



Social and Migration-Related Inequalities at the Transition from Primary to Lower Secondary Education in Germany: The Role of Parents' Knowledge of the Education System

Melanie Olczyk · Annabell Daniel · Hannah Glinka · Katharina Werner

Received: 30 November 2024 / Accepted: 18 August 2025 / Published online: 1 October 2025
© The Author(s) 2025

Abstract The German school system is characterised by early tracking and a high level of differentiation and stratification, leading to diverse educational pathways associated with differing qualifications and career opportunities. In this context, knowledge of the education system should be crucial for strategically navigating the educational process. This study examined how knowledge gaps among social groups contribute to social and migration-related inequalities during the transition from primary to secondary school. Additionally, it explored whether the impact of knowledge depends on the degree to which families' educational decisions are constrained, specifically by binding teacher recommendations. Data from Starting Cohort 2 of the National Educational Panel Study ($N_{students}=4,177$) were used, taking into ac-

Online Appendix: <https://kzfss.uni-koeln.de/sites/kzfss/pdf/Olczyk-et-al.pdf>

✉ M. Olczyk · H. Glinka

Institut für Soziologie, Martin-Luther-Universität Halle-Wittenberg
Emil-Abderhalden-Str. 26–27, 06108 Halle (Saale), Germany
E-Mail: melanie.olczyk@soziologie.uni-halle.de

H. Glinka

E-Mail: hannah.glinka@soziologie.uni-halle.de

A. Daniel

Institut für Pädagogik, Bildungs- und Sozialisationsforschung, Ludwig-Maximilians-Universität München
80802 Munich, Germany
E-Mail: A.Daniel@edu.lmu.de

K. Werner

ifo Institut—Leibniz Institut für Wirtschaftsforschung, Universität München e. V., Zentrum für Bildungsökonomik
Poschingerstr. 5, 81679 Munich, Germany
E-Mail: WernerK@ifo.de

Fakultät für Wirtschaft und Recht, Business School Pforzheim
Tiefenbronner Str. 65, 75175 Pforzheim, Germany

count parental education as well as the origin group (Former Soviet Union, Turkey, other) and generation status (first and second, 2.5th, and third generations). Controlling for key background characteristics such as grades, it was found that parental knowledge was positively associated with grammar school attendance in three out of five indicators. Overall, however, parental knowledge had only a small impact on group differences, with different patterns emerging: Controlling for knowledge slightly reduced social inequalities, while migration-related inequalities slightly increased. No evidence was found that the effect of knowledge varied by social origin or immigrant background, nor that it depended on the binding nature of teacher recommendations. The results suggested that although parental knowledge was associated with school choice, it did not substantially reduce existing inequalities. We discuss broader implications regarding the potential role of knowledge in shaping educational pathways.

Keywords Educational inequalities · Educational decision-making · Secondary school choice · Educational stratification · Institutional context

Soziale und migrationsbezogene Ungleichheiten beim Übergang von der Grundschule zur Sekundarstufe I in Deutschland: zur Bedeutung des elterlichen Wissens über das Bildungssystem

Zusammenfassung Das deutsche Bildungssystem zeichnet sich durch eine frühe Aufteilung der Schülerinnen und Schüler auf verschiedene Schulformen sowie ein hohes Maß an Differenzierung und Stratifizierung aus. Daraus resultieren verschiedene Bildungswege mit unterschiedlichen Bildungsabschlüssen und Berufschancen. In diesem Kontext sollte Wissen über das Bildungssystem ein zentraler Faktor sein, um Bildungsprozesse strategisch zu steuern. Die vorliegende Studie untersuchte, inwieweit Wissensunterschiede zwischen sozialen Gruppen soziale und migrationsbezogene Ungleichheiten beim Übergang in die Sekundarstufe bedingen. Zudem wurde analysiert, ob der Einfluss von Wissen davon abhängt, inwieweit familiäre Bildungsentscheidungen durch verbindliche Lehrkräfteempfehlungen eingeschränkt sind. Für die Auswertung wurden Daten der Startkohorte 2 des Nationalen Bildungspanels ($N_{\text{Schüler:innen}} = 4.177$) herangezogen, wobei die elterliche Bildung sowie die Herkunftsgruppe (ehemalige Sowjetunion, Türkei, andere) und der Generationenstatus (erste und zweite, 2,5. und dritte Generation) berücksichtigt wurden. Unter Kontrolle zentraler Hintergrundmerkmale wie Noten zeigte sich, dass elterliches Wissen in drei von fünf Indikatoren positiv mit dem Besuch eines Gymnasiums assoziiert war. Insgesamt hatte das elterliche Wissen jedoch nur einen geringen Einfluss auf die Gruppenunterschiede, wobei sich hier unterschiedliche Muster abzeichneten: Unter Kontrolle des Wissens verringerten sich soziale Ungleichheiten in der Schulwahl leicht, während migrationsbezogene Ungleichheiten geringfügig zunahmen. Es fanden sich keine Hinweise darauf, dass der Effekt von Wissen nach sozialer Herkunft oder Migrationshintergrund variierte oder von der Verbindlichkeit der Lehrkräfteempfehlungen abhing. Insgesamt deuteten die Ergebnisse darauf hin, dass elterliches Wissen zwar mit der Schulwahl in Verbindung stand, aber beste-

hende Ungleichheiten nicht substanziell verringerte. Abschließend diskutieren wir weiterführende Implikationen zur potenziellen Rolle von Wissen bei der Gestaltung von Bildungswegen.

Schlüsselwörter Bildungsungleichheiten · Bildungsentscheidungen · Schulwahl Sekundarstufe · Bildungsstratifizierung · Institutioneller Kontext

1 Introduction

Stratification of secondary education, as occurs in Germany, is closely tied to distinct educational pathways that influence subsequent postsecondary education and career opportunities (e.g. Borghans et al. 2019; Hillmert and Jacob 2010; Schindler et al. 2024). This stratification coincides with persistent social and migration-related inequalities in the placement of students into lower and upper secondary education: Children from socially less privileged families are disproportionately likely to attend schools that prepare them for vocational rather than academic tracks, even when they perform at a similar level to their peers from more privileged families at the end of primary education (Lämmchen et al. 2022; Neugebauer et al. 2013). In contrast, among students with comparable academic performance and social backgrounds, those from immigrant families often make more ambitious educational choices, such as opting for academic tracks (for an overview, see Dollmann 2016a).

Various studies referring to different theoretical approaches, such as rational choice theories (e.g. Diehl et al. 2016a; Erikson and Jonsson 1996) and reproduction theory (e.g. Jæger 2022), emphasise the role of resources, particularly cultural capital, in shaping educational outcomes. In this context, knowledge of the education system, including the available pathways and their access requirements, can serve as a critical resource for navigating the educational system strategically and achieving academic credentials (Forster and van de Werfhorst 2019). However, this knowledge is unequally distributed across social groups. Specifically, studies have shown that families from lower social strata and those of immigrant origin, in particular, often possess limited knowledge of the education system (Kretschmer 2019; Olczyk and Will 2019; Zimmermann 2024).

For secondary education, there are currently only a few international studies showing that various aspects of knowledge are related to educational attainment (e.g. for England, Davies et al. 2017; for the Netherlands, Forster and van de Werfhorst 2019; for Chile, Dinkelman and Martínez 2014). Even fewer studies examine the relevance of knowledge for explaining group-specific differences in educational outcomes (e.g. for Sweden, Kessel 2018; for the United States, Corcoran et al. 2018). For Germany, evidence is particularly scarce, especially concerning the transition to lower secondary education (for an exception, see Dollmann 2010), which suggests that parents' knowledge of their room to manoeuvre (i.e. bindingness of track recommendation) is relevant, although it was found to be of minor importance overall. However, aspects, such as knowledge about prerequisites or alternatives – which we would expect to be significant – were not considered in this study. A comprehensive examination of various knowledge aspects, along with their relevance to social and

migration-related inequalities, is still lacking. This gap motivates our first research question: How are social and migration-related inequalities at the transition from primary to secondary education in Germany related to differences in knowledge endowment? In this context, we also examine whether the impact of knowledge varies across social and immigrant groups.

Our second research question investigates how the significance of knowledge varies depending on the institutional context within Germany. Specifically, we investigate how the degree of restrictiveness, understood as the binding nature of teacher recommendations regarding secondary school type at the end of primary education, might moderate the impact of knowledge on educational transitions, as it significantly influences family decision-making processes (Dollmann 2011; Jähnen and Helbig 2015). This inquiry aligns with broader research on the role of institutional contexts in shaping educational inequalities (e.g. Dollmann 2021; Dräger et al. 2023).

In examining these mechanisms, we account for different aspects of immigrant background by distinguishing between origin group and generation status. Origin groups may differ in their specific knowledge of the education system as well as in concurrent processes such as aspirations or experiences of discrimination (e.g. Diehl et al. 2021; Ferrara and Salikutluk 2025). Generation status, in turn, tends to reflect families' proximity to the German education system, as later-generation families are more likely to have direct experience with its structures and requirements. However, beyond familiarity with the education system, generation status may be related, among others, to educational aspirations and perceived opportunities through processes of adaptation and social mobility (e.g. Hunkler and Schotte 2023; Segeritz et al. 2010). By considering both dimensions separately, we aim to provide a more nuanced understanding of migration-related inequalities in educational transitions.

To address these questions, we outline theoretical arguments on how knowledge endowment may relate to educational decisions in general and to group differences in these decisions in particular, and how institutional contexts might moderate these associations. Drawing on data from the longitudinal National Educational Panel Study (NEPS; Blossfeld and Roßbach 2019), Starting Cohort 2 (NEPS-SC2; NEPS Network 2022), we present empirical findings that provide evidence and contribute to the theoretical understanding of how knowledge shapes educational decision-making and interacts with institutional contexts.

2 Background and Theoretical Framework

2.1 The German Context

At the end of primary education, typically in grade 4, children transition into lower secondary education. Secondary education in Germany is characterised by between-school tracking offering three tracks within distinct school types: an academic track (grammar schools, *Gymnasium*), which qualifies students to enter tertiary education, and an intermediate and a lower track, both of which primarily prepare students for vocational education and training (VET; Eckhardt 2017). Furthermore, a growing

number of comprehensive schools either integrate all three tracks or combining the intermediate and lower tracks only. Thereby, the availability of school types, in particular the presence of comprehensive schools, varies between the German states (e.g. Becker et al. 2017; Maaz and Kühne 2020). Despite these recent developments in school types, the grammar school continues to maintain a high status as the central route to university (e.g. Spangenberg and Quast 2023). In line with the different objectives of the educational tracks, curricula considerably differ, among other things. The academic track is known for its rigorous curriculum and high standards. The content taught is not only denser and more extensive than in the intermediate or lower tracks but is also much more theoretical. The duration of schooling is also different: The academic track lasts until grades 12 or 13, the intermediate track until grade 10, and the lower track until grades 9 or 10 (Helbig and Nikolai 2015).

The decision about which secondary school type a child attends is strongly influenced by the child's academic performance in primary school. However, despite the expansion of education in recent decades, social disparities in terms of school type attended and qualification level attained have narrowed only slightly (e.g. Hadjar 2019; for an overview, see Winkler 2020), and research repeatedly shows social inequalities in the distribution across school tracks (Triventi et al. 2016). More specifically, even with comparable academic performance, children from less privileged families are less likely to attend grammar schools than their peers from socially privileged families (e.g. Dumont et al. 2014). For some immigrant groups, however, the opposite has been observed (e.g. Dollmann 2017). Various reasons for these inequalities have been proposed, highlighting the role of both resources and educational motives (e.g. Boudon 1974; Diehl et al. 2016a; Erikson and Jonsson 1996). Given the complexity of the German education system, with its numerous options and varying entry requirements, we focus on the role of knowledge in shaping educational decisions at the transition to secondary education.

