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ORIGINAL PAPER

Migration background and educational tracking

Is there a double disadvantage for second-generation immigrants?

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Abstract Research on immigrants' educational disadvantages documents substantial immigrant–native achievement gaps in standardized student assessments. Exploiting data from the German PIRLS extension, we find that second-generation immigrants also receive worse grades and teacher recommendations for secondary school tracks than natives, which cannot be explained by differences in student achievement tests and general intelligence. Second-generation immigrants' less favorable socioeconomic background largely accounts for this additional disadvantage, suggesting that immigrants are disproportionately affected by prevailing social inequalities at the transition to secondary school. We additionally show that differences in track attendance account for a substantial part of the immigrant–native wage gap in Germany.

Keywords Second-generation immigrants · Educational inequalities · Educational tracking · Economic assimilation · Germany · PIRLS

JEL Classification I21 · J15 · I28

1 Introduction

Recent evidence suggests that the economic assimilation of immigrants is failing in major European countries (Algan et al. 2010). Integration through edu-

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cation is widely believed to be an antidote to this problem, but such a strategy is likely to fail if equal opportunities in the educational system are not ensured. Indeed, recent studies, based on objective measures of educational success, namely standardized achievement tests, and document large achievement gaps between immigrant and native students (e.g. Schnepf 2007; Ammermueller 2007; Schneeweis 2011). Moreover, immigrant students may also be faced with disadvantages when it comes to more subjective measures of educational success, such as grades and teacher recommendations for secondary school tracks in tracked school systems. Subjective measures such as these are highly influential on actual track attended and thus, ultimately, the type of school certificate obtained. To the extent that differences in grades and teacher recommendations are not entirely explained by differences in standardized achievement tests, previous studies focusing on achievement gaps between immigrants and natives have not captured the full extent of immigrants' educational disadvantage.

Conditional on a range of measures of student achievement and general intelligence, this paper analyzes whether second-generation immigrants in Germany receive worse grades and, ultimately, worse teacher recommendations for secondary school tracks than natives. We exploit unique microdata from the German extension of the Progress in International Reading Literacy Study (PIRLS-E) 2001 that allow us to investigate differences between native and immigrant students at the transition from primary to secondary school in much more depth than previous studies (e.g. Schnepf 2002). Specifically, in addition to student achievement in reading and mathematics measured just before the transition to secondary school, PIRLS-E data offer a measure of general intelligence as well as information on grades and teacher recommendations for secondary school tracks.

We find that, compared to their native counterparts, male second-generation immigrants are 6.8 percentage points more likely to receive a recommendation for the lowest secondary school track (*Hauptschule*), and 6.7 percentage points less likely to be recommended for the highest track (*Gymnasium*) after controlling for test scores in reading and mathematics. This difference between natives and second-generation immigrants remains significant even after controlling for general intelligence. Female second-generation immigrants are 6.1 percentage points more likely to be recommended for the lowest secondary school track, even after controlling for reading and mathematics achievement, but this result becomes insignificant after controlling for general intelligence. Moreover, both female and male second-generation immigrants receive significantly worse school grades in German and mathematics, and these differences cannot be explained by differences in standardized student achievement tests or general intelligence alone.

We find that differences between natives and second-generation immigrants in regard to secondary school track recommendations become insignificant once we additionally control for students' socioeconomic background. This result is in line with evidence presented in Schnepf (2002), based on secondary school data, that immigrants' actual track attendance does not differ from

that of natives after controlling for student achievement and socioeconomic background.

Thus, we find no evidence of ethnic discrimination at the transition to secondary school track per se; rather, our results can be interpreted as evidence of more general inequalities at the transition to secondary school tracks in the sense that socioeconomic background affects track recommendations even conditional on student achievement. Second-generation immigrants are more negatively affected by these inequalities because, generally, they come from lower socioeconomic backgrounds. This interpretation is in line with previous studies which found more generally that early educational tracking between school types increases the effects of parental background on educational outcomes (e.g. Bauer and Riphahn 2006; Meghir and Palme 2005; Pekkarinen et al. 2009a).

This finding could be crucial to understanding the failing economic assimilation of immigrants. Extending recent research by Algan et al. (2010), we provide additional evidence that existing wage gaps between second-generation immigrants and natives in Germany are largely explained by differences in secondary school track attendance.

The remainder of the paper is structured as follows. Section 2 briefly describes the German school system. Section 3 discusses the concept of the double disadvantage. In Section 4, we describe the data, present the main estimation results, and discuss potential mechanisms for the findings as well as their economic relevance. Section 5 concludes.

2 Educational tracking in the German school system

Although almost every school system in the world features some form of assigning students to educational tracks based on ability, the German system is unusual in that it assigns students to fixed tracks very early on, usually at age 10.[1] Figure 1 illustrates the general structure of the German school system.

Education begins with optional kindergarten, which is available to all children between 3 and 6 years of age. General compulsory schooling begins in the year in which a child turns six and involves a minimum of 9 years of full-time schooling. During primary education, all children attend elementary school (*Grundschule*), and everyone is taught the same subjects. Elementary school usually lasts until fourth grade. Thereafter, students are separated into three educational tracks that differ in academic orientation and requirements: secondary general school (*Hauptschule*), intermediate school (*Realschule*), and high school (*Gymnasium*).

Secondary general school is the least academic track and usually lasts until grade 9 (or 10). It is typically followed by part-time enrollment in a vocational

[1] In Austria, students are also tracked at age 10; in the Czech Republic, Hungary, and Slovenia, at age 11; and in Belgium and the Netherlands, at age 13 (for a more comprehensive review, see Woessmann 2009).

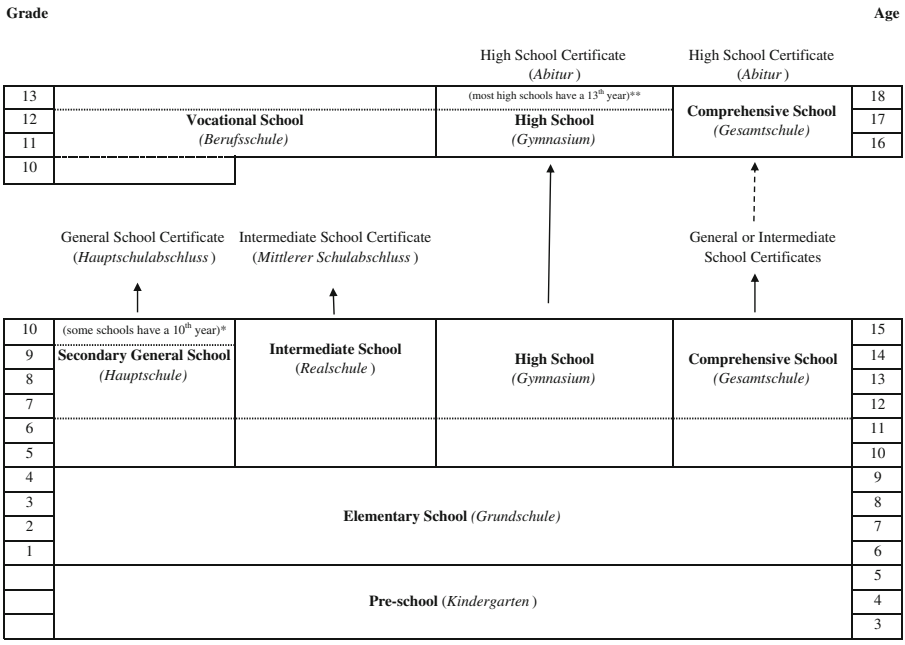


Fig. 1 The German school system. Stylized illustration of the German school system. Not all school types exist in all German states; secondary general schools, in particular, do not exist—or are very rare—in East German states; different types of comprehensive schools are generally more common in East German than in West German states. The *single asterisk* indicates that in some states, a secondary general school certificate can be obtained after grade 9, in others after grade 10; while the *double asterisks* indicate that in some states, the high school certificate (Abitur) can be obtained after grade 12, in others after grade 13

school (*Berufsschule*) combined with apprenticeship training until age 18. Intermediate school, the middle track in the German system, usually lasts until grade 10 and is traditionally followed by part-time attendance at a vocational school. However, students with high academic achievement can attend high school after graduation from intermediate school. High school is the most academic track and usually lasts until grade 13. It prepares students for university study or for a dual academic and vocational credential. The high school certificate (*Abitur*) is a precondition for academic studies.

