Migration Background and Educational Tracking: Is there a Double Disadvantage for Second-Generation Immigrants?

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Abstract

Research on immigrants' educational disadvantages largely focuses on differences in student achievement tests. Exploiting data from the German PIRLS extension, we find that second-generation immigrants face additional disadvantages with respect to grades and teacher recommendations for secondary school tracks that cannot be explained by differences in student achievement tests and general intelligence. Second-generation immigrations are disproportionately affected by prevailing social inequalities at the transition to secondary school tracks due to their generally less favorable socio-economic background. We additionally provide new evidence suggesting that these inequalities might be related to the failing economic assimilation of immigrants.

JEL-Code: I21, J15, I28.

Keywords: immigration, educational inequalities, educational tracking, Germany.

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1 Introduction

Recent evidence suggests that the economic assimilation of immigrants is failing in major European countries (Algan et al., 2010). Integration through education is widely believed to be a universal remedy against the failing economic assimilation of immigrants, but this strategy is likely to fail if equal opportunities in the educational system are not ensured. However, recent studies based on international student assessments have repeatedly documented large achievement gaps between immigrant and native students (e.g. Schnepf, 2007; Ammermueller, 2007; Schneeweis, 2010). While these findings are alarming, they might not even mirror the full extent of the educational inequalities between native and immigrant students, because they are limited to objective measures of educational success, namely standardized achievement tests. However, there might exist an additional educational disadvantage for immigrant students with respect to more subjective measures of educational success such as grades and teacher recommendations in tracked school systems. Such more subjective measures are highly relevant for track attendance and ultimately the type of school degree obtained. To the extent that differences in grades and teacher recommendations are not entirely explained by differences in standardized achievement tests, previous studies focussing on achievement gaps have not captured the full extent of immigrants' educational disadvantage.

This paper analyzes whether, conditional on a range of measures of student achievement and general intelligence, second-generation immigrants in Germany receive worse grades and ultimately worse teacher recommendations for secondary school tracks than natives. We exploit unique micro-data 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. In particular, besides measures of student achievement in reading and mathematics, this data offers 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 the two domains reading and mathematics. This difference between natives and second-generation immigrants remains significant even after controlling for general intelligence. On the other hand, females are 6.1 percentage points more likely to be recommended for the lowest sec-

ondary school track, even after controlling for reading and mathematics achievement, but this result becomes insignificant after general intelligence is controlled for. Moreover, both female and male second-generation immigrants receive significantly worse school grades in these two domains which also cannot be explained by differences in standardized student achievement tests and general intelligence alone.

Investigating potential explanations for the additional disadvantage with respect to teacher recommendations for secondary school tracks, we find that these differences between natives and second-generation immigrants become insignificant once controlling for students' socio-economic background. Thus, we do not find evidence for ethnic discrimination at the transition to secondary school tracks per se. We rather interpret these results as evidence for the existence of more general inequalities at the transition to secondary school tracks in the sense that socio-economic background affects track recommendations even conditional on student achievement. Second-generation immigrants are more negatively affected by these inequalities deriving from their generally lower socio-economic background. This interpretation is in line with previous studies finding 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 might be highly relevant for understanding the failing economic assimilation of immigrants. We support this conjecture by providing descriptive international evidence showing that achievement gaps between second-generation immigrants and natives widen more drastically between primary and secondary education in school systems with early educational tracking. Moreover, we provide new 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 relevance of the research question in a more general context and provides new related evidence on immigrant-native differences during compulsory education as well as on the labor market. In Section 4 we describe the data, present the main estimation results and provide a discussion of results. Section 5 concludes.

2 Educational Tracking in the German School System

We start by briefly describing the relevant institutional background. Almost any school system in the world features some form of assigning students to educational tracks by ability – be it tracking between school types or within schools. Germany is among the very few countries that assign students to fixed tracks very early on, usually at age ten.[1] Figure 1 visualizes the general structure of the German school system. Education begins with optional kindergarten, which is provided for all children between three and six years of age. Compulsory schooling lasts from age six until the age of 18. During primary education, all children attend elementary school (*Grundschule*), where the subjects taught are the same for all. Elementary school usually lasts until fourth grade. Thereafter, students in the German school system are separated into three different educational tracks that differ in academic orientation and requirements: secondary general school (*Hauptschule*), intermediate school (*Realschule*) and high school (*Gymnasium*).

The secondary general school is the least academic track and usually lasts until grade nine (or ten). It typically leads to part-time enrollment in a vocational school combined with apprenticeship training until the age of 18. The intermediate school represents the middle track in the German system and usually lasts until grade ten. It traditionally leads to part-time vocational schools and higher vocational schools, but for students with high academic achievement it is also possible to switch to high school on graduation. High school is the most academic track and involves completion of an entire upper secondary cycle, which usually lasts until grade 13. It prepares students for university study or for a dual academic and vocational credential. The high school degree (*Abitur*) is a precondition for academic studies.

Besides the three traditional school tracks, there exists a fourth, more recent, alternative, which is called *Gesamtschule* or comprehensive school. This comprehensive school often offers all the options of the three "tracks", but it can also be a school 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 percent of all students attend the highest track, while general and

[1] In Austria, students are also tracked at age ten, 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).

intermediate school attendance is almost equal with 24 percent and 23 percent respectively. Comprehensive schools, the omitted category, still play a minor role with only 18 percent attendance. Moreover, Table 1 reveals significant variation in the distribution of students by school types among the federal states. This reflects the fact that responsibility for the German educational system lies primarily with the federal states, resulting in different institutional regulations, such as the supply of schools of a specific school type. In recent years, several German states have moved away from the traditional tripartite structure as shown in Figure 1, and have, for example, abolished the general school or the intermediate school and, in turn, strengthened the role of the comprehensive schools. These federal states include Brandenburg, Saxony, Saxony-Anhalt, and Thuringia, which are neither included in Table 1 nor considered in the empirical analysis. In our empirical analysis, we additionally take any institutional differences between federal states into account by analyzing within-state variation only.

In each of the German federal states, the decision about the type of secondary school is strongly dependent on primary school teachers' recommendations. These are, in turn, based on the teachers' assessments of students' academic achievement - i.e. students' grades - in the two core subjects German and mathematics. According to the resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the German states in the Federal Republic of Germany, the track recommendation of the teacher should be based on cognitive skills, without taking into consideration parents' income, social class or migration background.[2] While the teacher's recommendation is not formally binding in every federal state, in practice, deviations from the recommended school track are rather rare.[3]

Moreover, due to low permeability between school tracks, the transition from primary to secondary school strongly determines the first school degree obtained. Even though the permeability between tracks during secondary education has increased over the last decades, recent official statistics suggest that still only 2.6 percent of all students switched school tracks between grade levels seven and nine. Moreover, the majority of switches is downward, as 65.6 percent of all track changes occur from a higher to a lower track (Autorengruppe Bildungsberichterstattung, 2008, p.255). After completion of secondary school, there also is the possibility of obtaining a higher educational degree through second-

[2]See KMK (1994). 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 percent of the parents follow the teacher's recommendation, while 6.7 percent attend a lower secondary school and 9.9 percent a higher secondary school than recommended by the teacher.

chance education. However, the percentage of first year university or university of applied sciences students that have obtained their university entrance certificate through second or third chance education was still rather low in 2008 (4.4 percent), and has only slightly increased in recent years (Autorengruppe Bildungsberichterstattung, 2010, Table F1-4A, p.291).

