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## The PISA shock, socioeconomic inequality, and school reforms in Germany

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## ABSTRACT

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### **The PISA Shock, Socioeconomic Inequality, and School Reforms in Germany**

In Germany, the poor performance in PISA 2000 stimulated a heated public debate and a strong policy response. The government reacted to the low average and remarkable disparities registered by the test, and spurred reforms led to a significant improvement in the country's educational performance and to a reduction of the gap between children from advantaged and disadvantaged educational backgrounds. Still, between-group achievement inequalities persist within the country. This paper, first, informs about important policy reforms following the PISA shock in 2000. It further gives a description of the current situation and persisting inequalities at secondary schools, with particular attention paid to students with migratory backgrounds.

**JEL Classification:** I24, I28, I21

**Keywords:** PISA shock, inequality, school reforms, migration background

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## 1. Introduction

Newspapers' headlines such as "A Disaster in Almost Every Respect" (TAZ, 2001) give an impression of the shock following the release of the first PISA results. The news had a "tsunami-like impact" on the educational discourse in Germany and occupied the headlines of German newspapers for several weeks (Waldow, 2009). The shock generated by the PISA release was grounded in the fact that Germany had quite a strong perception of its educational apparatus, believed to be an efficient and highly performing system which reflected the generally strong and efficient structure of the country's economy. The results of the first international comparison Germany took part in, PISA 2000, revealed a different story.

In order to understand German pupils' educational outcomes and the spike of debates which sprang from PISA 2000, a short overview of the most unique characteristics of German education is needed. A first important element of the German system is given by the great heterogeneity existing across states. The 16 German *Länder* are the sole authority in charge of educational decisions at state level, so that sizeable differences exist in terms of organization and efficiency, and hence in terms of students' educational outcomes, across *Länder* (see Wössmann, 2007, for evidence on cross-state variation in educational policies in Germany). The 16 states, as we will better explain at the end of the paper, present differences in terms of tracking age, central exit examinations and per-student expenditures, with some of these differences being a consequence of changes implemented after the PISA 2000 shock. Such heterogeneity makes it difficult to analyze educational outcomes in a unified framework, without taking into account regional differences. A second crucial aspect is the early tracking, characterizing the German system. At the age of ten (or twelve, in some *Länder*), after a common elementary school, each student is placed in one of the three existing school tracks, giving different access to higher tertiary education and to the labor market. The decision on the type of secondary school to attend is based on teachers' recommendations and pupils' performance in earlier classes. *Hauptschule* and *Realschule*, the least theoretically oriented secondary schools, provide education up to grade 9 and 10, allowing students to proceed to vocational training or to nonacademic careers, whereas *Gymnasium* provides education up to grade 12 or 13, preparing students to access university formation. The *Gymnasium* gives access to a standardized central examination, the *Abitur*, the only gateway to university access. Some *Länder* integrate all of the three tracks in a comprehensive school (*Gesamtschule*), making it easier to access the higher ability tracks.

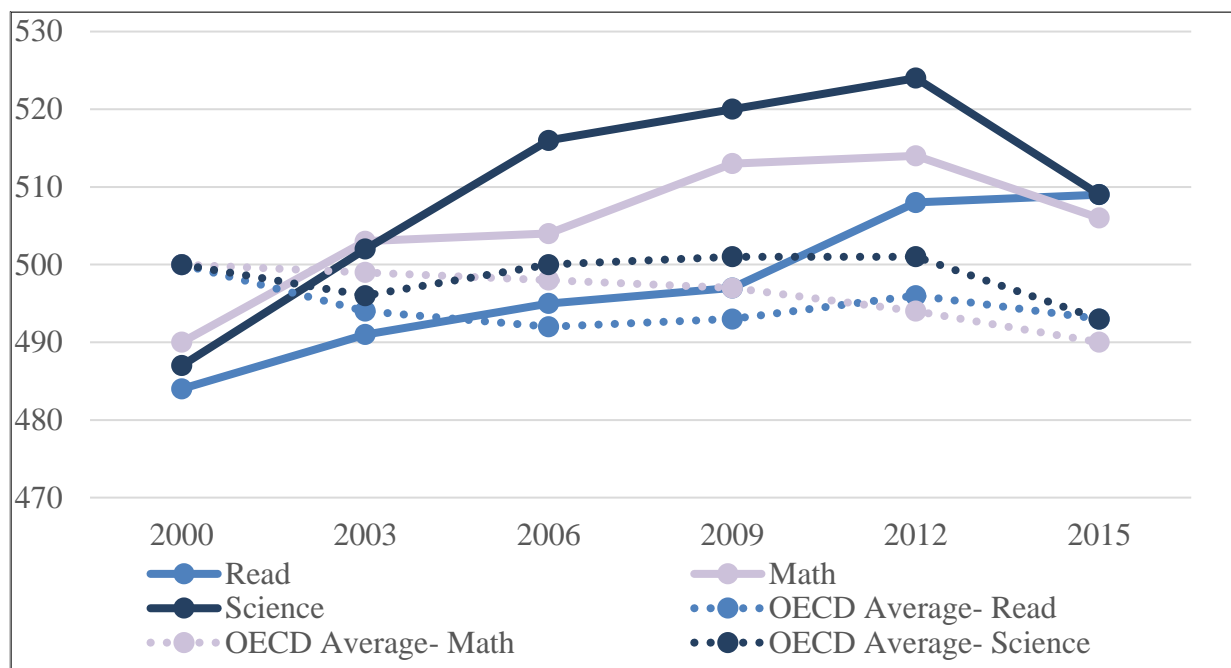
The three-tiered system was devised as a means to help all students develop their individual abilities already from an early age, preparing them to enter the labor market in a way that best takes into account their inclinations. Instead, as it was revealed quite clearly to the German society by the PISA 2000 results, the tracking system had a rather segregating effect, from a very early age (Odendahl, 2017).

