Reference Group Effects on Teachers' School Track Recommendations: Results from PIRLS 2006 Germany

Anne Milek, Max Planck Institute for Human Development, Berlin, Germany, anne.milek@gmx.de
Tobias C. Stubbe, Institute for School Development Research, Dortmund, Germany, stubbe@ifs.tu-dortmund.de
Ulrich Trautwein, Eberhard Karls University, Tübingen, Germany, ulrich.trautwein@uni-tuebingen.de
Oliver Luedtke, Eberhard Karls University, Tübingen, Germany, oliver.luedtke@uni-tuebingen.de
Kai Maaz, Max Planck Institute for Human Development, Berlin, Germany, maaz@mpib-berlin.mpg.de

Abstract

In the German education system, the transition from elementary to secondary school represents an early form of selection with far-reaching implications for students' educational biographies. This paper examines the extent to which teachers' recommendations of a secondary track are systematically related to mean class achievement level and whether there are differences in this reference group effect across the federal states. Using the German PIRLS 2006 dataset (7,752 students from 388 fourth-grade classes), multilevel logistic regression models were used to examine the relationship between the recommendations made by elementary school teachers and mean class achievement level in each of the 16 German federal states (Länder). Findings show a negative correlation between mean class achievement and teachers' recommendations that was mediated by school grades. Cross-state differences in the size of reference group effects did not reach a statistically significant level.

Key words: *Reference group effect, transition to secondary education, teachers' recommendations*

Introduction

An important characteristics of the German school system is the early selection of students approaching the end of grade 4[1] into separate secondary tracks that eventually award different qualifications: the vocational-track *Hauptschule*, the intermediate-track *Realschule*, and the academic-track *Gymnasium*. Students graduating from *Hauptschule* or *Realschule* generally enter vocational training; only those leaving *Gymnasium* with the *Abitur* qualification are eligible to attend university. Occupational outcomes in Germany are closely linked to the educational qualifications held and the doors those qualifications open (Müller, & Shavit, 1998).

Consequently, the transition from elementary to secondary education has far-reaching implications for students' educational biographies (Ditton, & Krüsken, 2006; Schnabel, Alfeld, Eccles, Köller, & Baumert, 2002). As they do not have the benefit of a Harry-Potter-style 'sorting hat' (Rowling, 1997) elementary school teachers are left with the task of (1) selecting the secondary track that best fits each student's abilities and development potential while (2) ensuring that all students have equal opportunities for educational participation. The main interest of this paper is to investigate whether teachers' recommendations are influenced by average student achievement in their classes.

Transition from Primary to Secondary School in the Different Federal States in Germany

In recent years, the alarming results of international educational assessments have re-focused research attention on the costs, benefits, and distributive justice of processes of transition in the German three-track system (for an overview, see Maaz, Hausen, McElvany, & Baumert, 2006). According to the

[1] While in most federal states this transition takes place at the end of grade four, in Berlin, Brandenburg and Bremen primary school lasts for six years.

guidelines of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany (KMK), the school-track recommendations made by elementary school teachers should be based primarily on students' academic aptitude and achievement. Several major criticisms can be levelled against the current system in this respect. There is evidence of systematic disadvantaging of (1) students from less privileged social backgrounds, (2) students with an immigrant background, and (3) boys. Although the KMK states that all students must have access to the educational track that best matches their aptitude, irrespective of their parents' social and financial status (KMK, 2006), the empirical data show that students from the above-mentioned groups are less likely than their equally high-achieving peers to be recommended for *Gymnasium* (see for an overview Arnold, Bos, Richert, & Stubbe, 2007).

As Germany is a federal republic and education is the responsibility of the 16 federal states there is no single educational system in Germany, but 16, and these differ to some extent. The PISA study revealed considerable cross-state differences in the reading, mathematics, and science literacy of 15-year-old students at the end of lower secondary education, as well as in the strength of the correlation between social background and academic attainment (Baumert, Trautwein, & Artelt, 2003).