3 Relevance of the Research Question

The key task of this paper is to analyze differences between natives and second-generation immigrants at the transition to secondary school tracks in a school system with ability tracking between school types. Immigrant-native differences at the transition to secondary school tracks most likely entail long-term consequences for future educational achievement as well as on labor market outcomes. Thus, studying such differences is highly relevant for understanding immigrant-native differences at later stages of the educational system as well as understanding existing immigrant-native wage gaps.

3.1 Educational Tracking and the Development of Cognitive Skills

We start by discussing the importance of tracking decisions for future educational achievement more generally. We then turn to the specific question of how educational tracking might cause differences in the academic development of natives and immigrants.

3.1.1 Educational Tracking and Cognitive Skills: Mechanisms and Evidence

There are theoretical arguments both in favor of and against educational tracking. On the one hand, to be able to design lessons targeted at students at different levels of cognitive skills, it is argued that creating homogeneous learning groups may be beneficial for students' learning. On the other hand, heterogeneous learning groups may suit both better and weaker students, since the better students will benefit from being able to explain learning contents to their fellow students. Whether educational tracking is beneficial, or harmful for students' development of cognitive skills is ultimately an empirical question (Woessmann, 2009).

Based on a cross-country difference-in-differences approach, Hanushek and Woessmann (2006) find little evidence that early educational tracking affects mean achievement of students, but find clear evidence that it is associated with larger educational inequality as

measured by increases in the variance of achievement between primary and secondary education. This international result is in line with national evidence supporting the hypothesis that educational tracking between school types has a causal effect on students' subsequent learning trajectories even conditional on initial achievement. Becker et al. (2006), for instance, find such substantial differential achievement gains in the three German secondary school types in mathematics. Maaz et al. (2008) argue that the three types of secondary school tracks represent differential developmental environments, with higher learning rates in the high tracks. The authors mention two main types of effects that can explain why such differential achievement trajectories may occur: first *compositional effects*, i.e. peer effects according to students' cognitive skills and/ or their socio-economic background, and second, *institutional effects*, subsuming factors such as different curricula and different teacher quality in the different secondary school tracks.

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

It should be noted that the existence of differential achievement trajectories even conditional on cognitive skills at the time of tracking emphasizes the importance of the sorting decision when students are tracked into different secondary schools. However, Figure 2 visualizes large overlaps in the distribution of reading performance by track recommendations at age ten and by secondary school tracks actually attended at age 15 in Germany.[4] This evidence is in line with previous findings (e.g. Schnepf, 2002), and suggests that educational inequalities exist beyond those measured by achievement gaps in international student assessments.

3.1.2 Migration Background, Educational Tracking, and Cognitive Skills

Because of differential achievement trajectories in the different types of secondary schools, early educational tracking might reinforce achievement gaps between natives and second-generation immigrants that exist at the time of tracking, if the latter are disproportionately sorted into lower secondary school tracks. In Figure 3, we plot achievement gaps between second-generation immigrants and natives at the ages of ten and 15 in 13 countries in the

[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.

spirit of Hanushek and Woessmann's (2006) difference-in-differences strategy. The graph visualizes two important observations about immigrant-native differences in educational outcomes during compulsory schooling.

The first observation is that second-generation immigrants perform worse in the reading assessments than natives both at the ages of ten and 15 in almost all countries. Investigating such achievement gaps in international student assessments such as PIRLS, PISA and TIMSS has so far been the focus of the economic literature on immigrants' educational disadvantages.[5] Several recent studies document the existence of large achievement gaps between natives and immigrants for most industrialized countries and at different stages of compulsory schooling (Entorf and Minoiu, 2005; Ammermueller, 2007; Schnepf, 2007; Schneeweis, 2010). These studies suggest that a large part of the differences in achievement between natives and immigrants at a given stage of compulsory schooling can be attributed to differences in socio-economic backgrounds and language proficiency, as well as institutional differences between school systems.

The second observation is that, on average, the achievement gap in reading between second-generation immigrants and natives increases more in countries where students are tracked before age 15 (as shown by the dashed lines) than in comprehensive systems (as shown by the solid lines). In particular, Germany shows the largest increase in achievement gaps among all countries, followed by Austria where students are also tracked at age ten. This suggests that educational tracking might be related to existing achievement gaps between natives and second-generation immigrants measured at later stages of compulsory schooling. We regard the evidence presented in Figure 3 as our main motivation to study immigrant-native differences in the transition to secondary school tracks in Germany in more detail.

The key idea of this paper is that the total difference in the unconditional probability to attend a specific school track can be decomposed into a part that can be attributed to differences in standardized achievement tests and cognitive ability and a part that cannot. We label the first part "first disadvantage" and the latter part "second disadvantage" following the language used in Schnepf (2007), who calls the achievement gap between natives and immigrants "disadvantage". Note that the first disadvantage directly corresponds to what is typically investigated in the economic literature on test score gaps between immigrants

[5]TIMSS is the Trends in International Mathematics and Science Study, assessing primary and secondary school students' mathematics and science achievement. PIRLS is the Progress in International Reading Literacy Study (see Appendix A.2.1 for details). PISA is the Programme for International Student Assessment (see Appendix A.2.2 for details).

and natives, while the second disadvantage is typically not considered in this literature on educational inequalities between immigrants and natives.

Figure 4 illustrates the idea of the double disadvantage for second-generation immigrants graphically. To simplify matters, Figure 4 visualizes a situation with only two potential school tracks: a low and a high track. Whether a student receives a recommendation for the high track or not depends on her position on the stylized one-dimensional distribution of cognitive skills and the stylized cutoff level. The decision rule is simple: A student receives a recommendation for the high track if her cognitive skills are above the specific cutoff level. The disadvantage for second-generation immigrants that is due to differences in cognitive skills can then be visualized by the differences in the respective skill distribution for natives (solid line) and second-generation immigrants (dotted line). This difference will give rise to differences in the probability of attending the higher track. The main idea of this study is that this difference generated by differences in cognitive skills may not fully explain the total disadvantage for second-generation immigrants defined as the unconditional differences in the probabilities of receiving a recommendation for the higher school track. A second disadvantage might arise if the cutoff levels were different for natives (solid line) and second-generation immigrants (dotted line). If such a second disadvantage exists, second-generation immigrants, in addition to being on a less favorable skill distribution, also need to have higher cognitive skills compared to natives to receive a recommendation for the higher school track.[6]

The idea of a double disadvantage is not novel in the literature. In a closely related paper, Schnepf (2002) more generally investigated 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, this analysis suffers from the shortcoming that cognitive skills are measured several years *after* the transition to secondary school occurred. To the extent that in higher educational tracks there are higher achievement gains, even conditional on initial achievement, it is unclear to what extent test score differences measured several years after entry into secondary schools are a cause or an effect of the attendance of a specific school track.[7] The key advantage

[6]While this graphical illustration is helpful to clarify the idea of the double disadvantage, 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 Figure 4. 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 rather on subjective assessments of their students' educational potential.

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

of our study is that we have tests of student achievement and cognitive abilities measured just *before* the selection into secondary school tracks.