A fourth track, called *Gesamtschule*, is an alternative to the traditional three tracks. This comprehensive school usually offers all options of the other three tracks but can also function as a step between general and intermediate school. It enrolls students of all ability levels in the fifth through the tenth grades.

Table 1 reports the percentage of students in eighth grade in 2001 by track and federal state, showing that the traditional tripartite secondary school system is still dominant in Germany. Roughly 30 % of all students attend the highest track; general and intermediate school attendance is almost equal at 24 and 23 %, respectively. Comprehensive schools, as yet, play a minor role with

Table 1 Students by type of secondary school in West German states

Federal state	School type (%)				Students
	General	Intermediate	High	Comprehensive	
Baden-Württemberg	32.4	32.4	28.9	0.5	129,417
Bavaria	39.0	28.6	27.2	0.3	145,521
Berlin	11.5	22.1	33.2	28.4	37,866
Bremen	22.1	26.8	29.8	15.4	6,687
Hamburg	11.8	14.2	35.2	30.4	16,301
Hesse	18.1	28.0	32.1	16.4	67,155
Lower Saxony	30.2	32.9	27.0	4.1	97,870
North Rhine-Westphalia	24.3	26.1	29.2	14.7	219,098
Rhineland-Palatinate	27.6	24.0	28.2	15.3	48,530
Saarland	0.4	2.0	30.3	62.2	12,239
Schleswig-Holstein	29.1	32.6	26.6	5.8	33,012
Germany	22.7	24.4	29.5	17.8	1,005,002

Figures refer to students in grade 8 in 2001. States in italics are not included in our estimation sample. Figures reported in the last row refer to the whole of Germany. Source: Standing Conference of the Ministers of Education and Cultural Affairs of the federal states in the Federal Republic of Germany

only 18 % attendance. Table 1 reveals significant variation in the distribution of students by school type among the federal states. This reflects the fact that education is primarily the responsibility of the federal states, resulting in different institutional regulations, such as the supply of schools of a specific school type. Recently, several German states have moved away from the traditional tripartite structure and have, for example, abolished the general school or the intermediate school and, in turn, strengthened the role of the comprehensive schools. We take institutional differences between federal states into account by analyzing within-state variation only.

In all federal states, the decision about what type of secondary school a student will attend is strongly dependent on primary school teacher recommendations. These, in turn, are based on the teachers' assessments of students' academic achievement (i.e., grades) in the two core subjects of German and mathematics. According to the Standing Conference of the Ministers of Education and Cultural Affairs of the German States in the Federal Republic of Germany, teacher track recommendations should be based on cognitive skills, with no consideration given to parents' income, social class, or migration background.[2] The degree to which teacher recommendations are binding varies between federal states, but, in practice, deviations from the recommended school track are rare.[3]

[2]See *Empfehlungen zur Arbeit in der Grundschule (Beschluss der Kultusministerkonferenz vom 02.07.1970 i.d.F. vom 06.05.1994)*, as cited in KMK (2010).

[3]Pietsch and Stubbe (2007, p. 436) find that 83.4 % of the parents follow the teacher's recommendation, while 6.7 % attend a lower secondary school, and 9.9 % a higher secondary school than recommended by the teacher.

Due to the low permeability between school tracks, the transition from primary to secondary school strongly determines the first school leaving certificate obtained. Recent official statistics suggest that only 2.6 % of all students switched school tracks between grades 7 and 9. Moreover, the majority of switches are downward: 65.6 % of all track changes are from a higher to a lower track (Autorengruppe Bildungsberichterstattung 2008, p. 255). After completion of secondary school, it is possible to obtain a higher educational qualification through second-chance education. However, the percentage of first year university or university of applied sciences students that obtained their university entrance certificate via second- or third-chance education was low in 2008 (4.4 %) and has increased only slightly since then (see Table F1-4A, p. 291, Autorengruppe Bildungsberichterstattung 2010).

3 The concept of the double disadvantage

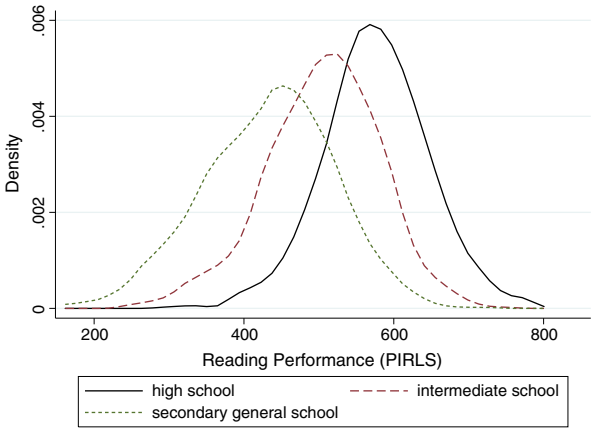
The goal of this paper is to discover whether there are differences between natives and second-generation immigrants regarding teacher recommendations for secondary school track that cannot be explained by differences in student achievement.

Figure 2 shows more generally that student achievement does not perfectly determine track attendance. Panel (a) reveals large overlaps in the distribution of cognitive skills by track recommendations at age 10.[4] These overlaps occur not only with respect to teacher recommendations but also with respect to secondary school track actually attended at age 15, as shown in Panel (b) of Fig. 2 (see also Schnepf 2002). This implies that although students attending a higher school track have, on average, higher cognitive skills, there are students with identical cognitive skills that attend lower secondary school tracks.

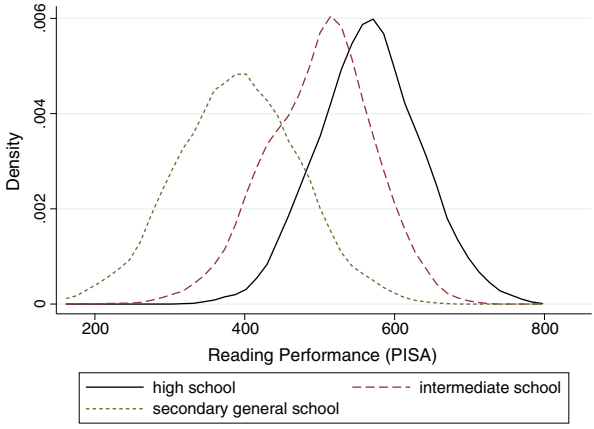
The key idea of this paper is that the total difference between second-generation immigrants and natives in the unconditional probability of attending a specific school track can be decomposed into two parts: one part that can be attributed to differences in standardized achievement tests and cognitive ability and one part that cannot. Following Schnepf (2007), we call the first of these parts the "first disadvantage" and the other the "second disadvantage". The first disadvantage is the one typically investigated in the economic literature on educational inequality between immigrants and natives; the second disadvantage has received far less attention.