The "PISA shock" brought to light several concerns. First, German students performed poorly, as compared to other OECD countries, with average test scores well below international averages, in all three areas

measured. Besides, the results of these tests revealed a great inequality existing within the system: students' socio-economic status and social background were largely related to educational success or failure in German schools. Having or not having a migratory background shaped enormously the differences in test achievements, and the gap between low and high achievers was particularly marked in Germany as compared to other countries. In addition, because students in *Gymnasiums* scored higher than those in other tracks, and because the attendance of *Gymnasium* rather than *Hauptschule* or *Realschule* is greatly determined by pupils' socio-economic background, the socio-economic selectivity imposed by the tracking system translated into a selectivity in terms of educational outcomes (Ertl, 2006). A great heterogeneity in mean test scores emerged as well across different *Länder*.

The intense debate initiated thanks to PISA 2000 caused some major policy change and a shift in the idea of education, as we will explain at the end of the paper. The strong reaction to the negative news about the educational system made it possible to implement a series of reforms aimed at reducing inequalities and enhancing the achievement of disadvantaged students. Since 2000, Germany's PISA results have exhibited a steady increase, reverting the trend of the beginning of the century. As can be seen in Figure 1, as of 2015 the country performs well above OECD averages in all tested areas, and the country scores have been growing from 2003 onwards.

Figure 1. Average Test Scores (2000-2015)



Notes: Data sources: OECD. Test scores were normalized to have a mean of 500 and variance equal to 100. Own calculation.

The rest of the paper is organized as follows. Section 2 highlights the main educational policy initiatives and changes spurred by the PISA debate in Germany. Section 3 presents the characteristics of the current student

population in Germany and informs about students' education outcomes, using the latest release of the PISA assessment, PISA 2015. Section 4 uses some regression analysis to assess the importance of explaining factors, where we focus on immigrant students and pupils coming from families with low parental educational achievement. Section 5 concludes..

## **2. German education policy and reforms after PISA 2000**

The disappointing “PISA Shock” of the first PISA results in 2000 has been a wakeup call to the German educational system. Germany's children performed significantly below the OECD average, and a broad group was identified as “functional illiterate”, because their cognitive competences, reading and writing skills were inadequate for everyday needs. Only a decade later, Germany has managed a turnaround. As shown in Figure 1, scores in reading, mathematics and science, have significantly increased and are well above OECD average after 2012. At the same time, the impact of socio-economic background has decreased. As noticed by OECD (2015), Germany is one of only three OECD countries where both mathematics scores and equity indicators have improved since 2003. Moreover, an increasing percentage of the German student population is “resilient”, meaning that pupils, despite their disadvantaged socio-economic background, score among the top 25% of students around the world (OECD, 2016b). The share of resilient students in Germany has increased by 9 percentage points since 2006, which is by far exceeding the OECD average increase of 2 percentage points during the same period. The increasing performance of students with a disadvantaged socio-economic background becomes even more remarkable when we distinguish between high and low educated parents by using the ISCED level (low parental education: at most level ISCED 1 or 2; high parental education: ISCED 5a or 6, achieved by either of the parents). As shown in Figure 3, the performance gap between advantaged and disadvantaged students used to be more than 70 PISA score points (roughly equivalent to two years of schooling) and high above the OECD average still in 2009, and it is down to less than 40 points – and well below the OECD average – in 2015.

