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

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Preliminary Version

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Abstract

Research on educational disadvantages of second-generation immigrants largely focuses on differences in student achievement tests. Exploiting data from the German PIRLS Extension, we provide evidence that second-generation immigrants face an additional disadvantage when tracked into different types of secondary school. We find that second-generation immigrants are less likely to receive a teacher recommendation for a higher school track. This difference cannot be attributed to differences in test scores or general intelligence alone. Based on these results, we argue that migrant-native test score gaps likely underestimate educational inequalities in tracked school systems.

JEL-Code: I21, J15, I28

Keywords: Immigration, Educational Inequalities, School Tracking, Germany

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1 Introduction

Integration through education is widely recognized as a universal remedy against failing economic assimilation of immigrants. Equal opportunities in the education system are a precondition for the success of this strategy. Previous research documents, however, large inequalities in educational achievement between immigrants and natives in all high immigration countries (e.g. Schnepf, 2007). Compositional differences in social background and differences in returns to background characteristics appear to drive a wedge between academic performance of immigrants and natives measured at different ages (Ammermueller, 2007; Schnepf, 2007). Moreover, differences in institutions of school systems have been found to account for part of the migrant-native achievement gap in a cross-country comparison (Entorf and Lauk, 2008; Schneeweis, 2010).

However, little is known about how immigrants' educational disadvantage evolves over different stages of compulsory schooling. One would, for example, hope that formal education narrows the achievement gap. Figure 1 provides initial evidence that this is not the case in most countries. There is significant variation between countries, with Germany and Austria showing the largest increases in educational inequality between natives and second-generation immigrants between the ages of ten and fifteen. So, what factors drive these cross-country differences? The institution of early between-school tracking has been found to increase educational inequality within school systems more generally (e.g. Hanushek and Woessmann, 2006). This paper aims to investigate more specifically whether early tracking into different school types contributes to the disparities in educational achievement between natives and second-generation immigrants.

Given the absence of comparable international panel data of student achievement, we tackle this research question by analyzing differences between natives and second-generation immigrants at the transition from primary to secondary school within a single country that has a tracked secondary school system: Germany. In particular, we investigate whether, conditional on a wide range of measures for cognitive achievement and general intelligence, second-generation immigrants face lower transition probabilities into higher secondary school tracks than natives.

For our empirical analysis, we use micro-data from the German extension of the PIRLS 2001 assessment that allow us to investigate the transition from primary to secondary school in much more depth than previous studies using the narrower international databases. In particular, this database offers a wide range of objective and subjective measures of cognitive skills and ability. In addition to the objective measures of student achievement in

reading and mathematics, it also provides a highly reliable measure of general intelligence. Moreover, we have information on the teacher recommendation for the type of secondary school as well as subject specific grades.

In line with previous research, we find significant achievement gaps measured in test scores between second-generation immigrants and natives. Referring to Schnepf (2007), we call this the first disadvantage for second-generation immigrants. With respect to the teacher recommendation for the secondary school track, we find significantly lower probabilities for second-generation immigrants relative to natives of receiving a recommendation for a higher school track. This difference cannot entirely be explained by differences in basic cognitive abilities and cognitive achievement measures. We refer to this second difference as the second disadvantage for second-generation immigrants.

We argue that the second disadvantage, i.e., the lower conditional transition probabilities for second-generation immigrants, may lead to an additional educational as well as economic disadvantage for two main reasons: a scissors effect of competence development in different school tracks and the possibility that future employers will “statistically discriminate” among applicants based on the type of secondary school they attended (Altonji and Pierret, 2001).

First, tracking into different school types may lead to a scissors effect of competence development, meaning that, given identical initial cognitive competencies, students may develop better cognitive competencies if they attend a higher secondary school track. Numerous studies have investigated whether such scissors effects exist both in school systems that track within schools and those that track between schools. For instance, Galindo-Rueda and Vignoles (2007) find positive effects of attending a selective versus comprehensive school in the UK, controlling for initial cognitive competencies. Generally, the econometric identification of scissors effects is plagued by selectivity bias: it is difficult to rule out the possibility that students, at the time of sorting into different tracks, also differ along unobserved dimensions (cf. Pischke and Manning, 2006). Reviewing several longitudinal education studies (LAU, BIJU, as well as the German extension of the TIMS Study), Avenarius et al. (2003, pp.198-201) conclude that the different German secondary school tracks differ in their effectiveness with respect to their students’ learning gains, supporting the existence of a scissors effect. Studies that come to different conclusions have generally used smaller samples of city states only, and their external validity is therefore questionable. The existence of a scissors effect in German secondary schools might be one explanation for the increase in the achievement gap between natives and second-generation

immigrants (shown above in Figure 1).

Second, most economists today agree that not only acquired human capital (such as student competencies measured by test scores in PIRLS or PISA) matters, but additionally, education has a signalling value (cf. Spence, 1973; Weiss, 1995). Following this idea, Altonji and Pierret (2001) have argued that when hiring, employers must assess the productivity of potential workers on the basis of limited information contained in resumes, or school leaving certificates. If, indeed, as the authors suggest, employers “statistically discriminate” among young workers on the basis of easily observable variables such as school degrees, the highest school degree achieved matters for labor market outcomes even after controlling for students’ cognitive competencies as measured by test scores. This is particularly likely to be true in a rather rigid labor market such as the German one.

Both arguments are particularly important given the traditionally low permeability between secondary school tracks in Germany. Only three percent of students change secondary school tracks after their initial school track choice.¹ Thus, secondary school track choice in Germany largely determines future educational career paths, as well as the highest educational qualification obtained.

It is important to emphasize that even if the scissors effect of tracking was absent, the second effect is a reason why an educational disadvantage measured in terms of test score gaps at age fifteen (cf. Schnepf, 2007; Schneeweis, 2010) is likely to underestimate the total degree of inequality in a tracked system. If education - at least to some degree - acts as a filter, two students with identical cognitive competencies in different secondary school tracks, student A in the higher one, and student B in the lower one, will have different expected life-time income even though they possess identical cognitive competencies. Figures 2 (a) and (b) show that, indeed, there is a large overlap in reading competencies between different secondary school tracks in Germany, both before secondary school track choice, at age 10, and after, at age 15. Moreover, in line with the existence of a scissors effect, the reading competencies of students of the different school tracks appear to diverge between the ages of 10 and 15.

The remainder of the paper is structured as follows: Section 2 briefly describes the German school system. Section 3 describes the data. In Section 4 we define, estimate, explain and quantify the double disadvantage for second-generation immigrants. Section 5 concludes.

