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Is the relation between family background and obtaining an *Abitur* mediated by malleable motivational variables?

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Abstract The present study examined the relation between family background variables, motivational factors, and educational attainment (defined as obtaining the highest form of school-leaving certificate in Germany—the *Abitur*) among students who attended *Gymnasium*. A multifaceted concept of both family background variables (parental educational level, parental occupational status, and immigrant background) and motivational factors (expectation of success, value of education, effort, and performance-oriented motivation) was applied. Structural equation models were estimated using longitudinal data from the German National Educational Panel Study (NEPS; $N = 5409$ students). The results showed that the relation between family background variables and obtaining an *Abitur* was smaller when motivational factors were included. The mediation model results suggest that focusing on breaking the link between parental education and students' expectations for success would be helpful for reducing educational inequality.

Keywords Educational inequality · Educational attainment · Motivation · Socioeconomic status

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Wird der Zusammenhang zwischen familiärer Herkunft und Erreichen des Abiturs durch veränderbare motivationale Variablen mediiert?

Zusammenfassung Vorliegend wurde der Zusammenhang zwischen familiären Herkunftsvariablen, motivationalen Einflussfaktoren und dem Bildungserfolg für Schülerinnen und Schüler untersucht. Bildungserfolg wurde durch das Erreichen des Abiturs definiert. Dabei wurden sowohl die familiäre Herkunft (elterliche Bildung, elterlicher Berufsstatus, Migrationshintergrund) als auch motivationale Einflussfaktoren (Erfolgserwartungen, Wert von Bildung, Anstrengungsbereitschaft, leistungsbezogene Motivation) als mehrdimensionale Konzepte berücksichtigt. Mit längsschnittlichen Daten des Nationalen Bildungspanels (NEPS; $N=5409$ Schülerinnen und Schülern) wurden Strukturgleichungsmodelle berechnet. Die Ergebnisse zeigten, dass der Einfluss familiärer Herkunftsmerkmale auf den erreichten Bildungsabschluss geringer war, wenn gleichzeitig motivationale Einflussfaktoren berücksichtigt wurden. Aus dem Mediationsmodell lässt sich ableiten, dass insbesondere das Aufbrechen des Zusammenhangs zwischen der elterlichen Bildung und den Erfolgserwartungen der Schülerinnen und Schüler in den Blick genommen werden sollte, um Bildungsungleichheit zu verringern.

Schlüsselwörter Bildungserfolg · Bildungsungleichheit · Motivation · Sozioökonomischer Hintergrund

1 Introduction

A person's level of educational attainment serves as a crucial foundation for their further life course. Education is closely related to income, and a higher level of educational attainment—especially tertiary education—can reduce unemployment (Stephens et al. 2015). In Germany, enrollment in tertiary education is largely conditional upon obtaining the highest form of school-leaving certificate—the *Abitur*. Other forms of school-leaving certificates typically allow graduates to enroll in vocational training. Moreover, an increasing share of jobs requires a university degree (Jury et al. 2017). To prevent educational inequality, students with equal academic performance should have equal opportunity to achieve higher levels of education, as educational inequality is associated with a waste of human potential and should therefore be avoided (Ehmke and Jude 2010).

Contrary to this premise, however, empirical research has shown that educational attainment depends on factors other than school performance. For example, students' educational attainment is related to their family background (Jury et al. 2017). This is concerning, because it means that students with different backgrounds have unequal opportunities to attain the same level of education. This effect also persists when controlling for academic performance (OECD 2019).

Additional to family background (FB), different aspects of motivation have emerged as important for improving students' educational outcomes, such as expectation of success and performance-related motivation (Wang and Finch 2018; Wiederkehr et al. 2015). While students' family background is relatively fixed,

motivation is malleable (Kriegbaum and Spinath 2016; Richardson and Abraham 2009). Therefore, it is assumed that enhancing motivation can contribute to reducing educational inequality (Wang and Finch 2018). The present study investigated this underlying assumption—that the impact of FB on educational attainment (defined as obtaining an *Abitur*) is mediated through malleable motivational factors.

While previous studies have mainly focused on (domain-specific) performance and motivation, we took a more general perspective focusing on the school leaving certificate and thus upper secondary students. Specifically, we investigated how a set of motivational factors mediated the association between FB and obtaining an *Abitur* among students enrolled in a *Gymnasium*. In order to answer the research question, three structural equation models were estimated using data from the German National Educational Panel Study (NEPS) starting cohort Grade 9. Initially, the standalone relations between FB and motivation and obtaining an *Abitur* were estimated in two separate models. Second, the mediating effect of motivation on the relationship between FB and obtaining an *Abitur* was computed using a comprehensive mediation model. The third model focused on the relations among FB and motivational factors to obtain a more comprehensive picture of the relations among all investigated variables.

2 Research background

2.1 The impact of family background on educational outcomes

The highest form of school-leaving certificate in Germany—the *Abitur*—is traditionally obtained by attending *Gymnasium*. In the past decades *Gymnasium* has gained in importance and the percentage of students attending *Gymnasium* has increased as well. In line with this trend, the percentage of students leaving school with an *Abitur* has also increased (Köhler 2004). Currently, about 50% of students leave school with an *Abitur*. Approximately two-thirds of them obtained this qualification at a *Gymnasium* (65%), while one-third obtained an *Abitur* at vocational or comprehensive schools (Statistisches Bundesamt [Destatis] 2021). Although educational inequalities with regard to obtaining an *Abitur* decreased in recent decades (Schindler 2014), the share of students attending *Gymnasium* is still not distributed equally across societal strata. While 62% of students with highly educated parents enrolled in *Gymnasium* after elementary school, this was only the case for 22% of students whose parents had a lower level of education (Horneber and Weinhardt 2018).