So, what educational policies and reforms, if any, might have caused these improvements? A first relevant remark to make is that the intense debate following PISA 2000 caused a major shift of the idea of education. Neumann et al. (2010) thoroughly explain how one of the core elements of the reform of the educational system following PISA 2000 was the passage from the German *Bildung*, an idea of education based on the development of the individual rather than on specific functional abilities, to the notion of Anglo-American literacy, where educational standards and assessment of students' achievements are central. PISA contributed to the development of an empirically-based framework for research in education, previously not very developed in Germany, somehow more practically oriented and based on competences (Ertl, 2006; Neumann et al., 2010). National Education Standards (NES), common across all *Länder*, were introduced by

the *Ständige Konferenz der Kulturminister* to define ability levels that all pupils should reach by the end of grade 4, ability levels which represent clear, assessable goals to be achieved within a specific age.

In addition, as Waldow (2009) points out, one should be aware of the fact that many of the changes to the educational system following PISA 2000 were already under way before the public release of the results, and were not uniquely determined by the test results, as many people believe. The introduction of educational standards and centralized examinations, the creation of all-day schools (*Ganztagsschule*) and the changes in the structure of lower secondary schools were elements already in place in some of the Federal States and in a discussion phase across the country. However, the PISA shock was employed as a legitimization tool to implement many long-needed changes in educational policy measures and to create consensus among the population for such changes (Waldow, 2009).

When having a closer look at the reforms carried out in Germany, it needs to be stressed at the outset that it is difficult to characterize the national educational system, because education is regulated by the individual federal states ("*Bundesländer*"), and every state has its own peculiarities. However, according to educational research and discussions among practitioners, seven major points have contributed to the improvement:

1. Rethinking streaming children at the age of 10
2. Softening segregation
3. Standardization of curricula
4. Monitoring and ensuring comparability
5. Introduction of central examinations
6. Increasing school autonomy
7. Expanding and strengthening the educational content of pre-primary schools

**Streaming:** The findings of 2000 have brought about strong arguments against tracking students into differing-ability schools as early as at age 10 (compared to the OECD average of 14), because it significantly increases educational inequality (Hanushek and Woessmann, 2006; Entorf & Lauk, 2008). Some few states (*Länder*) have introduced policies to reduce the potentially negative effects of early tracking on equity. In Berlin and Brandenburg, all primary schools are comprehensive until grade 6 (age 12), and in Hesse students can choose between 4-year and 6-year primary schools. Nevertheless, a large majority of secondary students, particular in the Western part of Germany, still undergo some early tracking. However, the downsides of the early tracking into different-ability schools have been alleviated by reforms that changed the German school system to a more comprehensive and less segregated approach in which students with greater heterogeneity of abilities are admitted to the same school.

**Segregation:** The perhaps most significant change has been the merging of the two lower-level tracks (*Realschule* and *Hauptschule*) into one school, called *Regionalschulen* ("regional schools") in several states. The change improved the general education level and it has taken away a lot of stigma, because *Hauptschulen* were and are still characterized as places for children with (very) poor prospects. The previously dominating



non-comprehensive school system was found to magnify the prevailing educational inequality between students with a low parental socio-economic background, particularly those with a migration background, and children from more privileged families (Entorf and Lauk, 2008). Closing *Hauptschulen*, again, does not apply to all states. Baden-Württemberg, Bavaria, Hesse, Lower Saxony and North Rhine-Westphalia maintain the traditional three-tier education system. However, *Hauptschulen* in Baden-Württemberg and Bavaria are still considered less segregated than elsewhere, because in these states the share of pupils attending the lowest-level track is still relatively large, and the system facilitates considerable upward mobility to higher-ability tracks (Bellenberg 2012). After all, as a matter of fact, PISA scores variation within schools was greater in 2015 (56%) than in 2006 (46%) (OECD, 2016b). Thus, the pre-reform ability grouping between schools has been partly replaced by ability grouping within schools. According to OECD (2015), only 32% of students have been in schools without grouping, whereas this number was 54% in 2003.

PISA results revealed a poor performance of students with a migration background. One of the key problems for their underperformance and lacking integration into the German society has been language problems. The KMK (The Standing Conference of the Ministers of Education and Cultural Affairs of the *Länder* in the Federal Republic of Germany) showed a prompt response and announced a series of policy responses (KMK 2002), including language training for migrant children starting already from pre-schools, and a concept called "*Deutsch als Zweitsprache*" ("German as second language"), which is now practiced in most kindergartens.

**Standardization:** The PISA shock prompted a debate about missing standards for education in Germany. Therefore, the Standing Conference of the Ministers of Education of the *Länder* (KMK) decided on cross-border educational standards for all federal states of Germany, which were introduced in 2003 and 2004. In 2004, a new Institute for Educational Quality Improvement (IQB, *Institut zur Qualitätsentwicklung im Bildungswesen*) has been founded. Its key objectives are development, operationalization, standardization and examination of educational standards, including the design of national tests across *Länder*. These tests address standards for basic school graduates at all school levels. The first implementation took place in 2009 in German, English and French languages, followed by Mathematics and German in 2011, and, by 2012, educational standards were introduced for all school types (GWK 2014). Therefore, contrary to pre-PISA times, students are now preparing for German and international standard tests such as PISA, IGLU (Internationale Grundschule-Lese-Untersuchung), and TIMSS.