3.2 Educational Tracking and Labor Market Success

Secondary school track attendance is also likely to affect future labor market performance. Thus, studying immigrant-native differences at the transition to secondary school tracks might be highly important for understanding the failing economic integration of immigrants. In this section, we emphasize the importance of our research question by providing new evidence on the relationship between track attendance and earnings more generally as well as showing that differences in track attendance actually explain a substantial part of the overall earnings gap between second-generation immigrants and natives.

3.2.1 Educational Tracking and Earnings: Mechanisms and Evidence

Theoretically, track attendance might affect earnings, because different school tracks lead to a differential accumulation of human capital. In fact, students attending higher school tracks typically end up with higher levels of educational attainment and more years of schooling (see Dustmann, 2004). Moreover, as argued above, students in higher tracks likely accumulate better cognitive skills during compulsory schooling, which translates into higher earnings later-on.[8] Track attendance might also affect earnings independently of accumulated cognitive skills when school degrees act as a signal to employers (cf. Spence, 1973). While true productivity is unobservable to employers, the latter must assess the productivity of applicants on the basis of limited information such as those contained in resumes, and school transcripts (cf. the literature on "statistical discrimination", Altonji and Pierret, 2001).

To shed light on the effects of track attendance on labor earnings, we provide new evidence based on three different data sets for Germany.[9] We operationalize track attendance by the highest secondary school degree obtained. Because of the low permeability of the German school system, school degrees can be regarded as good proxies for track attendance (see Dustmann, 2004).

Table 2 reports earnings regressions including indicator variables for the highest school degree obtained separately for men and women. Estimates reported in columns 1 and 4 of

[8]For example, recent studies reveal a positive causal effect of attending advanced high school math courses on earnings (Rose and Betts, 2004; Joensen and Nielsen, 2009).

[9]See Appendix A.1 for a detailed description of the data sets, the sample selection and the regression specifications.

Table 2 are based on the German Microcensus. The estimates suggest significant returns to obtaining a higher school degree. With respect to a male (female) worker with a general school degree, a male (female) worker holding an intermediate school degree earns 16 (13) percent more and a male (female) worker holding a high school degree earns 46 (41) percent more. These estimates are similar to earlier estimates of the association between school track attendance and earnings reported in Dustmann (2004).

The question remains, of course, to what extent these observed differences in average earnings by school degrees reflect a causal effect. Observed correlations between school degrees and earnings might be driven by the selection of individuals into different secondary school tracks based on unobserved cognitive abilities. While so far no convincing estimates of the causal effect of secondary school track attendance on earnings exists, we improve on existing estimates by including a measure of cognitive skills in the earnings regression with indicators for track attendance. In columns 2, 3, 5, and 6, we report estimation results based on the only two data sets available for Germany that contain both measures of adult cognitive skills as well as information on earnings. Columns 2 and 5 are based on the 2006 wave of the German Socio-Economic Panel (GSOEP) that contains a measure of intelligence, while columns 3 and 6 contain estimates based on the International Adult Literacy Survey (IALS) for Germany. Both measures have previously been included in Mincerian earnings regressions in the literature (see Heineck and Anger, 2010; Hanushek and Zhang, 2009).

In the case of the GSOEP sample, we observe significant returns to obtaining a higher school degree even conditional on the scores of the symbol correspondence test (SCT).[10] In the case of the IALS sample, we still observe a significant effect of obtaining the highest school degree, but do not find any significant differences between the general and the intermediate school degree after controlling for adult reading skills.

While we cannot rule out the possibility that for the selection into secondary school tracks other non-ignorable unobserved factors play a role, the estimates at least support the hypothesis that attending a higher school track leads to higher future earnings. In fact, as adult cognitive skills are to a large extent generated by formal schooling, we actually control for part of the outcome by including these measures of cognitive skills. It is all the more interesting that track attendance appears to affect labor market outcomes over and above any effect of track attendance on cognitive skills. This finding is in line with either track attendance also affecting the development of productive non-cognitive skills or with

[10]The estimated coefficients for the SCT score are comparable to the effects reported in Heineck and Anger (2010).

signalling theories of the labor market.

3.2.2 Migration Background, Educational Tracking, and Earnings

The evidence presented in the previous section suggests that secondary school track attendance and ultimately school degrees affect earnings. Thus, educational inequalities arising at the transition to secondary school tracks might be related to the poor labor market performance of second-generation immigrants in Germany, and might thus impede the economic assimilation of immigrants in the long run.

Differences in labor market outcomes between immigrants and natives that persist even for the descendants of immigrants have been subject to a large literature. Significant differences in earnings between immigrants and natives have been documented in several countries (Adsera and Chiswick, 2007). These differentials lead to a long discussion about explanations for existing wage gaps and the progress of the economic assimilation of immigrants over time (e.g. Chiswick, 1978; Borjas, 1994; Altonji and Blank, 1999). It is a common finding that part of the unconditional wage gap between natives and (both first- and second-generation) immigrants is to a large extent explained by differences in accumulated human capital. For Germany, several studies analyzed differences in earnings and in human capital accumulation across generations of immigrants, suggesting that the economic assimilation of immigrants is failing (e.g. Gang and Zimmermann, 2000; Thomsen et al., 2008; Algan et al., 2010). Compared to natives, descendants of immigrants accumulate less human capital and earn less even conditional on accumulated human capital. In particular, second-generation immigrants are also less likely to obtain school degrees from higher secondary school tracks (Riphahn, 2003).

We add to this literature by examining whether immigrant-native differences in secondary school track attendance can explain existing wage gaps between second-generation immigrants and natives in Germany. In particular, we extend recent research by Algan et al. (2010) on wage differentials between second-generation immigrants and natives by including indicators for secondary school degrees in the regression specification. Columns 1 and 3 of Table 3 replicate the estimation of unconditional earnings gap for second generation immigrants presented in Algan et al. (2010).[11] On average, native men earn 14

[11]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.1.1 for details on the estimations presented in Table 3 and Table A-1 for descriptive statistics on the estimation sample.

percent more than second-generation immigrants, while native women earn 18 percent more. Interestingly, these earnings gaps do not reduce substantially when additionally controlling for the age an individual left full-time education (see Table 3 in Algan et al., 2010). To assess to what extent differences in school degrees can explain the earnings gaps for second-generation immigrants, we additionally control for the highest school degrees obtained in columns 2 and 4 of Table 3. The estimated wage gap shrinks to three percent for men and ten percent for women.

The magnitude of this drop in the estimated earnings differential is striking and clearly suggests that the unfavorable distribution of school degrees has a large explanatory potential for the failing economic assimilation of immigrants. This also highlights the importance of understanding why second-generation immigrants are less likely to obtain higher school degrees. The educational inequalities arising at the transition to secondary school tracks that we study in the following might be part of the answer to this question.

4 Empirical Analysis

This section presents our main empirical analysis. In particular, we investigate differences between second-generation immigrants and natives in teacher recommendations for secondary school tracks and course grades at the end of primary education. We start by describing the data. We then lay out our estimation strategy and present the results. Finally, we discuss the interpretation of these results.

