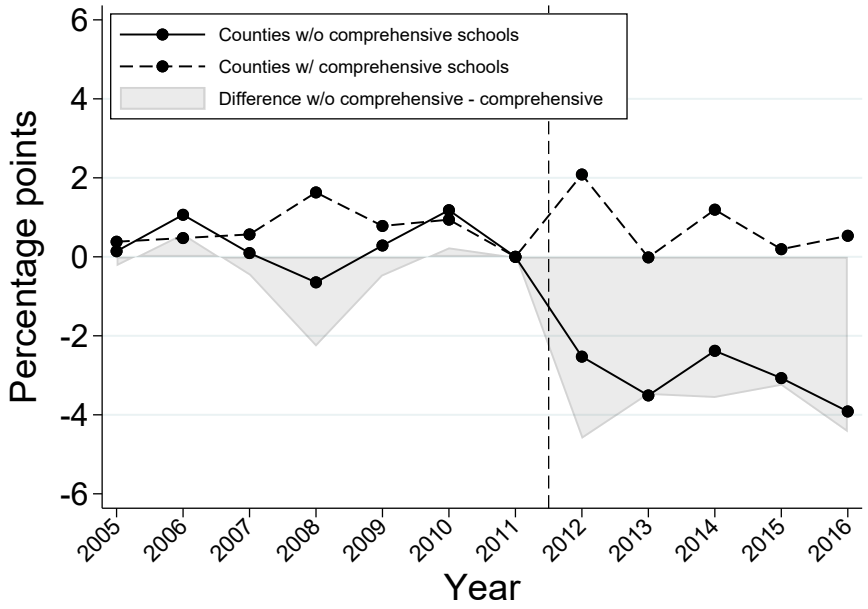
Notes: Panels (a) and (b) plot the likelihood to enroll in the academic track in repeal states for high- and low-SES students before (2011) and after (2016) the repeal of binding track recommendations by percentile of achievement index (AI). These statistics are smoothed with a triangular kernel with bandwidth 20. The grey shaded areas give the change over time in these statistics. The dashed grey lines gives the change relative to the respective change in no-repeal states. Panel (c) uses the statistics from Panels (a) and (b) and plots the change in the SES academic track enrollment gap over time by AI. The grey shaded area is the change in the SES gap in repeal states. The dashed grey line is the change in the SES gap in repeal states relative to the respective change in no-repal states.
Source: Own calculations based on NAS waves 2011 and 2016.

Figure 7: ACADEMIC TRACK TRANSITIONS CONDITIONAL ON ACADEMIC TRACK RECOMMENDATION BY SES, BINDING RECOMMENDATIONS, AND TRACKING SYSTEM



Notes: The figures plots the probability to enrol in the academic track for students with an academic track recommendation by SES, binding versus nonbinding track recommendation, and 3-tiered versus 2-tiered tracking systems. States are classified in the following way: binding and 3-tiered system: Baden-Württemberg and Bavaria; nonbinding and 3-tiered system: Lower-Saxony, North Rhine-Westphalia, and Hesse. Binding and 2-tiered system: Saxony, Saxony-Anhalt, and Thuringia; nonbinding and 2-tiered system: Schlesweig-Holstein, Hamburg, Bremen, Rhineland-Palatinate, and Saarland.
Source: Own calculations based on the NAS 2011 wave.

Figure 8: TRANSITIONS INTO THE INTERMEDIATE TRACK CONDITIONAL ON ACADEMIC TRACK RECOMMENDATION BY PRESENCE OF COMPREHENSIVE SCHOOLS



Notes: The figures plots the probability to enrol in the intermediate track conditional on receiving an academic track recommendation. The probabilities are normalized to 2011 levels and corrected for linear trends estimated over the 2005-2011 period. Counties with comprehensive schools prior to 2012 are Heidelberg, Freiburg, and Mannheim. The group of counties without comprehensive schools are restricted to cities with county rights (Baden-Baden, Karlsruhe, Konstanz, Stuttgart, Tübingen, and Ulm). The grey shaded area gives the difference between the group of counties with and without comprehensive schools.

Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Table 1: BINDING TRACK RECOMMENDATIONS AT THE END OF PRIMARY SCHOOL

School year	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Schleswig-Holstein (SH)						
Hamburg (HH)						
Lower Saxony (NI)						
Bremen (HB)						
North Rhine-Westphalia (NW)						
Hesse (HE)						
Rhineland-Palatinate (RP)						
Baden-Württemberg (BW)	✓					
Bavaria (BY)	✓	✓	✓	✓	✓	✓
Saarland (SL)						
Berlin (BE)						
Brandenburg (BB)	✓	✓	✓	✓	✓	✓
Mecklenburg-Vorpommern (MV)						
Saxony (SN)	✓	✓	✓	✓	✓	✓
Saxony-Anhalt (ST)	✓					
Thuringia (TH)	✓	✓	✓	✓	✓	✓

Notes: The checkmark (✓) indicates that the school's recommendation for a secondary school track was binding in the respective school year.
Source: State-specific school laws and www.kmk.org.

Table 2: FREE TRACK CHOICE EFFECTS ON SES GAPS IN TRACK DECISIONS

		Non-compliance likelihood		Non-compliance enrollment	
	Academic track enrollment	upward	downward	academic	non-academic
	(1)	(2)	(3)	(4)	(5)
Panel (a): Aggregate analysis, top-bottom SES quartiles					
Post-repeal × 4. SES quartile	-0.40	8.73***	5.06***	1.91***	3.23***
	(0.44)	(0.60)	(0.67)	(0.20)	(0.38)
Quartile FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
N	24	24	24	24	24
Panel (b): Dosage analysis, all counties					
Post-repeal × SES	-2.15	40.17***	22.78***	8.88**	14.87***
	(3.60)	(12.68)	(3.73)	(3.73)	(2.06)
	[0.52]	[0.00]	[0.00]	[0.04]	[0.00]
County FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
N	528	528	528	528	528
Mean of dep. var. in 2011	41.41	1.34	18.98	0.33	9.65
4.-1. SES quartile gap of dep. var. in 2011	15.88	0.97	-16.35	0.21	-5.99

Notes: The table presents the effects of the repeal of binding track recommendations on SES gaps in track decisions. Each column within a panel reports estimates from a different regression. Outcome variables are given in the column headers. Upward non-compliance likelihood (column 2) refers to the probability to enroll in the academic track conditional on not having an academic track recommendation. Downward non-compliance likelihood (column 3) refers to the probability to enroll in a non-academic track conditional on having an academic track recommendation. Non-compliance enrollment academic (column 4) refers to enrollment in the academic track for students without academic track recommendations. Non-compliance enrollment non-academic (column 5) refers to enrollment in non-academic tracks for students with academic track recommendations. All outcomes are measured in percentage points and have been corrected for linear trends estimated over the 2005-2011 period. Panel (a) uses the aggregated longitudinal time series by SES quartiles and years displayed in Figure 3, Figure 4, and Figure 5 (restricted to the top and bottom quartile). Each outcome variable is regressed on year dummies, a top quartile dummy, and an interaction of a post-reform dummy (2012+) and the bottom quartile dummy. The coefficient on the interaction is reported. Robust standard errors are reported in parentheses. Panel (b) uses the time series by counties and years. Each outcome variable is regressed on year dummies, county fixed effects, and an interaction of a post-reform dummy (2012+) and the share of the adult population with an academic track qualification. The coefficient on the interaction is reported. The regressions in Panel (b) are weighted by the county-year specific number of transitions. Standard errors clustered at the county level are reported in parentheses. p-values estimated using the wild bootstrap procedure with clustering at the county level are reported in brackets. Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.
Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Table 3: FREE TRACK CHOICE EFFECTS ON ACADEMIC TRACK TRANSITIONS (DID)

