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Report No: 77722-TR

Promoting Excellence in Turkey's Schools

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Human Development Sector Unit
Europe and Central Asia Region

Document of the World Bank

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Executive Summary

1. **The education system in Turkey has shown remarkable improvement since 2003 in terms of better student performance and reduced inequality with a concurrent and sustained increase in enrollments.** The country's scores in the three PISA disciplines (reading, math, and science) increased sharply by 20 points or more between 2003 and 2009. This represents the equivalent of having around half a year of additional schooling in each of the tested subjects. At the same time, inequalities in student performance have decreased as the gains in PISA scores have come overwhelmingly from low and medium achievers. For example, the performance of the bottom 1 percent of achievers has gone up by 30 points in reading, by 33 points in math, and by 25 points in science; the performance of high-achievers has, on average, also improved although by less than that of lower achievers. During the same period, the enrollment rate of 15-year-olds has grown by a strong 7.8 percent per year according to PISA, which makes these improvements even more remarkable.

2. **This report finds that most of the progress in the education system since 2003 has been the result of a combination of the overall socioeconomic progress being made in Turkey and increased effectiveness in the delivery of education.** The country's rapid economic growth has improved the socioeconomic conditions of the population and led to the gains of around 20 points in all PISA disciplines. However, the socioeconomic status of each student's family mattered less for his or her PISA results in 2009 than in 2003. This is because the delivery of education services has become more effective in the period between these PISA tests, improving the schooling provided to almost all Turkish students and thereby reducing inequalities.

3. **The Government's educational policies have contributed to the improvements in education outcomes – including curriculum reform, phased modernization of teaching and learning materials and practices, stronger focus on measuring learning outcomes through large scale national and international assessments, and enhanced monitoring and evaluation systems. Notwithstanding these successes, some challenges remain.** The performance of Turkey's average 15-year-old is still one full year (or 40 PISA points) behind the OECD average. Around 25 percent of the Turkish 15-year-olds do not read well enough to be able

to analyze and understand what they read and are therefore considered by the OECD to be "functionally illiterate"; however, this rate has been declining at a fast rate since 2003 when the equivalent proportion was 36 percent. Despite some progress in narrowing the achievement gap in between students from the richest and poorest income quintile groups, it was still about 100 points (or more than two years of education) as of 2009.

4. **This report continues the work undertaken in the previous World Bank (2011) report which examined a cross-section of countries that participated in PISA 2009, and pointed out that the average 15-year old in Turkey is 1 school year behind the average OECD counterpart in reading, math and science skills.** The current analysis relies on the subsequent availability of detailed data for PISA 2009, and exploits similar data from previous rounds of PISA in 2003 and 2006. This time trend analysis offers a key insight- it shows that while Turkey lags its OECD counterparts, it has nonetheless made remarkable improvement since 2003, especially for students from poorer households.

5. The report finds that the **main areas for further improvements** are:

6. **Encouraging an earlier start in school:**

According to PISA, across all OECD countries one year of pre-school was correlated with 34 additional points in reading, and around two-thirds of this impact was due to peer effects. On the basis of these estimates, Turkey's average score in reading would increase by 24 points if 100 percent of the country's students could attend a good quality pre-school for one year. Also, for the 15-year-olds who were tested in 2009, the average age of starting first grade was 6.8 years. Estimates show that bringing the average starting age closer to 6 could improve reading results by up to 10 points.

Recommendations:

- ❖ *Offer targeted support to expand enrolment in kindergarten to the lagging provinces.*
- ❖ *Ensure equity in access to ECE services by targeting the poorest households nationwide.*
- ❖ *Improve quality by rigorously monitoring, evaluating, and enforcing standards for pre-school education.*
- ❖ *Ensure adequate funding for ECE and involve private and not-for-profit actors in the ECE system.*
- ❖ *Reduce effective entrance age to Grade 1.*

7. **Improving teaching methods by:**

a. **Promoting the use of effective learning strategies:** An analysis of the PISA results indicates that learning in Turkey's schools could be significantly improved if all students were taught how to use effective learning strategies. As in other PISA countries, students who report having been taught "good" learning strategies (those used to understand, remember, and summarize information) tend to produce better test results. In Turkey, estimates have shown that an increase of about one standard deviation of the OECD indexes related to the use of the effective learning strategies would increase average student performance respectively by 24 points for the understanding and remembering techniques and by 23 points for the summarizing ones. Two-thirds of the benefits of the good learning strategies actually operate through peer effects. In total, an increase of just one standard deviation in the number of students that are taught these techniques would increase the average reading score in Turkey by 68 points (or the equivalent of almost one and a half years of schooling). Moreover, if all Turkish students had at least the average amount of knowledge of these techniques, the share of the "functionally illiterate" would drop from 25 percent to 10 percent.