¹cf. Autorengruppe Bildungsberichterstattung (2008, p.255)

2 The German School System

Before turning to the empirical analysis, we briefly describe the German education system. The general structure of the German system is visualized in Figure 3. Education begins with optional pre-school kindergarten education, which is provided for all children between three and six years of age. Starting at age six compulsory school attendance begins, and lasts until the age of 18. During primary education all children have to attend elementary school (*Grundschule*), where the subjects taught are the same for all. Elementary school usually lasts until 4th grade. Thereafter, the German school system introduces differentiated educational tracks.² Students are separated into three different types of secondary schools that differ in academic orientation and requirements: secondary general school (*Hauptschule*), intermediate school (*Realschule*) and high school (*Gymnasium*).

The general school is the least academic track and usually lasts until grade nine (or ten). It 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.³

According to the resolution of the Standing Conference of the Ministers of Education and Cultural Affairs (KMK) of the German *Länder*, the decision about different school tracks should be based on cognitive ability, without taking into consideration parents' income or social class. In each of the German *Länder*, 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. While the teacher's recommendation is not formally binding in every *Land*, in practice, deviations from the

²While some form of tracking - either between schools or within schools - exists in almost any school system in the world, Germany is among the very few countries that rely on a system based on early tracking between school types (see Woessmann, 2009).

³Besides the three traditional 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 5th through the 10th grades.

recommended school track are rather rare.⁴

Table 1 shows the percentage of students in 8th grade in 2001 by track and state, giving an idea about the relative importance of a given track in Germany. The last column contains the total number of students by state, while the bottom row presents the corresponding figures for all of Germany. Roughly 30 percent of all students attend the highest track, while general and intermediate school attendance is almost equal with 24 percent and 23 percent, respectively. Comprehensive schools still play a minor role with only 18 percent attendance.

Moreover, Table 1 reveals significant variation in attendance by school type between the states. This largely reflects institutional differences. Responsibility for the German education system lies primarily with the states. This results in different regulations about the tracking decision and the supply of schools of a specific type. Some states, for example, have completely abolished the *Realschule* or the *Hauptschule* and, in turn, strengthen the role of the comprehensive schools. We take these institutional differences into account in the empirical analysis.

This empirical evidence highlights the importance of the secondary school track choice for the life-time perspective of a child in Germany. Track attendance has been widely documented to be of major economic importance. First, while switching tracks after the initial secondary school track choice is possible in principle, mobility is rather low in practice. According to official school statistics, only 2.6% of all students switched school tracks between grade levels seven and nine. Moreover, the majority of switches is downward, as 65.6% of all track changes occur from a higher to a lower track (Autorengruppe Bildungsberichterstattung, 2008, p.255).⁵ Second, as curricula and other aspects of the learning environment differ between tracks, track attendance has a significant impact on the development of cognitive skills conditional on initial cognitive skills (Baumert et al., 2006). This is in line with findings presented in Hanushek and Woessmann (2006), who show, based on an international differences-in-differences approach that early school tracking increases educational inequality. Third, Dustmann (2004) shows that secondary school attendance is strongly associated with post-secondary education. More importantly, labor earnings are strongly associated with the type of secondary school degree. Dustmann (2004) estimates gains in log wages with respect to a general school degree of 0.20 (0.29) for an intermediate

⁴Pietsch 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.

⁵Based on PISA 2000 data, Baumert et al. (2003) report higher figures: 14% of all German students at the age of 15 switched secondary school tracks after the initial secondary school track decision.

school degree and 0.43 (0.55) for a high school degree for males (females).

3 The Data

We use micro data from the German extension of the Progress In International Reading Literacy Study (PIRLS-E) 2001. Its main objective is to provide an internationally comparable assessment of reading literacy of their 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 as well as cognitive ability. In particular, we use three types of cognitive measures in the subsequent analyses.

1. 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.
2. Second, PIRLS-E provides test scores on two subscales of a standardized test of cognitive abilities, the *Kognitive Fähigkeitstest* for grades 4 (KFT) by Heller and Perleth (2000)⁶: 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 following 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.
3. Third, we analyze subjective measures of student achievement, namely grades in German and mathematics.

⁶This is the German adaptation of the "Cognitive Abilities Test" by Thorndike and Hagen (1971)

Besides these three types of cognitive measures, we also have information on teachers' recommendations for the type of secondary school a child should attend at the end of the 4th grade. These different measures of student competencies on the one hand, and student performance on the other hand, allow us to investigate the transition process from primary to secondary school in much more depth than studies using the narrower international databases. Moreover, the database contains detailed information on students' individual characteristics and parental background.

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 rather low ($< 3\%$). 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, 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. Given the relatively large number of missing values for all measures of social background (see Table 2), 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). Our final sample consists of 3,436 students from 7 West German States, among them 580 second-generation immigrants and 2856 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.

Table 2 contains descriptive statistics, separately for native and second-generation immigrants as well as the percentage of missing values. The majority of native students receives a recommendation for high school, while most second-generation immigrants are recommended for general school. Moreover, second-generation immigrants, on average, come from less privileged social backgrounds, and have attended kindergarten for a shorter period of time. In both domains, reading and mathematics, their performance lags behind that of native students, with a slightly higher dispersion than that of native students. For all subsequent analyses, we standardize all cognitive measures (i.e., reading and mathe-

matics performance and the KFT score) to have a mean of zero and a standard deviation of one.

4 Empirical Strategy

The empirical analysis consists of four parts: first, we define the concept of the double disadvantages for second-generation immigrants at transition points in a tracked school system. Second, we estimate the double disadvantage based on PIRLS-E 2001 data. Third, we investigate possible explanations for the existence of the two disadvantages. Finally, we conduct a simple back-of-the-envelope calculation to quantify the relative importance of the second versus first disadvantage in terms of labor market outcomes.

Defining the Double Disadvantage

Before turning to the estimation and quantification of the double disadvantage, we want to clarify terms. What exactly do we mean by double disadvantage?

As the first disadvantage of second-generation immigrants, we define any differences in objective measures of student performance between natives and second-generation immigrants. In other words, test score gaps in reading and mathematics between natives and second-generation immigrants are named the first disadvantage. As the second disadvantage, we define any differences in transition probabilities into specific school tracks between natives and second-generation immigrants that remain after controlling for students' cognitive ability and performance. Figure 4 illustrates these two concepts graphically: The first disadvantage lies in the shift of the distribution of cognitive skills: on average, second-generation immigrants perform worse than natives (see Table 2 for descriptive evidence). This finding has been documented by a number of previous studies, and possible reasons for it have been investigated (e.g. Schnepf, 2007; Schneeweis, 2010). The second disadvantage is illustrated in Figure 4 by the distance between the two cutoff points for receiving a recommendation for intermediate school. We see that even if the first disadvantage was overcome by implementing suitable policy measures, there may remain a second disadvantage if second-generation immigrants face stricter cutoff rules than natives.⁷

This distinction is motivated by the observation that at points of transition in a tracked

⁷However, keep in mind that, in Germany, 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' competencies in German and mathematics (see also Section 2). Hypothetical cutoffs are shown here only for the sake of clarity of the argument.

school system future cognitive developments and educational attainment strongly depend on track attendance. To the extent that track attendance is not determined by cognitive performance alone, and to the extent that natives and second-generation immigrants face different transition probabilities conditional on cognitive performance, a comparison between natives and second-generation immigrants with respect to any measure of cognitive performance might not capture the entire educational disadvantage of second-generation immigrants. In contrast, at points of transition in the educational system, observed transitions may mark a more meaningful indicator for educational success than actual academic performance measures.