2.2 Knowledge Endowment Among Social Groups

Knowledge of the education system can be subsumed under informational capital (Bourdieu and Wacquant 1992), a form of incorporated cultural capital (Forster 2021; Forster and van de Werfhorst 2019; Lareau and Weininger 2003; Nauck and Lotter 2016). So far, different conceptualisations have been proposed in the literature (e.g. Lareau 2015; Nauck and Lotter 2016; Olczyk and Will 2019; Pfeffer 2008), which ultimately reflect different knowledge contents. We want to approach this using Lareau's terminology, which distinguishes between formal and informal knowledge (Lareau 2015; for a broader discussion of knowledge, Rowley 2007).

Lareau suggests that there is a difference between knowledge of an education system's official rules, regulations, and structure – formal knowledge – and knowledge of the unwritten rules of appropriate behaviour within the system – informal knowledge (Lareau 2015; Nauck and Lotter 2016). Informal knowledge includes, for example, knowing who to turn to for help, how to take part in academic discussions, and how to address superiors (e.g. professors or teachers; Lareau 2015). This concept of informal knowledge corresponds to the *hidden curriculum* introduced by

Bourdieu and Passeron (1970). Formal knowledge can take a more general form (e.g. knowledge of existing options and alternatives) as well as a more transition-specific form (e.g. knowing which grades are required for a certain university, how the application procedure works, or how much attending a specific school or university will cost; for a similar distinction, see Olczyk and Will 2019). Taking explicit account of the goal orientation of human action, one might label formal knowledge on how pursued goals can be achieved as strategic knowledge, as conceptualised by Pfeffer (2008).

In our article, we focus on formal knowledge of the education system as the fundamental prerequisite for strategic decisions, whose equitable distribution should most likely enhance equal opportunities. This focus is justified by several key considerations: First, formal knowledge is directly relevant for making informed choices about educational pathways, as it includes knowledge of, for example, requirements and institutional procedures. Second, it is more easily measurable and applicable in empirical research, enabling a systematic analysis of its distribution and impact. Third, formal knowledge is more amenable to policy interventions aimed at reducing educational inequalities. In contrast, informal knowledge, despite its potential role in navigating the education system, is more difficult to operationalise. It is often shaped by social interactions and cultural capital, making it less directly accessible to policy interventions. By concentrating on formal knowledge, this study aims to identify barriers to equal educational opportunities that can be addressed through informational policies and institutional interventions. In the following, we will refer to formal knowledge simply as “knowledge”.

Since educational pathways in Germany entail varying requirements, families from different educational backgrounds should have had distinct experiences and accordingly have different levels of familiarity with the different tracks. This addresses an important characteristic of knowledge, namely that its emergence is partly context dependent (Clemens 2021; Esser 2001; Pfeffer 2008). Furthermore, we can expect the gathering of information and hence the building of knowledge stocks (Rowley 2007) also to be restricted by available resources such as time, capabilities, and social networks (e.g. Ben-Porath 2009; Bell 2009; Hastings et al. 2016; Olson and Rosenfeld 1984). Consequently, the possession of certain knowledge will be linked to one’s social position in society and thus socially stratified (e.g. Berger and Luckmann 2016). Immigrants can be assumed to face the (additional) challenge of not having passed through the educational system of the host country and to be less familiar with it accordingly (for similar argumentation, see, e.g., Diehl et al. 2016b). Empirical studies have shown that knowledge of the education system is unevenly distributed across social groups. Families with lower educational backgrounds and immigrant families, particularly those of Turkish descent and from the Former Soviet Union and Yugoslavia, tend to have less knowledge regarding, for example, alternatives in upper secondary education and the prerequisites for different secondary school types (Kretschmer 2019; Olczyk and Will 2019; Zimmermann 2024).

In line with these considerations and empirical findings, we expect that families with lower educational backgrounds and families of immigrant origin possess lower levels of knowledge of the education system.

2.3 The Role of Knowledge in Educational Decision-Making

Although previous studies have hinted at theoretical arguments regarding possible relationships, a comprehensive examination of how knowledge of the education system (and which aspects of it) influences educational decisions remains lacking. The existing literature provides several points of departure, which will be sketched out and further developed below to enrich our expectations.

The most prominent approach in analysing educational decisions is based on rational-choice theories. Accordingly, families choose the course of action from the available set of options that seems most advantageous for achieving their interests, based on an evaluation of costs and benefits (e.g. Becker 2000, 2024; Boudon 1974; Breen and Goldthorpe 1997; Erikson and Jonsson 1996). If all families were fully informed about, for example, the requirements of specific school types, the available alternatives, and their own courses of action, this knowledge would enable strategic decision-making. Empirical evidence, though, shows group-specific differences in knowledge.

The question is how these differences in knowledge relate to decision-making behaviour. In understanding how knowledge of the education system is associated with educational decisions, we emphasise variations in theoretical decision parameters, i.e. subjectively assessed benefits, probabilities of success, and costs. These parameters are shaped by the resources available to children and their families – such as knowledge of the education system. Since resources are unevenly distributed across social groups, this disparity can lead to differences in how families evaluate the educational pathways available to them (for similar argumentation, see, e.g., Rageth and Sritharan 2022). Empirical studies have shown that subjective assessments of success probabilities, benefits, and costs vary systematically between social groups (e.g. Lievore and Triventi 2022; Stocké 2007; Zimmermann 2019), although it remains open to what extent these differences are due to differences in knowledge endowment.

Observable social and migration-related educational differences at the macro level can therefore be attributed to systematic differences in the investment behaviour of social groups (e.g. Kristen 2005). In terms of social inequalities, high-educated parents, having successfully navigated more demanding educational pathways, tend to have greater knowledge of the education system, particularly concerning the requirements and advantages of grammar schools. This knowledge allows them to be more optimistic about their children's chances of success in these environments. Empirical evidence supports this, showing that children from socially privileged families are often enrolled in more demanding school types, even when their academic performance in primary school is relatively lower (Ditton 2007; Gresch et al. 2009; Relikowski et al. 2010). By contrast, families from less privileged backgrounds tend to underestimate the probability of success in more demanding school types, even when the child performs relatively well in primary school (Dumont et al. 2014; Pietsch and Stubbe 2007; Stocké 2007).

For families with an immigration history, particularly those unfamiliar with the German education system, knowledge gaps can also shape the assessed theoretical parameters. For example, immigrant families may not know the specific requirements

for grammar schools. Their limited knowledge could result in an overly optimistic view of their educational options. This lack of knowledge may hinder them from accurately assessing the required efforts and demands, leading to an overestimation of the benefits of attending grammar schools.

In addition to the theoretical parameters and group differences in evaluating options, another factor may be the scope of knowledge of available alternatives and, hence, the awareness of different educational pathways (for similar argumentation, see Diehl et al. 2016b, pp. 10f.). While theoretical parameters focus on the evaluation of costs and benefits once options are known, this line of argument emphasises that knowledge of alternatives, such as different school types, varies across social groups, contributing to educational inequalities (e.g. Bell 2009; Hossler and Gallagher 1987; Kristen 2008).

Low-educated families, while more familiar with less demanding school types and VET, may lack detailed knowledge of grammar schools and the opportunities they offer. Their choice set might be narrower, focused more on the familiar path of the vocational track. In contrast, high-educated families often have more access to social networks and information that broaden their knowledge of the full spectrum of educational opportunities, including grammar schools and university pathways (e.g. Bell 2009; Ben-Porath 2009; Schneider et al. 2002). This greater access to knowledge of different tracks could allow high-educated families to weigh more options when making educational decisions.

Immigrant families may lack, for example, knowledge of the range of upper secondary education options, such as VET, which might be less familiar or even absent in their country of origin. Consequently, they may more frequently view grammar schools as the primary route to upward social mobility (Nauck and Lotter 2016). This limited knowledge of alternatives can contribute to choices that might not align with their children's abilities. As a result, these families may make decisions based on perceived prestige or societal expectations rather than on a comprehensive understanding of all the educational pathways available and their respective long-term opportunities and constraints.

In light of these considerations, we expect that social and migration-related differences may align with knowledge disparities between social groups. Hence, differences between the groups should decrease when knowledge endowment is considered. However, patterns may vary depending on the immigrant group under consideration, as generation status primarily reflects proximity to the education system and familiarity with educational structures, whereas origin groups are likely to be associated with more specific experiences and mechanisms, such as discrimination, immigrant optimism, or distinct migration histories. Therefore, when taking knowledge into account, reductions in differences are expected to be more evident for generation status. Furthermore, although more knowledge may lead to more informed decision-making, parallel processes related to social and immigrant background could moderate, or even counteract, the assumed impact of knowledge on education decisions.

For socially privileged families, knowledge may be crucial to translate ambitious aspirations into actual educational choices. Motivated by status maintenance (Boudon 1974; Breen and Goldthorpe 1997), these families can strategically use their

knowledge of the education system to secure prestigious pathways, even when these do not perfectly align with their children's abilities or interests (Dumont et al. 2019). For socially disadvantaged families, by contrast, knowledge may play a less decisive role. They may prioritise short-term, secure educational pathways instead of long-term, uncertain opportunities. Thus, while privileged families may use knowledge to maximise their children's educational opportunities, for disadvantaged families, the impact of this knowledge may be attenuated by financial or practical barriers that limit access to higher educational pathways.

Similarly, for immigrant families, knowledge does not necessarily translate into conventional educational decision-making patterns. Instead, distinctive migration-related factors may moderate the role of knowledge in shaping choices. One key factor could be immigrant optimism (Kao and Tienda 1995), particularly prevalent among families of Turkish descent (2016; 2022; Salikutluk 2016; for an overview, see Becker and Gresch 2016). The aspiration for upward mobility may lead families to prioritise academic pathways even when they are aware of alternative options. Another important factor could be anticipated and perceived discrimination, particularly in VET and on the labour market (for similar argumentation, see, e.g., Jonsson and Rudolphi 2011, pp. 489, 503). For example, some studies suggest that immigrant families, especially those of Turkish descent, expect high levels of discrimination in VET (e.g. for evidence among different immigrant groups seeking VET, see Hufnagl 2024), potentially leading them to reject this pathway despite possessing knowledge of it. These processes should be especially related to specific origin groups rather than generation status (see, e.g., Diehl et al. 2021, who examine generations within selected origin groups and provide evidence of the extent of perceived discrimination across generations), which is why we expect differential effects primarily for origin groups.

Taken together, these considerations suggest that knowledge of the education system, while important, may not be equally effective across all social and immigrant groups. Status maintenance motives or socioeconomic constraints, immigrant optimism, and perceived discrimination can moderate or even counteract the role of knowledge in shaping educational transitions. This highlights the importance of considering not only differences in knowledge endowment but also the varying ways in which knowledge is used or overridden in decision-making across different groups.

2.4 The Moderating Role of the Institutional Context

In Germany, there is an ongoing debate about whether decisions regarding the secondary school type should be made solely by parents or whether they should also involve the consideration of performance criteria in primary school, with teachers providing recommendations at the end of primary school regarding the most suitable type of secondary school for the child. Accordingly, German states vary in their regulations: In some, parental choice is unrestricted, whereas in others, teacher recommendations are binding, with varying degrees of flexibility for parents to appeal or override these recommendations (Helbig and Nikolai 2015).

Previous research suggests that when teacher recommendations are not binding, student achievement plays a less decisive role in secondary school placement (e.g.

Esser and Hoenig 2018). However, there is mixed evidence regarding whether social stratification in decision-making is stronger in nonbinding contexts (for empirical support, see, e.g., Gresch et al. 2010; Dollmann 2011, 2016b; Neugebauer 2010; for contrary evidence, see, e.g., Bach 2021; Büchler 2016; Jähnen and Helbig 2015). Regarding migration-related inequalities, Dollmann (2016b) found that such inequalities were more pronounced in settings with limited parental choice, particularly for students of Turkish descent from less-educated families. These findings may reflect not only group-specific aspirations but also differences in knowledge endowment.

In this context, we argue that knowledge might be particularly important when educational choices are less constrained by the institutional context, giving families room to manoeuvre when choosing the future school type for their child, and imply a stronger need to strategically manage key branching points. Consequently, we hypothesise stronger associations between parents' knowledge and students' educational attainment (i.e. attending a grammar school) in German states where the school's track recommendation for lower secondary school is not binding. However, it could also be argued that in more restrictive contexts, specific knowledge could be particularly useful in identifying potential loopholes or alternative routes within the system (for similar argumentation, see Dollmann 2016b, p. 520).