This bias might be explained by Boudon's (1974) theory of primary and secondary effects of social stratification. This model states that educational choices and thus educational outcomes depend on socioeconomic background, firstly because available socioeconomic resources differ among social strata, as argued by Bourdieu (1973), and secondly because educational choices depend on socioeconomic background, i.e., even students with similar competence levels might have different educational outcomes depending on their socioeconomic status (SES). One important explanation is the students' aim to maintain their parents' SES.

Relations between parental education and students' educational attainment have been found internationally. US students whose parents did not attend tertiary education tended to have a lower grade point average (GPA) (Stephens et al. 2014) and dropped out of college more often than their high-SES peers (DeAngelo et al. 2011). In the Netherlands, high-SES students enrolled in higher secondary education at higher rates than low-SES students (Kloosterman et al. 2009). Moreover, in PISA competence tests, high-SES students perform better than their low-SES peers (OECD 2019). Similar results have been found in Germany. Already in elementary school, high-SES students in Germany received better grades than their low-SES peers, even at equal performance levels on competence tests (Maaz et al. 2011). These higher grades among high-SES students in elementary school resulted in higher rates of enrollment in *Gymnasium*. Therefore, the transition from elementary to secondary school generates and increases social inequalities in the German educational system (Lohmann and Groh-Samberg 2010). This trend only strengthened after the transition to secondary school. In *Gymnasium* in particular, there was a correlation between parental educational level and students' scholastic performance. Low-SES students tended to perform worse than their high-SES peers and were therefore less likely to successfully obtain an *Abitur* (Horneber and Weinhardt 2018).

In addition to SES, having an immigrant background also influenced educational outcomes. Immigrants were less likely to exhibit a high level of school achievement. Knowledge of the language of instruction was an important factor in this context (OECD 2016).

Furthermore, occupational status is directly depending on the educational level (Weil and Lauterbach 2009). Prior research indicated also directed relations between family background variables—immigrant background predicted educational attainment and occupational status (Beicht and Granato 2010; OECD 2016).

In summary, family background variables were of high relevance for students' educational outcomes. In general, a high parental SES resulted in higher and an immigrant background in lower educational attainment and academic performance.

2.2 The impact of motivation on educational outcomes

Aside from family background, motivation is another crucial factor for educational outcomes. The expectancy-value model of achievement motivation by Wigfield and Eccles (2000) provides a comprehensive and multidimensional explanation of the relations among a number of distinct motivational factors relevant for educational outcomes. According to this model, achievement-related choices depend on the expectation of success and the value one assigns to a task. Expectations and values affect individuals' behavior directed towards achieving a goal; consequently, students who expected to be successful and assigned a high value to a task were more likely to succeed. Other relevant factors include the cultural environment, socializers' beliefs and behaviors as well as the child's perception of socializers' beliefs and behaviors, the child's goals, differential aptitudes, and previous achievement-related experiences (Wigfield and Eccles 2000). This model was used to derive key motivational predictors of educational attainment, namely the expectation of success and the value of education, as two key elements of Wigfield and Eccles' theory. Fur-

thermore, examining effort is essential to our aim of identifying protective factors for low-SES students and students from immigrant backgrounds, because students who put more effort into studying outperform their peers (Pu et al. 2020). Moreover, since we aimed to identify factors predicting attainment of an *Abitur* (a clearly performance-related goal), we also included performance motivation.

Expectation of success—whether domain-specific or in general—was a good predictor of future performance in terms of school grades as well as competence tests (Wiederkehr et al. 2015; Wigfield and Eccles 2000). In a study of German elementary school students, expectation of success emerged as a particularly important factor for academic achievement, measured as grade point average in core subjects, out of a set of motivational factors (Ditton et al. 2019). Moreover, Wigfield and Eccles (2000, p. 77) stated that “even when previous performance is controlled, children’s beliefs about their ability and expectancies for success are the strongest predictors of subsequent grades in math”. Finally, externally boosting US college students’ expectation of success increased math performance among students scoring low in perceived competence (Durik et al. 2015).

Subjective task value is another core element of Wigfield and Eccles’ (2000) theory. Research among German students has confirmed that ascribing a high value to STEM (science, technology, engineering, and maths) subjects positively affected grades achieved in these subjects (Steinmayr et al. 2012). Likewise, among students in other countries, valuing a task increased the intention and actual decision to persist with it (Martin 2002; Wigfield and Eccles 2000). Not only valuing specific tasks, but also valuing education in general has been found to positively influence educational attainment. A more positive attitude towards school and learning led to a higher GPA at the end of the school year among Slovak secondary school students (Verešová and Mala 2016).

US students’ expectation of success and value of education influenced how much effort they invested in accomplishing their goal (Arthur et al. 2006; Martin 2002). Students who ascribed a high value to education were more engaged in school (Durik et al. 2015). Consequently, students who put a great deal of effort into studying tended to outperform their peers who put less effort into studying (Arthur et al. 2006; Pu et al. 2020). This applied both to academic performance in general and to achievement test results in particular (Gneezy et al. 2019).

Furthermore, performance-related motivation is a facet of extrinsic motivation that has been identified as an important predictor of scholastic performance in both Germany and the US (Ditton et al. 2019; Richardson and Abraham 2009; Wang and Finch 2018). Research has shown that students who were motivated to learn felt less threatened by failure. Rather than reacting to pressure with a feeling of powerlessness, they developed approaches to deal with the pressure and succeeded in their tasks (Martin 2002).