	(1)	(2)	(3)
Free track choice	0.055**	0.053**	0.063***
	(0.022)	(0.021)	(0.017)
	[0.036]	[0.036]	[0.036]
Free track choice × high-SES	-0.015	-0.010	-0.016
	(0.029)	(0.029)	(0.026)
	[0.52]	[0.74]	[0.61]
State & year FE	✓	✓	✓
Student-level controls (excl. test scores)		✓	✓
Test score controls			✓
N	19,123	19,123	19,123
R^2	0.16	0.19	0.34

Notes: Each column of the table reports results from a separate regression where the outcome variable is academic track enrollment. Student-level controls include parents' highest years of education and ISEI, and dummies for migration background, German spoken at home, and gender. Standard errors in parentheses allow for clustering at the state level. Permutation-based p-values from repeatedly reassigning the repeal indicator to all possible permutations of two non-repeal states are reported in brackets. Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.
Source: Own calculations based on NAS waves 2011 and 2016.

Table 4: FREE TRACK CHOICE EFFECTS ON ACADEMIC TRACK TRANSITIONS BY RECOMMENDATION AND SES (DID)

	(1)	(2)	(3)
Panel (a): Academic track rec. & high-SES sample			
Free track choice	0.025	0.025	0.024
	(0.022)	(0.022)	(0.022)
	[0.196]	[0.217]	[0.217]
N	6,131	6,131	6,131
R^2	0.011	0.020	0.035
Panel (b): Academic track rec. & low-SES sample			
Free track choice	0.122***	0.116***	0.123***
	(0.046)	(0.045)	(0.044)
	[0.036]	[0.036]	[0.036]
N	3,823	3,823	3,823
R^2	0.034	0.046	0.083
Panel (c): Non-academic track rec. & high-SES sample			
Free track choice	0.217***	0.205***	0.194***
	(0.047)	(0.046)	(0.046)
	[0.036]	[0.036]	[0.036]
N	2,500	2,500	2,500
R^2	0.034	0.046	0.083
Panel (d): Non-academic track rec. & low-SES sample			
Free track choice	0.082***	0.080***	0.078***
	(0.019)	(0.019)	(0.019)
	[0.036]	[0.036]	[0.036]
N	6,669	6,669	6,669
R^2	0.019	0.031	0.052
State & year FE	✓	✓	✓
Student-level controls (excl. test scores)		✓	✓
Test score controls			✓

Notes: Each cell reports results from a separate regression where the outcome variable is academic track enrollment. Student-level controls include parents' highest years of education and ISEI, and dummies for migration background, German spoken at home, and gender. Standard errors in parentheses allow for clustering at the state level. Permutation-based p-values from repeatedly reassigning the repeal indicator to all possible permutations of two non-repeal states are reported in brackets. Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.
Source: Own calculations based on NAS waves 2011 and 2016.

Table 5: DIFFERENCES IN ACADEMIC TRACK TRANSITIONS FOR STUDENTS WITH ACADEMIC TRACK RECOMMENDATIONS BY SES, FREE TRACK CHOICE, AND TRACKING SYSTEM (CROSS-SECTION)

	3-tiered		2-tiered		3-tiered versus 2-tiered	
	Low-SES	All	Low-SES	All	Low-SES	All
	(1)	(2)	(3)	(4)	(5)	(6)
Free track choice	0.172***		0.044		0.029	
	(0.021)		(0.055)		(0.059)	
	[0.013]		[0.522]		[0.615]	
High-SES		0.247***		0.168**		0.165***
		(0.001)		(0.051)		(0.050)
Free track choice × high-SES		-0.204***		-0.066		-0.064
		(0.017)		(0.053)		(0.052)
		[0.019]		[0.403]		[0.456]
3-tiered					-0.108*	
					(0.055)	
					[0.161]	
Free track choice × 3-tiered					0.143**	
					(0.062)	
					[0.124]	
3-tiered × high-SES						0.082
						(0.050)
						[0.246]
Free track choice × 3-tiered × high-SES						-0.141**
						(0.055)
						[0.046]
Student controls	✓	✓	✓	✓	✓	✓
State FE		✓		✓		✓
N	926	2488	1,343	3,424	2,269	5,912
R^2	0.043	0.073	0.003	0.050	0.035	0.069

Notes: This table displays the effects of binding versus nonbinding track recommendations, and 2-tiered versus 3-tiered tracking systems on the probability to enroll in the academic track for students with academic track

Table 6: HETEROGENEITY BY CLASS-LEVEL SHARE OF BASIC TRACK RECOMMENDATIONS

	(1)	(2)	(3)
Panel (a): Academic track rec. & high-SES sample			
Free track choice	0.028	0.028	0.028
	(0.021)	(0.021)	(0.021)
	[0.357]	[0.357]	[0.250]
Free track choice × share basic track rec.	0.001	0.001	-0.009
	(0.127)	(0.127)	(0.127)
	[0.286]	[0.286]	[0.393]
N	6,086	6,086	6,086
Panel (b): Academic track rec. & low-SES sample			
Free track choice	0.085*	0.085*	0.090*
	(0.047)	(0.047)	(0.046)
	[0.321]	[0.321]	[0.214]
Free track choice × share basic track rec.	0.448	0.448	0.456*
	(0.277)	(0.277)	(0.277)
	[0.250]	[0.250]	[0.250]
N	3,797	3,797	3,797
Panel (c): Non-academic track rec. & high-SES sample			
Free track choice	0.152***	0.152***	0.148***
	(0.052)	(0.052)	(0.052)
	[0.107]	[0.107]	[0.107]
Free track choice × share basic track rec.	0.207	0.207	0.158
	(0.235)	(0.235)	(0.247)
	[0.179]	[0.179]	[0.429]
N	2,407	2,407	2,407
Panel (d): Non-academic track rec. & low-SES sample			
Free track choice	0.100***	0.100***	0.098***
	(0.021)	(0.021)	(0.020)
	[0.036]	[0.036]	[0.036]
Free track choice × share basic track rec.	-0.143	-0.143	-0.132
	(0.118)	(0.118)	(0.120)
	[0.643]	[0.643]	[0.643]
N	6,574	6,574	6,574
State & year FE	✓	✓	✓
Share basic track rec.	✓	✓	✓
Student-level controls (excl. test scores)		✓	✓
Test score controls			✓

Notes: Each column within a panel reports results from a separate regression where the outcome variable is academic track enrollment. The share of basic track recommendations in class has been standardized to have mean 0. Student-level controls include parents' highest years of education and ISEI, and dummies for migration background, German spoken at home, and gender. Standard errors in parentheses allow for clustering at the state level. Permutation-based p-values from repeatedly reassigning the repeal indicator to all possible permutations of two non-repeal states are reported in brackets. Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.
Source: Own calculations based on NAS waves 2011 and 2016.