Therefore, while we expect stronger associations between parental knowledge and students' educational attainment in contexts with nonbinding recommendations, we acknowledge that the role of knowledge in more restrictive settings remains theoretically ambiguous.

3 Data and Operationalisations

3.1 Data

The German National Educational Panel Study is a national multicohort study aimed at providing data on the development of a range of skills throughout the lifespan of cohort members (Blossfeld and Roßbach 2019).¹ We used longitudinal data from Starting Cohort 2 (NEPS-SC2: doi.org/10.5157/NEPS:SC2:11.0.0; NEPS Network 2022), which follows children and their parents who entered primary school in 2012.

We excluded students from the German states of Berlin, Brandenburg, and Mecklenburg-Western Pomerania, as primary education in these German states lasts up to grade 6, as well as students attending special-needs schools. The analysed sample consisted of data on 4,177 students.

¹ The NEPS is carried out by the Leibniz Institute for Educational Trajectories (LIfBi, Germany) in cooperation with a nationwide network.

3.2 Instruments

3.2.1 *Attended School Type in Lower Secondary Education*

Based on parents' information regarding the type of school attended during lower secondary education (i.e. in grades 5 or 6), we distinguished between students attending a grammar school (= 1) and students attending other school types (= 0).

3.2.2 *Highest Parental Education*

We used the highest level of parental education as gathered from the parent interviews and categorised families into low-, medium-, and high-educated groups based on the Comparative Analysis of Social Mobility in Industrial Nations (CASMIN) classification of education provided in the NEPS data. Low-educated families were those in which the highest parental education was no qualification, a lower secondary school-leaving certificate (with or without vocational training), or an intermediate school-leaving certificate without vocational training. Medium-educated families were those in which the highest parental education was an intermediate school-leaving certificate with vocational training or a university entrance qualification (with or without vocational training). High-educated families were those in which the highest parental education was a (technical) university degree.

3.2.3 *Immigrant Background*

We used and modified variables provided by the NEPS on students' origin group and generation status, based on the parents' responses regarding the country of birth of the student, the parents, and the grandparents (for more details, see Olczyk et al. 2016b). The approach used by NEPS for the origin variable is as follows: If the student was born abroad, the corresponding country was recorded. If the student was born in Germany (or if this information was missing), but one or both parents were born abroad, the birth country information of the parent(s) was used. In cases in which both the student and the parents were born in Germany (or if this information was missing), the birth countries of the grandparents were considered. We categorised the NEPS origin variable into four groups: students from families from the Former Soviet Union, students of Turkish descent, students from other countries, and students of majority descent. Similarly, the generation status was determined (for further details, see Olczyk et al. 2016b). Based on the generation status variable provided by the NEPS, we grouped first- and second-generation students together, meaning those students whose parents were born abroad. Additionally, we accounted for the 2.5th generation (students born in Germany, or with missing country of birth information, with one parent born abroad), as well as the third generation (i.e. students and their parents both born in Germany, or with missing information, but with at least one grandparent born abroad).

3.2.4 Knowledge of the Education System

Various aspects of parents' knowledge of the education system were assessed when children attended grade 3 (for further details, see Olczyk and Will 2019). For all knowledge questions included in the analysis, dummy variables were created, where 1 denoted a correct response and 0 indicated either an incorrect response or a "do not know" response (for their suggested coding approach, see Olczyk and Will 2019). The first set of questions pertained directly to the transition. Parents were queried whether the statements on the required grades to attend a grammar school (i.e. "In order to attend a grammar school, the child needs a grade average of at least 2 in the subjects math and German") and on the bindingness of teacher recommendations ("The child has to attend the school type that is recommended at the end of elementary school in every case") were correct, incorrect, or whether they did not know. Second, parents were asked about the duration of schooling required for several qualification levels, with the question left open-ended. Here, we used responses to the question to obtain the *Abitur* (the German high school diploma). The third set of knowledge items focused on alternatives. Parents were required to indicate which of the provided response options accurately described *Fachhochschulreife* (i.e. a qualification entitling the individual to study at a university of applied sciences) or the dual vocational training system in Germany. We opted for dummy coding for the knowledge variables to ensure that the coefficients between the knowledge variables would be directly comparable. For the school duration question, we did not account for deviations from the correct answer, as the level of precision in answer accuracy was not considered critical for the purposes of our analysis.

3.2.5 Institutional Context: Bindingness of Teacher Recommendations

The NEPS data provided information on the German states where students were sampled. We distinguished between German states characterised by a high degree of bindingness, i.e. where attending a grammar school without a recommendation is possible only by taking, for example, an aptitude test (= 1; students sampled in Bavaria, Saxony, Thuringia) and those where parents could decide independently of the teacher's recommendation (= 0).

3.2.6 Control Variables

To capture the direct influence of social and immigrant background on educational decisions, we additionally considered students' academic performance. This was measured using the average grades in mathematics and German at the end of grade 4, with higher values indicating lower performance (parents provided retrospective information about these grades). Furthermore, we considered whether older siblings lived in the household and had passed through the educational system and who might be already more familiar with secondary education (1 = *older siblings in the household*, 0 = *no older siblings*), and we included student gender as a dichotomised variable (1 = *female*, 0 = *male*).

Descriptive statistics of the study variables are displayed in Table 1.

3.3 Analytic Approach

3.3.1 Stepwise Approach

We applied a stepwise approach, beginning with the identification of social and migration-related group differences, both without and with adjustment for key background characteristics such as grades. Regarding immigrant background, we accounted for both origin group and generation status separately, as they reflect differ-

Table 1 Descriptive statistics (Source: Own calculations based on NEPS-SC2)

	M/%	SD	Min	Max	% imp
<i>Attended school type: grammar school</i>	60.2	–	0	1	28.80
<i>Highest parental education</i>					
Low-educated	6.5	–	1	3	0.10
Medium-educated	49.9	–			
High-educated	43.6	–			
<i>Origin group</i>					
Former Soviet Union	5.7	–	1	4	0.02
Turkey	2.6	–			
Other	23.7	–			
Majority	68.0	–			
<i>Generation status</i>					
First and second generation	8.7	–	1	4	0.02
2.5th generation	11.0	–			
Third generation	12.3	–			
Majority	68.0	–			
<i>Parents' knowledge of the education system</i>					
Required grades grammar school ^a	34.9	–	0	1	0.10
Binding track recommendation ^a	75.2	–	0	1	0.05
Duration grammar school ^a	92.8	–	0	1	0.02
Alternatives: <i>Fachhochschulreife</i> ^a	61.3	–	0	1	0.02
Alternatives: dual vocational training ^a	67.5	–	0	1	0.05
<i>German states with high degree of bindingness</i>	25.5	–	0	1	–
<i>Average grades (mathematics, German)</i>	2.17	0.72	1	6	19.30
<i>Older siblings in the household</i>	56.7	–	0	1	17.80
<i>Female student</i>	51.0	–	0	1	–

Distributions from unweighted data and the first imputed dataset are reported. Descriptive statistics by parents' education and immigrant background are summarised in Table S.2 in the Online Appendix. Table S.9 in the Online Appendix provides information on the share of correct answers to the knowledge items by degree of bindingness.

SD standard deviation, *min* minimum, *max* maximum, *imp* imputation

^aThe share of correct answers is displayed

ent aspects of immigrant background. Specifically, origin groups were expected to differ not only in their knowledge of the education system but also in concurrently occurring processes such as the extent of immigrant optimism and/or experiences of discrimination. In contrast, generation status was assumed to be related to differences in proximity to the education system, in particular of parents. In the next step, we introduced the knowledge items to assess their relevance for school choice and to examine whether they mediated observed group differences. To explore potential differential effects of knowledge across social and immigrant groups, we then tested interaction terms between knowledge and group membership. Since we expected parallel processes to vary particularly by origin group, we focused on interactions with origin group (results for generation status are presented in the Online Appendix). Finally, we examined the role of institutional context by testing interaction effects between knowledge and the degree of bindingness, assessing whether institutional constraints moderated the relationship between knowledge and attended school type.

3.3.2 Method

We conducted linear probability models (LPMs) to facilitate the interpretation of coefficients and avoid shortcomings related to logit models (e.g. Allison et al. 2020). For the LPM, we calculated school-level clustered standard errors to account for the clustered data structure. The results from the logit models are comparable to those from the LPM. Additionally, we employed Karlson–Holm–Breen (KHB) mediation analysis (Kohler et al. 2011). The KHB mediation analysis allows us to identify the key elements of parents' knowledge of the education system that have had the greatest impact on the alterations in the regression coefficients related to social and immigrant backgrounds, where parental knowledge is either excluded or included.

3.3.3 Missing Values

We used multiple imputations with iterated chained equations to deal with missing data (White et al. 2011). With the exception of the students' gender and the degree of bindingness in the federal state, all analysis constructs were multiply imputed (see also Table 1 for information on the share of missing values by construct). Besides the variables used in the analyses, the imputation models included further information from parent questionnaires such as parental educational aspirations, teacher recommendation, number of books in the household, and parents' contact with teachers. We generated 50 imputed datasets. We performed the regression analyses separately for each of the 50 imputed datasets and then combined the results using Rubin's rules (Rubin 1987). The convergence of the multiple imputation algorithm, as well as internal checks such as comparing summary statistics between the observed and the imputed data, further substantiated the appropriateness of the selected imputation models.

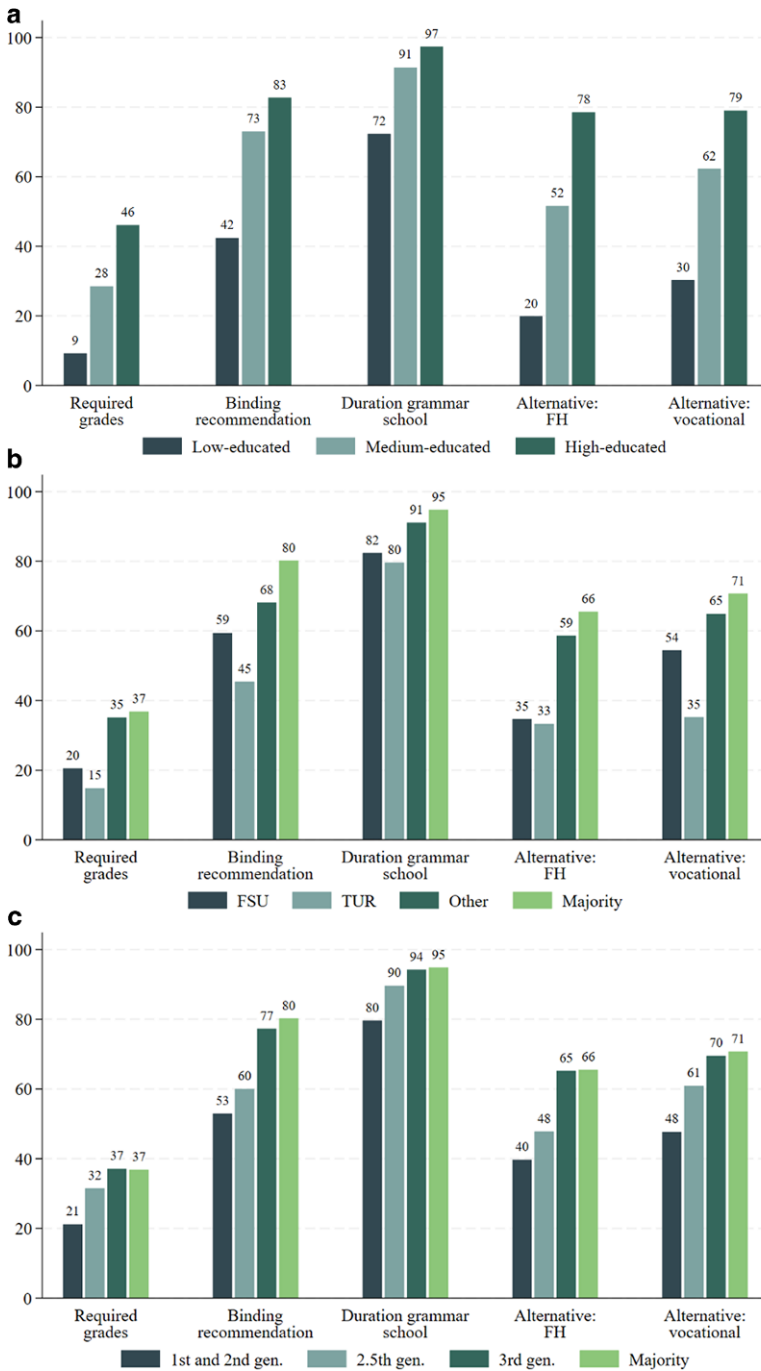


Fig. 1 Share of correct answers on knowledge items by parental education (a), origin group (b), and generation status (c). *FH* Fachhochschulreife, *FSU* Former Soviet Union, *TUR* Turkey. (Source: Own calculations based on NEPS-SC2)

4 Results

4.1 Group Differences in Knowledge Endowment

Figure 1a shows the share of parents who correctly answered each of the five knowledge items by education group. As expected, knowledge increased with the education level of parents. However, the relative size of knowledge gaps varied across items, with smaller differences across groups in knowledge of the duration of grammar school and larger differences in knowledge of *Fachhochschulreife*.