4.1 The German PIRLS-E Data

For the empirical analysis of immigrant-native differences in teacher recommendations and course grades, we use micro data from the German extension of the Progress In International Reading Literacy Study (PIRLS-E) 2001. PIRLS-E data have many advantages over the narrower international PIRLS database, allowing us to go beyond the existing literature. First, the PIRLS-E data contains a variety of subjective measures of student achievement, namely grades in German and mathematics, and teacher recommendations for the type of secondary school for each a child. Second, besides students' reading performance also available in the international PIRLS database, the German extension also provides a measure of students' mathematics performance. Third, in PIRLS-E, students were also tested on two subscales of a standardized test of cognitive abilities (IQ test), the *Kognitive Fähigkeitstest* for grade four (KFT) by Heller and Perleth (2000): Verbal

Analogies and Figure Analogies.[12]

We define as second-generation immigrants all students that were born in Germany, but that 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 (below 3 percent), and exclude data from those federal states where students are not tracked at age ten, namely Berlin, Bremen, and Hamburg. Moreover, we excluded all first-generation immigrants, i.e. all students who were not born in Germany, from the sample. Lastly, we only use those observations where information on the teacher recommendation as well as on migration background is available. Our final sample consists of 3,436 students from seven West German States, among them 580 second-generation immigrants and 2,856 native students. In all regression models that contain mathematics performance, we further had to drop all students from Lower Saxony, since they did not participate in the mathematics test.[13]

Table 4 presents descriptive statistics on teacher recommendations, course grades, and objective measures of cognitive skills separately for native and second-generation immigrants. The majority of native students receive a recommendation for high school, while most second-generation immigrants are recommended for general school. Moreover, second-generation immigrants receive on average worse grades in mathematics and German. Table 4 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, 2010). In both domains, reading and mathematics, second-generation immigrants' performance lags behind that of native students, with a slightly higher dispersion than that of native students.[14]

4.2 Empirical Strategy and Results

The descriptive statistics presented in Table 4 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 in Germany. The main objective of the empirical analysis in this section is now to investigate to what extent the differences in the track recommendations and course grades can be explained by

[12]This is the German adaptation of the "Cognitive Abilities Test" by Thorndike and Hagen (1971).

[13]For more details on the measures of cognitive skills, the construction of the sample, as well as descriptive statistics of student's background characteristics see Appendix A.2.1 and Table A-2.

[14]For all subsequent analyses, we standardize reading and mathematics performance, as well as the KFT scores to have a mean of zero and a standard deviation of one.

objective measures of student achievement and cognitive ability.

We start with teacher recommendations. We model the probability to receive a recommendation for a particular school track based on a multinomial logit model. Our dependent variable is the teacher recommendation that can take on three different values for either general school, intermediate school, or high school. The main explanatory variables of interest are the objective measures of cognitive skills described above and in more detail in Appendix A.2.1. These include reading and mathematics test scores, and KFT scores, as well as a dummy variable identifying second-generation immigrants. For all continuous regressors, we report average marginal effects after multinomial logit, and to assess the relevance of the second disadvantage of second-generation immigrants, we calculate the average discrete difference in predicted probabilities between second-generation immigrants and natives holding the other regressors at their respective values.

We present our estimates separately for males and females. Tables 5.1 and 5.2 show that male (female) second-generation immigrants are 19 (17) percentage points more likely to be recommended for general school (*Hauptschule*), and 17 (16) percentage points less likely to receive a teacher recommendation for high school (*Gymnasium*) than native students of the same sex (see columns 1 in both tables). These estimates reflect the unconditional differences in track recommendations between second-generation immigrants and natives reported in Table 4. Columns 2 of both tables show our estimate for the additional disadvantage of second-generation immigrants that cannot be attributed to differences in academic performance: 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, in contrast, 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 but slightly once we also control for our measure of cognitive ability, the KFT, although they are statistically significant only at the 10 percent level for the high school recommendation. For females, the estimated marginal effects remain negative, although no longer statistically significant once we additionally control for cognitive ability (see columns 3 in Tables 5.1 and 5.2).

We have shown above that, for boys, differences in teacher recommendations cannot be explained by objective measures of cognitive ability and performance alone, but, controlling for these measures of cognitive skills, there remains a significant disadvantage for second-

generation immigrants. While this fact is alarming, the underlying reasons deserve more attention.

Previous studies on test score differences between native and immigrant students have shown that compositional differences with respect to observable background characteristics can explain large parts of the test scores gaps (see Schnepf, 2007; Ammermueller, 2007; Schneeweis, 2010). These background characteristics include indicators for whether the language spoken at home is the test language, whether students have attended kindergarten, as well as a set of direct measures of parents' socio-economic status (income, education, and occupation).

In columns 4 and 5 of Tables 5.1 and 5.2, we therefore include measures for the socio-economic background[15], a dummy indicating whether the language spoken at home is the test language and a dummy indicating whether students have attended pre-primary education.[16] 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 males (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 zero for women. Overall, these results suggest that a large part of the existing second disadvantage for second-generation immigrants can be explained by compositional differences with respect to observable background characteristics.

We additionally estimate linear models, and regress grades in mathematics and German on objective measures of cognitive skills. As commonly the same teacher decides on both track recommendations and on grades, it is not surprising that these measures are strongly correlated.[17] While track recommendations are an institutional feature rather specific to the German school system, students are graded in almost any school system around the world. In Germany, grades range from one (best grade) to six (worst grade). Table 6 shows first of all that reading and mathematics test scores are significantly related to grades in both subjects (column 1), and so is general cognitive ability as measured by the KFT. More

[15]These measures include five dummies for the number of books at home, six dummies for household income, and three dummies for the highest parental educational degree.

[16]Due to the relatively large percentage of missing values for the background variables, we imputed the socio-economic background measures, language spoken at home, and attendance of pre-primary education using the method of multiple imputation by chained equations (MICE). For details see Appendix A.2.1.

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

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 (26) percent of a standard deviation for males (females).

The differences in German grades between second-generation immigrants and natives reduce substantively, once we control for students' socio-economic background, kindergarten attendance, and language spoken at home (see columns 2 and 4 of Table 6a).[18] For the differences in mathematics grades between second-generation immigrants and natives, we see a similar pattern: the estimates are significantly reduced once the background variables are included (see columns 2 and 4 of Table 6b). However, the estimates remain significant at the 10 percent level for males. For female second-generation immigrants, the grade disadvantage still amounts to 19 percent of a standard deviation after controlling for the background variables, and remains statistically significant at the 5 percent level.

Thus, Table 6 confirms the main findings of the previous analysis of teacher recommendations: Controlling for KFT scores and objectively measured test scores in reading and mathematics respectively, there remains a significant disadvantage for second-generation immigrants. These findings highlights the potentially more general relevance of the concept of the double disadvantage at other stages of formal schooling or in other school systems that do not track students according to ability.

Our finding of a second disadvantage with respect to grades indicates that the concept of the double disadvantage might be relevant more generally. Additional disadvantages with respect to subjectively assessed grades that cannot be explained by objective measures of student achievement might also matter at other stages of formal schooling or in school systems that do not track students according to ability.

4.3 Discussion of Results

The key insight of the empirical analysis is that observed differences between natives and second-generation immigrants in subjective measures of educational success such as teacher recommendations and grades cannot be explained by measures of cognitive skills typically investigated in economic studies on immigrant-native differences in educational outcomes alone.