For online publication

A Potential other channels

A.1 Capacity constraints

A potential mechanical explanation for the increased academic track enrollment of low-SES students with academic track recommendations are capacity constraints in intermediate track schools due to the inflow of students from the basic track after the repeal. A school's capacity is generally determined by a maximum class size threshold which was set to 30 students per class for the basic, intermediate, and academic track for the schools years 2011/12-2016/17. If intermediate track schools became oversubscribed, one would expect increased bunching in enrollment counts around multiples of the maximum class size threshold after the repeal. To test this, I obtained data on 5th grade enrollment for intermediate track schools for all municipalities in Baden-Württemberg one year before and after the repeal (2011 and 2012). Data for individual schools is not available but the vast majority of municipalities have only one intermediate track school, where the municipality-level information corresponds to the school level.[30] Figure A.6 plots the histogram of 5th grade intermediate track enrollment (relative to the next closest multiple of the maximum class size threshold) for all municipalities with a single intermediate track school before (grey bars) and after the repeal (white bars). The black bars show the change in the density over time. While there is evidence for bunching in enrollment just above the next closest multiple of the maximum class size threshold, this pattern is already apparent before the repeal. The absence of changes in the enrollment distribution before and after the repeal around class size thresholds suggests that capacity constraints in intermediate track schools did not change. This is also supported by the fact that 5th grade average class size in intermediate track schools did not change before and after the repeal—it remained at 24.5. Thus, it is unlikely that capacity constraints in intermediate track schools explain why low-SES students with an academic track recommendation increasingly enrolled in the academic track after the repeal.

A.2 *Gemeinschaftsschulen*

Baden-Württemberg started to transform some schools into a new school type called *Gemeinschaftsschule* in 2012, the same year as the repeal. This new type of school

[30] 82% of municipalities with intermediate track schools in the school years 2011/12-2012/13 had only a single intermediate track school.

is a form of comprehensive school in that its curriculum prepares students for all three track-specific qualifications. While it is generally not possible to obtain the academic track qualification in these schools—only very few have the required grade levels 11-13 (*Sekundarstufe II*)—students with sufficiently good grades are allowed to directly switch to an academic track school after grade 10.[31] Figure A.2 shows the gradual rollout of this new school type over time. One concern is that the introduction of comprehensive schools caused low-SES students to increasingly enroll in the academic track. However, comprehensive schools mostly affected students' school options by replacing the basic track. For example, 39 (93%) of the 42 new comprehensive schools in 2012 were former basic track schools. Only the remaining 3 (7%) schools replaced intermediate track schools. Given that they provide a direct path to an academic track qualification, these new comprehensive schools should have, if anything, drawn in students who would have otherwise enrolled in the academic track, rather than increased enrollment in the academic track. Hence, I expect my estimates to provide lower bounds for the effects of free track choice on academic track enrollment. However, the graphical evidence (Figures 3-5) suggests that most track decision changes occurred immediately in the first year of the repeal when transitions into these new comprehensive schools accounted only for 1.7% of all transitions (of which the great majority were by students recommended for the basic track). This makes it unlikely that the gradual transformation of (mostly basic track) schools into comprehensive schools explains the sharp changes in track decisions observed after the repeal.

B Placebo estimates

I perform several placebo checks to test the validity of the DiD and dosage estimates for the county-level analysis for Baden-Württemberg. I proceed as follows: (i) I backdate the repeal year; (ii) I correct the data for quartile-specific (county-specific) linear trends estimated over the backdated pre-repeal period; (iii) estimate effects for the first placebo post-repeal year. For example, when I set the placebo repeal year to 2011, I treat 2005-2010 as the pre-repeal period and 2011 as the only post-repeal year.

Table A.6 reports placebo estimates for the post-repeal times top-SES quartile coefficient for the DiD model in equation (1). Rows 1-3 contain placebo estimates

[31] This is not possible for graduates of the basic and intermediate track in Baden-Württemberg. Their only option to obtain an academic track qualification is through an *Berufliches Gymnasien*, which is special form of academic track only consisting of grade-levels 11-13 and with a stronger focus on vocational skills.

for different years. Row 4 contains estimates for the actual repeal year (2012) where the post-repeal period is restricted to 2012. Row 5 reports baseline estimates for the actual repeal for the full sample (2005-2016). I do not report standard errors because of the few number of observations.

Table A.7 reports corresponding placebo estimates for the dosage model (equation (2)), including standard errors. Except for academic track enrollment, the placebo estimates for all other outcomes are much smaller (at least by a factor of 5) than the actual repeal estimates in rows 4-5 and statistically insignificant. This suggests that interpolation bias is not a concern.

C Track mismatch

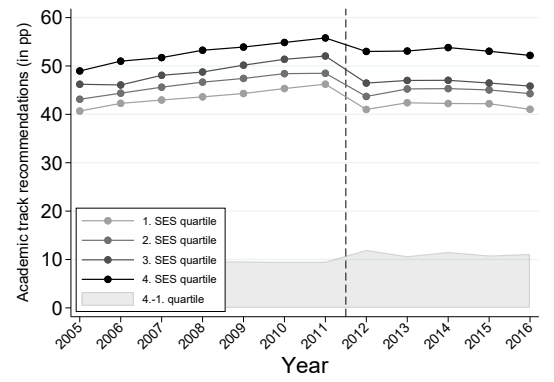
The repeal induced gap in academic track enrollment of students without an academic track recommendation between higher- and lower-SES counties suggests an increased mismatch between the curriculum and students' abilities in the academic track in higher- relative to lower-SES counties. This could manifest in relatively higher grade repetition rates in higher-SES counties after the repeal. Figure A.7 shows cumulative grade repetition rates for grades 5 and 6 across cohorts for the top and bottom quartile using the county-level data for Baden-Württemberg.[32] Panel (a) shows overall grade repetition rates. Panel (b) shows repetition rates in the academic track. The time series data have been corrected for quartile-specific linear trends estimated using the cohorts who made the transitions before 2012. Overall, there is a clear increase in grade repetitions, confirming findings by (Osikominu et al., 2021). Importantly, the increase in grade repetitions in the top quartile is twice that in the bottom quartile. Recall that overall transitions into the academic track increased similarly across quartiles. This suggests that students who entered the academic track after the repeal in higher-SES regions were lower achieving than those in the lower-SES regions.