Recommendations:

❖ *Through pre-service and in-service training, train teachers to educate students in the use of effective learning strategies. This can be done separately or in the context of the wider reform of teacher career management and incentives.*

❖ *The training should incorporate a module to address the specific needs for effective learning strategies of disadvantaged students.*

b. Improving classroom practice: Teachers' practices play a significant role in how students learn in Turkey. PISA measures teachers' practices in three dimensions: (i) the disciplinary climate; (ii) the quality of teacher-student relationships: and (iii) stimulation of student reading engagement. By improving these teaching practices within the classroom by one standard deviation, Turkey's scores in the three PISA disciplines would increase by about 11 points.

Recommendation:

❖ *Carry out a nationally representative assessment of teaching practices and classroom dynamics using the "Stalling method" of classroom observations.*

8. **Reducing inequalities of opportunities in upper secondary education:** In Turkey there are several types of upper secondary schools and average performance in PISA of these school types is quite different. Students in the best program – science and Anatolian high schools – had PISA scores that are equivalent to about additional three years of schooling than students in the streams with the lowest score (e.g. vocational schools). The selection process that streams students into different types of upper secondary schools according to their abilities is likely to have an effect on their academic performance not only on that education level but also in earlier stages in the school cycle. It is noteworthy that streaming has become gender neutral in Turkey, with the share of girls enrolled increasing significantly in the best schools. Some of the less stratified countries of the OECD (Canada, Denmark, Finland, Iceland, New Zealand, Norway, Sweden and UK) may offer lessons for Turkey. These countries have only one type of school, in some cases allowing choice of academic programs within the school, which means that the stakes at play when moving to upper secondary education are not as high as those in Turkey, where an examination streams people into different types of schools that vary widely in terms of quality (World Bank, 2013).

Recommendations:

❖ *Continue expanding access to the best educational programs for students from all socio-economic backgrounds.*

❖ *Consider reducing the types of upper secondary schools in Turkey, while expanding the number of academic programs within schools.*

9. **The findings in this report could be usefully complemented with further research including:**

a. A corroboration of PISA findings using other student assessments, such as TIMSS and national test results. The use of additional student achievement scores could allow to test the robustness of the relative weights accorded to socio-economic and school specific effects and thus help policy makers identify measures to maximize learning opportunities for socio-economically disadvantaged students.

b. An assessment of current teacher practice and classroom dynamics in Turkey's schools. This would be based on an application of the Stallings method of classroom observations to a nationally representative sample of schools and its aim is to provide useful information to understand what makes teachers effective in the classroom; and

c. A diagnostic on Teacher Career Management to assess current teacher management structures at the central, provincial and school level. This analysis would be based on structured interviews with key informants from central, provincial and sub provincial levels, and the application of questionnaires to a sample of teachers.

Chapter I: Introduction

1. **The education system in Turkey has shown remarkable improvement since 2003 in terms of better student performance and reduced inequality,**[1] **with a concurrent and sustained increase in enrollments.** The country's PISA scores increased sharply (by 20 points or more) between 2003 and 2009 in the three PISA disciplines (reading, math, and science), which represents about half a year of schooling in each of the tested subjects.[2] At the same time, inequalities in student achievements have decreased, and the gains in PISA scores have come overwhelmingly from low and medium achievers.[3] Between 2003 and 2009 the standard deviation at national level in PISA has decreased by 10 percent in reading, 12 percent in math, and 15 percent in science. The performance of the bottom 1 percent of achievers has gone up by 30 points in reading, by 33 points in math, and by 25 points in science. The performance of students between the 80th and 90th percentile has also improved, although by less than that of lower achievers. During the same period, the enrollment rate for 15-year-olds has grown by a strong 7.8 percent per year according to PISA, which makes these improvements even more remarkable.

2. **Notwithstanding these successes, some challenges remain.** The performance of Turkey's average 15-year-old is still one full year (or 40 PISA points) behind the OECD average. Around 25 percent of Turkish 15-year-olds do not read well enough to be able to analyze and understand what they read and are therefore considered by the OECD to be "functionally illiterate". However this rate had declined rapidly since 2003 when the equivalent proportion had been 36 percent. Despite some progress in narrowing the achievement gap between students from the richest and poorest income quintile groups, it was still about 100 points (or more than two years of education) as of 2009.

3. **The educational policies and reforms that the Government has implemented have made important contributions to improving outcomes in recent years.** Turkey made remarkable progress in increasing access to basic education since the Basic Education Law (Law No. 4306) was passed in August 1997, which mandated eight years of compulsory Education. As result of that law, Turkey launched an unprecedented expansion of public primary and secondary schooling. The expansion involved a broad range of actions including construction of new schools; renovation or expansion of existing schools; a massive provision of computers, educational equipment, and educational materials; new

[1] See Table 1 in Annex 1.