In conclusion, a large body of research has demonstrated the positive impact of motivational factors on scholastic performance and attainment. In this research, motivation has predominantly been operationalized as a domain-specific concept and educational outcomes as performance. However, there is still a need to further investigate the relation between general school-related motivation and overall educational attainment.

2.3 The relationship between family background and motivational factors

Not only has prior research demonstrated that FB and motivational factors influence educational attainment, there is also evidence that FB influenced motivational factors. Wigfield and Eccles' (2000) expectancy-value model likewise suggests a relation between family demographics and students' motivation. The above mentioned motive of status maintenance of parental SES leads to higher motivation among high-SES students. According to Bourdieu (1973) differences in available resources (economic, social, and cultural) might promote the anticipated family support. Also the time that is invested in learning activities is associated with a students resources. Related especially to students' social capital is furthermore the knowledge about the educational system. These differences promote especially students' expectation of success and learning motivation among students who are well equipped with resources. Also the Wisconsin Model of Socioeconomic Achievement has found family background to be related to and to be mediated by educational expectations as well as further individual variables (occupational aspirations, peer college aspirations) (Alexander et al. 1975).

Research investigating relation between motivation and educational outcomes largely took a domain-specific view, with a particular focus on STEM subjects, reflecting the origin of Wigfield and Eccles' model in predicting STEM achievement. They have demonstrated that SES influenced motivational factors. High-SES students in Germany and the US tended to report placing a stronger value on education and a higher level of performance motivation with respect to school tasks (Kriegbaum and Spinath 2016; Lazarides et al. 2015; Steinmayr et al. 2012). Parental employment positively predicted British students' achievement motivation (Cassidy 2000) and school motivation (Schoon 2008). Also, young Estonian adults with low SES tended to value education less and assessed their chances of accessing higher education as worse than their high-SES peers (Täht and Paškov 2013). Also educational expectations vary through social strata. While high-SES students' expectations are relatively stable from primary school on, the expectations of low-SES students are more volatile and tend to decline during secondary school (Bozick et al. 2010).

Apart from family background, another central social factor shaping student motivation is their immigrant background. Following the immigrant optimism theory, students with immigrant background are a positively selected group towards their educational aspirations and motivation. Due to the desire for a social increase (Kao and Tienda 1995). In general, students from immigrant backgrounds tend to have more positive attitudes towards education than their native peers. They score higher on the importance of education as well as achievement motivation (OECD 2019). They also tend to put more effort into studying on average (Greenman 2013; Tjaden and Hunkler 2017). Nevertheless they do not seem to be able to benefit from their higher motivation. Although they are more engaged they lag behind their native peers in respect to their academic outcomes (OECD 2019). Core reasons discussed are language difficulties and lack of information among immigrant students concerning the educational system (OECD 2016; Tjaden and Hunkler 2017).

Furthermore, for STEM subjects, there is evidence that science motivation mediated the impact of SES on GPA among US students (Wang and Finch 2018).

A mediating effect of school motivation was found among British students (Schoon 2008). Likewise, mediating effects of motivation were found in Germany. The relation between SES and math performance has been found to be mediated by the value students ascribed to maths (Steinmayr et al. 2012). Furthermore, for elementary school students, SES was found to be mediated by expectation of success. Indeed, no direct effect of parental education on scholastic achievement remained when motivational factors (expectation of success and parental aspirations) were considered (Ditton et al. 2019).

Despite this relation between FB and motivational factors, it is sometimes argued that motivational factors “might be a protective factor against the negative impact of low SES on academic achievement” (Wang and Finch 2018, p. 132). Hence, investigating the relation between FB and motivation could be an important starting point for reducing educational inequality. Therefore, in order to extend previous studies, the relation between FB and educational attainment should be examined among upper secondary students from a more general perspective, i.e., with respect to the complex relations between FB, motivation and educational attainment.

3 Research questions and hypotheses

The present study aimed to answer the central research question of whether the relation among family background and obtaining an *Abitur* is mediated by motivational factors and thus reduced or even eliminated. While the impact of domain-specific interest and motivation on domain-specific achievement has received frequent empirical support (Steinmayr et al. 2012; Wiederkehr et al. 2015), this study focused on general motivational aspects and obtaining the highest form of school-leaving certificate in Germany—the *Abitur*. Furthermore, we aimed to improve our understanding of the associations among central predictors of educational outcomes among upper secondary students, about whom we know less than about younger students. Our study built upon and expanded the previous research presented above by examining the following research questions and hypotheses:

Question 1: How are fundamental family background variables—namely parental educational level, parental occupational status, and immigrant background—related to obtaining an *Abitur* among students who attended *Gymnasium* at some point during their educational careers?

Hypothesis 1 (H1): High parental education and high parental occupational status are positively related to obtaining an *Abitur*; an immigrant background is negatively related to obtaining an *Abitur*.

Question 2: How are core motivational factors (expectation of success, value of education, effort, and performance-oriented motivation) associated with obtaining an *Abitur*?

H2: All aspects of motivation under investigation—expectation of success, value of education, effort, and performance-oriented motivation—are positively associated with obtaining an *Abitur* also when controlling for students' competences.

Question 3: Is the relation between family background (parental educational level, parental occupational status, and immigrant background) and obtaining an *Abitur* mediated by motivational factors (expectation of success, effort, value of education, and performance-oriented motivation)?