Analyses of the PIRLS 2001 and 2006 data have revealed similar findings for teachers' school track recommendations (Arnold et al., 2007; Bos et al., 2004; Pietsch, & Stubbe, 2007). For PIRLS 2006 Arnold, Bos, Richert & Stubbe (2010) showed that although social disparities in educational participation were observed in all federal states, the relative likelihood of attending a *Gymnasium* was less closely related to a student's social background in Lower Saxony, Rhineland-Palatinate, and Schleswig-Holstein, and that this connection was especially strong in Saarland, Saxony, and Hesse.

Reference Group Effects

Additionally, the effects of class-specific frames of reference on the grades that teachers assign to individual students, and which formed the basis for tracking decisions in Germany, further jeopardize the equitable educational participation of all students. As early as the 1960s, Aiken (1963) pointed out that teachers' assessments of student learning are not immune to reference group effects. Rather, teachers tend to grade on a curve. They are able to rank the students in a class in order of academic achievement quite accurately, with the highest-performing students being awarded top grades, the lowest-performing students being assigned low grades, and the rest falling in between (Ingenkamp, 1989; Tent, 1998). In consequence, a student in a high-performing class may well be given lower grades than a comparable student in another, lower-performing class.

Empirical studies have applied models of reference group effects deriving primarily from educational psychology to the context of educational transitions in Germany and German-speaking schools in the Swiss canton of Fribourg. These studies have provided consistent evidence that the reference group effect is not limited to grades. Teachers' assessments of individual students' aptitude (Maaz et al., 2008) and track recommendations (Gröhlich, & Guill, 2009; Milek, Lüdtke, Trautwein, Maaz, & Stubbe, 2009; Neumann, Milek, Maaz, & Gresch, 2010; Tiedemann & Billmann-Mahecha, 2007; Trautwein & Baeriswyl, 2007; Wagner, Helmke, & Schrader, 2009) are not independent of the mean class level of achievement either. Rather, students taught in particularly high-performing elementary school classes are less likely to be recommended for *Gymnasium* than students with comparable achievement levels and social background characteristics in lower-performing classes. Trautwein and Baeriswyl (2007) demonstrated that these effects are mediated primarily by grades. Replications of their findings (Gröhlich, & Guill, 2009; Milek et. al, 2009; Neumann et al., 2010) indicate that equally high-achieving students receive different tracking recommendations in different schools because the same grade awarded reflect differing levels of performance. Figure 1 presents the research model underlying this article, variants of which have also been used in the other studies.

[Insert Figure 1 about here.]

In view of the consistency of empirical findings, it can be considered established that mean class achievement is negatively associated with tracking outcomes and plays a key role as a composition factor influencing educational transition in Germany. However, less is known about how institutional, system-specific conditions impact on this pattern of relationships. Given the diverse institutional frameworks regulating the transition to secondary education across the German states, it seems plausible that the strength of reference group effects differs between states. A first study comparing Baden-Wuerttemberg, Bavaria, Hesse, and North Rhine-Westphalia (Milek et al., 2009) found no statistically significant differences in the size of reference group effects. The present study returns to this question, drawing on the PIRLS 2006 data, which allow all 16 states to be compared.

Research Questions

Over the past decade, scientific investigation of the German education system has revealed a number of cross-state differences for which institutional conditions – in addition to economic, social, and cultural conditions – may be responsible. Thus, the main questions addressed in this article are as follows: Are there cross-state differences in reference group effects at the transition from elementary to secondary schooling? And are some states better able than others to counteract these undesired effects?

Given previous results, we expect to find negative effects of mean class achievement on tracking recommendations in all states: we expect students with identical individual test scores to receive less favourable tracking recommendations in classes with particularly high mean class achievement, irrespective of the state. Previous research has also shown that school grades tend to mediate the negative effects of mean class achievement, and we expect to find a similar pattern of results in the present study.