[2] The recently released TIMSS 2011 country results tell a similar story. Girls outperform boys in both mathematics and science; students who have many resources as measured by the TIMSS's Home Educational Scale (based on the number of books at home and parent education) outperform those with just a few resources by 160 TIMSS points in science and by 185 TIMSS points in mathematics.

[3] See Table 1 in Annex 1.

recruitment and additional staff training. Teachers in primary schools increased from 384,170 in 2003 to 515,852 in 2012, and student teacher ratio fell from 27 to 21 students per teacher.

4. **The expansion of primary and secondary schooling was accompanied by the development of new curriculum in primary and secondary education, especially since 2004. A recent independent assessment of the revised secondary school curriculum regarded it as an improvement over the curriculum used in the past.**[4] **Curriculum reform was accompanied by initiatives to improve the teaching profession policies.** Turkey introduced incentives to improve teachers' professional and career development, and to ensure that teachers are appointed to distant rural schools. They have also focused on using technology to keep teachers connected and overcome potential isolation. The country has been implementing several activities for improving pre-service teacher education, for selecting the most highly qualified candidates from the pool of teacher candidates and for improving their career development and rewards system. For example, new teachers are being asked to work in schools in lagging provinces allowing them to accumulate points which make them eligible later to apply for schools and postings of their choice. Additionally, teachers are assigned to schools rather than to provinces to insulate deployment decisions at the provincial level from political pressures.

5. **Turkey is also modernizing its teaching and learning equipment, by providing computers and smart boards under the Prime Minister's Fatih Project. Simultaneously web-based services and tools have been made available to key stakeholders to improve accountability and transparency of the education system.** Over 97 percent of schools in Turkey are now connected to the internet, including many of its rural schools, increasing technological access to schools communities and improving connectivity and educational networks. Over 921 million school books have been distributed during 2003-2010 free of charge to all students in primary and secondary education; and over 844,000 computers have been allocated to schools as part of the setting up of Information Technology Classrooms in primary and secondary education. Several web-based services are now available for students, parents, teachers, public employees and citizens. Key web based services are (i) Management Information System: a school management information system software which includes the whole process from a student's first registration to his/her graduation; (ii) Parent Notification System: a system geared towards parents with children in schools, both public and private, that gives access to information about announcements, class schedule, absences, grades, exams and projects; (iii) Information Acquisition System: a system that allows asking questions and making suggestions and complaints and monitor them in accordance with the Information Acquisition Law; (iv) Distance Education Platform: a model of distance education through which users can get visual and audio computer training online; and (v) Education Information Network: designed for all education stakeholders, starting with teachers and students, which provides e-content for different grades.

6. **The rest of this report will analyze the evolution of regional and income inequalities in PISA scores, the overall effectiveness of the delivery of education in Turkey, and identify areas on which policymakers can focus to further improve educational outcomes.** The report pays particular attention to the role played by improved teaching and greater school accountability in improving educational outcomes. In a recent report (World Bank, 2011) the World Bank examined a cross-section of countries that participated in PISA 2009, and pointed out that the average 15-year old in Turkey is one school year behind the average OECD counterpart in reading, math and science skills. The current analysis relies heavily on the subsequent availability of detailed data for PISA 2009, and exploits similar data from previous rounds of PISA in 2003 and 2006. This time trend analysis offers a key insight- it shows that while Turkey lags its OECD counterparts, it has nonetheless made remarkable improvement overall, and especially in reducing inequalities, since 2003.

[4] The assessment was carried out by a consortium of Birmingham University-UK, Gazi University-Ankara, Turkish Curriculum and Instruction Association (EPODER)-Ankara and Global Advisory and Training Services (PGlobal)-Ankara. MONE (2012)