H3a: A high parental educational level and parental occupational status as well as an immigrant background are positively related to all aspects of motivation under investigation.

H3b: The relation between socioeconomic background variables and obtaining an *Abitur* is mediated by motivational factors (expectation of success, value of education, effort, and performance-oriented motivation) also when controlling for students' competences.

4 Method

4.1 Data and sample

Data from the German National Educational Panel Study (NEPS) starting cohort Grade 9 (SC4) (NEPS Network 2021)¹ were used to answer the study's research questions. The NEPS is a representative large-scale survey that provides longitudinal data on educational trajectories and development of competencies throughout the life course.

The following analyses drew upon data from students and their parents. Students were enrolled in Grade 9 at the time of first measurement (T1), which took place in Winter 2010/11. Overall, data from five measurement points were included in the analyses (from November 2010 to August 2013) (see Table 1 for an overview of measurement points, respondents and survey mode). Data from students were collected in schools via paper-and-pencil interview (PAPI). For students who changed schools, classes or left the educational system, an individual tracking procedure was implemented after T1; such students completed a computer-assisted personal interview (CAPI) or computer-assisted telephone interview (CATI). Parents were interviewed via CATI.

We included in our sample only students who had been enrolled in *Gymnasium* at some point during secondary school and thus had a chance of obtaining an *Abitur*

¹ This paper uses data from the National Educational Panel Study (NEPS; see Blossfeld and Roßbach (2019)). The NEPS is carried out by the Leibniz Institute for Educational Trajectories (LIfBi, Germany) in cooperation with a nationwide network.

Table 1 Measurement points, respondents and survey mode

	T1	T2	T3	T4	T5
Date	November 2010–January 2011	January 2011–July 2011	May 2011–July 2011	March 2012–May 2012	November 2012–January 2013 (students in school)/September 2012–August 2013 (school leavers)
Respondents	students	parents	students	students and school leavers	students and school leavers
Survey mode	PAPI	CATI	PAPI	PAPI (students in school) CATI/CAPI for school leavers	PAPI (students in school) CATI/CAPI for school leavers
Assessed variables	math competences, cognitive abilities, gender	PE, OS, IB	EOS	VOE	effort, PM

via the traditional route². Enrollment in *Gymnasium* immediately after elementary school was not mandatory for inclusion in the analyses. Furthermore, we defined no minimum time period of *Gymnasium* attendance. We excluded students who had never attended *Gymnasium*. The latter applied to 6019 students, while $N=5941$ students were included in the sample. A further 532 students had to be excluded from the analyses due to missing values on the independent variables. Consequently, our final sample comprised $n=5409$ students. The students' mean age at T1 was 14.6 years ($SD=0.65$), and 54.2% were female.

4.2 Variables

4.2.1 Educational attainment

Educational attainment was measured in terms of the highest school-leaving certificate obtained. The NEPS contains a variable capturing the highest form of school-leaving certificate obtained and is based on information collected from students at various measurement points (including ones beyond the temporal scope of this study). For the analysis, this variable was coded in binary form (0=no *Abitur*, 1=*Abitur*). Students were coded as having an *Abitur* only if it had been obtained within the specified school period or one year thereafter. Students who obtained an *Abitur* beyond this time period were not coding as having an *Abitur* in our analyses. 77.4% of our sample obtained an *Abitur*.

² For comprehensive schools, it was not possible to identify which school track particular students actually attended. Thus, it was impossible to determine whether each student in a multi-track school sought to obtain an *Abitur* or another school-leaving certificate. Therefore, only students who attended *Gymnasium* are included in the analyses. Focusing on students, who were enrolled in a *Gymnasium* can be interpreted as proxy of students' realistic aspiration towards the school-leaving certificates they would like to obtain at the given point of time, which allows for a more conservative estimation of motivational effects.

4.2.2 Family background variables

Students' family background was measured with three constructs.

Data on *parental education* (PE) were collected from parents at T2. The International Standard Classification of Education (ISCED) was used to operationalize parental education (UNESCO 1997). This scale ranged from 0 = early childhood education to 9 = doctoral or equivalent level. This variable was provided by the NEPS for the interviewed parent and their partner; in the current analysis, we considered the highest level within the household. The mean PE in our sample (see Table 2) was higher than the mean PE among all students in the complete NEPS dataset ($t = -35.20$; $df = 7522$; $p < 0.001$).

In addition, a measure of *parents' occupational status* (OS) was considered. The International Socio-Economic Index of Occupational Status (ISEI) was used to operationalize parental occupational status (Ganzeboom et al. 1992). Like PE, this information was collected from parents at T2 and was provided in the NEPS data for the interviewed parent and their partner. We computed the highest parental ISEI—the HISEI. Again, mean parental OS in our sample was higher than in the complete dataset ($t = -37.61$; $df = 9907$; $p < 0.001$). The mean parental HISEI among students attending *Gymnasium* was also higher compared to other large-scale assessments in Germany (Autorengruppe Bildungsberichterstattung 2018).

Students' immigrant background (IB) was measured at T2 based on their parents' answers. A student was considered to have an immigrant background if they, one of their parents, or both parents were born abroad (0 = non-immigrant background, 1 = immigrant background). This applied to 8% of our sample.

4.2.3 Motivational variables

Students' motivation was measured with four distinct constructs.

Expectation of success (EOS) of obtaining an *Abitur* was measured at T3 by asking students the following question: "Regardless of the qualifications that you can actually obtain at your school: How likely do you think it is that you could pass the *Abitur* examination?" Students could answer on a five-point Likert scale from 1 = "very unlikely" to 5 = "very likely". On average, the students in our sample assessed their chances of passing the *Abitur* as likely (see Table 2).