**Monitoring:** Differently from other OECD countries such as UK, results from IQB evaluations are not publicly available. IQB only publishes the ranking of states, and participating schools receive a summary about the performance of their students. This kind of monitoring is associated with less pressure on teachers and pupils than in countries where league tables are available at the individual school level. It has the advantage of

informing schools about its local problems and deficiencies, without inducing a circle of stigmatization of less successful schools.

**Centralization of exams:** Most *Länder* introduced the *Zentralabitur* (central upper secondary school leaving examination) during the years 2005 and 2008. As of today, all states except Rhineland-Palatinate have a centralized examination. Before 2000, it was in place in Bavaria and in Eastern states of the former GDR. The reform improved comparability, and it has put some pressure on schools, perhaps even stronger than that induced by other means of monitoring. However, contrary to a widespread belief, examinations are not standardized at the national but at the state level. Therefore, not surprisingly, there is still an ongoing demand for high and low quality standards, and for comparability between states.

**School autonomy:** Standardization, comparability and central exams can only be successful when school leaders have enough autonomy for school-specific changes and improvements. Indeed, Wößmann and Fuchs (2007) point out that school performance is positively correlated with school autonomy. OECD (2015) reports that in recent years German school leaders have benefited from increasing autonomy, and their use of instructional leadership approaches is above the OECD average.

**Preschools:** Attendance of kindergarten used to be relatively low in Germany, in particular for children with migration background. This has changed fundamentally. In 2012, 96% of the four-year-old German children (OECD average: 82%) and 91% of all three-year-olds (OECD average: 70%) attended kindergarten (GWG, 2014). As preschool is a place which offers the opportunity for leveling out social and cultural differences, the general acceptance of kindergarten has led to a decrease of the gap between children from high and low educated parents at the start of school.

### **3. Socioeconomic characteristics and inequality of the German student population in 2015**

In order to provide a description of the *current* situation at German schools, in particular on the situation of disadvantaged students in German secondary schools after reforms have been implemented, we first present some descriptive statistics focusing on pupils with a low socio-economic and/or migration background, and in Section 4 we continue by analyzing factors of performance at school in a multivariate framework. For this purpose, we make use of the most recent available wave of PISA, PISA 2015. The dataset of PISA 2015 on Germany contains information on about 6,000 students, mostly from 8th and 9th grade in 256 different schools.

As a measure of students' socio-economic background, we employ parental educational achievement, since in the case of Germany former publications have provided evidence of a particularly low intergenerational mobility with respect to educational attainment (see Heineck and Riphahn, 2009, Entorf and Minoiu, 2005). Children from poorly educated families face considerably more difficulties, as compared to those from highly

educated parents, this being particularly true for students having a migratory background. Recent evidence (Organisation for Economic Co-Operation and Development, 2018) finds some intergenerational progress in educational attainment, in particular for the native-born children of Turkish immigrants. However, the OECD report also concludes that, due to persistent intergenerational transmission mechanisms, the educational attainment of migrant children coming from families with a low parental status still lags behind that of Germans of native descent. Also Italian immigrants, according to Bönke and Neidhöfer (2018), despite exhibiting high intergenerational mobility, still display lower educational achievement as compared to native Germans, a sign that the assimilation process is not yet completed.

In this paper, we want to shed more light on the size and development of the gap between children from high and low educated parents, analyze potential reasons for persistent disadvantages such as language proficiency, and study the performance heterogeneity based on nationality, gender, school type etc. The empirical analysis of our paper follows the classification suggested by OECD (2016a), so that highly educated parents (one or both) have reached at least ISCED 5A (theoretically oriented tertiary and post-graduate qualifications) and poorly educated parents have reached at most ISCED level 2 (lower secondary qualifications). As a large share of the disadvantaged children have a migration background, the focus will be on children and parents with non-German roots. Again, following the classification suggested by the PISA assessment, a student is classified as non-German if both parents were born abroad and she or he was born either abroad (first generation immigrant) or in Germany (second generation immigrant). Table 1 displays the composition of subgroups of interest of the student population according to this parental background typology. All statistics are weighted and clustered according to PISA sampling methodology, i.e., at school level. Furthermore, results relative to PISA test scores are standardized to have a mean of zero and a variance of one, and only the first of the 10 available plausible values was employed.