Figure 3 graphically illustrates this double disadvantage for second-generation immigrants. In order to simplify matters, Fig. 3 shows only two possible school tracks: a low one and a high one. A student's track recommendation depends on her position on the stylized one-dimensional distribution of cognitive skills

[4]The figure displays the distribution of reading performance for exemplary purposes. Similar overlaps exist when focusing on math performance or on a combined measure of test scores in the two domains.



(a) Distribution of reading performance by recommendation for secondary school track at age 10



(b) Distribution of reading performance by secondary school track attended at age 15

Fig. 2 Distribution of reading performance by school track. Kernel density estimates based on PIRLS 2001 and PISA 2006 data for all of Germany. For both graphs, reading performance scores were standardized to have a mean of 500 and a standard deviation of 100. See Appendix A.1 for details on the data

and the stylized cutoff level. The decision rule is simple: a student will be recommended for the high track if her cognitive skills are above the specified cutoff level. The skill distribution for native students is represented by the solid line in Fig. 3 and that of second-generation immigrants by the dashed line. The first disadvantage (marked as 1 in the graph) corresponds to the difference in the means of these two distributions. This difference in cognitive skills will give rise to differences in the probability of attending the higher track. A second disadvantage (marked as 2 in the graph) could arise if the cutoff levels were different for natives and for second-generation immigrants. In such a case, as illustrated in Fig. 3, second-generation immigrants, in addition to having a

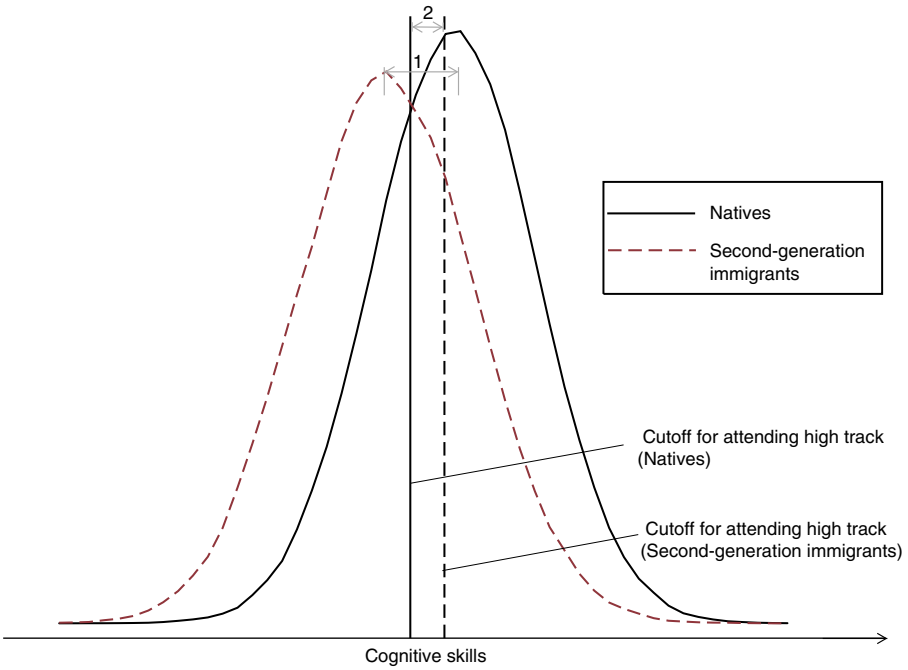


Fig. 3 This idealized figure illustrates the idea of the double disadvantage. The first disadvantage (marked as *1* in the graph) corresponds to the distance in the means of the two distributions of cognitive skills of natives and second-generation immigrants. The second disadvantage is shown as the distance in the cutoffs for the higher school track, which are different for natives and second-generation immigrants (marked as *2* in the graph)

less favorable skill distribution, would also need to have higher cognitive skills compared to natives to receive a recommendation for the higher school track.[5]

The idea of a double disadvantage is not novel in the literature. In a closely related paper, Schnepf (2002) investigates whether the selection of pupils at the transition from primary to secondary school in Germany can be explained by differences in achievement test scores based on TIMSS 1995 and PISA 2000 data. However, Schnepf (2002) measures cognitive skills several years *after* the transition to secondary school. To the extent that in higher educational tracks there are higher achievement gains, even conditional on initial achievement, it is unclear whether score differences measured several years after entry into secondary school are a cause or an effect of attending

[5]This illustration is helpful to clarify the idea of the double disadvantage; but in reality, the transition to secondary school tracks in Germany, in addition to having more than just two school tracks, is not a deterministic process as suggested by Fig. 3. In particular, it should be kept in mind that there are no objective, clear cutoff rules for receiving a recommendation for a particular type of school since teachers do not base their recommendation on objective tests but on subjective assessments of their students' educational potential.

a specific school track.[6] The key advantage of our study is that we have data on student achievement and cognitive ability measured just *before* selection into secondary school tracks. In addition, we have direct information on teacher recommendations and measures for general intelligence. Finally, Schnepf (2002) does not investigate differences in teacher recommendations for immigrants and natives conditional only on measures of cognitive skills, which we define as the relevant measure of the second disadvantage.

4 Empirical analysis

In this section, we investigate differences in teacher recommendations for secondary school tracks and course grades at the end of primary education between second-generation immigrants and natives. We describe the data, explain our estimation strategy, and present the results, ending with an interpretation of the results and a discussion of their economic relevance.

4.1 The German PIRLS-E data

For the empirical analysis of immigrant–native differences in teacher recommendations and course grades, we use microdata from the German extension of the Progress in International Reading Literacy Study 2001. In terms of objective measures of cognitive skills, PIRLS-E data contain information on students' reading and mathematics performance, as well as test scores on two subscales of a standardized test of cognitive abilities (IQ test), the *Kognitive Fähigkeitstest* (KFT) for grade 4 by Heller and Perleth (2000): Verbal Analogies and Figure Analogies. PIRLS-E data also contain a variety of subjective measures of student achievement, namely grades in German and mathematics, as well as teacher recommendations for the type of secondary school for each child. Moreover, the database provides rich socioeconomic background information.

We define as second-generation immigrants all students who were born in Germany but have at least one parent born abroad. We restrict our sample to West German students because the percentage of second-generation immigrants in East Germany is extremely low for historical reasons (below 3 %), and we exclude data from those federal states where students are not tracked at age 10. We use only those observations that contain information on the teacher recommendation as well as on migration background. Our final sample consists of 3,436 students from seven West German states, among them 580 second-generation immigrants and 2,856 native students.[7]

[6] See also the discussion in Schnepf (2002, p. 32).

[7] For details on the construction of the estimation sample, on the treatment of missing values, on the measures of cognitive skills, as well as descriptive statistics of students' background characteristics, see Appendix A.1.

Table 2 presents descriptive statistics by gender on teacher recommendations, course grades, and objective measures of cognitive skills separately for natives and second-generation immigrants. The majority of native students receive a recommendation for high school; most second-generation immigrants are recommended for general school. Moreover, second-generation immigrants receive on average worse grades in German and mathematics. Table 2 also presents evidence on achievement gaps between second-generation immigrants and natives that is in line with previous findings in the literature (Schnepf 2007; Ammermueller 2007; Schneeweis 2011). In both reading and mathematics, second-generation immigrants' performance lags behind that of native students, with a slightly higher dispersion than is found for native students.