The *value* students attach to *education* (value of education; VOE) was measured at T4 with five variables. Responses were recorded on a five-point Likert scale from 1 = "fully disagree" to 5 = "fully agree". An example item is "Having a good education is valuable in its own right" (Stocké 2005). The reliability of this scale was less than satisfactory ($\alpha = 0.59$).³ The value students attached to education was rather high among our sample.

General *effort* exerted for school was measured at T5 with three items, e.g., "I do more for school than I really have to" (Rakoczy et al. 2005). Responses were recorded on a four-point Likert scale from 1 = "does not apply" to 4 = "does apply".

³ Removing items from the scale did not improve the reliability of this scale.

Table 2 Means (*M*), standard deviations (*SD*), internal consistencies (α), *n* of respondents, and intercorrelations among all analyzed variables in our sample and in the complete NEPS dataset (in brackets)

	Descriptive statistics			Intercorrelations											
	<i>M</i>	<i>SD</i>	α	<i>n</i>	2	3	4	5	6	7	8	9	10	11	12
1) <i>Abitur</i>	0.77 (0.45)	0.42 (0.49)	-	5702	0.24	0.17	-0.11	0.41	0.06	0.03	-0.01	0.31	0.27	0.21	0.05
2) PE	6.48 (4.86)	1.92 (2.06)	-	4185	-	0.56	-0.37	0.25	-0.04	-0.05	-0.06	0.24	0.22	0.12	-0.03
3) OS	64.04 (50.53)	17.36 (18.33)	-	5322	-	-	-0.15	0.24	0.02	-0.03	-0.03	0.20	0.17	0.10	-0.04
4) IB	0.18 (0.22)	0.39 (0.42)	-	3378	-	-	-	-0.06	0.11	0.04	0.06	-0.15	-0.16	-0.08	0.00
5) EOS	3.89 (3.21)	0.93 (1.26)	-	5524	-	-	-	-	0.14	0.11	0.15	0.38	0.30	0.20	0.03
6) VOE	3.13 (3.08)	0.62 (0.69)	0.59 (0.59)	5288	-	-	-	-	-	0.15	0.26	-0.06	-0.06	-0.06	0.02
7) Effort	2.36 (2.37)	0.61 (0.62)	0.70 (0.70)	4426	-	-	-	-	-	-	0.53	-0.01	-0.01	-0.02	0.13
8) PM	2.67 (2.68)	0.66 (0.66)	0.82 (0.81)	4625	-	-	-	-	-	-	-	0.00	-0.01	-0.02	0.10
9) math competences	0.68 (0.02)	1.19 (1.21)	-	5725	-	-	-	-	-	-	-	-	0.41	0.40	-0.22
10) reading competences	0.62 (-0.03)	1.11 (1.26)	-	5555	-	-	-	-	-	-	-	-	-	0.32	0.10
11) cognitive abilities	9.62 (8.65)	1.92 (2.46)	-	5504	-	-	-	-	-	-	-	-	-	-	-0.04
12) gender	0.54 (0.50)	0.50 (0.50)	-	5814	-	-	-	-	-	-	-	-	-	-	-

Note. PE parental educational level, OS parental occupational status, IB immigrant background, EOS expectation of success, VOE value of education, PM performance-related motivation
 Significant correlations ($p < 0.05$) are in bold

The reliability of this scale was satisfactory ($\alpha=0.70$). Just like EOS and VOE, students' reported effort was rather high among our sample.

Performance-related extrinsic motivation (PM) was measured at T5 with four items, e.g., "I learn for school because I want to be one of the best." Students answered on a five-point Likert scale from 1="fully disagree" to 5="fully agree" (Schiefele et al. 2002). The reliability of this scale was good ($\alpha=0.82$). In contrast to EOS, VOE and effort, mean PM was rather low in our sample.

4.2.4 Control variables

Four control variables were included in all three models. Since performance and thus previous achievement-related experiences are crucial factors for educational attainment (Wigfield and Eccles 2000), we controlled for *math* and *reading competences*. The NEPS included WLE measures for math and reading competence at T1 (Duchhardt and Gerdes 2013; Haberkorn et al. 2012), which were standardized to have a mean of 0 in the full sample (Pohl and Carstensen 2012). Math competence in our sample ranged from -3.33 to 4.62 logits and was higher than in the complete dataset ($t=-59.64$; $df=11,227$; $p<0.001$). Reading competence ranged from -3.18 to 3.30 logits and was also higher in our sample compared to the complete dataset ($t=-53.77$; $df=10,852$; $p<0.001$).

Furthermore, we controlled for *basic cognitive skills*. These are central predictors of scholastic achievement, with a correlation between cognitive abilities and scholastic achievement of around 0.50 having been broadly demonstrated (Roth et al. 2015). Basic cognitive skills were measured in terms of reasoning (DGCF, Haberkorn and Pohl 2013; Lang et al. 2014) at T1. Basic cognitive skills were higher among students who had been enrolled in *Gymnasium* compared to the complete dataset ($t=-39.84$; $df=10,690$; $p<0.001$).

Moreover, relations between gender and educational attainment (OECD 2019) have been demonstrated. Therefore, we additionally controlled for *gender*. Information on gender was gathered from students at T1 (male=0, female=1).

4.3 Analyses

To answer the research questions, three structural equation models were estimated in Stata 16.1 (Stata Statistical Software 2019). Missing data were treated with full-information maximum likelihood (FIML) estimates. Standardized coefficients are reported. The sample size was held constant across all models.