Data and Methods

Germany participated in the IEA study PIRLS (Progress in International Reading Literacy Study) in the years 2001 and 2006 and will also participate in 2011. The empirical analyses conducted in this paper are based on data from the German sample of PIRLS 2006. An oversampling of the federal states allows for comparison of these different educational systems in Germany.

In addition to the reading achievement data of the fourth-grade students, PIRLS provides extensive background information about students and their families, as well as information about teachers, classes and schools. This comprehensive database enables researchers to analyze in depth the learning processes of students at the age of about 9–10 years. In Germany the questionnaires used in the international study have been expanded to include some specific national characteristics of the education systems.

For our analysis we used the reading achievement, the school grades, the students' gender, the teacher's school track recommendation for each student, as well as a dummy variable for each federal state.

For national analysis of the PIRLS data in Germany the reading data were rescaled using a Rasch model, adjusting the national mean to 100 and the standard deviation to 20. In Germany school grades range from 1 (very good) to 6 (insufficient). As the grades 5 and 6 are very rarely given in primary school we recoded these two grades to 4 (sufficient). The PIRLS data contain variables for the student's grade in the subjects German and Mathematics. The gender of the students was coded 0 for boys and 1 for girls. As educational policies differ between the 16 federal states it is difficult to survey the teacher's school track recommendation because the existing school types in grade five also differ between the federal states. For this reason in PIRLS 2006 the teachers were asked: "Which of the

following educational careers/school graduations would you recommend for this student?"[2], with the response options 'leaving certificate for *Hauptschule*', 'leaving certificate for *Realschule*', 'leaving certificate for *Gymnasium*' and 'other, please specify'. Based on this wording Arnold et al. (2007) use the term "school track preferences of the teachers" but stress that this is an indicator for the teachers' school track recommendations. For our analyses we generated a dichotomous variable as a dependent variable, taking the value 1 where a student was recommended for *Gymnasium* and 0 if not. To account for possible differences between the 16 federal states a dummy-coded indicator was generated for each particular state.

For the following analyses we used data from 7,752 students (weighted 7,585 students) from 388 classes, excluding those students from the original German sample who attend special schools (*Förderschulen*). Missing data were imputed using NORM 2.03[3]. For the level-1 data (individual level) five datasets with complete data were generated. Afterwards these data were aggregated to get five complete level-2 datasets (class level). All analyses were conducted with each of the five imputations. Results were combined using the formulas developed by Rubin (1987). Data were weighted according to the PIRLS 2006 User's Guide (Foy, & Kennedy, 2008) with the student house weight.

The random intercept models in this paper were calculated using HLM (Raudenbush, & Bryk, 2002). Following the common convention we interpret effect coefficients (odds ratios) and present the logit coefficients and the associated standard errors.

Results

Table 1 shows descriptive statistics for the 16 federal states. Especially in respect of the proportion of students with immigrant background large differences between the federal states could be found.[4] In the East-German territorial states between 11.6 (Mecklenburg-Western Pomerania) and 16.3 percent (Saxony) of the students have an immigrant background in terms of at least one parent being born in a foreign country. In the West-German territorial states this proportion was between 20.6 (Schleswig-Holstein) and 44.0 percent (Hesse). In the city states (Berlin, Bremen and Hamburg) almost half of the students had an immigrant background.

[Insert Table 1 about here.]

The average socio-economic status of the students' families differed only slightly between the 16 federal states.[5] On the other hand there were substantial differences in the average reading achievement (see Valtin, Bos, Buddeberg, Goy, & Potthoff, 2008 for details).

25 classes (35 classes in North Rhine-Westphalia) were sampled in each federal state. As the special classes were excluded from our analyses the number of classes is slightly smaller. The number of students (unweighted) lay between 378 in Saxony-Anhalt and 559 in Berlin (respectively 714 in North Rhine-Westphalia). The weighted number of students reflects the different sizes of the federal states.