[18] In an additional specification not shown here, but available from the authors upon request, we find some evidence that part of the grade disadvantage is due to school fixed effects. Estimating the same specification with class fixed effects did not change the results compared to the school fixed effects specification.

Analyzing potential explanations for the additional disadvantage with respect to recommendations for secondary school tracks, we find that these differences between natives and second-generation immigrants become insignificant once we control for students' socio-economic background. Thus, we do not find evidence for ethnic discrimination at the transition to secondary school tracks per se. We rather interpret these results as evidence for the existence of more general inequalities at the transition to secondary school tracks in the sense that socio-economic background affects track recommendations even conditional on student achievement. Second-generation immigrants are more negatively affected by these inequalities deriving from their generally lower socio-economic background.

This in turn raises the question why socio-economic background might matter for teacher recommendations and grades in particular, or any subjective measure of educational success more generally. We approach this question by briefly discussing two extreme explanations for the illustration of the argument.

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, while teachers possess better information on students' cognitive skills and educational potential and give their track recommendations accordingly. In this case, our findings would indicate that our measures of socio-economic background are proxies for relevant, but unobserved cognitive or non-cognitive skills.

On the other hand, the measures of student achievement and general intelligence provided in PIRLS-E might reflect students' true cognitive skills and educational potential well, but teachers' assessments are erroneous, that is, 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 as commonly investigated, but also do they face an additional disadvantage with respect to other, more subjective measures of educational success such as teacher recommendations for secondary school tracks and grades.

Although our analysis is confined to Germany, our finding of an additional disadvantage for second-generation immigrants at the transition to secondary school tracks can also be related to the more general literature on the effects of early educational tracking on educational inequalities. The descriptive evidence presented in Figure 3 suggests an association between early educational tracking and the relative educational performance of immigrants. The additional disadvantage for second-generation immigrants might partly

explain the relative increase in the achievement gaps between second-generation immigrants and natives after students have been sorted into different school types shown in Figure 3. Conditional on student achievement at the time of tracking, in school systems with early educational tracking, second-generation immigrants may be more likely than natives to be sorted into a school environment that presumably implies lower achievement trajectories.

5 Conclusion

In this paper, we analyze 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 micro-data from the German extension of the PIRLS 2001 assessment, 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 the two domains 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 general cognitive ability is controlled for. 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 commonly investigated test score gaps between natives and immigrants (Ammermueller, 2007; Schnepf, 2007; Schneeweis, 2010) 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.

Examining potential explanations for the additional disadvantage in terms of subjective measures of cognitive skills, we find that compositional differences with respect to socio-economic characteristics largely explain the 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 socio-economic background. 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 at the transition to secondary school tracks might have severe consequences for second-generation immigrants' relative educational and labor market performance. We support this conjecture by providing descriptive evidence that achievement gaps between second-generation immigrants and natives widen more drastically between primary and secondary education in school systems with early educational tracking. We additionally show that a substantial part of the existing immigrant-native wage gaps in Germany can be attributed to differences in secondary school track attendance between second-generation immigrants and natives. This evidence suggests that social inequalities at the transition to secondary school might be highly relevant for understanding the failing economic assimilation of immigrants.

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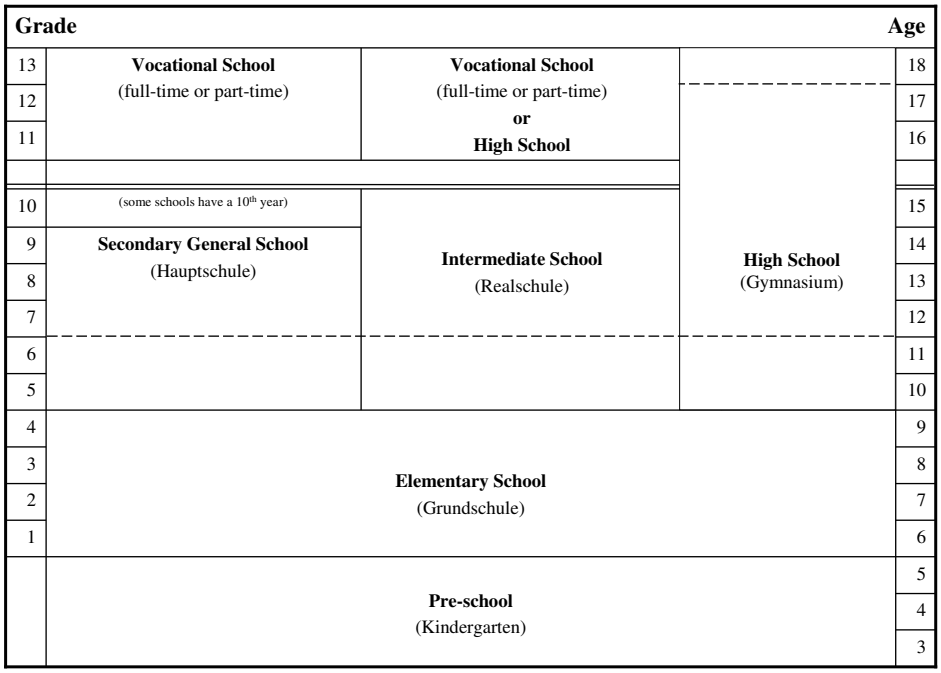
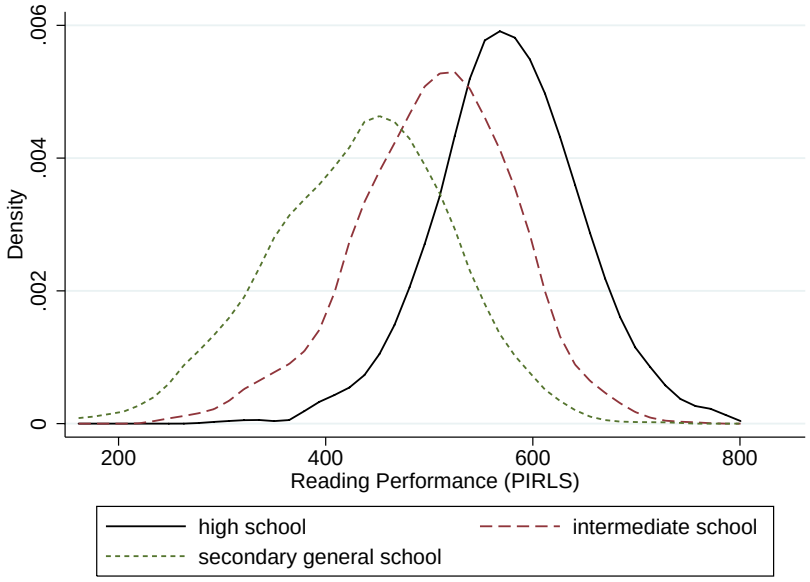
Figure 1: The German School System