Figure 1b, c documents differences in the shares of correct answers to each item by immigrant background, i.e. origin group (Fig. 1b) and generation status (Fig. 1c). Interestingly, the overall pattern of knowledge distribution was constant across all five items. Parents of Turkish descent had the lowest share of correctly answered survey items throughout, while, as expected, parents of majority descent had the highest share. Regarding knowledge differences by generation status, we observed a generational trend: Foreign-born parents (i.e. parents of first- and second-generation students) had the lowest share of correct answers, followed by constellations with one foreign-born parent (i.e. parents of 2.5th-generation students). In contrast, there were hardly any differences between parents of third-generation students and majority parents. Again, differences between groups differed in magnitude across different dimensions of knowledge.

4.2 Group Differences in Transition Behaviour

Without any controls, students from high-educated families were more likely, and students from low-educated families were less likely, to attend a grammar school compared to those from medium-educated families (model 1a, Table 2). Regarding immigrant background, no significant differences emerged for students from the Former Soviet Union or those of Turkish descent. However, students from other origin groups had a higher probability of attending grammar school (model 1b, Table 2). When considering generation status, students of the 2.5th and third generations showed a higher probability of attending a grammar school, while no significant differences were observed for first- and second-generation students (model 1c, Table 2). When academic performance at the end of grade 4 and other student and family characteristics were accounted for, the coefficients for parental education decreased substantially. At the same time, all origin and generation groups exhibited a significantly higher probability of attending a grammar school compared to majority students (models 2a and 2b, Table 2).

4.3 Parents' Knowledge and Its Relevance for Educational Inequalities

When incorporating parents' knowledge of the education system, educational inequalities by parental education decreased very slightly (model 3a, Table 2). This suggests that if students from low-educated families had parents with comparable knowledge levels, their probability of attending a grammar school would more closely resemble that of students from medium-educated families. Similarly, the

Table 2 Attendance at a grammar school predicted by student, family, and institutional characteristics. (Source: Own calculations based on NEPS-SC2)

	Model 1a	Model 1b	Model 1c	Model 2a	Model 2b	Model 3a	Model 3b
<i>Parental education (reference: medium-educated)</i>							
High-educated	0.23 ^{***} (0.02)	–	–	0.15 ^{***} (0.02)	0.15 ^{***} (0.02)	0.12 ^{***} (0.02)	0.13 ^{***} (0.02)
Low-educated	–0.22 ^{***} (0.04)	–	–	–0.13 ^{***} (0.03)	–0.14 ^{***} (0.03)	–0.10 ^{***} (0.03)	–0.10 ^{***} (0.03)
<i>Origin group (reference: majority)</i>							
Former Soviet Union	–	–0.00 (0.04)	–	0.08 [*] (0.03)	–	0.10 ^{**} (0.03)	–
Turkey	–	–0.04 (0.06)	–	0.11 [*] (0.06)	–	0.13 [*] (0.06)	–
Other	–	0.09 ^{***} (0.02)	–	0.08 ^{***} (0.02)	–	0.09 ^{***} (0.02)	–
<i>Generation status (reference: majority)</i>							
First and second generation	–	–	0.05 (0.03)	–	0.12 ^{***} (0.03)	–	0.14 ^{***} (0.03)
2.5th generation	–	–	0.08 ^{**} (0.03)	–	0.10 ^{***} (0.02)	–	0.11 ^{***} (0.02)
Third generation	–	–	0.06 [*] (0.02)	–	0.05 [*] (0.02)	–	0.05 [*] (0.02)

Table 2 (Continued)

	Model 1a	Model 1b	Model 1c	Model 2a	Model 2b	Model 3a	Model 3b
<i>Knowledge of the education system</i>							
Required grades grammar school	—	—	—	—	—	0.04** (0.02)	0.04** (0.02)
Binding track recommendation	—	—	—	—	—	−0.01 (0.02)	−0.00 (0.02)
Duration grammar school	—	—	—	—	—	0.06* (0.03)	0.06* (0.03)
Alternatives: <i>Fachhochschulreife</i>	—	—	—	—	—	0.05** (0.02)	0.05** (0.02)
Alternatives: dual vocational training	—	—	—	—	—	0.01 (0.02)	0.01 (0.02)
German states with high degree of bindingness (reference: states with nonbinding teacher recommendations)	—	—	—	−0.01 (0.02)	−0.01 (0.02)	−0.00 (0.02)	−0.00 (0.02)
<i>Average grades</i>							
	—	—	—	−0.29*** (0.01)	−0.29*** (0.01)	−0.28*** (0.01)	−0.28*** (0.01)
Older siblings in the household (reference: no older siblings)	—	—	—	−0.01 (0.02)	−0.01 (0.02)	−0.02 (0.02)	−0.02 (0.02)
<i>Female student</i>							
Constant	0.51*** (0.01)	0.58*** (0.01)	0.58*** (0.01)	−0.01 (0.01) 1.15*** (0.04)	−0.01 (0.01) 1.15*** (0.04)	−0.01 (0.01) 1.05*** (0.05)	−0.01 (0.01) 1.04*** (0.05)
R-squared	0.080	0.007	0.004	0.253	0.254	0.259	0.261
N	4,177	4,177	4,177	4,177	4,177	4,177	4,177

Regression coefficients with standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

advantage for students with high-educated parents can at least partly be attributed to knowledge; however, the effect operates in the opposite direction: If high-educated parents had less knowledge, their children's likelihood of attending a grammar school would approach that of children from medium-educated families, even when other factors were controlled for. Regarding migration-related inequalities, we observed a slight increase when parental knowledge was taken into account (models 3a and 3b, Table 2). This suggests that, assuming similar parental education levels and academic performance, students from the Former Soviet Union and those of Turkish descent – as well as both first- and second-generation and 2.5th-generation students – would have a higher probability of attending a grammar school than their majority-descent peers if their parents possessed the same level of knowledge. No significant changes were observed for students from other origins or for third-generation students (see also Table 3).

Three of the five knowledge items were significantly positively associated with the probability of attending a grammar school, namely knowledge of the required grades for attending a grammar school, the duration of grammar schools, and the alternative option (i.e. *Fachhochschulreife*). As KHB mediation analysis revealed, the level of mediation was highest for parents' knowledge of alternatives (i.e. *Fachhochschulreife*), followed by knowledge of the duration and prerequisites for attending a grammar school (Table 3).

However, the knowledge examined in this study had only a limited overall impact on secondary school choice and observed group differences, especially when considering the magnitude of changes in effect sizes and R^2 -values.

4.4 Moderation by Social and Immigrant Background

We found little evidence that the impact of knowledge varied across social groups (Table 4). The only notable interaction was between knowledge of dual vocational training and high parental education, suggesting that this specific type of knowledge is less relevant for students from high-educated families (model 4e). Additionally, we observed a significant coefficient for students from other origins regarding knowledge of grammar school duration (model 5c); however, given the heterogeneity of this group and the number of tested hypotheses, we refrain from a substantive interpretation.

Overall, our findings do not support systematic differential patterns in the role of knowledge across social groups. This conclusion remains unchanged even when social background is excluded from the analyses, addressing concerns that any potential effect might be prematurely masked (Table S.3, Online Appendix). Also, a similar pattern emerged when considering generation status instead of origin group (Table S.4, Online Appendix).

4.5 Moderation by the Institutional Context

To account for the moderating role of the institutional context, we calculated interactions between the degree of bindingness of teacher recommendations and the specific knowledge items (Table 5; see Table S.5 in the Online Appendix for generation

Table 3 Results from Karlson–Holm–Breen mediation analysis. (Source: Own calculations based on NEPS-SC2; first imputed dataset)

	Required grades grammar school	Binding track recommendation	Duration gram- mar school	Alternatives: <i>Fach- hochschule</i>	Alternatives: dual voca- tional training
Contribution of mediators to indirect effect in % ($\Delta\beta_{\text{Model 2a}} - \text{Model 3a}$ from Table 2)					
$\Delta\beta_{\text{Model 2a}} - \text{Model 3a}$ from Table 2					
<i>Highest parental education (reference: medium-educated)</i>					
High-educated	30.13	-3.57	17.56	48.31	7.56
Low-educated	21.15	-7.04	38.94	36.92	10.04
<i>Origin group (reference: majority)</i>					
Former Soviet Union	20.88	-7.15	33.54	47.18	5.54
Turkey	26.72	-12.11	33.91	37.83	13.65
Other	9.88	-19.23	45.02	52.30	12.03
Contribution of mediators to indirect effect in % ($\Delta\beta_{\text{Model 2b}} - \text{Model 3b}$ from Table 2)					
$\Delta\beta_{\text{Model 2b}} - \text{Model 3b}$ from Table 2					
<i>Generation status (reference: majority)</i>					
First and second generation	16.46	-2.84	42.19	34.95	9.24
2.5th generation	11.86	-4.43	26.27	58.26	8.04
Third generation	9.03	-6.58	41.00	38.65	17.90

* $p < 0.05$

Table 4 Attendance at a grammar school predicted by student, family, and institutional characteristics: differential effects of knowledge by social background and origin group. (Source: Own calculations based on NEPS-SC2)

	Model 4a	Model 4b	Model 4c	Model 4d	Model 4e	Model 5a	Model 5b	Model 5c	Model 5d	Model 5e
<i>Parental education (reference: medium-educated)</i>										
High-educated	0.16*** (0.02)	0.17*** (0.03)	0.12 (0.07)	0.16*** (0.03)	0.20*** (0.03)	0.14*** (0.02)	0.15*** (0.02)	0.14*** (0.02)	0.13*** (0.02)	0.14*** (0.02)
Low-educated	-0.11** (0.03)	-0.14** (0.05)	-0.12+ (0.07)	-0.11** (0.04)	-0.11** (0.04)	-0.12*** (0.03)	-0.13*** (0.03)	-0.12*** (0.03)	-0.11** (0.03)	-0.12*** (0.03)
<i>Origin group (reference: majority)</i>										
Former Soviet Union	0.09** (0.03)	0.08* (0.03)	0.09** (0.03)	0.10** (0.03)	0.09** (0.03)	0.07* (0.04)	0.12* (0.05)	0.17* (0.07)	0.10* (0.04)	0.07 (0.05)
Turkey	0.12* (0.06)	0.12* (0.06)	0.12* (0.06)	0.12* (0.06)	0.12* (0.06)	0.12+ (0.06)	0.12 (0.08)	0.14 (0.13)	0.11 (0.07)	0.09 (0.07)
Other	0.08*** (0.02)	0.09*** (0.02)	0.09*** (0.02)	0.09*** (0.02)	0.09*** (0.02)	0.10*** (0.02)	0.14*** (0.04)	0.22*** (0.06)	0.12*** (0.03)	0.11*** (0.03)
<i>Knowledge of the education system</i>										
Required grades grammar school	0.08** (0.02)	-	-	-	-	0.06** (0.02)	-	-	-	-
Binding track recommendation	-	0.02 (0.03)	-	-	-	-	0.04 (0.02)	-	-	-
Duration grammar school	-	-	0.07+ (0.04)	-	-	-	-	0.14*** (0.04)	-	-
Alternatives: Fachhochschulreife	-	-	-	0.07** (0.02)	-	-	-	-	0.07*** (0.02)	-