Figure 2 shows the proportion of the teachers' school track recommendations in the 16 federal states. The average values for Germany were 24.8 percent *Hauptschule*, 35.5 percent *Realschule* and 39.7 percent *Gymnasium*. These proportions varied substantially between the federal states. The values for

[2] "*Welche der folgenden Schullaufbahnen/Schulabschlüsse würden Sie für den Schüler/die Schülerin empfehlen?*"
[3] http://www.stat.psu.edu/~jls/misoftwa.html
[4] Differences to the results reported by Schwippert, Hornberg, & Goy (2008) are caused by the imputation of the missing values in this paper.
[5] Small differences to the results reported by Stubbe, Bos, & Hornberg (2008) are caused by differing imputation of the missing values.

a recommendation for *Gymnasium*, for example, lay between 27.6 percent in Mecklenburg-Western Pomerania and 57.0 percent in Bremen.

[Insert Figure 2 about here.]

The results for the multilevel model can be seen in Tables 2 and 3. The first model examined reading achievement and students' gender at an individual level, and reading achievement at the class level. A significant positive effect was found in terms of individual reading achievement, but none in terms of gender. In line with the theory the average reading achievement in the class produced a significant negative effect. Thus, students with equal individual achievement have a higher chance of receiving a recommendation for *Gymnasium* if they attend a class with below-average achievement.

[Insert Table 2 about here.]

[Insert Table 3 about here.]

In the second model the dummy variables for the federal states were included, with North Rhine-Westphalia as reference. It can be seen that the likelihood of receiving a recommendation for *Gymnasium* was significantly lower in Mecklenburg-Western Pomerania, Bavaria, Thuringia, Rhineland-Palatinate, Schleswig-Holstein, Brandenburg and Berlin provided the individual and the average class achievement were controlled. In this model the students' gender also had a significant effect, in terms of girls having higher odds of receiving a positive recommendation.

To test whether federal states differ in the size of reference group effects, interaction terms (federal state reading achievement) were considered in the third model. None of these terms were statistically significant so they were omitted in the fourth model. In this model the grades in the subjects German and Mathematics were included. Both coefficients were negative and significant, indicating that students with better grades have a higher chance of being recommended for *Gymnasium*. In both the third and the fourth model no significant effect of average class reading achievement could be found. In model four there was also no effect of gender.

Conclusion

This paper examined the extent to which teachers' recommendations of a secondary track are systematically related to mean class achievement level and whether there are differences in this reference group effect across the federal states. Findings show a negative association between mean class achievement and teachers' recommendations (model 1) that was mediated by school grades (model 2 vs. model 4). Hence, for a student in a low-performing class the chance of receiving a recommendation for *Gymnasium* proved to be higher than the chance for a comparable student in another, lower-performing class. However, in this study cross-state differences in the size of reference group effects were not statistically significant (model 3), thus indicating that similar reference group mechanisms apply regardless of the federal state.

Further studies may improve our understanding of whether certain school system structures or institutional conditions might help to counteract reference group effects that promote inequality. Considering, in particular, how important school transition decisions are in determining the direct entry qualification for certain fields of further education (e.g., universities, professional training), reference-group-related practices of recommendation for secondary school challenge the social justice of the school transition process.

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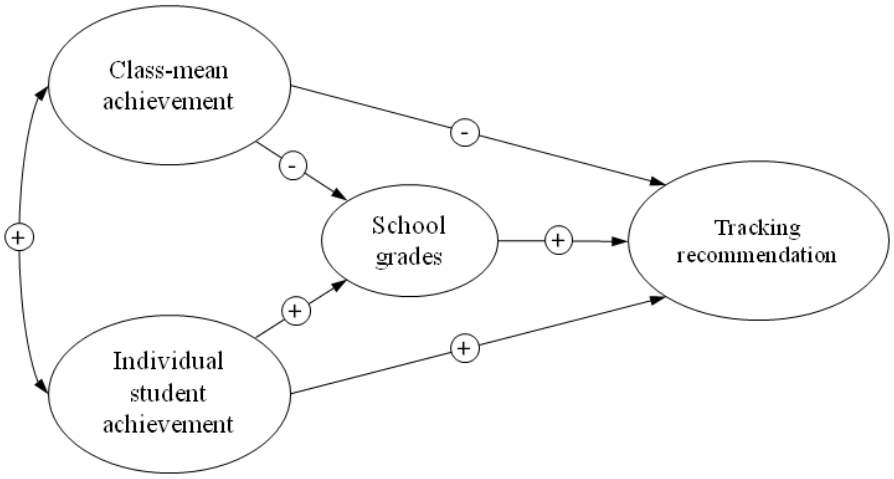