Our definition basically decomposes the entire difference in transition probabilities into a part that can be explained by cognitive performance and a part that cannot. Here, we investigate this distinction between first and second disadvantages focusing on transitions from primary to secondary school as an example. We believe this distinction might be generalizable to other instances of educational sorting based on assessed academic performance. Such sorting might occur between different institutions of the educational system, but might also occur within a certain institution (e.g. ability sorting within schools).

Estimating the Double Disadvantage

We proceed by estimating the two disadvantages defined above for the transition from primary to secondary school in Germany. We start with an estimate of the first disadvantage, before assessing the existence of the potential second disadvantage.

We obtain an estimate of second-generation immigrants' first disadvantage from OLS regressions of student performance in reading and mathematics, respectively, on a dummy for being a second-generation immigrant. Our estimates for the first disadvantage of second-generation immigrants are shown in columns (1) and (2) of Table 3: it amounts to one half of a standard deviation in reading, and more than one third of a standard deviation in mathematics.

To empirically assess the relevance of the concept of the second disadvantage, we use multinomial logit models, using the teacher recommendation that takes on three different values for either general school, intermediate school or high school, on various cognitive measures. In Table 4, we report average marginal effects after multinomial logit.

Column (1) of Table 4 shows that second-generation immigrants are 18 percentage points more likely to be recommended for general school (*Hauptschule*), and 16 percentage points less likely to receive a teacher recommendation for high school (*Gymnasium*). How-

ever, we have defined above as the second disadvantage a systematic difference between second-generation immigrants and natives in the probability of receiving a recommendation for a particular secondary school track conditional on cognitive ability and performance in reading and mathematics. Column (5) shows our estimates: second-generation immigrants are six percentage points more likely to be recommended for general school than natives, while there is no significant difference between second-generation immigrants and natives in the probability of receiving a recommendation for high school.

Explaining the Double Disadvantage

Previous studies showed that a relatively small set of indicators for parental socio-economic background largely accounts for the performance differences (measured by test scores) between natives and second-generation immigrants (see Schnepf, 2007; Ammermueller, 2007; Schneeweis, 2010). In this section, we explore which variables can explain the second disadvantage.

We start by investigating the first disadvantage. Table 5 reports estimates for the test score gap between second-generation immigrants and natives after controlling for various background characteristics. Compared to our estimate of the first disadvantage (see column (1)), the test score gap in reading is significantly reduced once we control for students' socio-economic background as measured by three types of variables: the number of books at home, household income, and highest parental educational degree (see column 2). Additionally controlling kindergarten attendance does not significantly reduce the test score gap (column 3). Column (4) shows, however, that controlling for language spoken at home significantly reduces the test score gap in reading to 15% of a standard deviation. Note, however, that the second-generation immigrants' first disadvantage in reading cannot be fully explained by the available information on students' background.

In the bottom panel of Table 5, we analyze the test score gap in mathematics. We observe a similar pattern in columns (1) to (4): the unconditional test score gap is considerably reduced once we control for students' socio-economic background. The test score gap is fully explained when we additionally control for language spoken at home.

Regarding the second disadvantage, many previous studies found that teacher recommendations can, besides objective ability and performance measures, also be explained by students' socio-economic status. Table 6 confirms this finding: Column (2) shows that the dummy for being a second-generation immigrant is considerably smaller, and statistically significant only at the 10%-level once our three measures of socio-economic background are

controlled for.

Up to now, we have shown that the teacher recommendation is not explained by objective measures of cognitive ability and performance alone, but, controlling for these cognitive measures, there remains a significant disadvantage for second-generation immigrants: the latter are less likely to be recommended for a higher school track by their teacher than native students.

In the next section, we therefore ask what possible mechanisms are. Of course, teachers do not base their recommendations on objective tests, but their recommendation can largely be explained by subjective grades.⁸ We hence go one step further and analyze to what extent students' grades can be explained by objective cognitive measures. Table 7 shows the results of a regression of grades in German and mathematics on objective cognitive measures. Even after controlling for all three cognitive measures, second-generation immigrants receive significantly worse grades (see column (3)). There are several possible explanations for this finding. On the one hand, this could indicate that grades measure relevant cognitive competencies in addition to the objective tests. On the other hand, this could mean that second-generation immigrants systematically have worse non-cognitive skills (e.g., show less effort or motivation, or simply study less). Another possibility would be, however, that teachers systematically discriminate against second-generation immigrants. Our results do not allow us to draw any conclusions about possible explanations. Yet, this difference between natives' and second-generation immigrants' grades does not significantly decrease once the three measures of social background (i.e., parents' social class, income and education) are controlled for.

To sum up, in this section, we have shown that second-generation immigrants face a double disadvantage: At the transition to secondary school, they are less likely to receive a recommendation for a higher school track, i.e. intermediate school or high school than native students, given the same general cognitive ability and performance. It is important to emphasize that this disadvantage is mostly explained by second-generation immigrants' lower socio-economic background, meaning that, compared to native students of the same SES, they do not face an additional disadvantage due to their ethnicity.

The finding that second-generation immigrants receive lower recommendations (and, finally, attend lower school tracks) is alarming because there is ample evidence that, for the majority of students, this early decision on the type of secondary school determines

⁸In a linear regression, the students' grades in German and mathematics account for 70 % of the variation in teacher recommendations. The second-generation immigrant dummy does not enter significantly in this regression. Therefore, we analyze, in the next step, what determines students' grades.

future educational career paths. Even though, legally, there is the possibility to change school tracks later during secondary education, in reality, the permeability between school tracks is low (Avenarius et al., 2003). Moreover, even after the completion of secondary school, there is the possibility to obtain a higher educational degree through second-chance education. It has been shown, however, that it is mostly students from socio-economically privileged families that make use of this possibility (Trautwein et al., 2004), and that those individuals taking this second chance yield significantly lower income than those that obtain their educational degree on the regular path (Vester, 2004).

Quantifying the Double-Disadvantage

In this section, we conduct a simple back-of-the-envelope-calculation to assess the relevance of the first versus second disadvantage of second-generation immigrants in terms of labor market outcomes.

Wage differentials between immigrants and natives that persist even for the descendants of migrants have been documented by labor economists for several decades and various countries. However, a large part of this wage gap can be explained by differences in accumulated human capital, usually measured by educational degrees (Chiswick, 1978; Borjas, 1985; Algan et al., 2010; Lang, 2005).