Germany has been the destination country of sizeable migration flows since the beginning of the twentieth century. On the one hand, a sizeable group of migrants came to Germany as temporary guest workers from 1955 to 1973, mostly from Turkey, Italy and former Yugoslavia. Although originally supposed to only temporarily work and live in Germany, they ended up bringing their families and raise most of the students who now form the group of second generation immigrants. A second group of immigrants, mostly first generation students, came from the former Yugoslavian countries and Eastern Europe, following the dissolution of socialism (Fertig and Schmidt, 2001, Carey, 2008). Such composite population is also reflected in the school system, where a migratory background characterizes a considerable proportion of the students. In PISA 2015, we observe roughly 16% of the students with a migratory background<sup>1</sup> (Table 1), of which the majority is formed by second generation pupils, i.e. children born in Germany with foreign parents.

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<sup>1</sup> A student is defined as native if at least one of the parent is born in Germany. She is defined as immigrant if either both parents or herself were born outside of Germany.

It is striking to see the differences in parental background for some of the subgroups of interest. First, we observe how the majority of natives have parents who achieved high qualifications in education, whereas among students with a migratory background the distribution is more balanced. The situation within the immigrant group, however, is far from being homogeneous. In order to take into account such heterogeneity, we classify a student as having a, say, Polish background, if either the father, the mother or the student was born in Poland (the same applies for the other countries of origin in the sample). While a student with a Polish background is comparable with a native German in terms of parental education, the same does not apply for all other countries of origin. Pupils from Turkey and from former Yugoslavia face a particularly disadvantaged situation at home, with 55% to 65% of them having parents who achieved only up to ISCED2 qualifications. Turkish pupils, amounting to 6% of the entire PISA sample and, thus, representing the largest share among foreign students in German schools, start their educational career with the strongest disadvantage relative to native students.

Table 1. Composition of Student Population

	Low parental education (%)	High parental education (%)	In whole PISA sample (%)
All students	22,1	34,4	
Native	36,7	63,3	84,5
with Migration Background	51,5	48,5	15,5
- Other Nationalities	35,9	64,1	11,7
- Ex-Yugoslavia	54,7	45,3	1,8
- Italy	48	51,9	1,5
- Poland	33,5	66,5	2,9
- Former USSR	44,5	55,5	4,7
- Turkey	64,9	35,1	5,6
- born in Germany (II gen)	56,5	43,5	12,3
- born abroad (I gen)	65,5	34,5	3,3
Language other than German at Home	49,2	50,8	10,5
Male	37,7	62,3	48,9
Female	40,6	59,4	51,1
Low Performers: Math	59,7	40,3	14,4
Low Performers: Read	54,5	45,5	12,4
Low Performers: Science	62,4	37,6	13,9
Gymnasium	16,8	83,2	36,7
More than 100 Books at Home	19,4	80,6	48,5
Single-Parent Households	41,4	58,6	13,7

*Notes:* Data sources: PISA 2015, 2012, Germany. Results are weighted and only the first plausible value for PISA scores has been employed. Information on single-parents family comes from PISA 2012 as the information was not available in PISA 2015. Native students have at least one parent born in Germany. Students are classified as being from a certain origin country if either the mother, the father or the student was born in the specified country. Low parental education is defined as either of the parents having achieved at most level ISCED 1 or 2 of education, and high parental education if ISCED 5a or 6 was achieved by either of the parents. Low performers are defined according to OECD guidelines: students that achieved a test score lower than 420, 407 and 410 points in math, reading and science, respectively.

Differences in parental educational backgrounds matter and persist to the next generation. Proficiency in PISA assessment is divided into 6 levels and low-performing students are defined as those who score below 420 points in math, 407 points in reading and 410 points in science (OECD, 2016a). Below such thresholds, students are believed to lack basic competencies required at their age level. Considerably high percentages of low performers show up in the low parental education category. Not surprisingly, on the opposite side of the spectrum, students attending Gymnasium and having more than 100 books at home (a proxy for cultural possession) are mostly from families with highly educated parents.

Living in a family with a single parent, in most cases the mother, is not necessarily associated with a poorer family background: on the contrary, in both categories more students belong to the high parental education classification. The same holds for speaking a foreign language at home.