[32]The grade repetition data come from the Statistical office of Baden-Württemberg: Table 08-D13.1i `www.bildungsmonitoring.de`

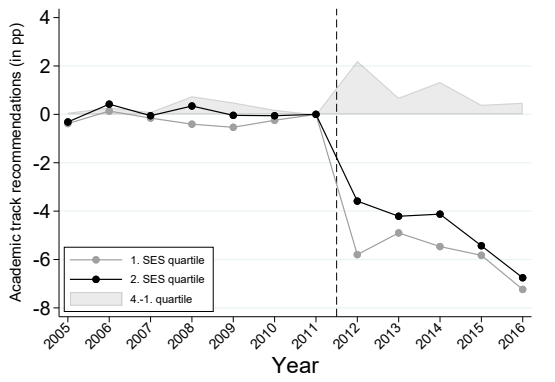
D Additional figures and tables

Figure A.1: EVOLUTION OF ACADEMIC TRACK RECOMMENDATIONS BY SES QUARTILES

Panel (a): All quartiles, raw means

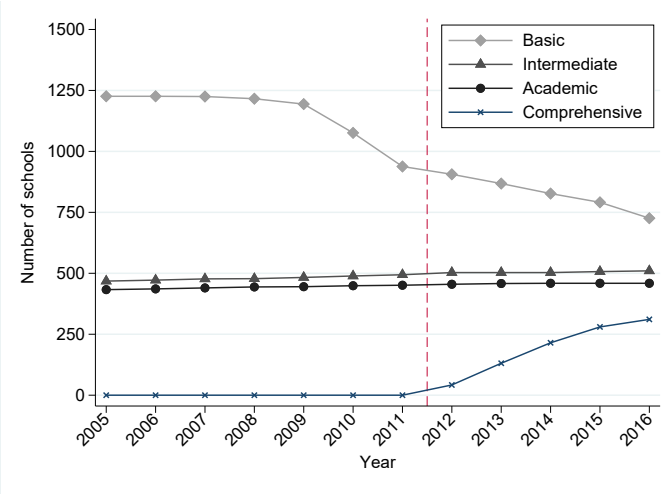


Panel (b): Corrected for linear pre-trends



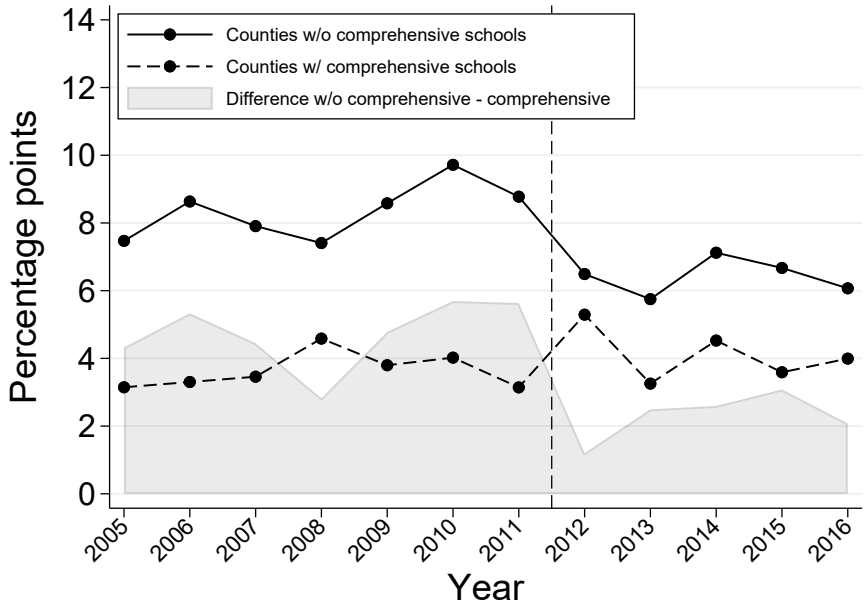
Notes: Panel (a) plots the fraction of academic track recommendations all counties in Baden-Württemberg by quartiles based on the share of the adult population with an academic track qualification within a county. The grey area plots the difference between the top and bottom quartile. Panel (b) plots the fraction of academic track recommendations for the bottom and top quartile normalized to 2011 levels and corrected for linear trends estimated over the period 2005-2011.
Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Figure A.2: EVOLUTION OF THE NUMBER OF SCHOOLS BY TRACK



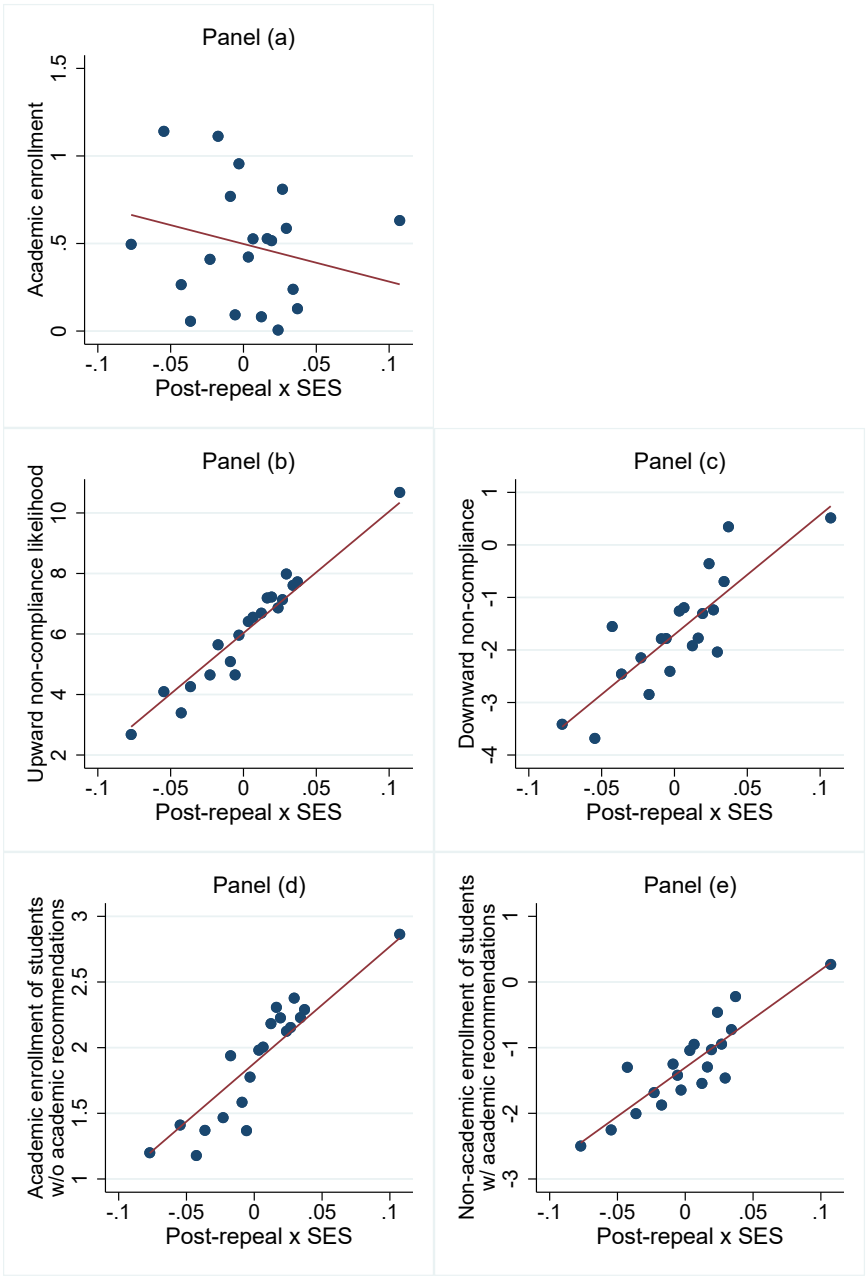
Notes: The figures plots the number of schools by track. Comprehensive schools comprise both *Schulen besonderer Art* of which three existed before 2012 and *Gemeinschaftsschulen* which were first introduced in 2012.
Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Figure A.3: TRANSITIONS INTO NON-ACADEMIC TRACKS CONDITIONAL ON ACADEMIC TRACK RECOMMENDATION BY PRESENCE OF COMPREHENSIVE SCHOOLS