Chapter II: Turkey's Performance in PISA

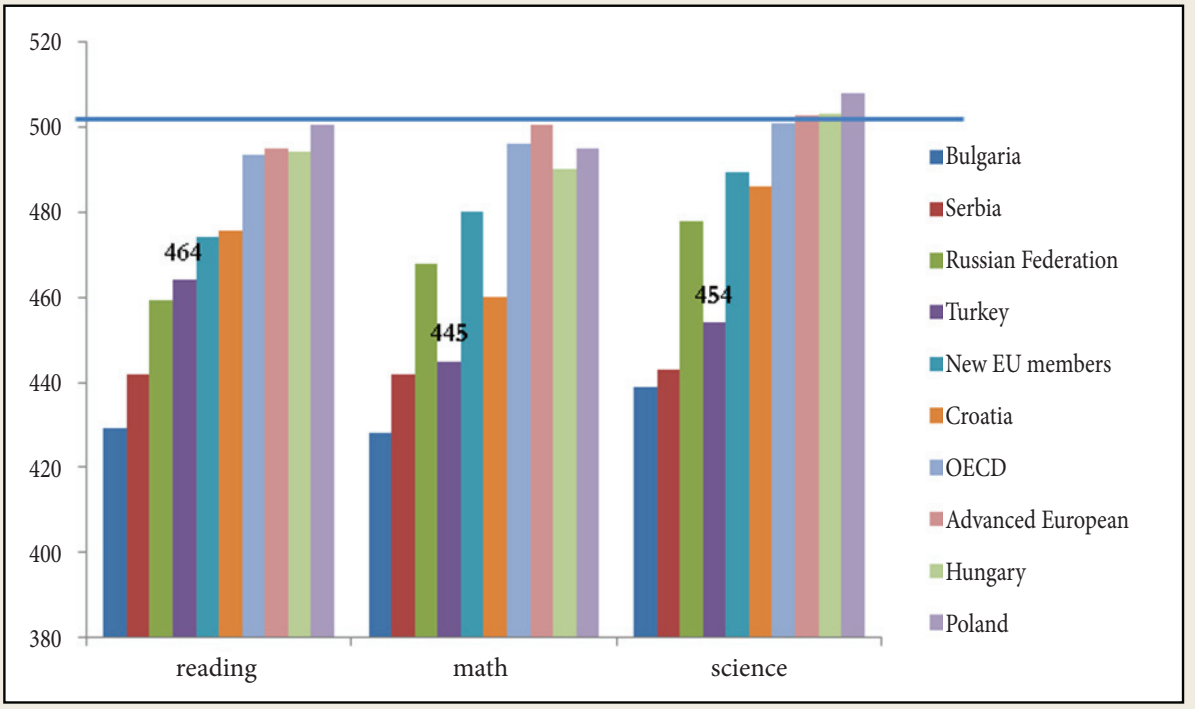
7. **The Program for International Student Assessment (PISA) is an international large scale assessment conducted by the Organization for Economic Cooperation and Development (OECD) of the academic performance of 15-year-olds in mathematics, science, and reading.** The tests were first administered in 2000 and have been repeated every three years thereafter. The aim of PISA is to improve educational policies and outcomes around the world. Turkey has participated in this international large scale assessment since 2003. This chapter analyses performance results for the country in a time trend perspective as well as in a regional perspective.

BOX 1 *Why PISA Matters*

Why does PISA matter for economic growth? Recent international evidence suggests that the quality of education is one of the strongest drivers of economic growth in the long term. A recent paper by Hanushek and Woessmann (2007 and 2010) built international measures of education quality by pulling together the results of international test scores, including TIMMS, PISA, PIRLS, and earlier international tests. Using this measure, they showed that countries that had better quality of education in the years 1960s, such as the Eastern Asian countries, experienced faster economic growth between 1960 and 2000. According to the authors' computations, on average, a 50 point increase in a country's PISA score will raise its growth rate by 1 percentage point over the following four or five decades. These effects will appear very gradually as the better trained cohorts enter into the labor force. Therefore, the economic benefits that will arise from a commitment to improving the quality of learning can be considerable.

Why does PISA matter for educational policy? The objective of the PISA testing is to determine how well students are prepared to meet some of the challenges of their future lives. In particular, levels of Reading literacy, Mathematical and Scientific literacy are assessed using items that require students to show how effectively they can apply their reading, mathematical and scientific skills and knowledge to solve problems set in real-world contexts. These problems are designed to reflect some of the kinds of thinking, tasks and activities the students might be expected to carry out in their day-to-day lives. A sample question from Math illustrates the applied nature of the PISA tests: "Nick wants to pave the rectangular patio of his new house. The patio has length 5.25 meters and width 3.00 meters. He needs 81 bricks per square meter. Calculate how many bricks Nick needs for the whole patio". Additional sample questions can be found at Source: http://pisa-sq.acer.edu.au/