4.2 Empirical strategy and results

Table 2 reveals significant differences between second-generation immigrants and natives with respect to several subjective and objective measures of student achievement at the end of primary education. The main objective

Table 2 Measures of educational success by migration background

Variables	Males			Females		
	Natives	Second-generation immigrants	Difference in means	Natives	Second-generation immigrants	Difference in means
Teacher recommendation						
General school (*Hauptschule*)	0.26	0.44	−0.18***	0.20	0.38	−0.18***
Intermediate school (*Realschule*)	0.33	0.31	0.02	0.34	0.33	0.02
High school (*Gymnasium*)	0.41	0.25	0.16***	0.46	0.30	0.16***
Course grades						
Grade in German	2.76	3.17	−0.41***	2.38	2.81	−0.43***
	(0.83)	(0.93)		(0.80)	(0.88)	
Grade in mathematics	2.46	2.87	−0.41***	2.56	3.02	−0.46***
	(0.88)	(0.98)		(0.91)	(0.97)	
Test scores						
Reading performance	−0.02	−0.50	0.48***	0.19	−0.39	0.58***
	(0.94)	(1.10)		(0.97)	(1.01)	
Mathematics performance	0.21	−0.11	0.32***	0.08	−0.49	0.41***
	(0.94)	(1.04)		(1.00)	(1.03)	

Data are weighted by the inverse of students' sampling probability. Grades in German and mathematics refer to average grades in the first semester of grade 4 and are measured on a scale from 1.0 (best) to 6.0 (worst). Test scores in reading and mathematics are standardized to have a mean of 0 and a standard deviation of 1. Standard deviations reported in parentheses. Scores of the Cognitive Abilities Test (KFT) are not reported because of confidentiality obligations. Data: PIRLS-E 2001

* significant at 10% level
** significant at 5% level
*** significant at 1% level

of the empirical analysis in this section is to investigate to what extent the differences in the track recommendations and course grades can be explained by objective measures of student achievement and general intelligence.

We start with teacher recommendations. We use multinomial logit to model the probability of receiving a recommendation for a particular school track.[8] Our dependent variable is teacher recommendation, which can be for general school, intermediate school, or high school. The main explanatory variables of interest are a dummy variable identifying second-generation immigrants, as well as the objective measures of cognitive skills described above and in more detail in Appendix A.1. These include reading and mathematics test scores, as well as KFT scores.

In Tables 3 and 4, we present our estimates separately for males and females, reporting average marginal effects after multinomial logit.[9] Male and female second-generation immigrants are 19(17) percentage points more likely to be recommended for general school (*Hauptschule*), respectively, and 17(16) percentage points less likely to receive a recommendation for high school (*Gymnasium*),respectively, than are native students of the same sex (see column 1 in both tables). These estimates reflect the unconditional differences in track recommendations between second-generation immigrants and natives reported in Table 2. Column 2 of Tables 3 and 4 show our estimate of the additional disadvantage of second-generation immigrants that cannot be attributed to differences in student achievement: conditional on test performance in reading and mathematics, male second-generation immigrants are 6.8 percentage points more likely to be recommended for general school and 6.7 percentage points less likely to receive a recommendation for high school. Female second-generation immigrants are 6.1 percentage points more likely to receive a teacher recommendation for general school conditional on reading and mathematics performance but not significantly less likely to receive a recommendation for high school. For males, these estimates reduce, albeit slightly, once we also control for our measure of cognitive ability, the KFT, although they are statistically significant only at the 10 % level for the high school recommendation. For females, the estimated marginal effects are also of similar magnitudes, although no longer statistically significant once we additionally control for general intelligence (see column 3 of Tables 3 and 4).

Thus, differences in teacher recommendations between second-generation immigrants and natives cannot be explained by objective measures of cognitive skills alone. Understanding the underlying mechanisms that explain this educational disadvantage is crucial. Previous studies on test score differences between native and immigrant students have shown that differences in observable background characteristics can explain a large portion of the test score gap

[8]Results are almost identical when estimating ordered logit, ordered probit, and linear probability models.

[9]More precisely, we calculate the average of discrete or partial changes over all observations, using the finite-difference method for categorical variables and the calculus method for continuous variables.

Table 3 Immigrant–native differences in teacher recommendations for general school

		Cognitive controls		Cognitive controls and other background variables	
	1	2	3	4	5
Outcome: general school (*Hauptschule*), males					
Second-generation immigrant	0.191*** (0.034)	0.068** (0.028)	0.063** (0.029)	0.040 (0.028)	0.044 (0.029)
Reading performance		−0.141*** (0.013)	−0.125*** (0.014)	−0.100*** (0.014)	−0.096*** (0.014)
Mathematics performance		−0.109*** (0.014)	−0.085*** (0.014)	−0.080*** (0.014)	−0.082*** (0.014)
KFT Verbal Analogies			−0.037** (0.016)	−0.038** (0.016)	−0.038** (0.016)
KFT Figure Analogies			−0.023* (0.012)	−0.021* (0.012)	−0.019 (0.012)
Socioeconomic status	No	No	No	Yes	Yes
Kindergarten attendance	No	No	No	No	Yes
Language spoken at home	No	No	No	No	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1,684	1,544	1,544	1,544	1,544
Outcome: general school (*Hauptschule*), females					
Second-generation immigrant	0.166*** (0.034)	0.061* (0.031)	0.050 (0.030)	0.032 (0.028)	0.030 (0.033)
Reading performance		−0.141*** (0.013)	−0.128*** (0.013)	−0.105*** (0.012)	−0.102*** (0.013)
Mathematics performance		−0.069*** (0.011)	−0.050*** (0.012)	−0.044*** (0.012)	−0.044*** (0.012)
KFT Verbal Analogies			−0.045*** (0.016)	−0.044*** (0.014)	−0.044*** (0.012)
KFT Figure Analogies			−0.018 (0.012)	−0.015 (0.011)	−0.015 (0.011)
Socioeconomic status	No	No	No	Yes	Yes
Kindergarten attendance	No	No	No	No	Yes
Language spoken at home	No	No	No	No	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1,752	1,578	1,578	1,578	1,578

The table reports average marginal effects after multinomial logit. Standard errors in parentheses are robust to clustering at the school level. Test performance in reading and mathematics and the KFT scores are standardized to have a mean of 0 and a standard deviation of 1. The KFT is a standardized test of general cognitive ability; in PIRLS-E 2001, students were tested on the two subscales "verbal analogies" and "figure analogies". Students' socioeconomic status is measured by categorical variables indicating the number of books at home, household income, and highest parental educational degree. In all specifications, we control for students' age. Data are weighted by the inverse of students' sampling probability. Data: PIRLS-E 2001

* significant at 10% level
** significant at 5% level
*** significant at 1% level

(see Schnepf 2007; Ammermueller 2007; Schneeweis 2011). These background characteristics include indicators for whether the language spoken at home is the test language, whether students have attended kindergarten, and a set of direct measures of parents' socioeconomic status.