Notes: The figures plots the probability to enrol in a non-academic track conditional on receiving an academic track recommendation. Counties with comprehensive schools prior to 2011 are Heidelberg, Freiburg, and Mannheim. The group of counties without comprehensive schools area restricted to those from the top SES quartile (Baden-Baden, Karlsruhe, Konstanz, Rhein-Neckar-Kreis, Stuttgart, Tübingen, and Ulm). The grey shaded gives the difference between the group of counties with and without comprehensive schools.
Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Figure A.4: BINNED SCATTERPLOTS FOR THE EFFECT OF FREE TRACK CHOICE ON SES GAPS IN TRACK DECISIONS



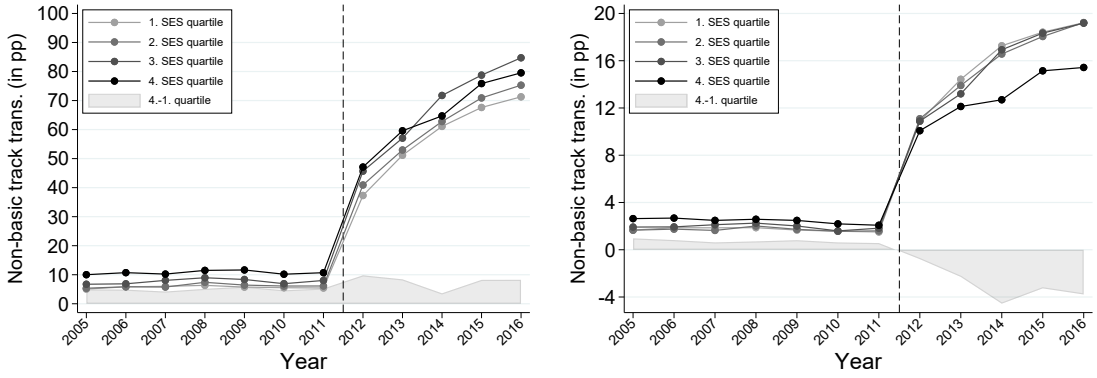
Notes: The figures plots binscatter for the dosage model in equation (2) for various outcomes. See Table 2 for more details. SES refers to the share of the adult population with an academic track qualification within a county. Panel (a) show results results with the academic track enrollment share as the outcome variable. The outcome variable in Panel (b) is the academic track enrollment share conditional on an intermediate track recommendation. The outcome variable in Panel (c) is the non-academic track enrollment share conditional on an academic track recommendation. The outcome variable in Panel (d) is the academic track enrollment share of students with an intermediate track enrollment recommendation. The outcome variable in Panel (e) is the non-academic track enrollment share of students with an academic track recommendation. All outcomes are measured in percentage points.

Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Figure A.5: NON-COMPLIANCE WITH BASIC TRACK RECOMMENDATIONS

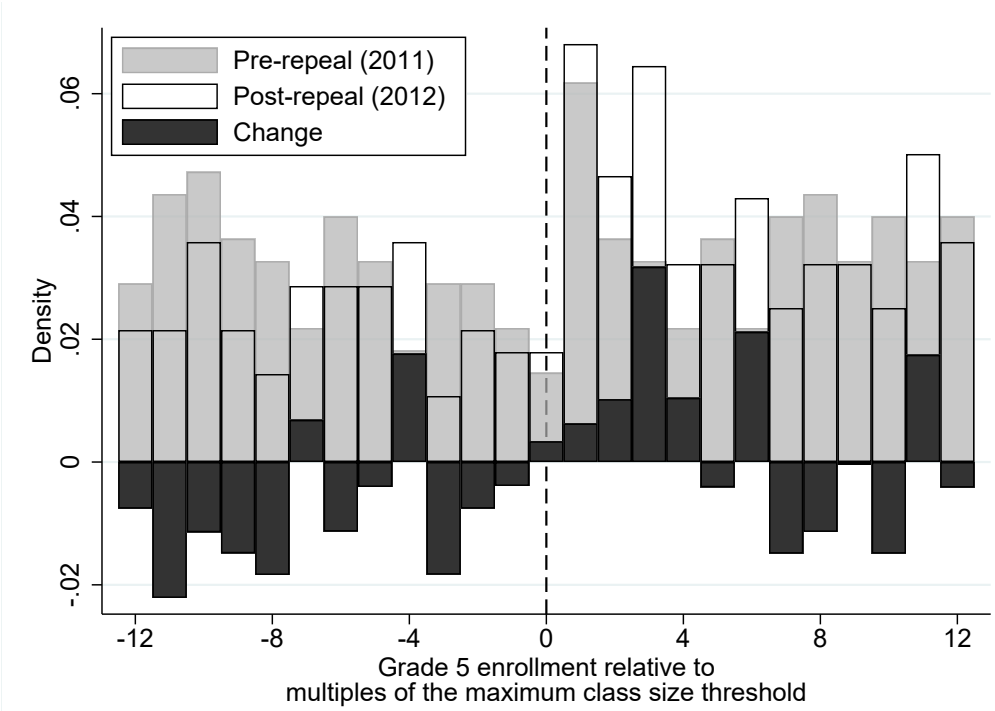
Panel (a): Transition likelihood conditional on basic track recommendation

Panel (b): Transitions by students w/ basic track recommendations



Notes: Panel (a) plots the probability to enrol in a track higher than the basic (i.e. $P(\text{track} \neq \text{Basic}|\text{rec.} = \text{Basic})$) for all counties in Baden-Württemberg by quartiles based on the share of the adult population with an academic track qualification within a county. The grey area plots the difference between the top and bottom quartile. Panel (b) plots the fraction of students who enter a non-basic track with a basic track recommendation (i.e. $P(\text{track} \neq \text{Basic}, \text{rec.} = \text{Basic})$) *Source:* Own calculations based on data from the Statistical Office of Baden-Württemberg.