Model 1 investigated the relations between family background (PE, OS, and IB) and obtaining an *Abitur*. In addition, based on existing empirical findings, paths from IB to PE and OS and a path from PE to OS are estimated. Model 2 investigated the relations among motivational factors (EOS, VOE, effort, and PM) and obtaining an *Abitur*. In addition, paths from EOS and VOE to effort were estimated based on theoretical assumptions. The included motivational constructs were correlated with one another in the analyses, with the exceptions of EOS and effort and VOE and effort. VOE, effort, and PM were modelled as latent variables. In Model 3, paths from all family background variables to all motivational constructs and obtaining

an *Abitur* and from the motivational constructs to obtaining an *Abitur* were estimated. In addition, the indirect effects of family background on obtaining an *Abitur* via the motivational factors were estimated. All three models were controlled for the relations between cognitive abilities, math and reading competence, and gender and obtaining an *Abitur*.⁴ Despite the binary outcome variable, we estimated a linear rather than a logistic model. This analysis strategy was chosen because linear regression coefficients are directly interpretable, in contrast to logistic regression coefficients. Furthermore, the error produced by using a linear rather than a logistic model is usually very small (Gomila 2019; Labovitz 1970). Due to the data structure (no unique class identifiers across measurement points), it was not possible to take into account the hierarchical structure of the data in terms of students nested within classes. Nevertheless, we clustered standard errors by school identifiers to minimize errors produced by the hierarchical structure of the data.

5 Results

5.1 Descriptives

With the exception of PM and effort, all included variables were correlated statistically significantly with obtaining an *Abitur* (see Table 2). Among FB variables, the strongest correlation with obtaining an *Abitur* was found for PE. Among motivational factors, the strongest correlation with obtaining an *Abitur* was found for EOS.

The analyzed family background variables clearly differed in terms of their associations with the motivational variables. While statistically significant correlations with all analyzed motivational constructs were found for PE, OS was only significantly correlated with EOS. IB was significantly correlated with VOE, effort and PM.

5.2 Relations between family background and obtaining an *Abitur*

The first hypothesis stated that among students attending *Gymnasium*, high PE and OS are positively related to obtaining an *Abitur*, while having an IB is negatively related. This hypothesis was evaluated in Model 1 (Table 3, see also Figure A1 in the supplemental material). The CFI in Model 1 indicated a good model fit, while the RMSEA was less satisfactory.

The results of Model 1 showed that higher PE statistically significantly increased the likelihood of obtaining an *Abitur*, while there was no significant relation with OS. This means that PE is a more central predictor of educational success in terms of obtaining an *Abitur* than OS when considered simultaneously. Students' IB was also not significantly related to obtaining an *Abitur* when PE was simultaneously

⁴ As a robustness check, we conducted our analyses redefining the analysis unit, including students who attended *Gymnasium* or a multi-track school during their secondary school time. The alternative results for model 3 are available in the supplementary material (Figure A4).

Table 3 Results of the structural equation models investigating the relation between family background variables and obtaining an Abitur (Model 1), motivational factors and obtaining an Abitur (Model 2) and the effects of family background mediated by motivational factors on obtaining an Abitur (Model 3)

	Model 1		Model 2		Model 3	
	β	SE	β	SE	β	SE
PE	0.13***	0.02	–	–	0.10***	0.03
OS	0.03	0.02	–	–	–0.01	0.02
IB	–0.02	0.02	–	–	–0.05	0.02
EOS	–	–	0.30***	0.02	0.31***	0.01
VOE	–	–	0.08***	0.02	0.09**	0.02
Effort	–	–	0.01	0.02	0.06	0.04
PM	–	–	–0.06**	0.02	–0.08	0.04
math competences	0.22***	0.02	0.15***	0.02	0.14***	0.02
reading competences	0.12***	0.01	0.10***	0.01	0.09***	0.01
cognitive abilities	0.07***	0.02	0.06***	0.02	0.06***	0.02
gender	0.09***	0.02	0.07***	0.01	0.08***	0.01
RMSEA	0.08	–	0.05	–	0.05	–
CFI	0.91	–	0.90	–	0.90	–
<i>df</i>	8	–	102	–	146	–
R ²	0.26	–	0.08	–	0.25	–
<i>N</i>	5409	–	5409	–	5409	–

Note. PE parental educational level, OS parental occupational status, IB immigrant background, EOS expectation of success, VOE value of education, PM performance-related motivation, RMSEA root mean square error of approximation, CFI comparative fit index, *df* degrees of freedom Standardized coefficients. Model identification was achieved by setting the loadings of the first indicator to 1

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

included in the model. These results have to be interpreted in the light of the strong relations among IB and PE and PE and OS.

The model with family background variables explained a total of 21% of the variance in obtaining an *Abitur* among students who had attended *Gymnasium* at some point during their school career. The findings support H1 with regard to PE but contradict the hypothesis with regard to IB and OS.

5.3 Relation between motivation and obtaining an *Abitur*

The relation between motivation and obtaining an *Abitur* was analyzed in Model 2 (see also Figure A2 in the supplemental material). Hypothesis H2 posited that all motivational factors under investigation would positively affect obtaining an *Abitur*. Model fit in Model 2 was acceptable.