In columns 4 and 5 of Tables 3 and 4, we therefore include measures for socioeconomic background, a dummy indicating whether the language spoken

Table 4 Immigrant–native differences in teacher recommendations for high school

		Cognitive controls		Cognitive controls and other background variables	
	1	2	3	4	5
Outcome: high school (*Gymnasium*), males					
Second-generation immigrant	−0.169*** (0.034)	−0.067** (0.034)	−0.058* (0.034)	−0.031 (0.033)	−0.017 (0.033)
Reading performance		0.174*** (0.014)	0.146*** (0.014)	0.117*** (0.014)	0.114*** (0.014)
Mathematics performance		0.118*** (0.016)	0.079*** (0.018)	0.069*** (0.018)	0.068*** (0.017)
KFT Verbal Analogies			0.050*** (0.016)	0.054*** (0.015)	0.054*** (0.015)
KFT Figure Analogies			0.053*** (0.013)	0.050*** (0.012)	0.050*** (0.012)
Socioeconomic status	No	No	No	Yes	Yes
Kindergarten attendance	No	No	No	No	Yes
Language spoken at home	No	No	No	No	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1,684	1,544	1,544	1,544	1,544
Outcome: high school (*Gymnasium*), females					
Second-generation immigrant	−0.158*** (0.032)	−0.031 (0.032)	−0.021 (0.032)	0.005 (0.032)	0.001 (0.036)
Reading performance		0.191*** (0.012)	0.166*** (0.013)	0.134*** (0.014)	0.134*** (0.014)
Mathematics performance		0.104*** (0.012)	0.065*** (0.013)	0.055*** (0.013)	0.055*** (0.013)
KFT Verbal Analogies			0.062*** (0.016)	0.057*** (0.015)	0.057*** (0.016)
KFT Figure Analogies			0.048*** (0.015)	0.041*** (0.015)	0.042*** (0.015)
Socioeconomic status	No	No	No	Yes	Yes
Kindergarten attendance	No	No	No	No	Yes
Language spoken at home	No	No	No	No	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1,752	1,578	1,578	1,578	1,578

The table reports average marginal effects after multinomial logit. Standard errors in parentheses are robust to clustering at the school level. Test performance in reading and mathematics and the KFT scores are standardized to have a mean of 0 and a standard deviation of 1. The KFT is a standardized test of general cognitive ability; in PIRLS-E 2001, students were tested on the two subscales "verbal analogies" and "figure analogies". Students' socioeconomic status is measured by categorical variables indicating the number of books at home, household income, and highest parental educational degree. In all specifications, we control for students' age. Data are weighted by the inverse of students' sampling probability. Data: PIRLS-E 2001

* significant at 10% level
** significant at 5% level
*** significant at 1% level

at home is the test language and a dummy indicating whether students have attended preprimary education. The results show that these control variables have strong explanatory power. For the outcome "general school," the estimated marginal effect of being a second-generation immigrant decreases to 4(3) percentage points for females and becomes insignificant in all specifications. With respect to receiving a recommendation for high school, the point

estimate for the average marginal effect of the second-generation immigrant dummy reduces sharply to −1.7 percentage points for males and to 0% for females. Overall, these results suggest that a large part of the second disadvantage for second-generation immigrants can be explained by differences in observable background characteristics.[10]

We additionally estimate linear models and regress grades in German and mathematics on objective measures of cognitive skills. Because it is usually the same teacher who both recommends a track and gives out grades, it is not surprising that these measures are highly correlated.[11] In Germany, grades range from 1 (best) to 6 (worst). Table 5 shows that reading and mathematics test scores are significantly related to grades in both subjects, as is general cognitive ability as measured by the KFT. More importantly, even after controlling for these measures of cognitive skills, second-generation immigrants receive significantly worse grades. In German, the difference between second-generation immigrants and natives amounts to about one-fifth of a standard deviation for both males and females. In mathematics, this difference is 18 and 26% of a standard deviation for males and females, respectively.[12]

The differences in German grades between second-generation immigrants and natives reduce substantially once we control for students' socioeconomic background, kindergarten attendance, and language spoken at home (see columns 2 and 4 of Table 5).[13] A similar pattern is evident for the differences in mathematics grades between second-generation immigrants and natives: the estimates are significantly reduced once these background variables are included (see columns 2 and 4 of Table 5). However, the estimates remain significant at the 10 % level for males. For female second-generation immigrants, the grade disadvantage still amounts to 19 % of a standard deviation after controlling for the background variables and remains statistically significant at the 5 % level.

Thus, Table 5 confirms the main findings of the previous analysis of teacher recommendations: in controlling for KFT scores and objectively measuring test scores in reading and mathematics, respectively, there remains a significant disadvantage for second-generation immigrants. This finding may have broad implications. Additional disadvantages with respect to subjectively assessed

[10]Note that returns to socioeconomic background characteristics do not differ significantly between second-generation immigrants and natives.

[11]In a linear regression, the students' grades in German and mathematics account for 70% of the variation in teacher recommendations. Note that the second-generation immigrant dummy does not enter significantly in this regression.

[12]In a related study, Kiss (2011) confirms the existence of grade disadvantages in mathematics for second-generation immigrants in primary school based on a matching approach but cannot find evidence for differences in grading within secondary school tracks between natives and second-generation immigrants at the age of 15.

[13]We find some evidence that part of the grade disadvantage is due to unobserved heterogeneity between schools. Estimating the same specification with class fixed effects did not change the results compared to the school fixed effects specification. These results are available from the authors upon request.

Table 5 Immigrant–native differences in course grades

	Males		Females	
	1	2	3	4
Outcome: grade in German				
Second-generation immigrant	0.187**	0.102	0.175***	0.103*
	(0.072)	(0.069)	(0.052)	(0.058)
Reading performance	−0.361***	−0.311***	−0.375***	−0.329***
	(0.022)	(0.023)	(0.024)	(0.025)
KFT Verbal Analogies	−0.171***	−0.173***	−0.146***	−0.135***
	(0.026)	(0.026)	(0.030)	(0.029)
KFT Figural Analogies	−0.056**	−0.040*	−0.019	−0.012
	(0.023)	(0.023)	(0.029)	(0.029)
Socioeconomic status	No	Yes	No	Yes
Kindergarten attendance	No	Yes	No	Yes
Language spoken at home	No	Yes	No	Yes
State fixed effects	Yes	Yes	Yes	Yes
Observations	1,355	1,355	1,374	1,374
Outcome: grade in Mathematics				
Second-generation immigrant	0.164**	0.119*	0.243***	0.171**
	(0.069)	(0.064)	(0.066)	(0.068)
Mathematics performance	−0.310***	−0.278***	−0.323***	−0.281***
	(0.027)	(0.026)	(0.023)	(0.024)
KFT Verbal Analogies	−0.174***	−0.168***	−0.129***	−0.111***
	(0.030)	(0.029)	(0.031)	(0.029)
KFT Figural Analogies	−0.087***	−0.075***	−0.168***	−0.147***
	(0.025)	(0.024)	(0.028)	(0.028)
Socioeconomic status	No	Yes	No	Yes
Kindergarten attendance	No	Yes	No	Yes
Language spoken at home	No	Yes	No	Yes
State fixed effects	Yes	Yes	Yes	Yes
Observations	1,540	1,540	1,577	1,577

The table reports coefficients from a linear regression. Standard errors in parentheses are robust to clustering at the school level. Grades in German and mathematics refer to average grades in the first semester of grade 4 and are measured on a scale from 1.0 (best) to 6.0 (worst). Test performance in reading and mathematics and the KFT scores are standardized to have a mean of 0 and a standard deviation of 1. The KFT is a standardized test of general cognitive ability; in PIRLS-E 2001, students were tested on the two subscales "verbal analogies" and "figure analogies". Students' socioeconomic status is measured by categorical variables indicating the number of books at home, household income, and highest parental educational degree. All regressions control for students' age, as well as a constant (results not reported). Data are weighted by the inverse of students' sampling probability. Data: PIRLS-E 2001

* significant at 10% level
** significant at 5% level
*** significant at 1% level

grades that cannot be explained by objective measures of student achievement might also occur at other stages of formal schooling or in school systems that do not track students according to ability.