FIGURE 1 *PISA 2009 Scores in Turkey and Other Countries in the Region*

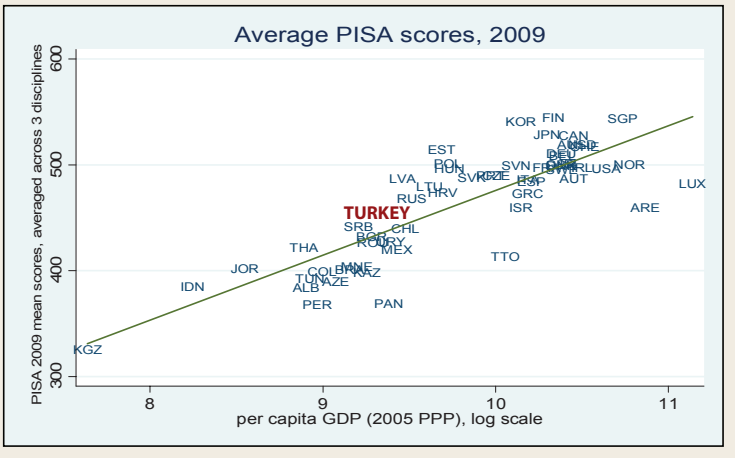


Source: Authors based on PISA datasets
Note: Blue line indicates OECD average

II.A Turkey's Performance in PISA in a Regional and Time Perspective

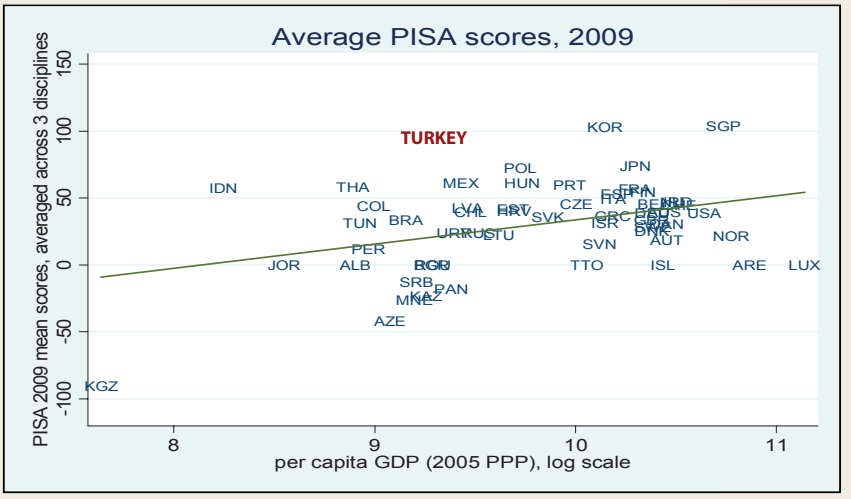
8. **Turkey's performance in PISA is higher than might have been expected given its level of economic development.** Its current PISA scores in reading, math, and science are all around 450. This means that its current performance in reading remains not far from the average of the new EU members but its performance is weaker in math and science than that of other countries of the region (see Figure 1). However, Turkey's education performance is better than average when its level of GDP per capita is taken into account (see Figure 2). The average PISA score of Turkish students in 2009 was approximately 10 points above average given its level of economic development (10 PISA points is approximately 2.5 standard deviations and it is statistically significant at 5 percent). This is even more impressive once the socioeconomic level as well as the level of per capita GDP is taken into account. In Figure 3 Turkey achieves almost 70 PISA points above average once GDP per capita and the countries' average socioeconomic index are taken into account. In fact, on those terms, Turkey's performance is the highest among the 65 participating countries, even higher than Korea or Singapore.

FIGURE 2 *Average PISA Scores and Per Capita GDP of All PISA Participants, 2009*



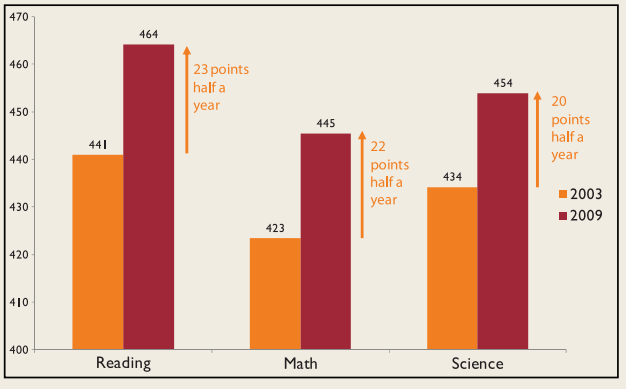
Source: Authors based on PISA datasets

FIGURE 3 *Average PISA Scores and Per Capita GDP of All PISA Participants after Controlling for Level of Socioeconomic Index,*[5] *2009*