Fig. 1: Theoretical model for reference group effects

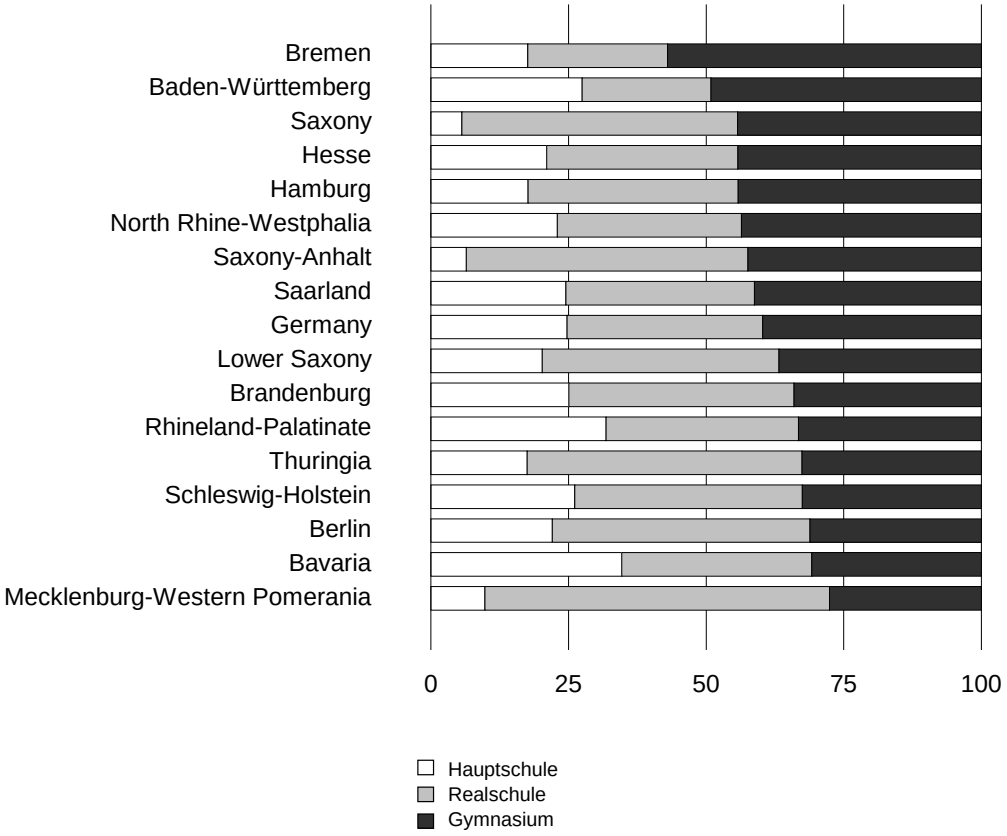

Fig.2: Teacher's school track recommendation for secondary school by federal state