In the previous section, we have argued that, in the German case, both the first and the second educational disadvantage of second-generation immigrants are likely to translate into the type of educational qualification achieved, which will in turn have an impact on later labor market outcomes such as wages (Dustmann 2004) and employment.

To quantify the double disadvantage for second-generation immigrants in terms of labor market outcomes, we conduct a simple back-of-the-envelope calculation taking into account both different employment probabilities and different wages as a result of school track choices at the end of primary school, and compute expected life-time earnings by school track. Then, we quantify the relative importance of the first and second disadvantage at the transition from primary to secondary school in terms of expected life-time earnings.

In a first step, using a sample from the German Socio-Economic Panel (GSOEP), we calculate age-earnings-profiles to estimate returns to completed school degrees as well as age-employment profiles conditional on having completed a certain school degree, separately for males and females (see Appendix for details on the estimation).

As our objective is to quantify the educational disadvantage net of other factors that may affect labor market outcomes of immigrants and natives later on, we estimate returns

to completed school degrees on a sample of native Germans. We fully acknowledge that there may be many possible reasons why returns to educational credentials may differ for natives and second-generation immigrants: e.g., different preferences for different groups of occupations, or labor market discrimination. We interpret our calculations, therefore, as a thought experiment - as opposed to real expected life-time earnings of second-generation immigrants in Germany - that holds all subsequent influences after secondary school entry constant for natives and second-generation immigrants.

Table 8 contains the results of this back-of-the-envelope-calculation. Table 8(a) reports the estimated expected earnings by gender and type of degree. The results are presented in absolute life-time earnings as well as averaged monthly earnings. The difference in expected life-time earnings by school degree are sizeable and comparable to the results presented in Dustmann (2004).⁹

Table 8(b) reports probabilities of transition into the three different types of secondary schools, by gender. Probabilities are presented for three different cases. The first two cases show unconditional attendance probabilities for natives and second-generation immigrants. The third scenario is hypothetical. In this scenario we present probabilities for second-generation immigrants in the absence of the second disadvantage. That is, we adjust actual probabilities by our estimates for the second disadvantage presented above. For each of the three cases we then calculate unconditional expected life-time earnings. We then define the overall educational disadvantage of second-generation immigrants as the difference in expected life-time earnings of natives and second-generation immigrants.

The overall disadvantage and the second disadvantage expressed as a percentage of actual expected life-time earnings of second-generation immigrants are reported for males and females at the bottom of the table. Holding everything but the transition probability to secondary school tracks constant, the overall disadvantage of second-generation immigrants would result in a seven percent reduction in expected life-time earnings for males and a ten percent reduction for females. The second disadvantage alone accounts for a three percent loss for males and a one percent loss for females. The ratios presented at the bottom right of Table 8(b) indicate the relative importance of the second disadvantage with respect to the overall disadvantage of second-generation immigrants. For males 35 percent of the overall disadvantage is explained by the fact that second-generation immigrants face significantly lower transition probabilities to higher school tracks after controlling for cognitive skills as opposed to natives. For females, this ratio is still sizeable with 14 percent.

⁹Note that estimates naturally differ from the ones presented in Dustmann (2004) as these estimates take into account differences in employment probabilities.

5 Conclusion

In this paper we investigate differences in teacher recommendations for secondary school tracks in Germany between natives and second-generation immigrants. We find that second-generation immigrants have a 12 percentage point higher probability of receiving a recommendation for the lowest track and a 9 percentage point lower probability of receiving a recommendation for the highest track conditional on a highly reliable measure of general intelligence. Controlling additionally for measures of cognitive achievement in reading and mathematics, second-generation immigrants still face a 6 percentage point higher probability of receiving a recommendation for the lowest track. No statistically significant difference is found concerning the recommendation for the highest track conditional on cognitive achievement and ability.

This suggests that the overall difference in receiving a recommendation for a higher track can be decomposed into a part that can be attributed to differences in measures of students' cognitive achievement and ability and a part that cannot. We refer to the first part as the first disadvantage and the latter part as the second disadvantage. The first disadvantage is what is commonly investigated in studies that focus on test score differences between natives and immigrants (Schnepf, 2007; Schneeweis, 2010). Our results suggest, however, that the educational disadvantage for immigrants is actually larger than what is measured by test score gaps alone.

Investigating possible explanations for the second disadvantage, we find that differences in social background account for the entire effect. Consistent with previous research, we find that also the first disadvantage can largely be explained by differences in natives' and second-generation immigrants' social background. Additionally, we investigate grades in different subjects as a measure for educational success. We find that our measures of cognitive achievement and ability cannot fully explain differences in school grades between natives and second-generation immigrants. The latter finding suggests that the relevance of the second disadvantage goes beyond transitions from primary to secondary school in a tracked school system, and thus might affect educational careers of second-generation immigrants also at other stages of the educational process or in school systems without early between-school tracking.

To quantify the relevance of the second disadvantage relative to the first, we estimate age-earnings and age-employment profiles. As shown previously by Dustmann (2004), track attendance has a significant impact on future labor market outcomes. We use estimated expected earnings by school degree to weight probabilities of obtaining a specific track

recommendation for second-generation immigrants, once unadjusted and once adjusted for the second disadvantage. We then compare these to estimated expected earnings for natives and find that 35 percent of the overall educational disadvantage for boys and 14 percent for girls is explained by the second disadvantage.

These findings add to the debate on the successful integration of second-generation immigrants. On the one hand, our findings suggest that, with respect to the first disadvantage, participation in early childhood education and language competencies transmitted by students' parents are key policy levers towards the integration of second-generation immigrants, replicating the conclusions of several previous studies (e.g. Entorf and Minoiu, 2005; Schnepf, 2007; Schneeweis, 2010). On the other hand, in line with findings by Entorf and Lauk (2008), we interpret our findings as suggesting that there likely remains an additional educational disadvantages for second-generation immigrants due to the tracking of students into different school types at age ten, that cannot be tackled by the above mentioned policy measures aiming at the first disadvantage alone.

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Appendix: Calculation of Age-Earnings-Profiles

To calculate this ratio, we require the following ingredients: the unconditional probabilities to attend a certain track for natives and second-generation immigrants, our estimates for the second disadvantage and weights based on expected life-time earnings by secondary school track.

In principle we could use the estimates provided in Dustmann (2004) as proxy for wage differentials between school track. This requires, however, some simplifications: Firstly, Dustmann (2004) estimates returns to completed school degrees, not tracks attended at the beginning of secondary school. The probabilities of completing an attended track might be quite different for natives and second-generation immigrants.

Aiming at a calculation of expected lifetime earnings, in addition to estimating the returns to secondary school degree, we also estimate employment ratios by age. Hence, we re-estimate age-earning profiles presented in Dustmann (2004), as well as employment profiles. We also employ the German Socio-Economic Panel (GSOEP) as data source. We deviate, however, from the specification used in Dustmann (2004) insofar as we estimate returns to secondary school degree by age. We also base our estimation on the entire time span of the GSOEP covering the years from 1984 to 2008.