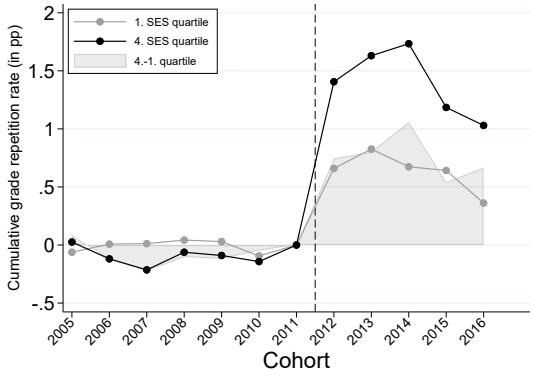
Figure A.6: DISTRIBUTION OF GRADE 5 ENROLLMENT IN INTERMEDIATE TRACK SCHOOLS



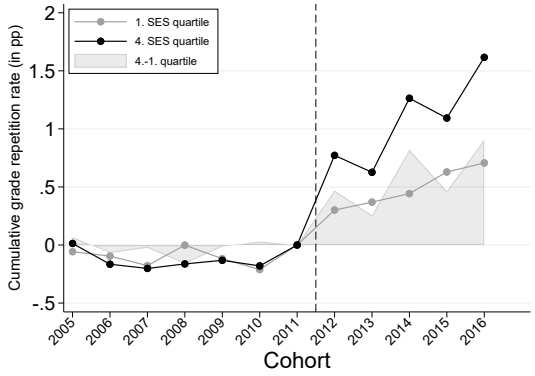
Notes: The figures plots the distribution of 5th grade enrollment in intermediate track schools before (grey bars) and after the repeal (white bars). Each bin refers to 5th grade enrollment counts relative to the next closest multiple of 30 (the maximum class size threshold). The dark bars show the pre- and post-repeal change in the density. The sample is restricted to municipalities in Baden-Württemberg with only one intermediate track school for the school years 2011/12-2012/13.
Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Figure A.7: GRADE REPETITION BY SES QUARTILES

Panel (a): Aggregate grade repetition



Panel (b): Academic track grade repetition



Notes: Panel (a) plots the cumulative number of grade repeaters in grades 5 and 6 as a fraction of total transitions by cohorts and quartiles. A cohort refers to students transitioning to a secondary school track in a given year. Panel (b) plots the cumulative number of grade repeaters in grades 5 and 6 in the academic track as a fraction of total transitions into the academic track by cohorts and quartiles. Quartiles are based on the share of the adult population with an academic track qualification within a county. The grey area plots the difference between the top and bottom quartile. The time series have been normalized to 2011 levels and corrected for quartile-specific linear trends estimated over the period 2005-2011.
Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Table A.1: PARTIAL CORRELATIONS OF COUNTY-LEVEL CHARACTERISTICS

	Share adult population w/ academic track qualification	Academic track transition rates (pre-repeal)		
	(1)	(2)	(3)	(4)
Primary household income	-0.03	0.05		0.08*
	(0.14)	(0.15)		(0.05)
GDP per capita	-0.00	-0.01		-0.01
	(0.19)	(0.21)		(0.08)
Population density	0.71**	0.64**		-0.04
	(0.28)	(0.26)		(0.08)
Share adult population w/ academic track qualification			0.94***	0.96***
			(0.07)	(0.08)
N	44	44	44	44
R^2	0.49	0.42	0.89	0.89

Notes: This table shows coefficient estimates with each column corresponding to a separate regression. The outcomes variables are listed in the column header. All variables are measured at the county level in 2011 and standardized to have mean zero and unit standard deviation. Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.
Source: Own calculations based on data from the German Census 2011, Statistical Offices of the States, the National Account Systems, and the Federal Employment Agency.

Table A.2: DESCRIPTIVE STATISTICS BY SES QUARTILES BEFORE AND AFTER 2011

	1. SES quartile		2. SES quartile		3. SES quartile		4. SES quartile		4.-1. SES quartile	
	Pre-repeal	Post-repeal	Pre-repeal	Post-repeal	Pre-repeal	Post-repeal	Pre-repeal	Post-repeal	Pre-repeal	Post-repeal
Adult population w/ academic track qualification (in %)	16.17	16.17	20.14	20.14	25.03	25.03	37.66	37.66	21.48	21.48
Academic track transitions (in %)	33.58	36.58	36.50	40.18	40.89	44.79	49.32	54.85	15.74	18.28
Intermediate track transitions (in %)	36.43	39.60	34.89	38.29	34.27	35.62	26.01	25.48	-10.42	-14.12
Academic recommendations (in %)	43.83	41.94	45.73	44.27	48.72	46.47	53.65	53.70	9.82	11.75
Intermediate recommendations (in %)	25.94	29.41	25.31	28.30	25.73	29.65	22.92	25.08	-3.03	-4.33
P(track=Intermediate|rec. = Academic)	23.52	20.38	20.41	18.20	16.63	13.62	7.46	6.36	-16.05	-14.02
P(track=Academic|rec. = Intermediate)	0.88	13.03	1.15	15.74	1.39	17.40	2.34	23.07	1.46	10.05
P(track=Basic|rec. = Intermediate)	3.64	2.60	3.49	2.52	2.52	1.95	1.98	1.70	-1.66	-0.91
P(track=Academic|rec. = Basic)	0.02	1.32	0.04	1.80	0.04	2.05	0.06	3.16	0.03	1.84
P(track=Intermediate|rec. = Basic)	4.41	30.92	4.78	34.22	5.95	36.10	5.61	33.94	1.20	3.01

Notes: This table provides statistics for the 44 counties of Baden-Württemberg. It partitions the counties into four quartile groups based on the share of the adult population with an academic track qualification within a county in the year 2011. Pre-repeal refers to the period 2005/06-2011/12. Post-repeal refers to the period 2012/13-2016/17.
Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Table A.3: ROBUSTNESS DOSAGE ESTIMATES

		Non-compliance likelihood		Non-compliance enrollment	
	Academic track enrollment	upward	downward	academic	non-academic
	(1)	(2)	(3)	(4)	(5)
Panel (a): Baseline specification					
Post-repeal × SES	-2.15	40.17***	22.78***	8.88**	14.87***
	(3.60)	(12.68)	(3.73)	(3.73)	(2.06)
	[0.55]	[0.00]	[0.00]	[0.04]	[0.00]
N	528	528	528	528	528
Panel (b): Controlling for academic track recommendations					
Post-repeal × SES	-4.31	40.12***	21.34***	9.12**	13.43***
	(3.56)	(12.65)	(3.77)	(3.68)	(1.79)
	[0.29]	[0.00]	[0.00]	[0.02]	[0.00]
N	528	528	528	528	528
Panel (c): County-specific linear trends					
Post-repeal × SES	0.86	39.83***	21.74***	8.69**	13.71***
	(3.74)	(12.37)	(4.02)	(3.75)	(2.24)
	[0.81]	[0.00]	[0.00]	[0.05]	[0.00]
N	528	528	528	528	528
Panel (d): Excluding counties w/ comprehensive schools					
Post-repeal × SES	1.46	57.49***	22.10***	14.45***	14.32***
	(3.77)	(8.08)	(4.71)	(2.19)	(2.51)
	[0.70]	[0.00]	[0.00]	[0.00]	[0.00]
N	492	492	492	492	492
County FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Mean of dep. var. in 2011	41.41	1.34	18.98	0.33	9.65