Table 1: Descriptive statistics by federal state

	BW	BY	BE	BB	HB	HH	HE	MV	NI	NW	RP	SL	SN	ST	SH	TH	**Total**
migration background[1] in percent	34.9	25.2	50.1	14.8	45.3	43.5	44.0	11.6	21.5	34.3	22.3	24.2	16.3	12.1	20.6	12.4	**29.8**
									M(SD)								
average HISEI[2]	50.0	50.4	49.5	50.5	48.3	48.9	48.6	49.5	50.4	49.4	50.4	49.7	50.4	48.3	50.7	48.5	**49.8**
	(17.0)	(15.8)	(16.9)	(16.7)	(17.1)	(17.5)	(16.6)	(16.4)	(15.8)	(15.9)	(15.9)	(17.5)	(15.3)	(15.9)	(16.3)	(15.5)	**(16.2)**
average reading achievement	-0.03	0.19	-0.29	-0.06	-0.35	-0.28	-0.15	0.20	-0.02	-0.04	0.07	0.00	0.15	0.13	-0.01	0.19	**0.00**
	(0.99)	(0.97)	(1.20)	(1.08)	(1.14)	(1.09)	(1.03)	(1.00)	(0.91)	(1.00)	(0.96)	(1.01)	(0.98)	(0.95)	(0.95)	1.01	**(1.00)**
average class size	19.2	21.8	23.1	19.1	21.5	22.6	21.1	18.1	18.9	21.7	20.9	18.0	17.9	16.8	21.2	18.7	**20.6**
	(4.0)	(3.3)	(2.7)	(3.1)	(3.6)	(5.0)	(3.8)	(4.0)	(2.8)	(2.5)	(3.6)	(2.8)	(3.1)	(4.3)	(3.1)	(3.6)	**(3.6)**
number of classes (unweighted)	22	24	24	24	24	24	24	23	24	33	24	25	23	23	24	23	**388**
number of students (unweighted)	421	516	559	451	509	557	499	410	551	714	497	445	417	378	500	428	**7752**
number of students (weighted)	1131	1267	224	151	58	167	619	87	860	1745	398	98	228	129	292	132	**7585**

BW = Baden-Württemberg. BY = Bavaria. BE = Berlin. BB = Brandenburg. HB = Bremen. HH = Hamburg. HE = Hesse. MV = Mecklenburg-Western Pomerania. NI = Lower Saxony. NW = North Rhine-Westphalia. RP = Rhineland-Palatinate. SL = Saarland. SN = Saxony. ST = Saxony-Anhalt. SH = Schleswig-Holstein. TH = Thuringia

[1] at least one parent born in foreign country

[2] highest International Socio-Economic Index of Occupational Status (Ganzeboom. de Graaf & Treiman. 1992)

Table 2: Results from the multilevel analysis (part 1)

	Teachers' recommendation for Gymnasium					
	Model 1			Model 2		
Predictors	Logit	SE	OR	Logit	SE	OR
Constant	-0.75 ***	0.07	0.47	-0.77 ***	0.07	0.46
Fixed effects						
Individual level						
Reading achievement	1.55 ***	0.06	4.73	1.56 ***	0.06	4.78
Female	0.73	0.07	1.14	0.15 *	0.07	1.16
Grade (German)						
Grade (Mathematics)						
Class level						
Reading achievement	-0.23 **	0.07	0.79	-0.14 *	0.07	0.87
MV				-1.16 ***	0.27	0.31
BY				-0.96 ***	0.24	0.38
TH				-0.93 **	0.27	0.39
RP				-0.67 **	0.23	0.51
SH				-0.64 **	0.19	0.53
BB				-0.52 *	0.22	0.59
BE				-0.43 *	0.21	0.65
NI				-0.34	0.21	0.71
SN				-0.32	0.23	0.73
ST				-0.24	0.27	0.79
SL				-0.23	0.22	0.80
HH				-0.17	0.25	0.85
HE				-0.08	0.26	0.92
BW				-0.33	0.22	1.39
HB				-0.42	0.23	1.52
Random effects						
Var (U_{0j})	0.55			0.40		
R^2	0.37			0.40		