The results showed that EOS was particularly positively associated with obtaining an *Abitur*. Statistically significant but weaker associations with VOE were also found. Thus, students' expectations of success were particularly positively related to educational attainment among students who had at some point attended *Gymnasium*. No relation with effort was found. As theoretically expected, effort was significantly positively affected by EOS and VOE. The association with PM—though weak—was

Table 4 Direct effects of family background variables on motivational factors and indirect effects of family background variables on obtaining *Abitur* through motivational factors in Model 3 (Table 3)

	Overall motivational factors		EOS		VOE		Effort		PM	
	β	SE	β	SE	β	SE	β	SE	β	SE
Direct effects on motivational factors										
PE	–	–	0.19***	0.02	0.02	0.03	–0.09**	0.03	–0.06*	0.03
OS	–	–	0.12***	0.02	0.09***	0.03	–0.00	0.02	0.01	0.02
IB	–	–	–0.03	0.02	0.18***	0.03	0.03	0.03	0.06*	0.02
Indirect effects on obtaining an <i>Abitur</i>										
PE	0.02**	0.00	0.09***	0.01	0.01***	0.00	0.01*	0.00	0.00	0.00
OS	0.00***	0.00	0.00	0.00	0.00	0.00	0.00***	0.00	0.00	0.00
IB	–0.07**	0.01	–0.23***	0.02	–0.02*	0.01	0.02	0.01	0.03*	0.01

Note. PE parental educational level, OS parental occupational status, IB immigrant background, EOS expectation of success, VOE value of education, PM performance-related motivation

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

significantly negative when all motivational variables were considered and thus contradicted the assumed relation.

The model with motivational variables explained a total of 8% of the variance in educational attainment among students who had attended *Gymnasium* at some point during their school career. These findings indicate that EOS and VOE predict obtaining an *Abitur* even when controlling for math and reading competence, cognitive abilities and gender, partially supporting H2.

5.4 Relations between family background and obtaining an *Abitur* mediated by motivational factors

5.4.1 Predicting motivational factors via family background

Model 3 (see also Figure A3 in the supplemental material) examined motivational factors as a potential mediator of the relation between FB variables and educational attainment. Model fit indices were good. Given the greater complexity of the third model compared to the first and second models, the RMSEA value in particular must be evaluated positively. In Hypothesis H3a, positive relations between PE, OS, and IB and motivational factors were expected. Heterogeneous associations between different family background variables and the motivational constructs were observed when all predictors were considered simultaneously.

PE was positively associated with EOS (Table 4). In turn, PE was not significantly related to VOE and negatively predicted students' effort and PM.

The results concerning the relationship between OS and motivational factors yielded a similar picture. Here again, EOS was the main motivational construct predicted. However, VOE was significantly predicted by OS, but not by PE. No significant relations between OS and effort or OS and PM were found.

A different picture arose for the relations between IB and motivational factors. While EOS was associated with PE and OS, EOS was not statistically significantly related to IB. Instead, positive relations with VOE and PM were observed.

In light of these results, it can be stated that there are relations between family background variables and motivational factors, although H3a was only partly confirmed—namely for the motivational constructs EOS in relation to PE and OS. OS and IB were positively related to VOE. Only IB significantly positive predicted PM, while the relation between OS and PM was negative, contradicting H3a.

5.4.2 Mediation role of motivational factors

Hypothesis H3b stated that motivational factors would mediate the relation between family background variables and obtaining an *Abitur*.

The indirect effects from family background variables to obtaining an *Abitur*, mediated by motivational factors, were mainly small (Table 4). For PE, indirect effects through EOS, and to a lesser extent VOE and effort, were found. A reduced relation between PE and educational attainment was observed when motivational factors were included in the model (Table 3), indicating a partial mediation for PE. The decrease in this effect compared to Model 1 was significant ($\Delta\chi^2 = 28.00$, $\Delta df = 1$; $p < 0.001$). As IB and OS did not have a statistically significant direct effect on obtaining an *Abitur* in Model 1, a mediation cannot be tested. The individual and overall indirect effects for OS were near 0. However, indirect effects of IB via VOE and PM emerged.

Hypothesis H3b can be confirmed with respect to PE. The association decreased in comparison to Model 1, with the mediation mainly due to EOS. Students who had attended a *Gymnasium* at some point in their educational career were more likely to graduate with an *Abitur* if their parents had higher levels of education due to a direct as well as an indirect effect mediated by higher personal expectations regarding their own educational attainment. Moreover, R^2 indicated that Model 3 explains 21% of the variance in obtaining an *Abitur*.

6 Discussion

Our study aimed to determine whether students' motivation decreases or at least weakens the relation between family background and obtaining an *Abitur* among students who had attended *Gymnasium* at some point during their scholastic careers. This would be an important result, because students' family background is relatively stable, while motivation is malleable. If motivational factors buffer the relationship between family background and educational attainment, this would provide a starting point for improving the achievement of students from disadvantaged backgrounds.

Using data from the NEPS starting cohort Grade 9 (SC4), we first analyzed the relation between family background and obtaining an *Abitur*. Secondly, we examined the association between motivational factors and obtaining an *Abitur*. Finally, in the third model, all constructs were analyzed simultaneously, with motivational factors functioning as mediating variables. All models were controlled for math and reading

competence, cognitive abilities, and gender. Extending previous research (Steinmayr et al. 2012; Wiederkehr et al. 2015) by focusing on obtaining an *Abitur*, the analyses examined general school-related motivation rather than domain-specific variables.