4.3 Interpretation and mechanisms

That the differences between second-generation immigrants and natives in recommendations for secondary school tracks become insignificant once we

control for students' socioeconomic background suggests that there is no ethnic discrimination per se at the transition to secondary school. Rather, there appear to be more general inequalities at the transition to secondary school tracks in the sense that socioeconomic background affects track recommendations even after controlling for student achievement.[14] Second-generation immigrants are more negatively affected by these inequalities due to their generally lower socioeconomic backgrounds. This raises the question of why socioeconomic background might matter for teacher recommendations and grades.

On the one hand, the measures of student achievement and general intelligence provided in PIRLS-E may be insufficient proxies for students' true cognitive skills and educational potential. Teachers might be better informed as to students' cognitive skills and educational potential and make track recommendations accordingly. In this case, our findings would indicate that our measures of socioeconomic background are proxies for relevant, but unobserved, cognitive or noncognitive skills.

On the other hand, the measures of student achievement and general intelligence provided in PIRLS-E might be very good indicators of students' cognitive skills and educational potential, and it is the teachers' assessments that are erroneous, that is, they are at least to some extent unrelated to students' cognitive skills or educational potential. Our main conclusion holds regardless of the underlying explanation: not only are second-generation immigrants disadvantaged with respect to objective measures of cognitive skills, but they also face an additional disadvantage with respect to other, more subjective measures of educational success, such as teacher recommendations for secondary school tracks and grades.

4.4 Economic relevance

Several studies show that the economic assimilation of immigrants in Germany is failing (e.g. Algan et al. 2010). Second-generation immigrants considerably lag behind in terms of educational attainment (e.g. Gang and Zimmermann 2000; Riphahn 2003) and labor market outcomes even conditional on educational attainment (e.g. Algan et al. 2010). The extent to which the double disadvantage—that is, inequalities between natives and second-generation immigrants at the transition to secondary schools—matter for the economic assimilation of immigrants depends on the long-term effects of track choice on subsequent educational attainment and labor market success.

Dustmann (2004) finds substantial associations between having obtained a higher secondary school (i.e., either intermediate or high school) certificate and wages. This may either be due to an increase in productivity or due to the

[14] In sociology and psychology, it is well established that at points of transition in the educational system, the impact of students' socioeconomic background on educational outcomes tends to be amplified (for a brief overview see Maaz et al. 2008). This finding, however, has to date received much less attention in the economic literature on educational production.

signaling value of attending higher school tracks or both. In line with the first explanation, it has been shown that attending higher school tracks positively affects learning trajectories: conditional on initial achievement, in mathematics, students learn substantially more in higher secondary school tracks (e.g. Becker et al. 2006). Given the low permeability between secondary school tracks (cf. Section 2), this finding suggests that immigrant–native differences in cognitive skills at the time of entering lower secondary school will be amplified. Moreover, obtaining a higher school leaving certificate is associated with higher subsequent postschool educational qualifications, such as completing an apprenticeship training or tertiary education (Dustmann 2004). The signaling literature further suggests that secondary school track attendance might affect earnings independently of accumulated cognitive skills since employers cannot in advance observe the applicants' true productivity but have to make assumptions about it based on information contained in resumes and/or school transcripts.[15]

In the context of this study, we are particularly interested in the question to what extent differences between second-generation immigrants and natives in secondary school track attendance can account for existing wage gaps between these two groups in Germany.[16] In order to address this question, we extend recent work by Algan et al. (2010) on wage differentials between second-generation immigrants and natives by including indicators for secondary school certificates in the regression specification. Columns 1 and 3 of Table 6 replicate the estimation of unconditional wage gaps for second-generation immigrants presented in Algan et al. (2010).[17] On average, native men earn 14 % more than second-generation immigrants, while native women earn 18 % more. Interestingly, these wage gaps do not reduce substantially when additionally controlling for the age at which an individual left full-time education (see Table 3 in Algan et al. 2010). In order to assess to what extent differences in school certificates can explain the wage gaps for second-generation immigrants, we instead control for the highest school certificate obtained (see columns 2 and 4 of Table 6). The estimated wage gap shrinks to 3 % for men and to 10 % for women, a striking drop clearly suggesting that the unfavorable distribution of school certificates has strong potential to explain a substantial part of the failing economic assimilation of immigrants in Germany.

[15] See Spence (1973) for the seminal paper in the signaling literature, and Altonji and Pierret (2001) for recent evidence on the existence of employer learning and statistical discrimination.

[16] In an earlier study, Schmidt (1997) shows that the gap in earnings between native Germans and ethnic German migrants is substantially reduced when controlling for participation in advanced secondary schooling (a proxy for attending the highest school track) and participation in postsecondary education.

[17] Note that these results correspond to the results for second-generation immigrants in Germany reported in Table 4 of (Algan et al. 2010) apart from the fact that we do not further distinguish between different countries of origin of second-generation immigrants. We thank Albrecht Glitz for providing us with the relevant programming code to replicate their results. See Appendix A.2 for details on the estimations presented and Table 8 for descriptive statistics on the estimation sample.

Table 6 Immigrant–native wage gaps before and after controlling for school certificates

	Men		Women	
	1	2	3	4
Second-generation immigrant	−0.142**	−0.032*	−0.182**	−0.097**
	(.017)	(0.016)	(0.021)	(0.020)
Intermediate school		0.147**		0.114**
		(0.005)		(0.005)
High school		0.485**		0.449**
		(0.005)		(0.006)
Region dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Potential experience	Yes	Yes	Yes	Yes
Observations	181,722	181,722	158,565	158,565

The table reports coefficients on dummy variables in a linear earnings equation. Estimations are based on the 2005 and the 2006 wave of the German Microcensus. All individuals are employed at the time of the survey. First-generation immigrants are excluded from the sample. The sample aged 16–64 years old. The dependent variable is log net hourly wages. The highest school certificate obtained is indicated by dummy variables with general school certificate being the omitted category. The model is estimated by censored normal regression due to the right censoring of the monthly income information. Estimations are weighted using population weights provided by the German statistical office. All estimations control for a quartic of potential experience, region dummies, and time dummies. Robust standard errors are in parentheses

* significant at 10% level
** significant at 5% level
*** significant at 1% level

5 Conclusion

In this paper, we analyze the differences between second-generation immigrants and natives in course grades and teacher recommendations for secondary school tracks at the end of primary school in Germany. Exploiting unique microdata from the German extension of PIRLS 2001, we show that, compared to natives, male second-generation immigrants are 6.8 percentage points more likely to receive a recommendation for the lowest secondary school track (*Hauptschule*), and 6.7 percentage points less likely to be recommended for the highest secondary school track (*Gymnasium*) after controlling for test performance in reading and mathematics. Female second-generation immigrants, compared to natives, are 6.1 percentage points more likely to be recommended for the lowest secondary school track, even after controlling for test performance in reading and mathematics; but this result becomes insignificant after controlling for general cognitive ability. Moreover, even after controlling for objective measures of cognitive skills, both female and male second-generation immigrants receive significantly worse school grades in these two domains.