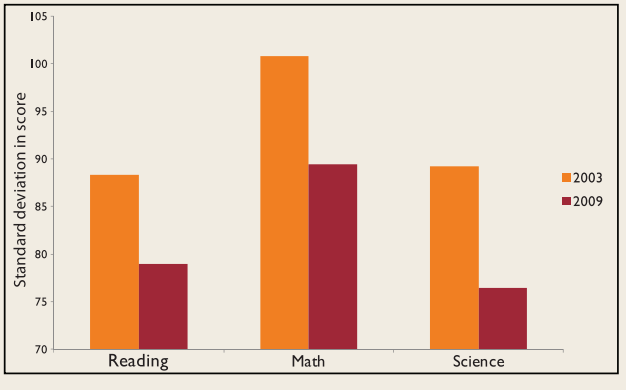
Source: Authors based on PISA datasets

FIGURE 4 *Turkey's PISA Scores by Discipline, 2003-2009*



Source: Authors based on PISA datasets

FIGURE 5 *Standard Deviation of Turkey's Scores by Discipline, 2003-2009*



Source: Authors based on PISA datasets

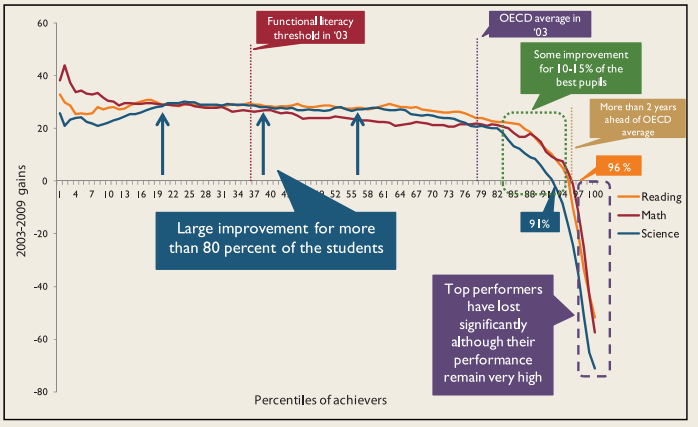
9. **Turkey's PISA scores increased sharply between 2003 and 2009 in all disciplines (reading, math, science).** This progress represents about half a year of schooling in each of the tested subjects (see Figure 4). At the same time, inequalities in results have decreased substantially as measured by the standard deviations in scores (see Figure 5).

10. **Gains in PISA scores have come overwhelmingly from low and medium achievers.** The performance of the bottom 1 percent of achievers has gone up by 30 points in reading, by 33 points in math, and by 25 points in science (see Figure 6). The performance of students between the 80th and 90th percentile in achievement has also improved although by less than that of lower achievers. The performance of Turkey's top PISA achievers declined between 2003 and 2009, but this decrease only affected a limited share of students - only 4 percent in reading and math and 8 percent in science -while the average performance of the majority of students remains high. The same pattern can be observed by proficiency level (see Figure 7). Considerable progress was made by the lowest achievers (proficiency level 1) and by the moderate and strong achievers (proficiency levels 3 and 4), with only the top performers showing a slight decline in performance.

[5] The Programme for International Student Assessment (PISA) index of economic, social and cultural status was created on the basis of the following variables: the International Socio-Economic Index of Occupational Status (ISEI); the highest level of education of the student's parents, converted into years of schooling; the PISA index of family wealth; the PISA index of home educational resources; and the PISA index of possessions related to "classical" culture in the family home. Source OECD (http://stats.oecd.org/glossary/detail.asp?ID=5401).

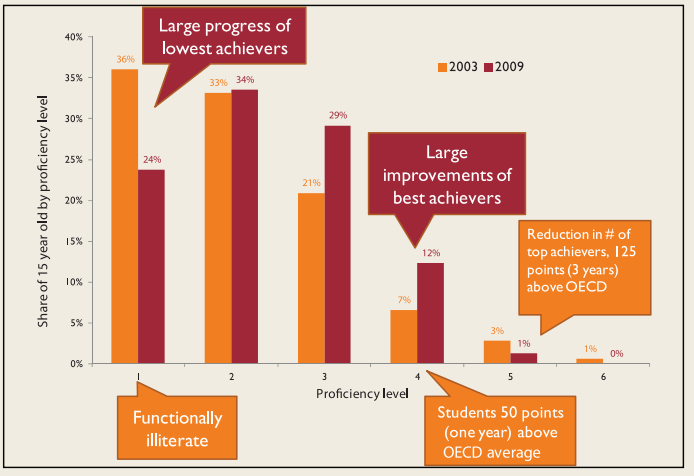
11. **The improvement in educational outcomes in Turkey is due both to socioeconomic progress and system-wide improvements in effectiveness.** A decomposition of the changes in learning outcomes can be used to isolate the relative contribution made by various factors. Here an Oaxaca-Blinder decomposition[6] is performed to examine how much of the improvement in education outcomes in Turkey between 2003 and 2009 can be explained by improvements in students' socio-economic background and changes in the composition of the student sample (explained variation) and how much is due to system-wide effects (unexplained variation) such as improvements in effectiveness.[7] As shown in Table 1, better socio-economic conditions (related to the country's rapid economic growth) have produced gains around 20 points in all disciplines. At the same time, the extension of upper secondary education resulted in a more diverse school population and increased enrollments in lower grades. With this expansion the share of "late"[8] students (that is, students attending grades 9 or lower) has indeed increased sharply from just over 8 percent in 2003 to 29 percent in 2009, while the share of students ahead of the appropriate grade enrolled in grade 11 or higher has decreased from around 39 percent to 4 percent in the same period (see Figure 1 in Annex 1). This phenomenon cost Turkey around 10 PISA points. The most important development has been the simultaneous increase in the effectiveness and quality of the education system and the decrease in the returns to socioeconomic background. While all students experienced an improvement in their socioeconomic status during this period, the benefits derived from this declined, because the education system became better at allowing students from less advantaged families to achieve their full potential. The result, as shown in Table 1, is that system-wide effects over compensate for the decline in returns to socioeconomic background, leading to an overall improvement in educational outcomes and a decline in the variation of educational achievements.