Table 4 (Continued)

	Model 4a	Model 4b	Model 4c	Model 4d	Model 4e	Model 5a	Model 5b	Model 5c	Model 5d	Model 5e
Alternatives: dual vocational training	—	—	—	—	0.05* (0.02)	—	—	—	—	0.03 (0.02)
<i>Interaction: knowledge x parental education</i>										
Required grades x high-educated	-0.05 (0.03)	—	—	—	—	—	—	—	—	—
Required grades x low-educated	-0.11 (0.10)	—	—	—	—	—	—	—	—	—
Binding track recommendation x high-educated	—	-0.02 (0.03)	—	—	—	—	—	—	—	—
Binding track recommendation x low-educated	—	0.03 (0.06)	—	—	—	—	—	—	—	—
Duration grammar school x high-educated	—	—	0.03 (0.07)	—	—	—	—	—	—	—
Duration grammar school x low-educated	—	—	0.00 (0.07)	—	—	—	—	—	—	—
<i>Fachhochschulreife</i> x high-educated	—	—	—	-0.03 (0.03)	—	—	—	—	—	—
<i>Fachhochschulreife</i> x low-educated	—	—	—	-0.01 (0.08)	—	—	—	—	—	—
Dual vocational training x high-educated	—	—	—	—	-0.07* (0.03)	—	—	—	—	—
Dual vocational training x low-educated	—	—	—	—	-0.03 (0.07)	—	—	—	—	—
<i>Interaction: knowledge x origin group</i>										

Table 4 (Continued)

	Model 4a	Model 4b	Model 4c	Model 4d	Model 4e	Model 5a	Model 5b	Model 5c	Model 5d	Model 5e
Required grades x Former Soviet Union	—	—	—	—	—	0.07 (0.07)	—	—	—	—
Required grades x Turkey	—	—	—	—	—	0.01 (0.14)	—	—	—	—
Required grades x other	—	—	—	—	—	−0.05 (0.04)	—	—	—	—
Binding track recommendation x Former Soviet Union	—	—	—	—	—	—	−0.06 (0.07)	—	—	—
Binding track recommendation x Turkey	—	—	—	—	—	—	0.02 (0.11)	—	—	—
Binding track recommendation x other	—	—	—	—	—	—	−0.08 ⁺ (0.04)	—	—	—
Duration grammar school x Former Soviet Union	—	—	—	—	—	—	—	−0.09 (0.08)	—	—
Duration grammar school x Turkey	—	—	—	—	—	—	—	−0.01 (0.14)	—	—
Duration grammar school x other	—	—	—	—	—	—	—	−0.17 [*] (0.07)	—	—
<i>Fachhochschulreife</i> x Former Soviet Union	—	—	—	—	—	—	—	—	0.01 (0.06)	—

Table 4 (Continued)

	Model 4a	Model 4b	Model 4c	Model 4d	Model 4e	Model 5a	Model 5b	Model 5c	Model 5d	Model 5e
<i>Fachhochschulreife</i> x Turkey	-	-	-	-	-	-	-	-	0.07 (0.11)	-
<i>Fachhochschulreife</i> x other	-	-	-	-	-	-	-	-	-0.06 ⁺ (0.04)	-
Dual vocational training x Former Soviet Union	-	-	-	-	-	-	-	-	-	0.03 (0.06)
Dual vocational training x Turkey	-	-	-	-	-	-	-	-	-	0.09 (0.10)
Dual vocational training x Other	-	-	-	-	-	-	-	-	-	-0.03 (0.04)
<i>German states with high degree of bindingness (reference: states with nonbinding teacher recommendations)</i>	-0.01 (0.02)	-0.01 (0.02)	-0.00 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.00 (0.02)	-0.01 (0.02)	-0.01 (0.02)
<i>Average grades</i>	-0.29 ^{***} (0.01)	-0.29 ^{***} (0.01)	-0.29 ^{***} (0.01)	-0.28 ^{***} (0.01)	-0.29 ^{***} (0.01)	-0.29 ^{***} (0.01)	-0.29 ^{***} (0.01)	-0.29 ^{***} (0.01)	-0.28 ^{***} (0.01)	-0.29 ^{***} (0.01)
<i>Older siblings in the household (reference: no older siblings)</i>	-0.02 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.02 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)
<i>Female</i>	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
<i>Constant</i>	1.13 ^{***} (0.04)	1.14 ^{***} (0.04)	1.09 ^{***} (0.05)	1.11 ^{***} (0.04)	1.12 ^{***} (0.04)	1.14 ^{***} (0.04)	1.12 ^{***} (0.04)	1.02 ^{***} (0.05)	1.11 ^{***} (0.04)	1.13 ^{***} (0.04)
<i>R-squared</i>	0.256	0.253	0.255	0.256	0.255	0.256	0.254	0.256	0.257	0.254
<i>N</i>	4,177	4,177	4,177	4,177	4,177	4,177	4,177	4,177	4,177	4,177

Regression coefficients with standard errors in parentheses. The Online Appendix includes additional analyses without considering parental education (models 6a-e, Table S.3) as well as considering generation status instead of origin group (Table S.4)

⁺ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5 Attendance at a grammar school predicted by student, family, and institutional characteristics: differential effects of knowledge by institutional context. (Source: Own calculations based on NEPS-SC2)

	Model 6a	Model 6b	Model 6c	Model 6d	Model 6e
<i>Parental education (reference: medium-educated)</i>					
High-educated	0.14*** (0.02)	0.15*** (0.02)	0.14*** (0.02)	0.13*** (0.02)	0.14*** (0.02)
Low-educated	-0.12*** (0.03)	-0.13*** (0.03)	-0.12*** (0.03)	-0.12*** (0.03)	-0.13*** (0.03)
<i>Immigrant background (reference: majority)</i>					
Former Soviet Union	0.09** (0.03)	0.08* (0.03)	0.09** (0.03)	0.09** (0.03)	0.08** (0.03)
Turkish descent	0.12* (0.06)	0.12* (0.06)	0.12* (0.06)	0.12* (0.06)	0.12* (0.06)
Other	0.08*** (0.02)	0.09*** (0.02)	0.09*** (0.02)	0.09*** (0.02)	0.09*** (0.02)
<i>Knowledge of the education system</i>					
Required grades grammar school	0.05*** (0.02)	-	-	-	-
Binding track recommendation	-	0.01 (0.02)	-	-	-
Duration grammar school	-	-	0.08* (0.04)	-	-
Alternatives: <i>Fachhochschulreife</i>	-	-	-	0.06** (0.02)	-
Alternatives: dual vocational training	-	-	-	-	0.03 (0.02)

Table 5 (Continued)

	Model 6a	Model 6b	Model 6c	Model 6d	Model 6e
German states with high degree of bindingness (<i>reference: states with nonbinding teacher recommendations</i>)	-0.00 (0.02)	-0.00 (0.04)	0.02 (0.05)	-0.01 (0.03)	0.01 (0.03)
<i>Interaction: knowledge x bindingness</i>					
Required grades x bindingness	-0.01 (0.03)	-	-	-	-
Binding track recommendation x bindingness	-	-0.01 (0.04)	-	-	-
Duration grammar school x bindingness	-	-	-0.03 (0.06)	-	-
<i>Fachhochschulreife x bindingness</i>					
Dual vocational training x bindingness	-	-	-	0.00 (0.03)	-
<i>Average grades</i>					
Older siblings in the household (<i>reference: no older siblings</i>)	-0.29*** (0.01)	-0.29*** (0.01)	-0.29*** (0.01)	-0.28*** (0.01)	-0.29*** (0.01)
<i>Female student</i>	-0.02 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)
<i>Constant</i>	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
	1.14*** (0.04)	1.14*** (0.04)	1.08*** (0.05)	1.12*** (0.04)	1.13*** (0.04)
<i>R-squared</i>	0.255	0.253	0.255	0.256	0.254
<i>N</i>	4,177	4,177	4,177	4,177	4,177

Regression coefficients with standard errors in parentheses. The Online Appendix includes additional analyses for generation status (Table S.5)

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

status instead of origin group). We found no significant interactions, indicating that parents' knowledge is important for educational decisions across different contexts, regardless of institutional constraints and their potential restrictions.

4.6 Sensitivity Checks

The reported results were robust against using an alternative indicator of students' social background, namely the Highest International Socio-Economic Index of Occupational Status (HISEI; Tables S.6a and S.6b, Online Appendix). Since parental education and HISEI were highly correlated, we opted against considering them simultaneously. Furthermore, it is possible that knowledge is particularly relevant for students in the middle to lower performance spectrum. To test this possibility, we divided the average grades into two groups using a median split and then calculated an interaction between the median group variable and the knowledge items. However, no evidence of heterogeneous effects was found in this context (Table S.7, Online Appendix). To ensure robustness, we also conducted sensitivity analyses using a summative score. This approach shifts the focus from examining the relevance of specific knowledge aspects to evaluating whether overall higher levels of knowledge relate to educational transitions. The results were consistent with those presented in the main analysis (Table S.8, Online Appendix).

5 Conclusion and Discussion

Our research provides insight into whether and how knowledge endowment may shape educational transitions and how knowledge differences contribute to social and migration-related inequalities. In line with previous research, we found that students from high-educated families as well as those from families with an immigrant history have a higher probability of attending a grammar school when central student and family characteristics such as students' grades were accounted for. When additionally considering parents' knowledge of the education system, we observed a very slight decrease in social inequalities, while migration-related inequalities very slightly increased. The latter finding concerned both origin group and generation group differences (i.e. the difference between students of Former Soviet Union and Turkish descent, as well as first- and second-generation students and 2.5th-generation students compared to majority peers). Hence, regarding the changing migration-related gaps, families with an immigration history possessing similar knowledge were more likely to opt for a grammar school. This finding at least partially contradicted our initial expectation that these families would make more ambitious educational decisions due to a lower knowledge endowment regarding alternative pathways. Moreover, the level of mediation was highest for parents' knowledge of alternatives (i.e. *Fachhochschulreife*), followed by knowledge of the duration and prerequisites for attending a grammar school. Furthermore, our findings suggest no differential effects by social or immigrant background, meaning that the role of parental knowledge in shaping educational decisions applied similarly across social and immigrant groups. Also, the association between knowledge and

attended secondary school type did not vary with the institutional context, namely whether teacher recommendations at the end of primary education were binding or whether parents could decide independently of this recommendation.