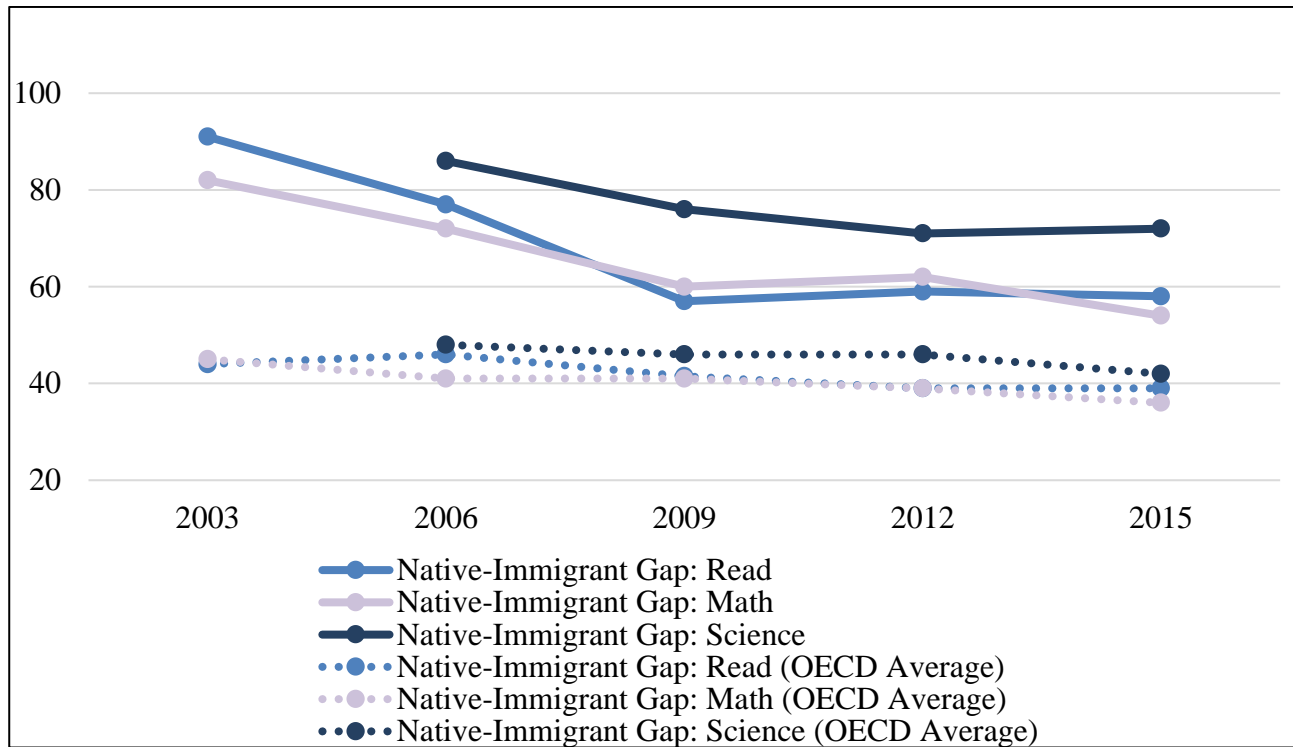
#### **4. Factors of associated with students' outcomes in secondary school**

From the descriptive statistics of Table 1, it clearly emerges that there is a positive relation between test scores and socio-economic characteristics of the family, in particular with the educational level of parents. Figure 2 and 3, plotting the change in the average test score gaps between native and immigrant students (Figure 2), and between students with high and low parental education (Figure 3), visualize that the country has considerably reduced the gaps which emerged in the first PISA surveys. The difference in performances of students whose parents are highly or poorly educated has reduced by about 40 points on average in all subject areas, becoming even smaller than the OECD average gap. However, despite improving their performance over time, immigrants in Germany still achieve between 60 to 70 points less than natives, while the OECD gap is of about 40 points on average. According to OECD guidelines, one school year of competences corresponds to about 35-40 points in the PISA tests, immigrants' performance is behind that of natives by about one and a half year of schooling. Hence, although there has been a remarkable decrease in inequality originating from a heterogeneous parental background, considerable gaps do still exist.

In order to better identify factors associated with students' school performance, we employ multivariate linear regressions and estimate the partial correlation between students' characteristics and PISA test results, conditioning on other relevant variables. Marginal effects from OLS estimation are presented in Table 2. Columns (1), (3) and (5) report estimates for all relevant variables, columns (2), (4) and (6) have a more direct focus on parental education (by omitting variables that depend on the influence of parents). The gap of students with a migratory background becomes obvious throughout all six models of Table 2. Immigrant students, no matter whether born abroad or in Germany, score significantly worse than native Germans with at least one parent born in Germany. Pupils born abroad (i.e. first-generation students) are the ones who experience the biggest disadvantage, and they do so the later they arrive in Germany, as can be seen from the estimated coefficients associated with age at arrival. We also observe that important differences in

performance relate to the country of origin: when at least one of the parents (or the kid) is born in Turkey, the average student has a difference of 0.3 to 0.6 standard deviations in her test score, with math and science being especially affected by such disadvantage. Also, pupils of Italian origin experience a disadvantage, whereas Polish origin positively correlates with test scores, although not always significantly.

Figure 2. Average Native-Immigrant Gap (2003-2015)



Notes: Data sources: OECD. Test scores were normalized to have a mean of 500 and variance equal to 100. Own calculation.