FIGURE 6 *Progression in PISA Scores by Percentile of Achievers, 2003-2009*



Source: Authors based on PISA datasets

FIGURE 7 *Progression in PISA Scores by Proficiency Level, 2003-2009*



Source: Authors based on PISA datasets

TABLE 1 *Oaxaca-Blinder Decomposition of Turkey's Performance Gains, 2003-2009*

Total change 2003-2009	Reading 18	Math 15	Science 16
of which explained by changes in:			
..socioeconomic and wealth factors	16	20	18
..grade structure	-10	-11	-10
..other factors*	4	1	2
..returns to socioeconomic and wealth	-36	-67	-23
..other returns	4	2	4
..country effectiveness	41	70	25

Source: Authors based on PISA datasets
Note: See Annex 2 for technical details.
* Other factors include; Students' learning strategies and teacher practices.

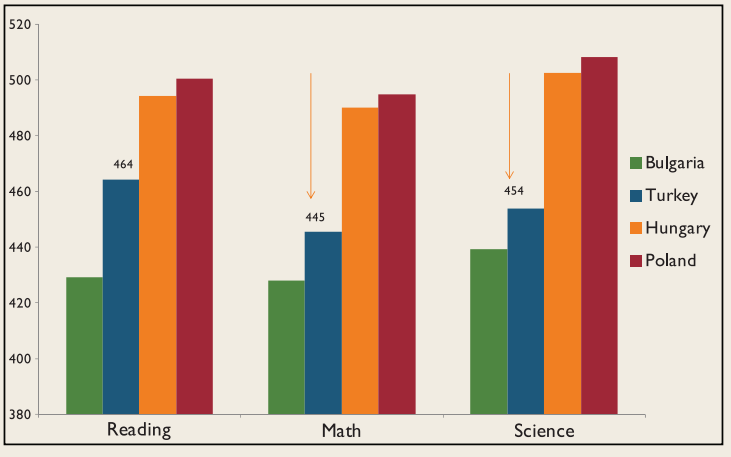
6 See Annex 2 for technical information on the Oaxaca-Blinder decomposition.

7 Ideally the decomposition should control for the resources spent in education. However, this information is not available at the school level in the PISA dataset.

8 According to PISA a 15 year old is expected to be enrolled in grade 10.

12. **While Turkey was 40 to 50 PISA points below Hungary and Poland (see Figure 8), the Turkish education system appears to be more efficient after all observable factors are accounted for.** In other words, once all observable factors are taken into account Turkey is able to get higher returns in terms of PISA results than those countries. Based on the Oaxaca-Blinder decomposition of the gaps between Turkey and the benchmarking countries and once socioeconomic factors are taken into account, Turkey's system appears more efficient (see Table 2). First, as students in the PISA sample in Turkey come on average from lower grades their PISA scores are lower. Second, Turkey's socioeconomic conditions lag behind those of Hungary or Poland, which also affects the country's relative performance. In addition, Turkish students tend to be less familiar with the most efficient learning strategies than students in other PISA countries resulting in lower PISA scores for Turkish students. However, teacher practices (discipline, relationship with students, encouragement of reading, and the structure of lessons) are better in Turkey, which partially compensates for these variables. After all observable factors have been taken into account; the Turkish system appears to be much more efficient. The effectiveness gap measures what is left of the achievement gap once all observable factors have been taken into account and is a measure of the overall effectiveness of the educational system. This effectiveness is substantially higher in Turkey than elsewhere, for example, 24 PISA points higher than in Hungary, 13 PISA points higher than in Poland, and 81 PISA points higher than in Bulgaria.

FIGURE 8 *Comparison of Turkey's Average Scores in PISA 2009 with Benchmarking Countries*



Source: Authors based on PISA datasets

TABLE 2 *Oaxaca-Blinder Decomposition of the Difference in PISA 2009 Reading Scores between Turkey and Benchmarking Countries*

	vs. Hungary	vs. Poland	vs. Bulgaria
Total gap in reading vs. benchmark	**-34**	**-42**	**21**
of which is captured by differences in:			
..socioeconomic and wealth endowments	-60	-43	-58
..grade structure	-11	-6	-17
..other factors	-2	0	5
..returns of socioeconomic and wealth	11	-6	15
..other returns	3	0	-5
..country effectiveness	24	13	81

Source: Authors based on PISA datasets
Note: See Annex 2 for technical details

13. **Despite these remarkable improvements, Turkey's performance is still one full year behind the OECD average.** As mentioned in Chapter I, around 25 percent of Turkish 15-year-olds still do not read well enough to be able to analyze and understand what they read and are therefore considered by the OECD to be "functionally illiterate"[9] (see Figure 9), though this is down from 36 percent in 2003. So Turkey has further catching up to do to compete with the most advanced OECD countries – an important factor in its future competitiveness. At the same time, as shown by the analysis above, as Turkey's income and socioeconomic conditions further improve, this is likely to lead to further improvements in its PISA scores.