Broadly, we demonstrated that parents' knowledge of the education system mattered and contributed to group-specific inequalities in decision-making behaviour, albeit to a very limited extent. Our findings therefore support efforts to reduce group differences in knowledge endowment. This is underscored by the finding that the knowledge items were positively associated with the probability of attending a grammar school, with knowledge of alternatives showing the highest level of mediation. One possible explanation for this could be that parents who are aware of alternative qualifications, such as the *Fachhochschulreife*, may perceive the grammar school path as particularly valuable, recognising that it provides access to a broader range of opportunities, including pathways to universities and *Fachhochschulen*. In this way, broader knowledge of alternatives may not only facilitate more informed choices but may also shape parental inclinations towards grammar school attendance. However, our study did not explicitly examine the pathways through which knowledge becomes relevant to educational decisions. It remains open whether knowledge primarily affects the estimation of theoretical choice parameters, such as benefits, costs, and the probability of success, or whether it influences which educational alternatives are actively considered. In this context, our finding that the overall association between knowledge and school choice did not differ by social or immigrant background is particularly relevant. Based on theoretical considerations, we had anticipated that the impact of knowledge could be moderated by social and immigrant background, for example, due to factors such as status maintenance motives or socioeconomic constraints, immigrant optimism, and perceived discrimination. However, our results suggest that knowledge plays a largely uniform role across different groups. This raises the question of why these anticipated moderating effects did not materialise. One possible explanation is that knowledge itself represents a robust and independent resource in educational decision-making, which applies similarly across different social groups. Even if immigrant optimism or perceived discrimination influence educational aspirations, they may not necessarily alter how knowledge of the education system translates into school choices. Likewise, while socially privileged families may be more inclined to use their knowledge strategically, and disadvantaged families may weigh financial security more heavily, these tendencies do not appear to systematically weaken or amplify the role of knowledge in our analysis. At the same time, our study does not rule out the possibility that different types of knowledge matter more for different groups. For instance, immigrant families may particularly benefit from knowledge of access requirements, whereas socially disadvantaged families might be more influenced by knowledge of financial support options. Moreover, how knowledge impacts educational decision-making could also be shaped by cognitive processes and social mechanisms. For instance, decision-making strategies, such as reflective or intuitive reasoning (e.g. Kahneman 2003; Kroneberg 2014), and risk aversion could shape how families process and act upon the knowledge they have. Prior research suggests that socially less privileged families tend to exhibit greater risk aversion, leading them to favour educational paths perceived as safe (Breen et al. 2014; He and Hong 2018; Stocké 2007). How-

ever, given the absence of significant moderation effects in our analysis, it remains unclear whether systematic differences in cognitive decision-making processes exist between social groups or whether knowledge operates largely independently of such factors. Future research should examine whether specific dimensions of knowledge interact with decision-making strategies across social groups and under what conditions these interactions shape educational choices.

Our study is not without limitations. First, our sample is positively selective, with 60% of students attending a grammar school and 44% and 50% of students being from high- and medium-educated families, respectively (Table S.2, Online Appendix). Consequently, we likely underestimated the association between knowledge and educational decisions. Second, combined differentiation considering both origin group and generational status was not feasible due to case numbers (Table S.1, Online Appendix). This limitation may result in some imprecision, as generation status encompasses multiple origin groups, thereby aggregating groups that could differ in relevant mechanisms. As a result, processes specific to individual origin groups, such as those related to discrimination or aspirations, may not be as clearly captured (for similar argumentation, see, e.g., Hunkler and Schotte 2023; Olczyk et al. 2016a). Furthermore, we did not directly account for the specific education systems that parents experienced, particularly when they were foreign-born. Instead, we linked this factor to generation status, which introduces additional imprecision that should be addressed in future research. Third, we distinguished only whether children attended a grammar school or not. With the increasing prevalence of comprehensive schools integrating all three tracks – at least in some German states (for distributions in the period of interest to us, see *Autorengruppe Bildungsberichterstattung* 2016; Table D1–3A) – family decisions about specific school types with respect to secondary qualification levels are delayed, as all qualification levels are offered within a single school. However, with the data at hand, it was not possible to distinguish between comprehensive schools that include only the low and intermediate tracks and comprehensive schools that additionally offer the academic track. Fourth, with our data, we were unable to examine bidirectional relationships, such as how educational aspirations and preferences may shape information-seeking behaviour and vice versa. Thus, knowledge might also serve as a proxy for a family's ambitions. Future research could consider conducting surveys of these constructs at multiple time points to capture the processes of mutual influence between knowledge, ambitions, and transition behaviour. Fifth, the study considered only a subset of knowledge aspects. Specifically, we examined knowledge related to the transition and knowledge concerning alternatives. For alternatives, the study considered only whether parents knew about vocational training and the qualification level of *Fachhochschulreife*. The more qualitative aspects of these alternatives were not addressed, nor was knowledge of specific alternatives in secondary education, such as types of schools and/or (accessible) schools and the conditions that might be relevant to parents, such as pedagogical concepts, learning objectives, and learning climate. In this context, it might also be important to consider what in particular high-educated parents and immigrant families know about alternatives to grammar schools and how this knowledge shapes their transition decisions. In general, while substantial progress has been made in measuring academic achievement and per-

formance, (comprehensive) direct measures of knowledge of the education system remain relatively rare. In this context, we also want to mention other types of knowledge that might be of importance but, to our knowledge, have not attracted much attention so far. Taking different types of knowledge into account can be assumed to render decision-making situations more complex. Informal knowledge such as how to talk to teachers could be of importance here – a factor of which we know less (for an exception, see, e.g., Santelices et al. 2020). Another type of knowledge that might be of significance next to internalised knowledge itself is the confidence attached to this knowledge and the accompanying perception of reality and hence how well a person feels informed about these topics (Lareau and Weininger 2003; Harazd and van Ophuysen 2008; Hossler et al. 1991; Morgan 2010; Neumeyer and Will 2024). Such self-assessed or perceived level of knowledge could be relevant to decision-making, too: Feeling unfamiliar with, for example, specific school types could lead to a decision against a specific school type, even given some level of formal and informal knowledge. In this context, one could imagine that formal, informal, and self-assessed or perceived knowledge might be highly correlated with one another, as the degree of self-assessed or perceived knowledge could be associated with further information gathering or could also be dependent on preceding processes of information gathering. Furthermore, whether families prove able to correctly apply their knowledge in educational choice situations has not been represented in the survey instruments. A potential instrument to examine this aspect quantitatively might be the literacy concept (see, for example, Lusardi and Mitchell 2011, who focus on financial literacy). Additionally, we observed some variation between German states with binding versus nonbinding teacher recommendations in the share of correct answers to the knowledge items (Table S.9 in the Online Appendix). This raises the question of whether differences in parental knowledge of the education system are influenced by varying institutional settings and levels of information access across German states. Future research should consider these regional differences to investigate the extent to which regional factors impact educational knowledge and associated educational decisions. Finally, we cannot rule out that the knowledge indicators are confounded with other transition-relevant factors, such as social contacts and social embeddedness.

Overall, addressing the above-mentioned limitations in future research will provide a more nuanced understanding of the relation between (various types of) knowledge endowment and educational transitions among social groups. In this context, while we investigated the relevance of knowledge at the transition to secondary education, future research could consider the permeability of the German education system (for an overview, see Winkler 2020) and thus focus on the relevance of specific knowledge of potential (later) alternative paths. For example, it is possible – under certain conditions – to change between school types or, after successfully completing the intermediate track, to transition to the academic track in upper secondary education. Possibly, knowledge appears to be (more) central here. Furthermore, while we focused on social and migration-specific inequalities in attending a specific school type, future research should also consider the alignment between children's abilities and skills and the chosen school type or a specific secondary school (due to differences in the design of schools, instruction, and learning climate

among schools within the same school type) and examine group-specific differences in this regard. Considering this alignment and group differences in a potential mismatch would better reflect the consequences of transition decisions for children. This more qualitatively oriented perspective is supported by current Programme for International Student Assessment (PISA) findings, which indicate that performance heterogeneity at grammar schools has increased over the years (Diedrich et al. 2023, p. 80; Weis et al. 2019, p. 75).

In general, a greater understanding of the role of knowledge in decision-making processes can contribute to determine necessary adjustments for information campaigns, as well as their optimal timing for implementation in relation to the time of transitions (for evidence that information acquisition varies with the time remaining until decision, see, e.g., Daniel 2017; Giustinelli and Pavoni 2017; Bell 2009; Hossler et al. 1991). The finding that the relevance of knowledge did not vary with the bindingness of teacher recommendations suggests that structural differences between German states might not uniformly shape the role of knowledge in educational decisions. However, this does not necessarily imply that these structural differences are insignificant. Rather, it is possible that different types of knowledge play a varying role depending on the institutional context, which may not have been fully captured by our measures. For example, in states with binding recommendations, knowledge of appeal procedures or alternative pathways to higher education (e.g. vocational routes leading to university entrance qualifications) may be particularly relevant. In contrast, in states with nonbinding recommendations, knowledge of school reputation or admission criteria might play a greater role in shaping parental decisions. This highlights the need for further research to examine how specific aspects of knowledge interact with institutional constraints and shape educational transitions. The aim here should be to provide general information on the subsequent alternatives and later options, as well as on the locally available schools and key features of these (such as workload outside of school and school-specific extracurricular opportunities) at a low threshold.

Supplementary Information The online version of this article (<https://doi.org/10.1007/s11577-025-01018-9>) contains supplementary material, which is available to authorized users.

Funding We gratefully acknowledge funding support from the Deutsche Forschungsgemeinschaft (DFG, OL 720/1-1) and the College for Interdisciplinary Educational Research (CIDER).

Funding Open Access funding enabled and organized by Projekt DEAL.

Data Availability The data used are available for research at the NEPS Research Data Centre in Bamberg, Germany.

Code Availability The code for the analysis is available on the Open Science Framework: https://osf.io/rwpcy/?view_only=e6a93054a59046dba5917ed98d7cf005.

Conflict of interest M. Olczyk, A. Daniel, H. Glinka, and K. Werner declare that they have no competing interests.

Open Access Dieser Artikel wird unter der Creative Commons Namensnennung 4.0 International Lizenz veröffentlicht, welche die Nutzung, Vervielfältigung, Bearbeitung, Verbreitung und Wiedergabe in jeglichem Medium und Format erlaubt, sofern Sie den/die ursprünglichen Autor(en) und die Quelle ordnungsgemäß nennen, einen Link zur Creative Commons Lizenz beifügen und angeben, ob Änderungen

vorgenommen wurden. Die in diesem Artikel enthaltenen Bilder und sonstiges Drittmaterial unterliegen ebenfalls der genannten Creative Commons Lizenz, sofern sich aus der Abbildungslegende nichts anderes ergibt. Sofern das betreffende Material nicht unter der genannten Creative Commons Lizenz steht und die betreffende Handlung nicht nach gesetzlichen Vorschriften erlaubt ist, ist für die oben aufgeführten Weiterverwendungen des Materials die Einwilligung des jeweiligen Rechteinhabers einzuholen. Weitere Details zur Lizenz entnehmen Sie bitte der Lizenzinformation auf <http://creativecommons.org/licenses/by/4.0/deed.de>.