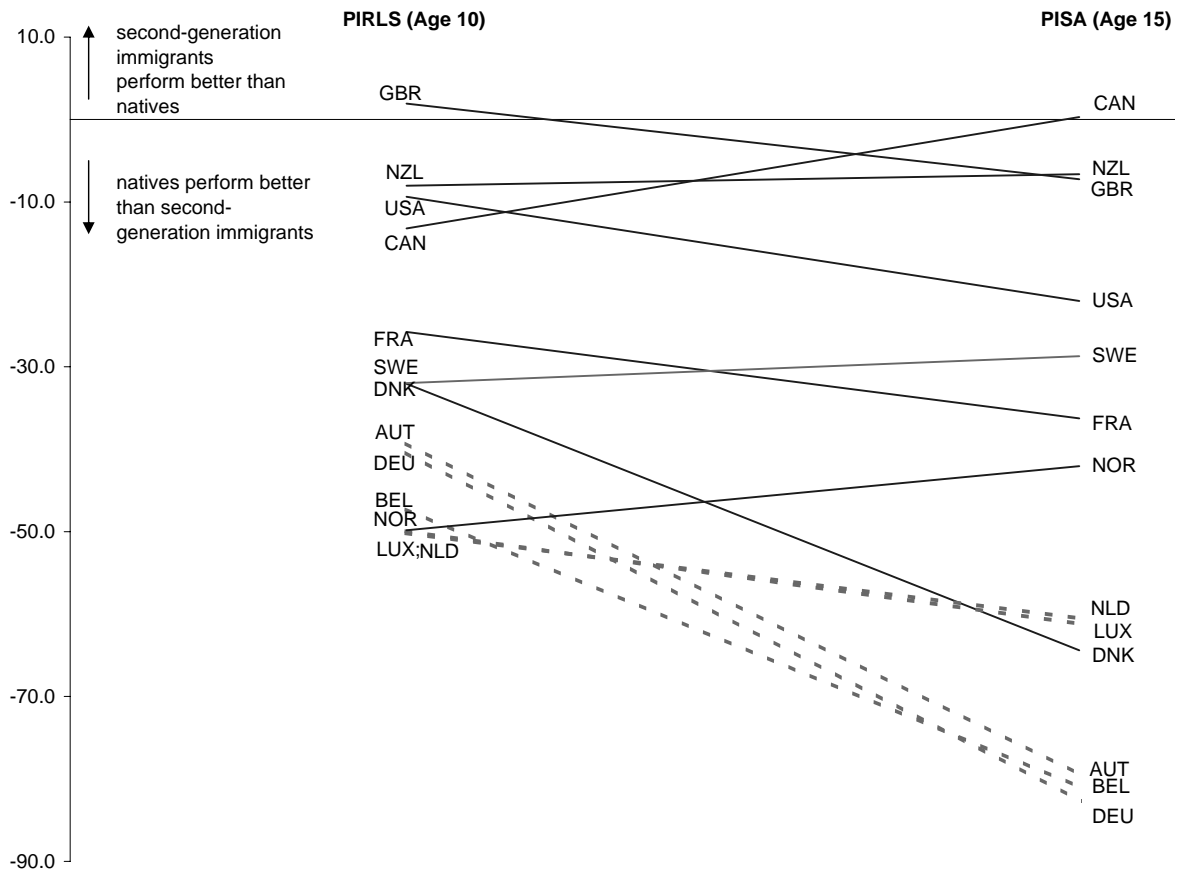
Figure 5 presents the results of these estimations. Panel A and B provides estimates for average gross monthly earnings by age for males and females. Panel C and D plot estimated employment profiles for males and females. All panels report profiles separately for the three types of secondary school degree. The results show the expected patterns. Individuals with high school degrees earn on average the most over the working life followed by individuals with intermediate school degrees. Early in life the picture is, however, somehow reversed. This is explained by the fact that higher school degree typically lead to more post-secondary education. Thus, employment probabilities for individuals with high school degrees are well below the other employment probabilities until age 30. Individuals with high school degree observed working in the early 20s are very selected group and predominantly do not engage in full-time employment, which depress average earnings within this group. Later in life, however, employment probabilities of individuals with higher school degrees dominate the employment probabilities of individuals with lower school degrees. The typical differences in wage and earnings profiles between males and females are also reflected in these estimates.

The estimates based on the GSOEP allow us to calculate expected life-time earnings by type secondary school degree. For each age and type of degree we simply multiple the

estimated employment probability with the estimated monthly labor earnings and then sum up expected earnings over the working life, separately for males and females. Table 8 contains the results of this calculation.

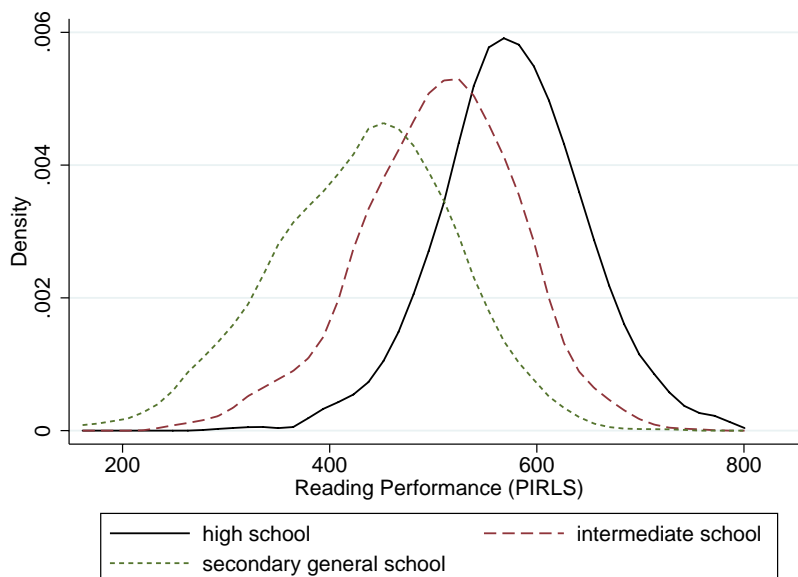
Tables & Figures

Figure 1: International Evidence: Development of the Test Score Gap in Reading between Age 10 and 15