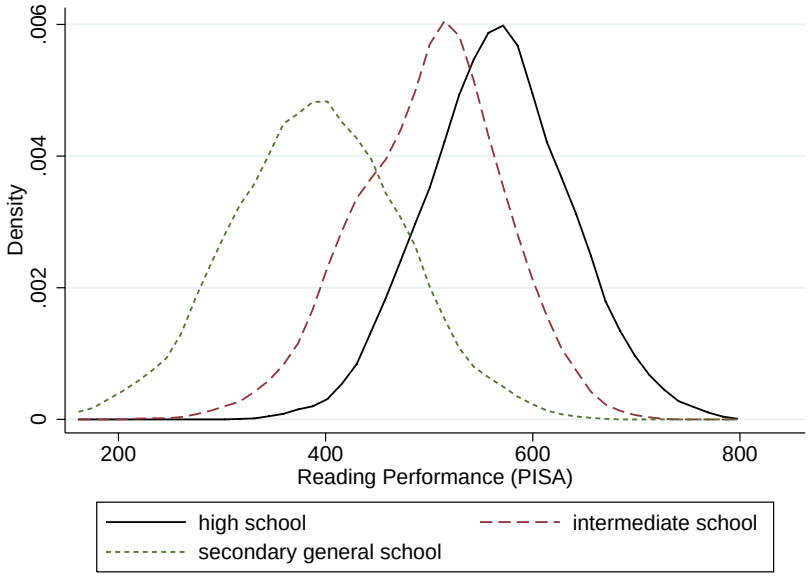


Notes: Stylized illustration of the German school system with a focus on the three classical secondary school tracks. Next to these classical school tracks, students can also attend comprehensive schools in some federal states.

Figure 2: Distribution of Reading Performance by School Track



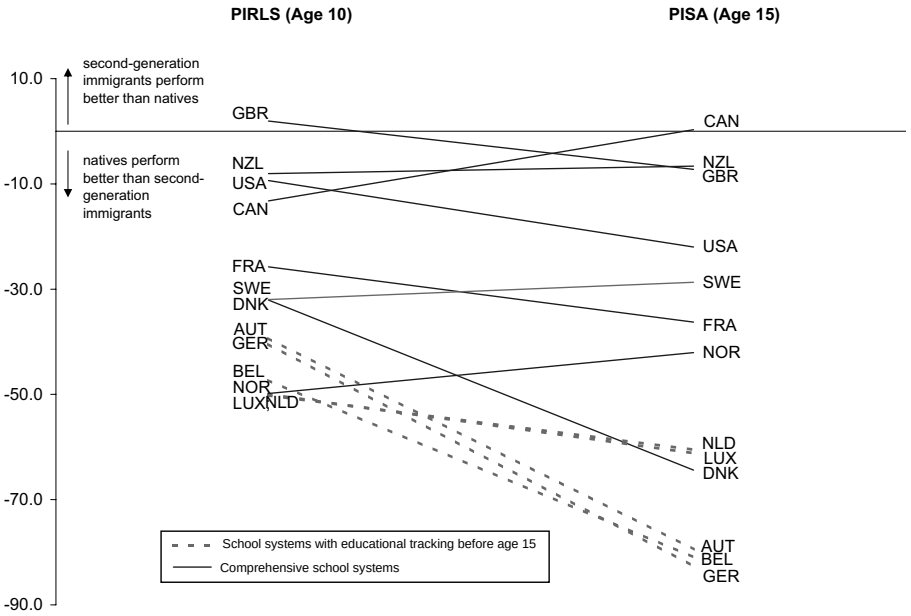
(a) Distribution of reading performance by recommendation for secondary school track at age 10



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

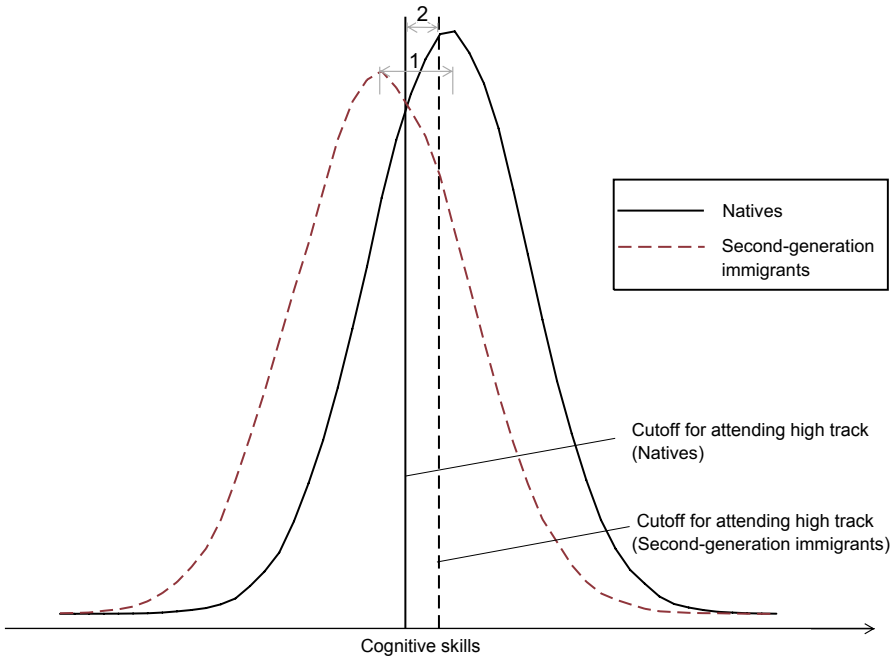
Notes: Kernel density estimates based on PIRLS 2001 and PISA 2006 data for all of Germany. For both graphs, reading performance scores were standardized to have a mean of 500 and a standard deviation of 100. See Appendix A.2.1 and A.2.2 for details on the data.

Figure 3: International Evidence: Development of the Test Score Gap in Reading between Age 10 and 15



Notes: The graph reports the test score gap in reading between second-generation immigrants and natives at the ages of ten and 15. Dotted lines denote school systems where tracking takes place before age 15, solid lines denote school systems where this is not the case (i.e. comprehensive school systems). Test score gaps at age ten are estimated using PIRLS 2001 data for GER, FRA, GBR, NLD, NOR, NZL, SWE, and PIRLS 2006 data for AUT, BEL, CAN, DNK and USA. Test score gaps at age 15 are estimated using PISA 2006 data for all countries except the USA, for which data are based on PISA 2003. PIRLS and PISA data are standardized to have an international mean of 500 and an international standard deviation of 100. See Appendix A.2.1 and A.2.2 for details on the data.

Figure 4: Illustrating the Double Disadvantage



Notes: 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 mean 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 that are different for natives and second-generation immigrants (marked as 2 in the graph).

Table 1: Students by Type of Secondary School in the German Federal States in 2001

Federal State	School type in percent			Students in 1000s
	General	Intermediate	High	
Baden-Württemberg	32.4	32.4	28.9	129,417
Bavaria	39.0	28.6	27.2	145,521
Berlin	11.5	22.1	33.2	37,866
Bremen	22.1	26.8	29.8	6,687
Hamburg	11.8	14.2	35.2	16,301
Hesse	18.1	28.0	32.1	67,155
Lower Saxony	30.2	32.9	27.0	97,870
North Rhine-Westphalia	24.3	26.1	29.2	219,098
Rhineland-Palatinate	27.6	24.0	28.2	48,530
Saarland	0.4	2.0	30.3	12,239
Schleswig-Holstein	29.1	32.6	26.6	33,012
Germany	22.7	24.4	29.5	1,005,002

Notes: Figures refer to students in the 8th grade in 2001. Shares refer to the three classical school tracks only. The remaining students attend comprehensive schools including *Integrierte Gesamtschulen*, *Schularten mit mehreren Bildungsgängen* or *Freie Waldorfschulen* and *Sonderschulen*. Shares for the four federal states with combined general and intermediate schools are not reported. Source: Standing Conference of the Ministers of Education and Cultural Affairs of the federal states in the Federal Republic of Germany.