References

- Allison, Paul D., Richard A. Williams and Paul von Hippel. 2020. Better predicted probabilities from linear probability models. With applications to multiple imputation. https://www.stata.com/meeting/us20/slides/us20_Allison.pdf.
- Autorengruppe Bildungsberichterstattung. 2016. *Bildung in Deutschland: ein indikatorengestützter Bericht mit einer Analyse zu Bildung und Migration*. Bielefeld: wbv Media.
- Bach, Maximilian. 2021. Heterogeneous responses to school track choice: evidence from the repeal of binding track recommendations. *ZEW Discussion Paper* 21-104. Mannheim.
- Becker, Rolf. 2000. Klassenlage und Bildungsentscheidungen. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 52:450–474.
- Becker, Rolf. 2024. Social classes, school performance, subjective expected utilities, and educational decisions. *Soziale Welt* 75:165–197.
- Becker, Birgit, and Cornelia Gresch. 2016. Bildungsaspirationen in Familien mit Migrationshintergrund. In *Ethnische Ungleichheiten im Bildungsverlauf: Mechanismen, Befunde, Debatten*, eds. Claudia Diehl, Christian Hunkler and Cornelia Kristen, 73–115. Wiesbaden: Springer Fachmedien.
- Birgit Becker, Cornelia Gresch and Thomas Zimmermann. 2023. Are they still aiming high? The development of educational aspirations of lower secondary school students with immigrant backgrounds in Germany. *International Migration Review* 57:1216–1248.
- Becker, Michael, Marko Neumann and Hanna Dumont. 2017. Recent developments in school tracking practices in Germany: an overview and outlook on future trends. *ORBIS SCHOLAE* 10:9–25.
- Bell, Courtney A. 2009. All choices created equal? The role of choice sets in the selection of schools. *Peabody Journal of Education* 84:191–208.
- Ben-Porath, Sigal R. 2009. School choice as a bounded ideal. *Journal of Philosophy of Education* 43:527–544.
- Berger, Peter L., and Thomas Luckmann. 2016. *Die gesellschaftliche Konstruktion der Wirklichkeit. Eine Theorie der Wissenssoziologie*, vol. 6623. 26. Auflage. Frankfurt a. M.: Fischer-Taschenbuch-Verl.
- Blossfeld, Hans-Peter, and Hans-Günther Roßbach, eds. 2019. *Education as a lifelong process—The German National Educational Panel Study (NEPS)*. Wiesbaden: Springer VS.
- Borghans, Lex, Ron Diris, Wendy Smits and Jannes de Vries. 2019. The long-run effects of secondary school track assignment. *PloS one* 14:e0215493.
- Boudin, Raymond. 1974. *Education, opportunity, and social inequality. Changing prospects in Western society*. New York: Wiley.
- Bourdieu, Pierre, and Jean-Claude Passeron. 1970. *Reproduction: Elements for a theory of the education system*. Paris: Éditions de Minuit.
- Bourdieu, Pierre, and Loïc Wacquant. 1992. *An invitation to reflexive sociology*. Chicago: University of Chicago Press.
- Breen, Richard, and John H. Goldthorpe. 1997. Explaining educational differentials. Towards a formal rational action theory. *Rationality and Society* 9:275–305.
- Breen, Richard, Herman G. van de Werfhorst and Mads M. Jaeger. 2014. Deciding under doubt: a theory of risk aversion, time discounting preferences, and educational decision-making. *European Sociological Review* 30:258–270.
- Büchler, Theresa. 2016. Schulstruktur und Bildungsungleichheit: Die Bedeutung von bundeslandspezifischen Unterschieden beim Übergang in die Sekundarstufe I für den Bildungserfolg. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 68:53–87.
- Clemens, Iris. 2021. Wissen und der homo connectus. Überlegungen zu einem Grundbegriff der Erziehungswissenschaft aus einer relationalen Perspektive. In *Denken in wechselseitiger Beziehung. Das Spectaculum relationaler Ansätze in der Erziehungswissenschaft*, erste Auflage, eds. Malte Ebner von Eschenbach and Ortfried Schäffter, 50–70. Weilerswist: Velbrück Wissenschaft.

- Corcoran, Sean, Jennifer Jennings, Sarah Cohodes and Carolyn Sattin-Bajaj. 2018. *Leveling the playing field for high school choice: results from a field experiment of informational interventions*. NBER Working Paper Series No. 24471. Cambridge, MA: National Bureau of Economic Research (NBER).
- Daniel, Annabell. 2017. *Sekundäre Disparitäten und ihre Veränderung am Übergang von der Schule zur Hochschule*. Dissertation. Berlin.
- Davies, Peter, Neil M. Davies and Tian Qiu. 2017. Information and choice of A-level subjects: a cluster randomised controlled trial with linked administrative data. *British Educational Research Journal* 43:647–670.
- Diedrich, Jennifer, Frank Reinhold, Aiso Heinze and Kristina Reiss. 2023. Mathematische Kompetenz in PISA 2022. Von Leistungsunterschieden und ihren Entwicklungen. In *PISA 2022. Analyse der Bildungsergebnisse in Deutschland*, 1. Auflage, eds. Doris Lewalter, Jennifer Diedrich, Frank Goldhammer, Olaf Köller and Kristina Reiss, 53–86. Münster: Waxmann.
- Diehl, Claudia, Christian Hunkler and Cornelia Kristen (eds.). 2016a. *Ethnische Ungleichheiten im Bildungsverlauf*. Wiesbaden: VS Verlag für Sozialwissenschaften.
- Diehl, Claudia, Christian Hunkler and Cornelia Kristen. 2016b. Ethnische Ungleichheiten im Bildungsverlauf. Eine Einführung. In *Ethnische Ungleichheiten im Bildungsverlauf*, eds. Claudia Diehl, Christian Hunkler, and Cornelia Kristen, 3–31. Wiesbaden: VS Verlag für Sozialwissenschaften.
- Diehl, Claudia, Elisabeth Liebau and Peter Mühlau. 2021. How often have you felt disadvantaged? Explaining perceived discrimination. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 73:1–24.
- Dinkelman, Taryn, and Claudia Martínez A. 2014. Investing in schooling in Chile: the role of information about financial aid for higher education. *The Review of Economics and Statistics* 96:244–257.
- Ditton, Hartmut. 2007. Schulübertritte, Geschlecht und soziale Herkunft. In *Kompetenzaufbau und Laufbahnen im Schulsystem. Ergebnisse einer Längsschnittuntersuchung an Grundschulen*, ed. Hartmut Ditton, 63–87. Münster, New York, München, Berlin: Waxmann.
- Dollmann, Jörg. 2010. *Türkischstämmige Kinder am ersten Bildungsübergang: primäre und sekundäre Herkunftseffekte*. 1. Aufl. Wiesbaden: VS Verlag für Sozialwissenschaften.
- Dollmann, Jörg. 2011. Verbindliche und unverbindliche Grundscholempfehlungen und soziale Ungleichheiten am ersten Bildungsübergang. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 63:595–621.
- Dollmann, Jörg. 2016a. Der Übergang von der Primar- in die Sekundarstufe. In *Ethnische Ungleichheiten im Bildungsverlauf*, eds. Claudia Diehl, Christian Hunkler and Cornelia Kristen, 517–542. Wiesbaden: VS Verlag für Sozialwissenschaften.
- Dollmann, Jörg. 2016b. Less choice, less inequality? A natural experiment on social and ethnic differences in educational decision-making. *European Sociological Review* 32:203–215.
- Dollmann, Jörg. 2017. Positive choices for all? SES- and gender-specific premia of immigrants at educational transitions. *Research in Social Stratification and Mobility* 49:20–31.
- Dollmann, Jörg. 2021. Ethnic inequality in choice- and performance-driven education systems: a longitudinal study of educational choices in England, Germany, the Netherlands, and Sweden. *The British Journal of Sociology* 72:974–991.
- Dräger, Jascha, Thorsten Schneider, Melanie Olczyk, Anne Solaz, Alexandra Sheridan, Elizabeth Washbrook, Valentina Perinetti Casoni, Sarah J. Kwon and Jane Waldfogel. 2023. The relevance of tracking and social school composition for growing achievement gaps by parental education in lower secondary school: a longitudinal analysis in France, Germany, the United States, and England. *European Sociological Review* 40:964–980.
- Dumont, Hanna, Kai Maaz, Marko Neumann and Michael Becker. 2014. Soziale Ungleichheiten beim Übergang von der Grundschule in die Sekundarstufe I. Theorie, Forschungsstand, Interventions- und Fördermöglichkeiten. *Zeitschrift für Erziehungswissenschaft* 17. Suppl.24:141–165.
- Dumont, Hanna, Denise Klinge and Kai Maaz. 2019. The many (subtle) ways parents game the system: mixed-method evidence on the transition into secondary-school tracks in Germany. *Sociology of Education* 92:199–228.
- Eckhardt, Thomas. 2017. *The education system in the Federal Republic of Germany 2015/2016. A description of the responsibilities, structures and developments in education policy for the exchange of information in Europe*. KMK: Bonn.
- Erikson, Robert, and Jan O. Jonsson, eds. 1996. *Can education be equalized? The Swedish case in comparative perspective*. Westview Press: Stockholm.
- Esser, Hartmut. 2001. *Soziologie. Spezielle Grundlagen, Band 6: Sinn und Kultur*. Frankfurt a. M., New York: Campus Verlag.
- Esser, Hartmut, and Kerstin Hoenig. 2018. Leistungsgerechtigkeit und Bildungsungleichheit. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 70:419–447.

- Ferrara, Alessandro, and Zerrin Salikutluk. 2025. Ambitious, misaligned, or uncertain? The occupational and educational aspirations of immigrant-origin youth in Germany. *Journal of Ethnic and Migration Studies* 51(5):1270–1293.
- Forster, Andrea G. 2021. *Navigating educational institutions: mechanisms of educational inequality and social mobility in different educational systems*. Dissertation, Amsterdam.
- Forster, Andrea G., and Herman G. van de Werfhorst. 2019. Navigating institutions: parents' knowledge of the educational system and students' success in education. *European Sociological Review* 69:1–17.
- Giustinelli, Pamela, and Nicola Pavoni. 2017. The evolution of awareness and belief ambiguity in the process of high school track choice. *Review of Economic Dynamics* 25:93–120.
- Gresch, Cornelia, Jürgen Baumert and Kai Maaz. 2009. Empfehlungstatus, Übergangsempfehlung und der Wechsel in die Sekundarstufe I: Bildungsentscheidungen und soziale Ungleichheit. In *Bildungsentscheidungen*, eds. Jürgen Baumert, Kai Maaz und Ulrich Trautwein, 230–256. Wiesbaden: VS Verlag für Sozialwissenschaften.
- Gresch, Cornelia, Jürgen Baumert and Kai Maaz. 2010. Empfehlungstatus, Übergangsempfehlung und der Wechsel in die Sekundarstufe I: Bildungsentscheidungen und soziale Ungleichheit. In *Bildungsentscheidungen*, eds. Jürgen Baumert, Kai Maaz und Ulrich Trautwein, 230–256. Wiesbaden: VS Verlag für Sozialwissenschaften.
- Hadjar, Andreas. 2019. Educational expansion and inequalities: how did inequalities by social origin and gender decrease in modern industrial societies? In *Research Handbook on the Sociology of Education*, ed. Rolf Becker, 173–192. Cheltenham and Northampton, MA: Edward Elgar Publishing.
- Harazd, Bea, and Stefanie van Ophuysen. 2008. Was bedingt die Wahl eines nicht empfohlenen höheren Bildungsgangs? *Zeitschrift für Erziehungswissenschaft* 11:626–647.
- Hastings, Justine S., Christopher A. Neilson, Anely Ramirez and Seth D. Zimmerman. 2016. (Un)informed college and major choice: evidence from linked survey and administrative data. *Economics of Education Review* 51:136–151.
- He, Tai-Sen, and Fuhai Hong. 2018. Risk breeds risk aversion. *Experimental Economics* 21:815–835.
- Helbig, Marcel, and Rita Nikolai. 2015. *Die Unvergleichbaren. Der Wandel der Schulsysteme in den deutschen Bundesländern seit 1949*. Bad Heilbrunn: Verlag Julius Klinkhardt.
- Hillmert, Steffen, and Marita Jacob. 2010. Selections and social selectivity on the academic track: a life-course analysis of educational attainment in Germany. *Research in Social Stratification and Mobility* 28:59–76.
- Hossler, D., and K. Gallagher. 1987. Studying student college choice: a three-phase model and the implications for policymakers. *College and University* v62 n3 p207–21:207–221.
- Hossler, Don, Jack Schmidt and Gary Bouse. 1991. Family knowledge of postsecondary costs and financial aid. *Journal of Student Financial Aid* 21:4–17.
- Hufnagl, Julia. 2024. Intersectional discrimination in the transition to vocational education and training. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie* 56:37–54.
- Hunkler, Christian, and Kristin Schotte. 2023. Educational integration by the third generation? Placement and academic achievement of students with immigrant background in Germany. *Zeitschrift für Erziehungswissenschaft* 26:373–401.
- Jähnen, Stefanie, and Marcel Helbig. 2015. Der Einfluss schulrechtlicher Reformen auf Bildungsungleichheiten zwischen den deutschen Bundesländern. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 67:539–571.
- Jonsson, Jan O., and Frida Rudolphi. 2011. Weak performance—strong determination: school achievement and educational choice among children of immigrants in Sweden. *European Sociological Review* 27(4):487–508.
- Jäger, Mads Meier. 2022. Cultural capital and educational inequality: an assessment of the state of the art. In *Handbook of Sociological Science*, eds. Klarita Gërkhani, Nan de Graaf and Werner Raub, 121–134: Edward Elgar Publishing.
- Kahneman, Daniel. 2003. Maps of bounded rationality. Psychology for behavioral economics. *American Economic Review* 93:1449–1475.
- Kao, Grace, and Marta Tienda. 1995. Optimism and achievement: the educational performance of immigrant youth. *Social Science Quarterly* 76:1–19.
- Kessel, Dany. 2018. *School choice, school performance and school segregation*. Dissertation, Stockholm.
- Kohler, Ulrich, Kristian B. Karlson and Anders Holm. 2011. Comparing coefficients of nested nonlinear probability models. *The Stata Journal* 11:420–438.
- Kretschmer, David. 2019. Explaining native-migrant differences in parental knowledge about the German educational system. *International Migration* 57:281–297.