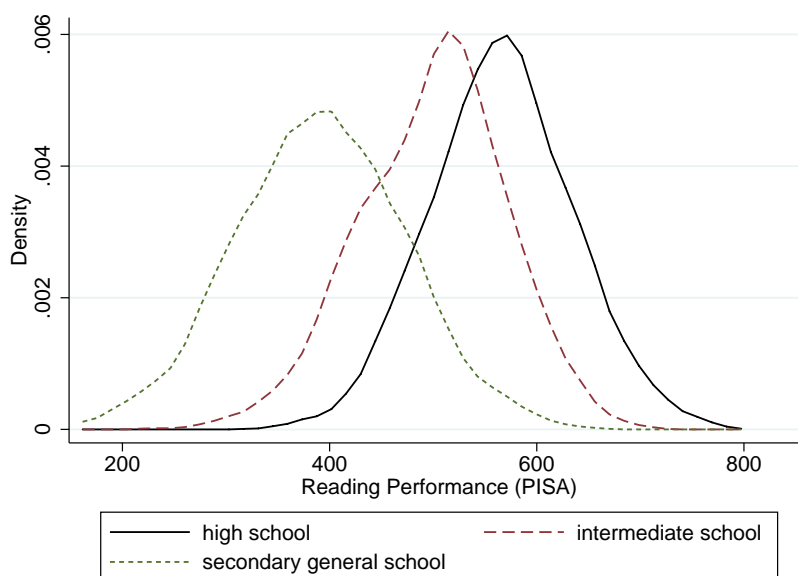


Notes: The graph reports the test score gap in reading between second-generation immigrants and natives at the ages of ten and fifteen. Test score gaps at age ten are estimated using PIRLS 2001 data for DEU, FRA, GBR, NLD, NOR, NZL, SWE, and PIRLS 2006 data for AUT, BEL, CAN, DNK and USA. Test score gaps at age fifteen 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.

Figure 2: Distribution of Reading Performance, by School Track



(a) Distribution of Reading Performance by recommendation for secondary school at age 10



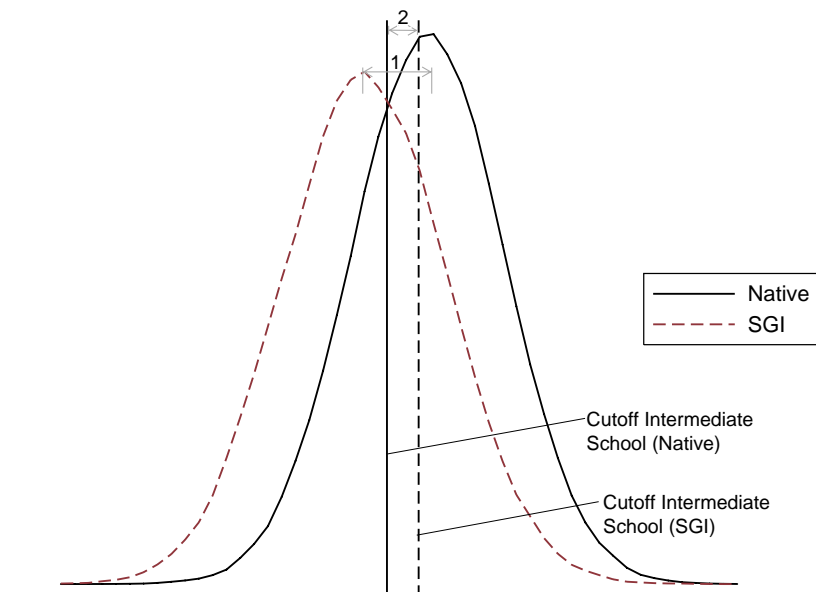
(b) Distribution of Reading Performance by secondary school track attended at age 15

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.

Figure 3: The German School System

Grade					Age
13	Vocational school (full-time or part-time)	Vocational school (full-time or part-time) or High School	Vocational school (full-time or part-time) or High School		18
12					17
11					16
10	(some schools have a 10 th year)	Intermediate School (Realschule)	Comprehensive School (Gesamtschule)	High School (Gymnasium)	15
9	Secondary General School (Hauptschule)				14
8					13
7					12
6					11
5					10
4	Elementary School (Grundschule)				9
3					8
2					7
1					6
	Pre-School (Kindergarten)				5
					4
					3

Figure 4: Illustrating the Double Disadvantage



Notes: This idealized figure illustrates the idea of the double disadvantage, based on simulated data. The first disadvantage 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 intermediate school, that are different for natives and second-generation immigrants (SGI).