Logit = unstandardized logit-coefficient; SE = standard error of the logit; OR = odds ratio
BW = Baden-Württemberg. BY = Bavaria. BE = Berlin. BB = Brandenburg. HB = Bremen.
HH = Hamburg. HE = Hesse. MV = Mecklenburg-Western Pomerania. NI = Lower Saxony.
RP = Rhineland- Palatinate. SL = Saarland. SN = Saxony. ST = Saxony-Anhalt.
SH = Schleswig-Holstein. TH = Thuringia (reference: NW = North Rhine-Westphalia)
R^2 calculated according to Snijders & Bosker (1999)
* p < .05; ** p < .01; *** p < .001

Table 3: Results from the multilevel analysis (part 2)

	Teachers' recommendation for Gymnasium					
	Model 3			Model 4		
Predictors	Logit	SE	OR	Logit	SE	OR
Constant	-0.76 ***	0.07	0.47	-1.88 ***	0.14	0.15
Fixed effects						
Individual level						
Reading achievement	1.57 ***	0.06	4.81	0.49 ***	0.09	1.64
Female	0.15 *	0.07	1.16	0.02	1.14	1.02
Grade (German)				-2.72 ***	0.13	0.07
Grade (Mathematics)				-2.15 ***	0.12	0.12
Class level						
Reading achievement	-0.11	-0.07	0.90	-0.07	0.10	1.08
MV	-1.08 **	0.34	0.34	-3.47 ***	0.48	0.03
BY	-0.97 ***	0.24	0.38	-1.82 ***	0.42	0.16
TH	-1.00 **	0.28	0.37	-3.06 ***	0.44	0.05
RP	-0.71 **	0.23	0.49	-0.86 *	0.35	0.42
SH	-0.64 **	0.19	0.53	-0.41	0.37	0.66
BB	-0.56 *	0.22	0.57	-3.59 ***	0.45	0.03
BE	-0.39	0.23	0.68	-1.52 ***	0.39	0.22
NI	-0.35	0.22	0.71	-0.36	0.33	0.70
SN	-0.29	0.25	0.75	-1.23 **	0.42	0.29
ST	-0.22	0.33	0.81	-2.09 ***	0.40	0.12
SL	-0.24	0.22	0.79	-0.20	0.41	0.82
HH	-0.07	0.28	0.93	-0.52	0.37	0.59
HE	-0.07	0.29	0.93	0.27	0.52	1.31
BW	0.30	0.21	1.35	0.77 *	0.36	2.16
HB	0.68 *	0.27	1.97	0.12	0.44	1.12
MV * Reading achievement	-0.28	0.34	0.76			
BY * Reading achievement	-0.10	0.26	0.90			
TH * Reading achievement	0.01	0.31	1.01			
RP * Reading achievement	0.00	0.27	1.00			
SH * Reading achievement	0.16	0.30	1.17			
BB * Reading achievement	-0.28	0.24	0.76			
BE * Reading achievement	-0.02	0.21	0.98			
NI * Reading achievement	0.10	0.36	1.11			
SN * Reading achievement	-0.21	0.25	0.81			
ST * Reading achievement	-0.20	0.44	0.82			
SL * Reading achievement	0.10	0.22	1.10			
HH * Reading achievement	0.05	0.23	1.06			
HE * Reading achievement	-0.05	0.25	0.95			
BW * Reading achievement	-0.37	0.21	0.69			
HB * Reading achievement	0.19	0.24	1.21			
Random effects						
Var (U_{0j})	0.41			1.44		
R^2	0.40			0.83		

Logit = unstandardized logit-coefficient; SE = standard error of the logit; OR = odds ratio
BW = Baden-Württemberg. BY = Bavaria. BE = Berlin. BB = Brandenburg. HB = Bremen. HH = Hamburg. HE = Hesse. MV = Mecklenburg-Western Pomerania. NI = Lower Saxony. RP = Rhineland-Palatinate. SL = Saarland. SN = Saxony. ST = Saxony-Anhalt. SH = Schleswig-Holstein. TH = Thuringia (reference: NW = North Rhine-Westphalia)
R^2 calculated according to Snijders & Bosker (1999)
* p < .05; ** p < .01; *** p < .001