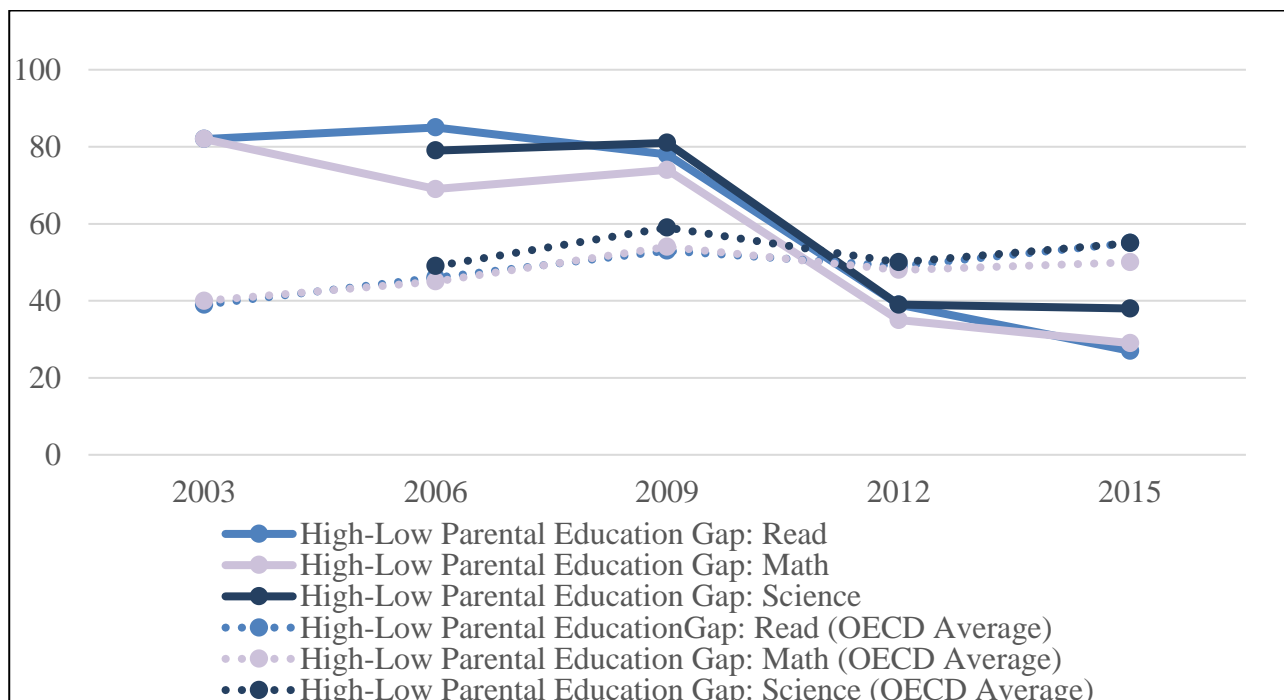
Students' characteristics representing parental economic background and education are highly correlated with students' assessments. Because we want to analyze the strength of the intergenerational educational correlation, we have a closer look at the particular role of parents' education in column (2), (4), and (6). Here, we omit "Gymnasium" and "Books at Home" (a proxy for family's wealth and cultural capital), as these characteristics might already be the result of the educational background of parents (see Angrist and Pischke, 2009, for an indepth discussion of the concept of "bad control" variables). Once parental education is the only proxy for students' socio-economic background, we observe a very strong influence of low parental education on school performance of children. In all three-subject areas, the difference between performance levels amounts to about 0.4 standard deviation when compared to non-low educated parents.