These findings imply that typical studies of test score gaps between natives and immigrants (e.g. Schnepf 2007; Ammermueller 2007; Schneeweis 2011) underestimate immigrants' total educational disadvantage. With respect to other measures of educational success such as grades or teacher recommendations for secondary school tracks, second-generation immigrants face an additional

disadvantage that cannot be attributed to differences in student achievement tests or general intelligence alone.

We find that differences in socioeconomic characteristics largely explain this additional disadvantage. Thus, prevailing social inequalities at the transition to secondary school tracks appear to disproportionately affect second-generation immigrants due to their generally less favorable socioeconomic backgrounds. This interpretation is in line with more general findings in the literature showing that early educational tracking reinforces the effects of parental background on both educational outcomes (Bauer and Riphahn 2006; Meghir and Palme 2005; Pekkarinen et al. 2009a) and labor market success (e.g. Brunello and Checchi 2007; Dustmann 2004; Meghir and Palme 2005; Pekkarinen et al. 2009b).

The additional disadvantage encountered by second-generation immigrants at the transition to secondary school can have severe consequences on their future labor market performance. Indeed, we show that a large part of the wage gap between second-generation immigrants and natives in Germany can be attributed to differences in secondary school track attendance. Thus, social inequalities at the transition to secondary school could be crucial for understanding the failing economic assimilation of immigrants.

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Appendix A: Description of data sets

A.1 The German extension of the Progress in International Reading Literacy Study (PIRLS-E) 2001

PIRLS is an internationally comparable assessment of reading literacy of primary school students. As in most countries, in Germany, 10-year old students were tested, all of which attended the fourth grade of primary school. The PIRLS-E 2001 database is unique in that it contains a wide range of objective and subjective measures of cognitive skills.

We use three types of cognitive measures in our analyses of the double disadvantage. First, we use a measure of students' mathematics performance provided by the German extension of the PIRLS-E. Second, we use the test scores on two subscales of a standardized test of cognitive abilities, the *Kognitive Fähigkeitstest* for grade 4 by Heller and Perleth (2000): Verbal Analogies and Figure Analogies. This is the German adaptation of the "Cognitive Abilities Test" by Thorndike and Hagen (1971). A total response time of 7 or 8 min was devoted to these subtests. Both subscales measure an individual's capacity for logical thinking and reasoning. Generally, a high share of total variance in the scores of the KFT subscales is accounted for by a factor termed

"general intelligence," with the highest factor loadings on the figure analogies subscale. Heller and Perleth (2000) point out that, on average, students with migration background show stronger differences in performance on the different subscales than native students, which is why we use the scores on the two subscales separately in all our analyses. Also, note that the authors warn against the interpretation of KFT results as indicating an invariant indicator of intelligence. An individual's KFT test score is to be interpreted not as a measure of innate, invariant cognitive ability, but it is to be conceived also as an outcome of formal education, indicating an individual's cognitive strengths and weaknesses, as well as potential need for remedial education.

Third, we analyze subjective measures of student achievement, namely grades in German and mathematics as well as teacher recommendations for the type of secondary school a child should attend at the end of grade 4. Both grades and recommendations are provided by the teachers. PIRLS-E also contains detailed information on students' individual characteristics and parental background. Given the relatively large number of missing values for all measures of social background, we impute household income, parental education, and number of books at home, as well as kindergarten attendance and language spoken at home, using the method of multiple imputation by chained equations (MICE). This imputation approach gives valid inferences under the assumption that data are missing at random. We set the number of imputations $M = 25$ to keep the sampling error due to imputation relatively low.

Table 7 contains descriptive statistics on students' background characteristics, and reveals that second-generation immigrants, on average, come from less privileged social backgrounds and have attended kindergarten for a shorter period of time. For our analyses of the second disadvantage for second-generation immigrants, we use data for West German states only since for historical reasons, there are very few second-generation immigrants in East Germany. Given that primary school has six grades in Berlin and Bremen, students' families do not have to make a decision about which academic track to choose at the end of grade 4. We therefore drop observations from these two states.

Additionally, Hamburg and Saarland have been excluded because there is no differentiation between lower and intermediate secondary school in grades 5 and 6. There remains a sample of $N = 5,071$ observations from seven West German states in the sample: Baden-Württemberg, Bavaria, Hesse, Lower Saxony, North-Rhine Westphalia, Rhineland-Palatinate, and Schleswig-Holstein. We further had to delete 1,165 observations (23.0%) because either the information on the teacher recommendation ($N = 415$) or on migration background ($N = 827$) was missing or both.[18] Moreover, we excluded from the sample all first-generation immigrants, i.e., all students who were not born in Germany ($N = 519$). Our estimation sample consists of 580 second-

[18]Note that there are no systematic differences in the amount of missing information on teacher recommendations between natives and second-generation immigrants.

Table 7 Descriptive statistics on students' background characteristics

	Natives		Second-generation immigrants		
	Mean	SD	Mean	SD	Diff. in means
Number of books at home					
0 – 10	0.04		0.15		0.11***
11 – 25	0.22		0.28		0.06**
26 – 100	0.35		0.35		−0.01
101 – 200	0.21		0.10		−0.09***
More than 200	0.19		0.12		−0.08***
Highest parental education level					
Lower secondary or below	0.12		0.24		0.12***
Upper secondary	0.58		0.57		−0.03
Tertiary	0.29		0.19		−0.09***
Household income					
Less than 40,000 DM	0.10		0.16		0.07***
40,000–59,999 DM	0.16		0.25		0.08***
60,000–79,999 DM	0.25		0.23		−0.02
80,000–99,999 DM	0.20		0.16		−0.05**
100,000–119,999 DM	0.13		0.10		−0.03*
More than 120,000 DM	0.16		0.10		−0.05**
Individual characteristics					
Age (in months)	125.46	5.13	126.29	5.70	0.94***
Female	0.50		0.52		0.01
Kindergarten attendance					
Did not attend	0.02		0.08		0.06***
Less than 1 year	0.01		0.01		0.00
1 year	0.03		0.06		0.04**
Between 1 and 2 years	0.01		0.03		0.01
2 years	0.21		0.20		−0.03
More than 2 years	0.72		0.63		−0.08**
Test language spoken at home					
Always or almost always	0.98		0.67		−0.30***
Sometimes	0.01		0.31		0.29***
Never	0.00		0.02		0.01**

Data are weighted by the inverse of students' sampling probability. Household income categories refer to annual gross income measured in *Deutsche Mark* (DM). Data: PIRLS-E 2001

* significant at 10% level
** significant at 5% level
*** significant at 1% level

generation immigrants and 2,856 native students. In all regression models that contain mathematics performance, we also dropped all students from Lower Saxony since they did not participate in the mathematics test.

A.2 The German microcensus

The German Microcensus is the largest scale annually conducted household survey in Germany with a sample of 1 % of the German population. The statistical office provides public use files with information on 70 % random samples of the Microcensus data which contain up to half a million observations. We use Microcensus data for the years 2005 and 2006.