Notes: The table presents the effects of the repeal of binding track recommendations on SES gaps in track decisions based on the dosage model in equation (2). Each cell reports estimates from a different regression. The unit of analysis are county-year observations. Outcome variables are given in the column headers. Upward non-compliance likelihood (column 2) refers to the probability to enroll in the academic track conditional on not having an academic track recommendation. Downward non-compliance likelihood (column 3) refers to the probability to enroll in a non-academic track conditional on having an academic track recommendation. Non-compliance enrollment academic (column 4) refers to enrollment in the academic track for students without academic track recommendations. Non-compliance enrollment non-academic (column 5) refers to enrollment in non-academic tracks for students with academic track recommendations. All outcomes are measured in percentage points and have been corrected for linear trends estimated over the 2005-2011 period. Each outcome variable is regressed on year dummies, county fixed effects, and an interaction of a post-reform dummy (2012+) and the share of the adult population with an academic track qualification. The coefficient on the interaction is reported. All regression are weighted by the county-year number of transitions. Panel (a) reports estimates for the baseline specification. Panel (b) includes controls for the share of academic track recommendations. Panel (c) uses the raw outcome variables (not corrected for linear pre-trends) and instead includes county-specific linear trends in the regression model. Panel (d) reports results when the three counties which had comprehensive schools before 2012 (*Freiburg*, *Heidelberg*, and *Mannheim*) are excluded. Standard errors clustered at the county level are reported in parentheses. p-values estimated using the wild bootstrap procedure with clustering at the county level are reported in brackets. Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Table A.4: ROBUSTNESS DID ESTIMATES (BOTTOM VERSUS TOP QUARTILE)

		Non-compliance likelihood		Non-compliance enrollment	
	Academic track enrollment	upward	downward	academic	non-academic
	(1)	(2)	(3)	(4)	(5)
Panel (a): Baseline specification					
Post-repeal × 4. SES quartile	-0.40	8.73***	5.06***	1.91***	3.23***
	(0.44)	(0.60)	(0.67)	(0.20)	(0.38)
N	24	24	24	24	24
Panel (b): Controlling for academic track recommendations					
Post-repeal × 4. SES quartile	-1.09	9.97***	5.40***	2.33***	3.41***
	(0.68)	(0.74)	(1.06)	(0.24)	(0.61)
N	24	24	24	24	24
Panel (c): County-specific linear trends					
Post-repeal × 4. SES quartile	0.31	8.42***	4.41***	1.81***	2.81***
	(0.55)	(0.58)	(1.03)	(0.19)	(0.60)
N	24	24	24	24	24
Panel (d): Excluding counties w/ comprehensive schools					
Post-repeal × 4. SES quartile	-0.07	9.31***	4.27***	2.12***	2.90***
	(0.38)	(0.64)	(0.64)	(0.22)	(0.35)
N	24	24	24	24	24
Quartile FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Mean of dep. var. in 2011	41.41	1.34	18.98	0.33	9.65
4.-1. SES quartile gap of dep. var. in 2011	15.88	0.97	-16.35	0.21	-5.99

Notes: The table presents the effects of the repeal of binding track recommendations on bottom-top quartile SES gaps in track decisions based on difference-in-differences model in equation (1). Each cell reports estimates from a different regression. The unit of analysis are quartile-year observations. Outcome variables are given in the column headers. Upward non-compliance likelihood (column 2) refers to the probability to enroll in the academic track conditional on not having an academic track recommendation. Downward non-compliance likelihood (column 3) refers to the probability to enroll in a non-academic track conditional on having an academic track recommendation. Non-compliance enrollment academic (column 4) refers to enrollment in the academic track for students without academic track recommendations. Non-compliance enrollment non-academic (column 5) refers to enrollment in non-academic tracks for students with academic track recommendations. All outcomes are measured in percentage points and have been corrected for linear trends estimated over the 2005-2011 period. Each outcome variable is regressed on year dummies, quartile fixed effects, and an interaction of a post-reform dummy (2012+) and the share of the adult population with an academic track qualification. The coefficient on the interaction is reported. Panel (a) reports estimates for the baseline specification. Panel (b) includes controls for the share of academic track recommendations. Panel (c) uses the raw outcome variables (not corrected for linear pre-trends) and instead includes quartile-specific linear trends in the regression model. Panel (d) reports results when the three counties which had comprehensive schools before 2012 (*Freiburg*, *Heidelberg*, and *Mannheim*) are excluded. Robust standard errors clustered at the county level are reported in parentheses. Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Table A.5: BALANCING TESTS DOSAGE MODEL

	Basic track recommendations (1)	Intermediate track recommendations (2)	Academic track recommendations (3)
Post-repeal × SES	3.84	-4.13	-2.43
	(2.75)	(2.58)	(2.21)
	[0.18]	[0.16]	[0.28]
N	528	528	528
R^2	0.872	0.692	0.681

Notes: The table presents effects for the dosage model in equation (2). Each cell reports estimates from a different regression where the outcome variables are the share of basic, intermediate, and academic track recommendations in columns 1-3, respectively. All outcomes are measured in percentage points. Post-repeal refers to period after 2011. SES refers to the share of the adult population with an academic track qualification within a county. Standard errors clustered at the county level are reported in parentheses. *p*-values estimated using the wild bootstrap procedure with clustering at the county level are reported in brackets. Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.
Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Table A.6: PLACEBO DID ESTIMATES (BOTTOM VERSUS TOP QUARTILE)

		Non-compliance likelihood		Non-compliance enrollment	
	Academic track enrollment	upward	downward	academic	non-academic
	(1)	(2)	(3)	(4)	(5)
Repeal year = 2009: N=10	0.21	0.40	-0.76	0.15	-0.32
Repeal year = 2010: N=12	-1.50	0.29	2.09	0.05	1.05
Repeal year = 2011: N=14	-0.20	0.05	-0.39	0.06	-0.16
Repeal year = 2012: N=16	-0.03	7.31	5.56	1.47	3.52
Repeal year = 2012 (full sample): N=24	-0.40	8.73	5.06	1.91	3.23
Quartile FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Mean of dep. var. in 2011	41.41	1.34	18.98	0.33	9.65
4.-1. SES quartile gap of dep. var. in 2011	15.88	0.97	-16.35	0.21	-5.99

Notes: See Appendix B and notes under Table 2 for more details about the specification and variables. Each cell corresponds to a different regression.
Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Table A.7: PLACEBO DOSAGE ESTIMATES

		Non-compliance likelihood		Non-compliance enrollment	
	Academic track enrollment	upward	downward	academic	non-academic
	(1)	(2)	(3)	(4)	(5)
Repeal year = 2009: N=220	-0.14	1.25	-0.32	0.45	0.04
	(3.07)	(2.00)	(3.29)	(0.45)	(1.77)
	[0.96]	[0.63]	[0.94]	[0.42]	[0.98]
Repeal year = 2010: N=264	-4.34	-0.70	5.50	-0.21	2.31
	(2.96)	(1.62)	(4.03)	(0.33)	(2.23)
	[0.25]	[0.70]	[0.22]	[0.57]	[0.34]
Repeal year = 2011: N=308	-0.47	0.80	0.62	0.43	0.28
	(3.52)	(1.18)	(3.21)	(0.39)	(1.70)
	[0.91]	[0.53]	[0.86]	[0.33]	[0.87]
Repeal year = 2012: N=352	-0.18	33.31***	28.15***	6.75**	17.02***
	(3.43)	(11.36)	(3.90)	(3.16)	(2.06)
	[0.97]	[0.00]	[0.00]	[0.12]	[0.00]
Repeal year = 2012 (full sample): N=528	-3.20	32.40***	21.80***	6.65***	14.47***
	(2.05)	(3.91)	(2.17)	(1.22)	(1.16)
	[0.40]	[0.00]	[0.00]	[0.07]	[0.00]
County FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Mean of dep. var. in 2011	41.41	1.34	18.98	0.33	9.65