- Kristen, Cornelia. 2005. *School choice and ethnic school segregation. Primary school selection in Germany*, Bd. 437. Münster: Waxmann.
- Kristen, Cornelia. 2008. Primary school choice and ethnic school segregation in German elementary schools. *European Sociological Review* 24:495–510.
- Kroneberg, Clemens. 2014. Frames, scripts, and variable rationality: an integrative theory of action. In *Analytical Sociology*, ed. Gianluca Manzo, 95–123. Chichester, United Kingdom: Wiley.
- Lämmchen, Ronja, Anna Bachsleitner and Josefine Lüh. 2022. Soziale Ungleichheit des Bildungserwerbs in der schulischen Bildung. In *Soziale Ungleichheit des Bildungserwerbs von der Vorschule bis zur Hochschule. Eine Forschungssynthese zwei Jahrzehnte nach PISA*, 1st ed., eds. Anna Bachsleitner, Ronja Lämmchen and Kai Maaz, 95–140. Münster, New York: Waxmann.
- Lareau, Annette. 2015. Cultural knowledge and social inequality. *American Sociological Review* 80:1–27.
- Lareau, Annette, and Elliot B. Weininger. 2003. Cultural capital in educational research. A critical assessment. *Theory and Society* 32:567–606.
- Lievore, Ilaria, and Moris Triventi. 2022. Social background and school track choice: An analysis informed by the rational choice framework. *Acta Sociologica* 65:111–129.
- Lusardi, Annamaria, and Olivia Mitchell. 2011. Financial literacy around the world: an overview. *Journal of Pension Economics and Finance* 10(4):497–508.
- Maaz, Kai, and Stefan Kühne. 2020. Flickenteppich Sekundarschulsystem? Eine Analyse der Schulstrukturen der 16 Länder. *Pädagogik* 2(20):43–48.
- Morgan, Julie Margetta. 2010. *The role of financial information in college decision making: implications for federal higher education policy*. Doctoral dissertation, Boston College.
- Nauck, Bernhard, and Vivian Lotter. 2016. Bildungstransmission in Migrantenfamilien. In *Ethnische Ungleichheiten im Bildungsverlauf*, eds. Claudia Diehl, Christian Hunkler and Cornelia Kristen, 117–155. Wiesbaden: VS Verlag für Sozialwissenschaften.
- NEPS Network. 2022. *National Educational Panel Study, Scientific Use File of Starting Cohort Kindergarten*. Bamberg: Leibniz Institute for Educational Trajectories, National Educational Panel Study.
- Neugebauer, Martin. 2010. Bildungsungleichheit und Grundschulempfehlung beim Übergang auf das Gymnasium: Eine Dekomposition primärer und sekundärer Herkunftseffekte. *Zeitschrift für Soziologie* 39:202–214.
- Neugebauer, Martin, David Reimer, Steffen Schindler and Volker Stocké. 2013. Inequalities in transitions to secondary school and tertiary education in Germany. In *Determined to succeed?* Ed. Michelle Jackson, 56–88. Stanford, CA: Stanford University Press.
- Neumeyer, Sebastian, and Gisela Will. 2024. Secondary ethnic effects in the transition to higher education in Germany and their explanations. *Research in Higher Education* 65:1514–1539.
- Neumeyer, Sebastian, Melanie Olczyk, Miriam Schmaus and Gisela Will. 2022. Reducing or widening the gap? How the educational aspirations and expectations of Turkish and majority families develop during lower secondary education in Germany. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 74:259–285.
- Olczyk, Melanie, and Gisela Will. 2019. *Measuring knowledge about the German education system in NEPS*. NEPS Survey Paper No. 56. Bamberg: Leibniz Institute for Educational Trajectories, National Educational Panel Study.
- Olczyk, Melanie, Julian Seuring, Gisela Will and Sabine Zinn. 2016a. Migranten und ihre Nachkommen im deutschen Bildungssystem: Ein aktueller Überblick. In *Ethnische Ungleichheiten im Bildungsverlauf*, eds. Claudia Diehl, Christian Hunkler and Cornelia Kristen, 33–70. Wiesbaden: Springer VS.
- Olczyk, Melanie, Gisela Will and Cornelia Kristen. 2016b. *Immigrants in the NEPS: identifying generation status and group of origin*. NEPS Working Papers No. 4. Bamberg: Leibniz Institute for Educational Trajectories, National Educational Panel Study.
- Olson, Lorayn, and Rachel A. Rosenfeld. 1984. Parents and the process of gaining access to student financial aid. *The Journal of Higher Education* 55:455.
- Pfeffer, Fabian T. 2008. Persistent inequality in educational attainment and its institutional context. *European Sociological Review* 24:543–565.
- Pietsch, Marcus, and Tobias C. Stubbe. 2007. Inequality in the transition from primary to secondary school: school choices and educational disparities in Germany. *European Educational Research Journal* 6:424–445.
- Rageth, Ladina, and Aranya Sritharan. 2022. *Decision-making under information asymmetry: How do misinformation and uncertainty affect tertiary education choices?* CES Working Paper No. 12.
- Relikowski, Ilona, Thorsten Schneider and Hans-Peter Blossfeld. 2010. Primäre und sekundäre Herkunftseffekte beim Übergang in das gegliederte Schulsystem: Welche Rolle spielen soziale Klasse und Bildungsstatus in Familien mit Migrationshintergrund? In *Komparative empirische Sozialforschung*,

- eds. Tilo Beckers, Klaus Birkelbach, Jörg Hagenah and Ulrich Rosar, 143–167. Wiesbaden: VS Verlag für Sozialwissenschaften.
- Rowley, Jennifer. 2007. The wisdom hierarchy: representations of the DIKW hierarchy. *Journal of Information Science* 33:163–180.
- Rubin, Donald B. 1987. *Multiple imputation for nonresponse in surveys*. New York: Wiley.
- Salikutluk, Zerrin. 2016. Why do immigrant students aim high? Explaining the aspiration–achievement paradox of immigrants in Germany. *European Sociological Review* 32:581–592.
- Santelices, Maria V., Magdalena Zarhi, Catherine Horn, Ximena Catalán and Alicia Ibáñez. 2020. Information sources and transition to higher education: Students, teachers and school counselors' perspectives. *International Journal of Educational Research* 103:101617.
- Schindler, Steffen, Eyal Bar-Haim, Carlo Barone, Jesper Fels Birkelund, Vikki Boliver, Queralto Capsada-Munsech, Jani Erola, Marta Facchini, Yariv Feniger, Laura Heiskala, Estelle Herbaut, Mathieu Ichou, Kristian B. Karlson, Corinna Kleinert, David Reimer, Claudia Traini, Moris Triventi and Louis-André Vallet. 2024. Educational tracking and social inequalities in long-term labor market outcomes: Six countries in comparison. *International Journal of Comparative Sociology* 65:39–62.
- Schneider, Mark, Paul E. Teske and Melissa Marschall. 2002. *Choosing schools. Consumer choice and the quality of American schools*. Princeton, N.J., Oxford: Princeton University Press.
- Segeritz, Michael, Oliver Walter and Petra Stanat. 2010. Muster des schulischen Erfolgs von jugendlichen Migranten in Deutschland: Evidenz für segmentierte Assimilation? *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 62:113–138.
- Spangenberg, Heike, and Heiko Quast. 2023. Zum Einfluss vorgelagerter Bildungspfade auf die Studienentscheidung. In *Vielfalt von hochschulischen Bildungsverläufen*. Higher Education Research and Science Studies, eds. Jessica Ordemann, Frauke Peter, and Sandra Buchholz, 21–46. Wiesbaden: Springer Fachmedien Wiesbaden.
- Stocké, Volker. 2007. Explaining educational decision and effects of families' social class position: an empirical test of the Breen Goldthorpe Model of Educational Attainment. *European Sociological Review* 23:505–519.
- Triventi, Moris, Nevena Kulic, Jan Skopek and Hans-Peter Blossfeld. 2016. Secondary school systems and inequality of educational opportunity in contemporary societies. In *Models of secondary education and social inequality. An international comparison*, eds. Hans-Peter Blossfeld, Sandra Buchholz, Jan Skopek, and Moris Triventi, 3–24. Northampton, MA: Edward Elgar Pub.
- Weis, Mirjam, Anastasia Doroganova, Carolin Hahnel, Michael Becker-Mrotzek, Thomas Lindauer, Cordula Artelt and Kristina Reiss. 2019. Lesekompetenz in PISA 2018 – Ergebnisse in einer digitalen Welt. In *PISA 2018. Grundbildung im internationalen Vergleich*, eds. Kristina Reiss, Mirjam Weis, Eckhard Klieme and Olaf Köller, 47–80. Münster: Waxmann.
- White, Ian R., Patrick Royston and Angela M. Wood. 2011. Multiple imputation using chained equations: Issues and guidance for practice. *Statistics in Medicine* 30:377–399.
- Winkler, Oliver. 2020. Mehr Chancengleichheit durch mehr Durchlässigkeit? In *Individualisierte Übergänge*, eds. Sven Thiersch, Mirja Silkenbeumer and Julia Labede, 35–59. Wiesbaden: Springer Fachmedien Wiesbaden.
- Zimmermann, Thomas. 2019. Social influence or rational choice? Two models and their contribution to explaining class differentials in student educational aspirations. *European Sociological Review* 36:65–81.
- Zimmermann, Thomas. 2024. Explaining differences in decision-relevant educational knowledge between parents with and without an immigrant background in Germany. *Research in Social Stratification and Mobility* 90:1008.

Melanie Olczyk Dr. rer. pol., Research associate (postdoctoral fellow) in the junior research group Educational Integration of Refugee Children and Youth in Germany (EDIREG) at Martin Luther University Halle-Wittenberg. Fields of research: educational sociology and educational inequality, migration and integration, comparative analysis of contemporary societies. Selected publications: High realistic aspirations—Do normative pressures overthrow rational calculations? Applying the model of frame selection to the educational aspirations of immigrant and majority students in Germany. *Rationality and Society* 36, 2024 (with M. Schmaus, S. Neumeyer and G. Will); Teacher judgements and gender achievement gaps in primary education in England, Germany, and the US. *Social Science Research* 116, 2023 (with S. Gentrup, T. Schneider, A. Volodina, V. Perinetti Casoni, E. Washbrook, S. J. Kwon and J. Waldfogel).

Annabell Daniel Dr. phil., Professor for pedagogy with a focus on empirical educational research at Ludwig-Maximilians-Universität München. Fields of research: social disparities, educational transitions, higher education research. Selected publications: Higher education non-completion, employers, and labor market integration: experimental evidence. *Social Science Research* 105, 2022 (with M. Neugebauer); The role of perceived benefits, costs and probability of success in students' plans for higher education. A quasi-experimental validation of rational choice theory. *European Sociological Review* 34, 2018 (with R. Watermann).

Hannah Glinka MA Sociology, Doctoral researcher at the Martin Luther University Halle-Wittenberg. Fields of research: sociology of education and migration. Publication: Mathematics and science competences of first-generation students with and without a refugee background: What role does the socio-economic and ethno-lingual composition of school classes play? *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 76, 2024 (with O. Winkler).

Katharina Werner Dr. oec. publ., Professor at the department of economics at Business School Pforzheim. Fields of research: economics of education, educational decision-making, educational inequality. Selected publications: The e-word—on the public acceptance of experiments. *Economic Letters* 235, 2024 (with M. Fischer, E. Grewenig, P. Lergetporer et al.); Does ignorance of economic returns and costs explain the educational aspiration gap? Representative evidence from adults and adolescents. *Economica* 88, 2021 (with P. Lergetporer and L. Wößmann).