These data allow identification of second-generation immigrants based on citizenship and year of arrival in Germany. The reference native group

Table 8 Characteristics of the employed population by migration background

Variable	Men			Women		
	Natives	Second-generation immigrants	Natives–second-generation immigrants	Natives	Second–generation immigrants	Natives–second-generation immigrants
General school	0.42	0.50	−0.08*	0.37	0.36	0.01**
Intermediate school	0.25	0.29	−0.04	0.32	0.38	−0.06**
High school	0.33	0.21	0.12**	0.31	0.27	0.05**
Hourly wages	11.80	9.42	2.36**	9.93	7.96	1.98**
	(18.80)	(6.97)		(13.40)	(7.83)	
Observations	178,853	2,874		156,366	2,200	

The table reports selected average characteristics for natives and second-generation immigrants separately. Data sources are the 2005 and 2006 waves of the German Microcensus. All individuals are employed at the time of the survey. First-generation immigrants are excluded from the sample. The sample aged 16–64 years old. Average characteristics are weighted using population weights provided by the German statistical office. Standard deviations are reported in parentheses

* significant at 10% level
** significant at 5% level
*** significant at 1% level

consists of nonnaturalized German citizens born in Germany. We identify second-generation immigrants as individuals born in Germany who either hold only foreign citizenship or German citizenship that they obtained through naturalization.[19] This identification of second-generation immigrants as well as other sample restrictions correspond to the sample construction used in Algan et al. (2010). The data provides information on employment status, normal working hours per week, and net monthly earnings. We construct an approximate log hourly wage measure by subtracting the log of normal hours worked from the log of net monthly earnings.[20] Most importantly, the data also contains information on the type of secondary school certificate. We use secondary school certificates to proxy for track attendance as had been done previously in the literature (see Dustmann 2004). See Table 8 for descriptive statistics by gender and migration background.

Appendix B: Robustness check: missing information on migration background

One potential concern with our empirical analysis is that we have to exclude a relatively large number of observations due to missing information on migra-

[19]First-generation immigrants, defined as individuals born outside of Germany who have either only foreign citizenship or who obtained German citizenship through naturalization, are excluded from the sample.

[20]In principle, one would also have to subtract the log of weeks per month, but this is a constant and will be captured in the constant term in the regression analysis.

tion background. Thus, our results might identify effects for a specific subset of second-generation immigrants. In order to assess the potential relevance of the group of students omitted due to missing information on migration background, we conduct three robustness checks, the results of which are shown in Table 9.

The table shows average marginal effects after multinomial logit for our main specifications of interest (without controls for socioeconomic background). These results should be compared to the average marginal effects for second-generation immigrants reported in columns 1–3 of Tables 3 and 4.

First, we include all students with missing information on migration background as a separate category in our multinomial logit model (columns 1–3). Second, we code all students with missing information on migration background as second-generation immigrants (columns 4–6). Third, we code all students with missing information on migration background as natives (columns 7–9).

All three robustness checks fully support our main results. The results from estimations including students with missing migration background as a separate category show that students with missing information on migration background receive on average less favorable teacher recommendations for secondary school tracks than natives (column 1). However, when additionally controlling for differences in achievement (column 2) and controlling for differences in achievement and general intelligence (column 3), we no longer observe a statistically significant difference in teacher recommendations for this group.

This reflects the common finding that, in international student assessments, nonresponse in the background questionnaires is more common among students with low ability. Thus, students with missing information on migration background also receive on average less favorable teacher recommendations for secondary school tracks than natives, but this difference in teacher recommendations is almost entirely explained by differences in student achievement and general intelligence.

Although marginal effects for students with missing information on migration background in columns 2 and 3 are not significant, the signs of the estimates may indicate that students in this group are slightly less likely to receive a recommendation for high school and slightly more likely to receive a recommendation for secondary general school than natives. This is consistent with the hypothesis that this group of students, similar to the group of students with observed information on migration background, consists mainly of native students, but also includes a small group of second-generation immigrants.

Columns 4–6 (Tables 7, 8, and 9) show how our main results change if we code all students with missing information on migration background as second-generation immigrants (natives). Given the results presented in columns 1–3, we expect that the estimated average marginal effects for second-generation immigrants will become smaller in absolute terms. Overall, this is indeed what we see. For male students (panels (a) and (b) of Table 9), the estimated differences in teacher recommendations between natives and second-generation immigrants after controlling for cognitive skills are smaller in absolute values

Table 9 Robustness check: missing information on migration background

	Missings included as separate category			Missings coded as second-generation immigrants			Missings coded as natives		
	1	2	3	4	5	6	7	8	9
Males									
(a) Outcome: General School (*Hauptschule*)									
Second-generation immigrant	0.186***	0.068**	0.063**	0.223***	0.048**	0.042*	0.128***	0.059**	0.056**
	(0.034)	(0.028)	(0.028)	(0.025)	(0.023)	(0.023)	(0.034)	(0.026)	(0.027)
Missing migration background	0.248***	0.033	0.025						
	(0.031)	(0.029)	(0.028)						
(b) Outcome: High School (*Gymnasium*)									
Second-generation immigrant	−0.166***	−0.062*	−0.056*	−0.198***	−0.043*	−0.034	−0.116***	−0.057*	−0.053*
	(0.034)	(0.031)	(0.032)	(0.025)	(0.025)	(0.025)	(0.032)	(0.030)	(0.031)
Missing migration background	−0.220***	−0.024	−0.012						
	(0.027)	(0.031)	(0.031)						
Observations	2,097	1,908	1,908	2,097	1,908	1,908	2,097	1,908	1,908
Females									
(c) Outcome: General School (*Hauptschule*)									
Second-generation immigrant	0.163***	0.059*	0.047	0.181***	0.038*	0.028	0.125***	0.054*	0.044
	(0.034)	(0.031)	(0.031)	(0.024)	(0.022)	(0.021)	(0.033)	(0.030)	(0.029)
Missing migration background	0.197***	0.019	0.012						
	(0.030)	(0.022)	(0.022)						

Table 9 (continued)

	Missings included as separate category			Missings coded as second-generation immigrants			Missings coded as natives		
	1	2	3	4	5	6	7	8	9
(d) Outcome: High School (*Gymnasium*)									
Second-generation immigrant	−0.158*** (0.032)	−0.031 (0.031)	−0.021 (0.031)	−0.211*** (0.022)	−0.038* (0.022)	−0.029 (0.022)	−0.110*** (0.032)	−0.022 (0.031)	−0.014 (0.031)
Missing migration background	−0.257*** (0.027)	−0.047 (0.029)	−0.037 (0.028)						
Observations	2,089	1,886	1,886	2,089	1,886	1,886	2,089	1,886	1,886
Student achievement	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
General intelligence	No	No	Yes	No	No	Yes	No	No	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The table reports average marginal effects after multinomial logit. Standard errors in parentheses are robust to clustering at the school level. Student achievement refers to test performance in reading and mathematics. General intelligence refers to KFT scores. Data are weighted by the inverse of students' sampling probability. Data: PIRLS-E 2001

* significant at 10% level
** significant at 5% level
*** significant at 1% level

in comparison to the estimates presented in columns 1–3 in Tables 3 and 4. However, all estimates remain statistically significantly different from zero except for the estimated marginal effect for the outcome high school in panel (b) column 3. For female second-generation immigrants, the point estimates are smaller and partly insignificant, as shown in panels (c) and (d) of Table 9. This generally confirms our main findings reported in columns 1–3 in Tables 3 and 4.

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