Figure 5: Age-Earnings and -Employment Profiles by School Degree

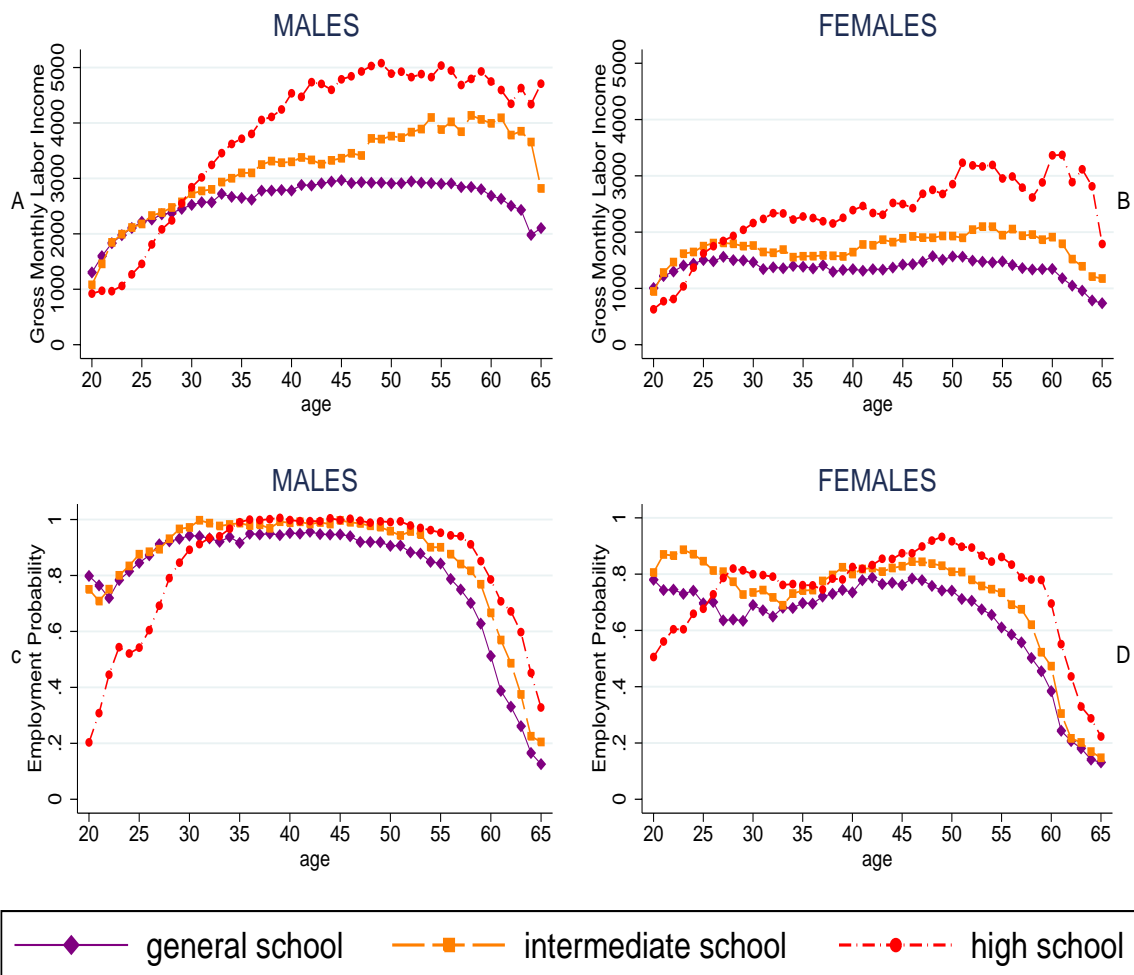


Table 1: Students by Type of Secondary School in the German *Laender* in 2001

Federal State	School Type in per cent				Students in 1000s
	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
Brandenburg	-	17.0	29.1	48.1	37,615
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
Mecklenburg-Vorpommern	11.4	42.8	30.1	9.6	27,740
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
Saxony	-	-	32.4	61.3	57,334
Saxony-Anhalt	-	-	32.8	59.3	35,333
Schleswig-Holstein	29.1	32.6	26.6	5.8	33,012
Thuringia	-	-	33.4	58.9	33,284
Germany	22.7	24.4	29.5	17.8	1,005,002

Note: Figures refer to students in the 8th grade in 2001. Comprehensive schools include *Integrierte Gesamtschulen* as well as *Schularten mit mehreren Bildungsgängen*. Others include *Freie Waldorfschulen* and *Sonderschulen*. Source: KMK

Table 2: Descriptive Statistics

	Native			Second-generation		
	Mean	Stdev	% miss.	Mean	Stdev	% miss.
Teacher recommendation						
General school(<i>Hauptschule</i>)	0.23		9.9%	0.41		10.6%
Intermediate school (<i>Realschule</i>)	0.34		9.9%	0.32		10.6%
High school (<i>Gymnasium</i>)	0.44		9.9%	0.28		10.6%
Cognitive measures [†]						
Reading performance	562.0	57.3	0.0%	530.7	63.5	0.0%
Mathematics performance	529.3	91.9	0.0%	494.2	99.4	0.0%
Grade in German	2.5	0.8	0.0%	3.0	0.9	0.0%
Grade in Math	2.5	0.9	0.0%	2.9	1.0	0.0%
Number of books at home						
0 – 10 books	0.04		10.8%	0.12		26.2%
11 – 25 books	0.19		10.8%	0.30		26.2%
26 – 100 books	0.33		10.8%	0.34		26.2%
101 – 200 books	0.23		10.8%	0.11		26.2%
more than 200 books	0.21		10.8%	0.13		26.2%
Highest parental education level						
Lower secondary or below	0.10		10.8%	0.20		26.2%
Upper secondary	0.59		10.8%	0.59		26.2%
Tertiary	0.32		10.8%	0.21		26.2%
Household income						
below EUR 20,000	0.10		10.8%	0.13		26.2%
EUR 20,000–EUR 30,000	0.15		10.8%	0.26		26.2%
EUR 30,000–EUR 40,000	0.23		10.8%	0.24		26.2%
EUR 40,000–EUR 50,000	0.20		10.8%	0.16		26.2%
EUR 50,000–EUR 60,000	0.14		10.8%	0.10		26.2%
EUR 60,000 or more	0.18		10.8%	0.11		26.2%
Individual characteristics						
Age (in months)	125.5	5.1	0.0%	126.4	5.7	0.0%
Female	0.51		0.0%	0.53		0.0%
Kindergarten attendance						
did not attend	0.02		8.7%	0.08		19.2%
less than 1 year	0.00		8.7%	0.01		19.2%
1 year	0.03		8.7%	0.07		19.2%
between 1 and 2 years	0.02		8.7%	0.03		19.2%
2 years	0.23		8.7%	0.20		19.2%
more than 2 years	0.70		8.7%	0.63		19.2%
Test language spoken at home						
always or almost always	0.98		0.8%	0.68		0.5%
sometimes	0.01		0.8%	0.30		0.5%
never	0.00		0.8%	0.02		0.5%

Notes: Data are weighted by the inverse of students' sampling probability. [†] Scores of the Cognitive Abilities Test (KFT) not reported here for confidentiality reasons. Data: PIRLS-E 2001

Table 3: Estimating the First Disadvantage

	Reading Performance (1)	Mathematics Performance (2)
SGI	-0.528*** (0.054)	-0.374*** (0.065)
<i>N</i>	3436	3122

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

Notes: OLS coefficients. Standard errors in parentheses are robust to clustering at the school level. All regressions include a constant (results not reported). Data are weighted by the inverse of students' sampling probability. SGI is a dummy for being a second-generation immigrant. Test performance in reading and mathematics are standardized to have a mean of 0 and a standard deviation of 1.

Table 4: Estimating the Second Disadvantage

(a) Outcome General School (<i>Hauptschule</i>)				
	(1)	(2)	(3)	(4)
SGI	0.176*** (0.026)	0.068*** (0.021)	0.064*** (0.023)	0.055** (0.023)
Reading performance		-0.189*** (0.008)	-0.141*** (0.010)	-0.126*** (0.011)
Mathematics performance			-0.088*** (0.010)	-0.067*** (0.010)
KFT Verbal Analogies				-0.042*** (0.012)
KFT Figure Analogies				-0.020** (0.008)
Observations	3436	3436	3122	3122
(b) Outcome: High School (<i>Gymnasium</i>)				
	(1)	(2)	(3)	(4)
SGI	-0.162*** (0.023)	-0.052** (0.023)	-0.048** (0.024)	-0.040 (0.025)
Reading performance		0.247*** (0.008)	0.183*** (0.010)	0.156*** (0.010)
Mathematics performance			0.111*** (0.010)	0.073*** (0.012)
KFT Verbal Analogies				0.051*** (0.011)
KFT Figure Analogies				0.052*** (0.009)
Observations	3436	3436	3122	3122

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

Notes: Average marginal effects after multinomial logit. Standard errors in parentheses are robust to clustering at the school level. All models include student age (in months), as well as a gender dummy and *Länder* dummies. Data are weighted by the inverse of students' sampling probability. SGI is a dummy for being a second-generation immigrant. 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". All four cognitive measures are standardized to have a mean of 0 and a standard deviation of 1.