Despite focusing on students who attended *Gymnasium* in their educational career, which is a socially selective group, the often-reported relation between family background and educational attainment and/or performance for the overall student population (OECD 2019) was also evident in this selective sample. Parental education was a more central predictor of obtaining an *Abitur* compared to parental occupational status and immigrant background, which are only of minor relevance when parental education is simultaneously considered. Previous studies support the observation that immigrant background has a weaker association with educational success when socioeconomic background variables were also considered (OECD 2016). It is conceivable that a similar mechanism operates with respect to parental occupational status in regard to parental education. However, this requires further investigation. The hypothesis concerning the relation between parental education and obtaining an *Abitur* among students who had attended *Gymnasium* can be confirmed. This indicates that similar mechanisms predict obtaining an *Abitur* and (domain-specific) performance.

The results also support and extend previous findings that motivational factors predict educational attainment, although important differences arose between the analyzed motivational constructs. When considering four core motivational constructs simultaneously, it became evident that expectation of success particularly notably predicted obtaining an *Abitur*, while there was no relation with effort. Similar findings were found by Marsh et al. (2016). There was no significant relation among effort and grades among lower secondary school students. Research concerning immigrant students found that a higher score on motivation did not necessarily result in better performance (OECD 2019). In an attenuated manner this might also apply for the relation among effort and obtaining an *Abitur* in our sample. Furthermore, due to the relation among expectation of success and obtaining an *Abitur* no relation with effort might be found.

In summary, Hypothesis H2 can be confirmed with the exception of the relation between performance motivation and obtaining an *Abitur*, which was in the opposite direction as expected. However, the correlations in Table 2 and the results in Model 3 indicate non-significant relations between performance motivation and obtaining an *Abitur*. Due to these results and the weak relation, we do not consider it useful to interpret the coefficient in terms of content.

The results support the notion that motivational variables are systematically related to family background, although the picture was heterogeneous. Confirming the formulated hypotheses, parental education and occupational status predicted students' expectations of success. Moreover, parental occupational status and students' immigrant background predicted the value of education, while students' immigrant background was positively related to effort and performance motivation. Contrary to our formulated hypotheses, we found negative relations between parental education and students' effort and performance motivation. This might be due to the better performance of high-SES students. Since they perform better it might not be necessary for them to develop high scores on effort and performance motivation in contrast

to low-achieving low-SES peers. No relations were found between parental education and value of education, nor between parental occupational status and effort and performance motivation. Nevertheless, it can be stated that high-SES students and students from immigrant backgrounds tend to be more motivated at school.

Mediation analyses showed a partial mediation of parental education, indicating that motivational factors weaken the relation between parental education and obtaining an *Abitur*. The most important mediator was expectation of success, which was also the main predictor of obtaining an *Abitur* among the analyzed motivational factors. This aligns with studies investigating mediation effects in a domain-specific context (Ditton et al. 2019; Steinmayr et al. 2012; Wang and Finch 2018).

Most importantly, the association between parental education and motivational variables should be considered when aiming to reduce or eliminate the relation between family background and educational attainment, because parental education was the most important predictor of all three family background variables in our sample.

This study has some core strengths, including the analysis sample stemming from a large, representative sample of German students, the longitudinal design following students from Grade 9 to the end of their schooling, as well as the comprehensive approach simultaneously considering three core family background variables and four important motivational constructs. Nevertheless, this study had several limitations that must be addressed, beginning with the low reliability of the value of education measure. Although the direction of the relation with value of education aligned with previous research, it may nevertheless have been distorted. In future research, particular attention should be paid to this construct to test whether the effect is replicable for educational success in general.

Another limitation concerns the time of first measurement. Students were interviewed for the first time in Grade 9, making it difficult to track their educational trajectories throughout (lower) secondary school, since they provided retrospective answers on which school track they had attended in each year of lower secondary school. In this context another limitation should be mentioned concerning the time of measurement of motivational factors. Several motivational factors were measured temporally close before *Abitur*. This close temporal relationship may have influenced the results for motivational factors such as the expectation of obtaining an *Abitur*. Unfortunately, data from NEPS starting cohort Grade 5 (SC3), which follows students from Grade 5 to the transition to the labor market or tertiary education, are not yet available. In the future, an attempt to replicate this study's findings with that sample can be undertaken. Moreover, the data did not allow us to take classroom context into account via multilevel analysis.

Further research should thus replicate this study's findings and extend its perspective by including classroom context variables. These should be included in the form of multilevel analyses whenever possible, because research has shown that peers can affect motivational factors and therefore educational success (Ladd et al. 2009). Likewise, different pathways to obtaining an *Abitur* should be examined, since enrollment in *Gymnasium* represents the traditional but by no means the only way to achieve this qualification (e.g., enrollment in a comprehensive school or vocational school).

In terms of the results' implications for educational practice, we concentrate on parental education as the most central predictor among the family background variables. One crucial factor for reducing educational inequality is breaking the relation between parental education and expectation of success. Expectation of success stood out as important predictor of obtaining an *Abitur* that was in turn dependent on parental education. Thus, it is essential to support low-SES students' educational attainment by specifically strengthening their expectations of success. This is especially important given that stereotypes about low-achieving low-SES students and high-achieving high-SES students are reproduced among students (Jury et al. 2017; Kriegbaum and Spinath 2016; Wiederkehr et al. 2015). This internalization of stereotypes, which leads to a lower level of self-efficacy among low-SES students, can be addressed in educational settings.

Our results provide comprehensive information on the relation between family background, motivation and obtaining an *Abitur*. We examined a multifaceted set of both family background and motivational factors, with parental education emerging as a particularly central predictor of obtaining an *Abitur*. A partial mediation via motivational factors was found, suggesting starting points for reducing educational inequality.

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