Table 2. Correlates of student performance

VARIABLES	Read		Math		Science	
	(1)	(2)	(3)	(4)	(5)	(6)
First Generation	-0.279* (0.141)	-0.398** (0.158)	-0.265** (0.115)	-0.388*** (0.132)	-0.115 (0.134)	-0.249 (0.153)
Second Generation	-0.110* (0.055)	-0.159** (0.061)	-0.057 (0.051)	-0.109** (0.054)	-0.155*** (0.051)	-0.218*** (0.055)
Italian Origin	-0.116 (0.100)	-0.174* (0.103)	-0.253** (0.114)	-0.313** (0.123)	-0.173* (0.097)	-0.232** (0.099)
Polish Origin	0.164** (0.068)	0.156* (0.081)	0.081 (0.074)	0.072 (0.091)	0.046 (0.082)	0.036 (0.096)
Ex-USSR Origin	0.143* (0.072)	0.126 (0.079)	0.038 (0.062)	0.020 (0.065)	0.019 (0.070)	0.004 (0.070)
Turkish Origin	-0.269*** (0.072)	-0.421*** (0.080)	-0.457*** (0.061)	-0.615*** (0.074)	-0.432*** (0.056)	-0.595*** (0.061)
Ex-Yugoslavia Origin	0.023 (0.103)	-0.002 (0.110)	-0.122 (0.098)	-0.148 (0.099)	-0.251** (0.098)	-0.279*** (0.104)
Other Origin	-0.132*** (0.041)	-0.184*** (0.053)	-0.196*** (0.042)	-0.250*** (0.052)	-0.152*** (0.041)	-0.205*** (0.054)
Female	0.100*** (0.024)	0.137*** (0.026)	-0.301*** (0.021)	-0.262*** (0.023)	-0.208*** (0.022)	-0.165*** (0.025)
Age	0.228*** (0.046)	0.178*** (0.053)	0.325*** (0.045)	0.273*** (0.051)	0.256*** (0.043)	0.206*** (0.051)
Low Parental Education	-0.063** (0.027)	-0.347*** (0.030)	-0.112*** (0.026)	-0.407*** (0.032)	-0.094*** (0.027)	-0.405*** (0.032)
More than 100 Books	0.262*** (0.023)		0.275*** (0.024)		0.367*** (0.026)	
Gymnasium	0.898*** (0.034)		0.926*** (0.037)		0.892*** (0.037)	
Other Language at Home	-0.262*** (0.050)	-0.317*** (0.061)	-0.249*** (0.048)	-0.306*** (0.057)	-0.271*** (0.043)	-0.335*** (0.056)
Age at arrival: 4-6	0.140 (0.207)	0.182 (0.235)	0.261 (0.202)	0.305 (0.226)	-0.045 (0.216)	-0.016 (0.246)
Age at arrival: 7-9	-0.218 (0.219)	-0.367 (0.248)	-0.234 (0.204)	-0.388* (0.227)	-0.178 (0.197)	-0.336 (0.228)
Age at arrival: 10-12	-0.425 (0.365)	-0.617* (0.344)	-0.399* (0.202)	-0.598*** (0.213)	-0.315* (0.183)	-0.522** (0.199)
Age at arrival: 13-15	-0.784*** (0.217)	-0.849*** (0.259)	-0.154 (0.226)	-0.222 (0.264)	-0.589*** (0.214)	-0.667*** (0.252)
Constant	-3.909*** (0.723)	-2.579*** (0.837)	-5.250*** (0.715)	-3.875*** (0.808)	-4.222*** (0.674)	-2.840*** (0.808)
N	5,317	5,317	5,317	5,317	5,317	5,317
R-squared	0.345	0.108	0.378	0.138	0.398	0.142

Notes: Data source: PISA 2015, Germany. Table reports results of OLS regressions. First plausible value employed. All results are weighted and replication weights are taken into account. Test scores were normalized to have a mean of 0 and variance equal to 1. Errors are robust and clustered at the school level. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Native students have at least one parent born in Germany. Students are classified as having a certain origin country if either the mother, the father or the student was born in the specified country. Low parental education is defined as either of the parents having achieved at most level ISCED 1 or 2 of education.

Figure 3. Average High-Low Parental Education Gap (2003-2015)



Notes: Data source: OECD. Test scores were normalized to have a mean of 500 and variance equal to 100. Own calculation.

Clearly, many factors that correlate with students' performances are missing in the estimation model, which is why our estimates rather represent partial correlations than causal effects. However, the multivariate model confirms the descriptive results of the previous section: migratory and socio-economic background of the pupil can negatively affect the test score of disadvantaged students. Students with some foreign background, less books and a non-German language spoken at home, and with parents who themselves have achieved low levels of education, on average achieve scores which range between 0.2 to 0.6 standard deviations below the average performance of their respective counterparts.

## 5. Conclusions

The PISA shock has acted as a spur to the German educational system. Many reforms have been implemented which eventually led to a schooling system which has become more standardized and centralized, more closely monitored, and perhaps most importantly, less segregated than at the time before PISA 2000. The result of this change can be seen when looking at the performance difference of PISA scores between children from high educated and those from low educated parents (ISCED 5a or 6, compared to ISCED 1 or 2). Whereas the disadvantage was significantly above the OECD average still in 2009, it fell well below the OECD average after the year 2012. Still, children with a migratory history lag behind. Despite some improvements, the gap



between native and immigrant children has remained above the OECD level. When analyzing the reasons for this persistent disadvantage, language problems can easily be identified as one of the major obstacles. In this respect, the common practice of early tracking restricts integration, as many of those with a poor command of the German language end up in *Hauptschulen*, where they keep the peers speaking their mother tongue.

Finally, although OECD's PISA tests seems to be very successful, particularly in Germany, it should be noted that OECD has also been criticized. For example, in an open letter to Mr. Schleicher (The Guardian 2014), director of the OECD's Programme for International Student Assessment (PISA), many educational scientists from around the world expressed their concern about a potentially misleading impact of PISA tests. Among others, they worried about a bias in favor of the economic role of public schools. They emphasized that preparing children for gainful employment "... is not the only, and not even the main goal of public education". Instead, students should be prepared for participation in democratic self-government, moral action and wellbeing. This critique is certainly an opinion which is not shared by the majority of German citizens and researchers working on education, but it represents the voice of a significant number of practitioners and educational scientists.

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