Table 5: Explaining the First Disadvantage

(a) Dependent Variable: Reading Performance						
	(1)	(2)	(3)	(4)	(5)	(6)
SGI	-0.528*** (0.054)	-0.280*** (0.046)	-0.267*** (0.047)	-0.150*** (0.048)	-0.190*** (0.050)	-0.197*** (0.052)
Student SES		✓	✓	✓	✓	✓
Kindergarten attendance			✓	✓	✓	✓
Language spoken at home				✓	✓	✓
State FE		✓	✓	✓		
School FE					✓	
Class FE						✓
<i>N</i>	3436	3436	3436	3436	3436	3436

(b) Dependent Variable: Mathematics Performance						
	(1)	(2)	(3)	(4)	(5)	(6)
SGI	-0.374*** (0.065)	-0.201*** (0.054)	-0.190*** (0.053)	-0.076 (0.054)	-0.040 (0.051)	-0.044 (0.051)
Student SES		✓	✓	✓	✓	✓
Kindergarten attendance			✓	✓	✓	✓
Language spoken at home				✓	✓	✓
State FE		✓	✓	✓		
School FE					✓	
Class FE						✓
<i>N</i>	3122	3122	3122	3122	3122	3122

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

Notes: OLS coefficients. Standard errors in parentheses are robust to clustering at the school level. Test performance in reading and mathematics are standardized to have a mean of 0 and a standard deviation of 1. SGI is a dummy for being a second-generation immigrant. Students' socio-economic status (SES) 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 and gender, as well as a constant (results not reported). Data are weighted by the inverse of students' sampling probability.

Table 6: Explaining the Second Disadvantage: Teacher Recommendations

(a) Outcome General School (<i>Hauptschule</i>)				
	(1)	(2)	(3)	(4)
SGI	0.055** (0.023)	0.038* (0.022)	0.043* (0.022)	0.039 (0.025)
Reading Performance	-0.126*** (0.011)	-0.104*** (0.010)	-0.103*** (0.010)	-0.103*** (0.010)
Mathematics Performance	-0.067*** (0.010)	-0.063*** (0.009)	-0.062*** (0.009)	-0.062*** (0.009)
KFT Verbal Analogies	-0.042*** (0.012)	-0.042*** (0.011)	-0.043*** (0.011)	-0.043*** (0.011)
KFT Figure Analogies	-0.020** (0.008)	-0.015* (0.008)	-0.015* (0.008)	-0.015* (0.008)
Student SES		✓	✓	✓
Kindergarten attendance			✓	✓
Language spoken at home				✓
<i>N</i>	3122	3122	3122	3122

(b) Outcome: High School (<i>Gymnasium</i>)				
	(1)	(2)	(3)	(4)
SGI	-0.040 (0.025)	-0.016 (0.024)	-0.014 (0.025)	-0.010 (0.024)
Reading Performance	0.156*** (0.010)	0.126*** (0.011)	0.124*** (0.011)	0.124*** (0.011)
Mathematics Performance	0.073*** (0.012)	0.065*** (0.011)	0.066*** (0.011)	0.066*** (0.011)
KFT Verbal Analogies	0.051*** (0.011)	0.051*** (0.010)	0.050*** (0.010)	0.049*** (0.010)
KFT Figure Analogies	0.052*** (0.009)	0.047*** (0.009)	0.048*** (0.009)	0.048*** (0.009)
Student SES		✓	✓	✓
Kindergarten attendance			✓	✓
Language spoken at home				✓
<i>N</i>	3122	3122	3122	3122

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

Notes: Average marginal effects after multinomial logit. Standard errors in parentheses are robust to clustering at the school level. SGI is a dummy for being a second-generation immigrant. 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 (SES) 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.

Table 7: Explaining the Second Disadvantage: Grades

(a) Dependent Variable: Grade in German						
	(1)	(2)	(3)	(4)	(5)	(6)
SGI	0.215*** (0.044)	0.157*** (0.042)	0.126*** (0.045)	0.087** (0.043)	0.071 (0.043)	0.055 (0.046)
Reading performance	-0.453*** (0.015)	-0.484*** (0.016)	-0.389*** (0.018)	-0.348*** (0.018)	-0.368*** (0.019)	-0.345*** (0.018)
KFT			-0.165*** (0.019)	-0.161*** (0.019)	-0.167*** (0.018)	-0.162*** (0.019)
Verbal Analogies KFT			-0.062*** (0.018)	-0.052*** (0.018)	-0.051*** (0.017)	-0.051*** (0.018)
Figure Analogies KFT						
Student SES				✓	✓	✓
Kindergarten attendance					✓	✓
Language spoken at home						✓
Class FE		✓	✓	✓	✓	✓
<i>N</i>	2729	2729	2729	2729	2729	2729

(b) Dependent Variable: Grade in Mathematics						
	(1)	(2)	(3)	(4)	(5)	(6)
SGI	0.253*** (0.047)	0.225*** (0.045)	0.171*** (0.046)	0.120** (0.046)	0.124** (0.047)	0.124*** (0.046)
Mathematics performance	-0.445*** (0.017)	-0.489*** (0.018)	-0.352*** (0.019)	-0.320*** (0.020)	-0.329*** (0.019)	-0.320*** (0.020)
KFT			-0.178*** (0.022)	-0.163*** (0.021)	-0.161*** (0.022)	-0.162*** (0.021)
Verbal Analogies KFT			-0.130*** (0.018)	-0.118*** (0.017)	-0.123*** (0.017)	-0.119*** (0.017)
Figure Analogies KFT						
Student SES				✓	✓	✓
Kindergarten attendance					✓	✓
Language spoken at home						✓
Class FE		✓	✓	✓	✓	✓
<i>N</i>	3117	3117	3117	3117	3117	3117

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

Notes: OLS coefficients. 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). SGI is a dummy for being a second-generation immigrant. 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 (SES) 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 and gender, as well as a constant (results not reported). Data are weighted by the inverse of students’ sampling probability.

Table 8: Expected Lifetime Earnings and Transition Probabilities

(a) Expected Lifetime Earnings

	By Degree Averages			Differences	
	General School	Interm. School	High School	High-Int	Int-Gen
Absolute Earnings					
Males	1,171,491	1,507,415	1,852,790	345376	335923
Females	486,685	684,644	984,524	299880	197959
Average Monthly Earnings					
Males	2,169	2,791	3,431	640	622
Females	901	1,267	1,823	555	367

(b) Transition Probabilities

	General School	Interm. School	High School	High-Int	Int-Gen
<i>Natives</i>					
Males	0.26	0.33	0.41	0.08	0.07
Females	0.2	0.34	0.46	0.12	0.14
<i>Second-generation immigrants (actual)</i>					
Males	0.44	0.31	0.25	-0.06	-0.13
Females	0.38	0.33	0.3	-0.03	-0.05
<i>Second-generation immigrants (hypothetical)</i>					
Males	0.38	0.31	0.31	0	-0.07
Females	0.33	0.38	0.3	-0.08	0.05
<hr/>					
Disadvantage in %	<i>overall</i>	<i>second</i>	<i>ratio</i>		
Males	0.08	0.03	0.35		
Females	0.11	0.01	0.13		

Notes: Estimates in Panel A are based on GSOEP data. All figures report expected gross labor earnings in 2008 euros.