Notes: See Appendix B and notes under Table 2 for more details about the specification and variables. Each cell corresponds to a different regression. Standard errors clustered at the county level are reported in parentheses. p-values estimated using the wild bootstrap procedure with clustering at the county level are reported in brackets. Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Table A.8: DESCRIPTIVE STATISTICS BY SES, 2011 AND 2016, REPEAL AND NO-REPEAL STATES

	High-SES				Low-SES			
	Repeal states		No-repeal states		Repeal states		No-repeal states	
	2011	2016	2011	2016	2011	2016	2011	2016
Academic track enrollment	0.71	0.75	0.71	0.70	0.30	0.36	0.30	0.31
Academic track recommendation	0.75	0.71	0.70	0.70	0.40	0.38	0.33	0.37
P(track=Academic|rec. = Non-academic)	0.06	0.29	0.23	0.24	0.02	0.10	0.07	0.07
P(track=Non-academic|rec. = Academic)	0.07	0.06	0.09	0.11	0.28	0.22	0.23	0.29
Migration background	0.23	0.28	0.23	0.25	0.33	0.37	0.28	0.29
German spoken at home	0.87	0.78	0.86	0.79	0.81	0.74	0.83	0.76
Parents' highest years of education	17.25	17.19	17.20	17.07	12.92	13.26	12.89	13.26
Parents' highest ISEI	54.60	65.75	52.59	65.12	32.33	42.13	32.97	40.76

	Repeal states		No-repeal states	
	2011	2016	2011	2016
Share high-SES	0.48	0.45	0.42	0.44

Notes: This table provides descriptive statistics for the NAS sample. Repeal states are Baden-Württemberg and Saxony-Anhalt. High-SES students are those with at least one parent with an academic track qualification. Low-SES students are those without a parent with an acadmeic track qualification.
Source: Own calculations based on NAS waves 2011 and 2016.

Table A.9: TRANSITION DECISIONS FOR STUDENTS WITH ACADEMIC TRACK RECOMMENDATIONS BY TRACKING SYSTEM (CROSS-SECTION)

	3-tiered				2-tiered				3- & 2-tiered			
	Non-academic		All		Non-academic		All		Non-academic		All	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Free track choice	0.173***	0.172***			0.035	0.044			0.035	0.029		
	(0.025)	(0.021)			(0.060)	(0.055)			(0.059)	(0.059)		
High-SES			0.247***	0.247***			0.167**	0.168**			0.167***	0.165***
			(0.005)	(0.001)			(0.051)	(0.051)			(0.050)	(0.050)
Free track × high-SES			-0.208***	-0.204***			-0.065	-0.066			-0.065	-0.064
			(0.015)	(0.017)			(0.053)	(0.053)			(0.052)	(0.052)
3-tiered									-0.098	-0.108*		
									(0.056)	(0.055)		
Free track × 3-tiered									0.138**	0.143**		
									(0.063)	(0.062)		
3-tiered × high-SES											0.080	0.082
											(0.050)	(0.050)
Free track × 3-tiered × high-SES											-0.143**	-0.141**
											(0.054)	(0.055)
Student controls		✓		✓		✓		✓		✓		
State FE			✓	✓			✓	✓			✓	✓
N	926	926	2,488	2,488	1,343	1,343	3,424	3,424	2,269	2,269	5,912	5,912
R^2	0.046	0.075	0.075	0.092	0.002	0.027	0.051	0.080	0.039	0.064	0.071	0.088

Notes: See notes under Table 5 for more details about the specification and variables. The sample is restricted to students with academic track recommendations. Student controls: Gender, migration background, and test scores.
Source: Own calculations based on NAS waves 2011 and 2016.

Table A.10: FREE TRACK CHOICE EEFFECTS ON SES GAPS IN GRADE REPETITION

	Aggregate (1)	Basic track (2)	Intermediate track (3)	Academic track (4)
Free track choice × SES	2.98**	3.63	6.72*	1.73*
	(1.44)	(4.74)	(3.82)	(0.92)
	[0.11]	[0.51]	[0.28]	[0.04]
County FE	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
N	528	528	528	528
R^2	0.60	0.40	0.63	0.44
Mean of dep. var. in 2011	1.54	1.65	2.05	1.10

Notes: The table presents effects for the dosage model in equation (2). Each cell reports estimates from a different regression. In column 1 the outcome variable is the number of grade repeaters in grades 5 and 6 as a fraction of all transitions into a secondary school track for a given cohort and county. In columns 2, 3, and 4 the outcome variables are the track-specific number of grade repeaters in grades 5 and 6 as a fraction of the track-specific transitions for a given cohort and county. All outcomes are measured in percentage points. Post-repeal refers to the cohorts transitioning into a secondary school track after 2011. SES refers to the share of the adult population with an academic track qualification within a county. All outcomes have been corrected for county-specific linear trends estimated over the period 2005-2011. The regressions have been weighted by the county-cohort specific number of transitions. Standard errors clustered at the county level are reported in parentheses. *p*-values estimated using the wild bootstrap procedure with clustering at the county level are reported in brackets. *p*-values estimated using the wild bootstrap procedure with clustering at the county level are reported in brackets. Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.
Source: Own calculations based on data from the Statistical Office of Baden-Württemberg.

Table A.11: DIFFERENT FORMS OF INFERENCE FOR TABLE 3

Free track choice coefficient	0.063	
P-values	Restricted	Unrestricted
Cluster-robust standard errors	-	0.001
Wild cluster bootstrap	0.045	0.000
Randomization inference	0.036	
Free track choice × high-SES coefficient	-0.016	
P-values	Restricted	Unrestricted
Cluster-robust standard errors	-	0.821
Wild cluster bootstrap	0.575	0.438
Randomization inference	.610	
State & year FE	✓	
Student-level controls (excl. test scores)	✓	
Test score controls	✓	

Notes: See notes under Table 3 for more details about the specification and variables.
Source: Own calculations based on NAS waves 2011 and 2016.

Table A.12: DIFFERENT FORMS OF INFERENCE FOR TABLE 4

Sample	Academic track rec. & high-SES	
Free track choice coefficient	0.024	
p-values	Restricted	Unrestricted
Cluster-robust standard errors	-	0.083
Wild cluster bootstrap	0.464	0.308
Randomization inference	0.217	
Sample	Academic track rec. & low-SES	
Free track choice coefficient	0.123	
p-values	Restricted	Unrestricted
Cluster-robust standard errors	-	0.006
Wild cluster bootstrap	0.276	0.008
Randomization inference	0.036	
Sample	Non-academic track rec. & high-SES	
	0.194	
p-values	Restricted	Unrestricted
Cluster-robust standard errors	-	0.000
Wild cluster bootstrap	0.045	0.000
Randomization inference	0.036	
Sample	Non-academic track rec. & low-SES	
	0.123	
p-values	Restricted	Unrestricted
Cluster-robust standard errors	-	0.000
Wild cluster bootstrap	0.100	0.000
Randomization inference	0.036	
State & year FE	✓	
Student-level controls (excl. test scores)	✓	
Test score controls	✓	

Notes: See notes under Table 4 for more details about the specification and variables.
Source: Own calculations based on NAS waves 2011 and 2016.

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