Table 2: Earnings by School Degree

	Men			Women		
	Microcensus	GSOEP	IALS	Microcensus	GSOEP	IALS
	(1)	(2)	(3)	(4)	(5)	(6)
Intermediate school	0.158***	0.118***	0.073	0.127***	0.194***	–0.093
	(0.005)	(0.043)	(0.054)	(0.005)	(0.051)	(0.066)
High school	0.460***	0.311***	0.204***	0.412***	0.416***	0.336***
	(0.005)	(0.046)	(0.075)	(0.006)	(0.062)	(0.088)
Symbol correspondence test		0.003*			0.003	
		(0.002)			(0.002)	
Literacy test score			0.001**			0.002**
			(0.001)			(0.001)
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	No	No	Yes	No	No
Potential experience	Yes	Yes	Yes	Yes	Yes	Yes
Observations	172,660	922	396	151,463	906	329

* p<0.10, ** p<0.05, *** p<0.01

Notes: The table reports coefficients in a linear earnings equation. The highest school degree obtained is indicated by dummy variables with general school degree being the omitted category. All reported standard errors are robust. Sample aged 21 to 64. *Columns 1 and 4:* Estimations are based on the 2005 and the 2006 wave of the German Microcensus. The dependent variable is log net hourly wages. The model is estimated by censored normal regression due to the right-censoring of the monthly income information. Estimations control for a quartic of potential experience, region dummies and time dummies. *Columns 2 and 5:* Estimations are based on the 2006 wave of the German Socio Economic Panel. The model is estimated by OLS. The dependent variable is log gross hourly wages. All estimations control for a quartic of age and regional indicators. The symbol correspondence test (SCT) corresponds to a sub-module in the non-verbal section of the Wechsler Adult Intelligence Scale (WAIS). SCT scores range on a scale from 0 to 90. *Columns 3 and 6:* Estimations are based on the 1994 International Adult Literacy Survey data for Germany. The model is estimated by censored normal regression due to the right-censoring of the monthly income information. The dependent variable is log gross hourly wages. Estimations control for a quartic of age and region dummies. The literacy skill measure is combined measure of prose literacy, document literacy and quantitative literacy. Literacy scores range on a scale from 0 to 500.

Table 3: Immigrant-Native Earnings Gaps before and after Controlling for School Degrees

	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

* p<0.10, ** p<0.05, *** p<0.01

Note: 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. Sample aged 16 to 64. The dependent variable is log net hourly wages. The highest school degree obtained is indicated by dummy variables with general school degree 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 in parentheses.

Table 4: Measures of Educational Success by Migration Background

	Natives		Second-generation immigrants		
	Mean	Stdev	Mean	Stdev	Diff. in Means
Teacher recommendation					
General school(*Hauptschule*)	0.23		0.41		0.18***
Intermediate school (*Realschule*)	0.32		0.31		-0.02
High school (*Gymnasium*)	0.44		0.28		-0.16***
Course grades					
Grade in German	2.58	0.84	3.02	0.92	0.44***
Grade in mathematics	2.52	0.90	2.95	0.98	0.44***
Test scores					
Reading performance	562.37	57.24	532.30	62.75	-30.07***
Mathematics performance	529.32	91.79	494.21	98.44	-35.11***

* p<0.10, ** p<0.05, *** p<0.01

Notes: Data are weighted by the inverse of students' sampling probability. Grades in Germany are measured on a scale from 1 (=best grade) to 6 (=worst grade). Scores of the Cognitive Abilities Test (KFT) not reported here for confidentiality reasons. Data: PIRLS-E 2001

Table 5.1: Immigrant-Native Differences in Teacher Recommendations for General School

(a) Outcome: General School (*Hauptschule*), Males

		Cognitive controls		Cognitive controls and other background variables	
	(1)	(2)	(3)	(4)	(5)
Second-generation immigrant	0.191***	0.068**	0.063**	0.040	0.044
	(0.034)	(0.028)	(0.029)	(0.028)	(0.029)
Reading performance		-0.141***	-0.125***	-0.100***	-0.096***
		(0.013)	(0.014)	(0.014)	(0.014)
Mathematics performance		-0.109***	-0.085***	-0.080***	-0.082***
		(0.014)	(0.014)	(0.014)	(0.014)
KFT Verbal Analogies			-0.037**	-0.038**	-0.038**
			(0.016)	(0.016)	(0.016)
KFT Figure Analogies			-0.023*	-0.021*	-0.019
			(0.012)	(0.012)	(0.012)
Socio-economic 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

(b) Outcome: General School (*Hauptschule*), Females

		Cognitive controls		Cognitive controls and other background variables	
	(1)	(2)	(3)	(4)	(5)
Second-generation immigrant	0.166***	0.061*	0.050	0.032	0.030
	(0.034)	(0.031)	(0.030)	(0.028)	(0.033)
Reading performance		-0.141***	-0.128***	-0.105***	-0.102***
		(0.013)	(0.013)	(0.012)	(0.013)
Mathematics performance		-0.069***	-0.050***	-0.044***	-0.044***
		(0.011)	(0.012)	(0.012)	(0.012)
KFT Verbal Analogies			-0.045***	-0.044***	-0.044***
			(0.016)	(0.014)	(0.012)
KFT Figure Analogies			-0.018	-0.015	-0.015
			(0.012)	(0.011)	(0.011)
Socio-economic 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

* p<0.10, ** p<0.05, *** p<0.01

Notes: 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' socio-economic status is measured by categorical variables indicating the number of books at home, household income, and highest parental educational degree. Data are weighted by the inverse of students' sampling probability. Data: PIRLS-E 2001

Table 5.2: Immigrant-Native Differences in Teacher Recommendations for High School

(a) Outcome: High School (*Gymnasium*), Males

		Cognitive controls		Cognitive controls and other background variables	
	(1)	(2)	(3)	(4)	(5)
Second-generation immigrant	-0.169***	-0.067**	-0.058*	-0.031	-0.017
	(0.034)	(0.034)	(0.034)	(0.033)	(0.033)
Reading performance		0.174***	0.146***	0.117***	0.114***
		(0.014)	(0.014)	(0.014)	(0.014)
Mathematics performance		0.118***	0.079***	0.069***	0.068***
		(0.016)	(0.018)	(0.018)	(0.017)
KFT Verbal Analogies			0.050***	0.054***	0.054***
			(0.016)	(0.015)	(0.015)
KFT Figure Analogies			0.053***	0.050***	0.050***
			(0.013)	(0.012)	(0.012)
Socio-economic 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

(b) Outcome: High School (*Gymnasium*), Females

		Cognitive controls		Cognitive controls and other background variables	
	(1)	(2)	(3)	(4)	(5)
Second-generation immigrant	-0.158***	-0.031	-0.021	0.005	0.001
	(0.032)	(0.032)	(0.032)	(0.032)	(0.036)
Reading performance		0.191***	0.166***	0.134***	0.134***
		(0.012)	(0.013)	(0.014)	(0.014)
Mathematics performance		0.104***	0.065***	0.055***	0.055***
		(0.012)	(0.013)	(0.013)	(0.013)
KFT Verbal Analogies			0.062***	0.057***	0.057***
			(0.016)	(0.015)	(0.016)
KFT Figure Analogies			0.048***	0.041***	0.042***
			(0.015)	(0.015)	(0.015)
Socio-economic 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

* p<0.10, ** p<0.05, *** p<0.01

Notes: 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' socio-economic status is measured by categorical variables indicating the number of books at home, household income, and highest parental educational degree. Data are weighted by the inverse of students' sampling probability. Data: PIRLS-E 2001

Table 6: Immigrant-Native Differences in Course Grades

(a) Outcome: Grade in German

	Males		Females	
	(1)	(2)	(3)	(4)
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)
Socio-economic 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

(b) Outcome: Grade in Mathematics

	Males		Females	
	(1)	(2)	(3)	(4)
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)
Socio-economic 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

* p<0.10, ** p<0.05, *** p<0.01

Notes: The table reports coefficients from a linear regression. Standard errors in parentheses are robust to clustering at the school level. Grades are measured on a scale from 1 (=best grade) to 6 (=worst grade). 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' socio-economic 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

A Description of Data Sets

A.1 Labor Market Data

A.1.1 The German Microcensus

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

Table A-1: Characteristics of the Employed Population by Migration Background

	Men			Women		
Variable	Natives	SGI	Natives-SGI	Natives	SGI	Natives-SGI
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	

* p<0.10, ** p<0.05, *** p<0.01

Notes: The table reports selected average characteristics for natives and second-generation immigrants (SGI) 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. Sample aged 16 to 64. Average characteristics are weighted using population weights provided by the German statistical office. Standard deviations reported in parentheses.

These data allow identification of second-generation immigrants based on citizenship and year of arrival in Germany. The reference native group consists of non-naturalised German citizens born in Germany. We identify second-generation immigrants as individuals born in Germany who hold either 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

[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.

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 degree. We use secondary school degrees to proxy for track attendance as done previously in the literature. Ideally, we would like to observe track attendance at the beginning of secondary education, but school degrees can be regarded as good proxies for original track choice (see Dustmann, 2004).

A.1.2 The German Socio-Economic Panel (GSOEP)

The German Socio-Economic Panel (GSOEP) is an annual household panel survey conducted since 1984 that is representative of the resident population of Germany. The wave 2006 provides information on cognitive abilities for respondents who were surveyed with a computer-assisted personal interview (CAPI). We use the symbol correspondence test (SCT) that was developed after the Symbol Digit Modalities Test (Smith, 1995) and corresponds to a sub-module in the non-verbal section of the Wechsler Adult Intelligence Scale (WAIS) as a proxy for cognitive ability. This measure of cognitive ability has been previously used in the literature (see Heineck and Anger, 2010; Anger and Heineck, 2010). As outcome variable we use an approximate log hourly wage measure by subtracting the log of normal hours worked from the log of gross monthly earnings. We trim the estimation sample by excluding one percent of all wage observations in each tail of the wage distribution. We restrict the sample to contain only adults between age 21 to 64. The data also contains information about the federal state of residence, which we exploit to construct regional indicators that we include as control variables in the regression.

A.1.3 International Adult Literacy Survey (IALS)

The International Adult Literacy Survey (IALS) was conducted by the OECD in 23 countries and regions. We use country information for Germany only. In Germany IALS was conducted in 1994. IALS was designed to measure individual literacy skills of the adult population. IALS provides measurement of cognitive skills in three different areas. Prose literacy measures the knowledge and skills needed to understand and use information from texts including editorials, news stories, poems, and fiction. Document literacy measures the knowledge and skills required to locate and use information contained in various formats, including job applications, payroll forms, transportation schedules, maps, tables, and

[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.

graphics. Quantitative literacy measures the knowledge and skills required to apply arithmetic operations, either alone or sequentially, to numbers embedded in printed materials, such as balancing a checkbook, calculating a tip, completing an order form, or determining the amount of interest on a loan from an advertisement. The literacy scores range on a scale from zero to 500 points for each area. Since the literacy scores are highly correlated with each other, we use the average of the scores in the analysis. The literacy skill measures were supplemented by variables measuring other individual characteristics, such as age, education, and labor market outcomes. In particular, the data contains information about the type of school degree and earnings measured in 20 categories. The earnings information provided in the IALS data has been previously used to estimate Mincerian type of regressions (see Hanushek and Zhang, 2009). We approximate earnings by using mean earnings within each category and use censored normal regressions to account for the top-coding of the data. We approximate log hourly wage measure by subtracting the log of normal hours worked from the log of net monthly earnings. We trim the estimation sample by excluding one percent of all wage observations in each tail of the wage distribution. We restrict the sample to contain only adults between age 21 to 64.

A.2 Student Achievement Data

A.2.1 The German Extension of the Progress in International Reading Literacy Study 2001(PIRLS-E)

The main objective of the Progress in International Reading Literacy Study 2001 (PIRLS-E 2001) is to provide an internationally comparable assessment of reading literacy of their primary school students. As in most countries, in Germany, ten-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 as well as cognitive ability. In particular, we use three types of cognitive measures in our analyses of the double disadvantage.

First, in addition to the measures of students' reading performance of the international PIRLS database, the German extension PIRLS-E also provides a measure of students' mathematics performance. Second, PIRLS-E provides test scores on two subscales of a standardized test of cognitive abilities, the *Kognitive Fähigkeitstest* (KFT) for grades four by Heller and Perleth (2000): Verbal Analogies and Figure Analogies. A total response time of seven (eight) minutes was devoted to these two subtests, respectively. Both subscales measure an individual's ability of logical thinking and reasoning, while generally, a

high share of total variance in the scores of KFT subscales is accounted for by a factor General Intelligence, with the highest factor loadings on the Figure Analogies subscale. Moreover, 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, in all analyses, the scores on the two subscales separately. 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 the fourth grade. 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 (MAR). Table A-2 contains descriptive statistics on students' background characteristics, separately for second-generation immigrants and natives, 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, the number of second-generation immigrants is extremely low 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 four. We therefore drop observations from these two states. Additionally, Hamburg has been excluded because there is no differentiation between lower and intermediate secondary school in grades five and six. Moreover, we excluded all first-generation immigrants ($N = 519$), i.e. all students who were not born in Germany, from the sample. Of the $N = 4,552$ students that were left in the sample, we only use those observations where information on the teacher recommendation as well as on migration background is available. Our estimation sample consists of 580 second-generation immigrants and 2,856 native students.

Table A-2: Descriptive Statistics on Students' Background Characteristics

	Natives		Second-generation immigrants		
	Mean	Stdev	Mean	Stdev	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**

* p<0.10, ** p<0.05, *** p<0.01

Notes: 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

A.2.2 The Programme for International Student Assessment (PISA)

The Programme for International Student Assessment was set up as a joint effort of OECD member countries in 2000. It is a three-yearly assessment of science, reading and mathematics literacy, testing a representative sample of students near the end of compulsory schooling, when they are about 15 years old. We use descriptive data from the PISA 2003 and 2006 cycles in Figures 2 and 3. For details see OECD (2004) and OECD (2007).