14. **Also, inequalities in learning achievement among students from different socioeconomic backgrounds remain large.** Even though the achievement of Turkey's students from all socioeconomic groups has increased and though the achievement

[9] Those students may be able to decipher a text, but they do not read fast and well enough to extract the relevant information from what they read.

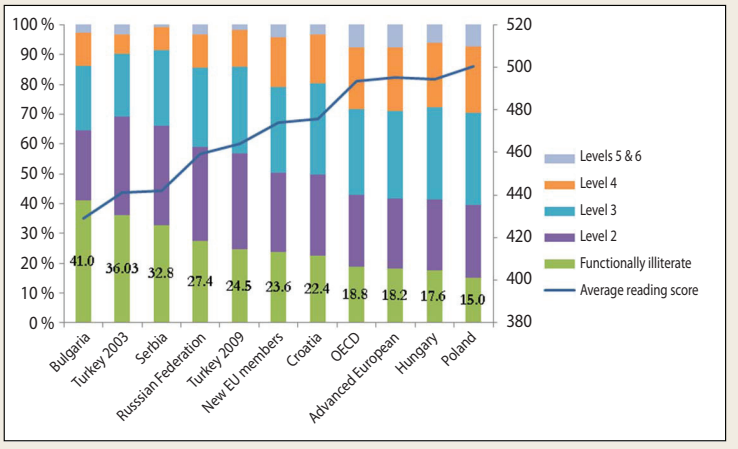
gap between the richest and the poorest socioeconomic groups has shrunk, the achievement gap among these income groups in the 2009 PISA scores was still about 100 PISA points or more than two years of education (see Figure 10). This is critical as Turkey moves towards a more skill-intensive specialization in the international division of labor, which will require an increase in the supply of skilled labor across all socioeconomic groups. This in turn will help Turkey further reduce the level of income inequality, which remains at the higher end of the OECD spectrum.

15. **The following section examines the PISA results in more detail to identify potential areas of focus for policy that would allow Turkey to close the remaining achievement gaps to other OECD countries.**

II.B Identifying the Factors that Drive Turkish Students' Performance in PISA

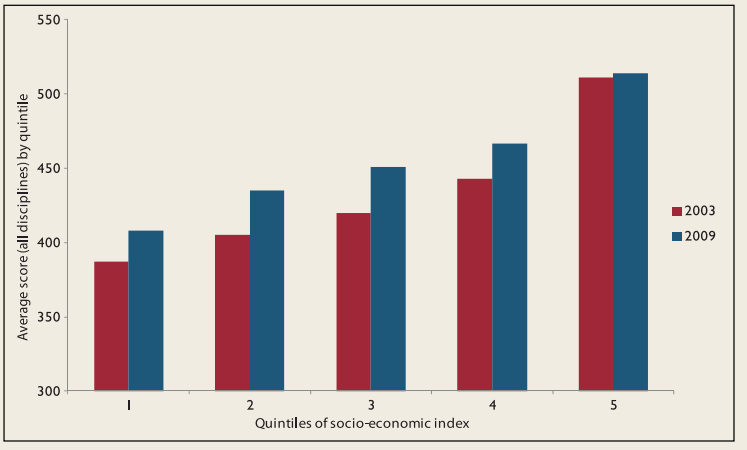
16. **There are three broad determinants of students' performance in the PISA tests: (i) the individual student's characteristics; (ii) the characteristics of the other students in his or her school; and (iii) the school's characteristics.** The first category contains all the factors that cannot be modified by policy in the short to medium run, including the students' gender, age, and socioeconomic characteristics (such as their parent's education, occupation, income, and wealth). The second category exists because student performance is also affected by the characteristics of the other students in the school. This phenomenon is called the peer effect and has been proven to be very strong.[10] The third category includes information about those school characteristics that can be affected by education policy, including the school and classroom environment, the teacher's practices and qualifications, the student's learning strategies (which at least partially can be attributed to their teacher's efforts), the autonomy of the school, its accountability, and the design of the education system.[11] In this section an analysis of variation in performance within and between schools in Turkey is performed in order to determine the role of individual and school characteristics on student's performance. Our main interest is in variables that may be affected by policy. Results here rely on PISA 2009 only and exploit

FIGURE 9 *Distribution of 15-year-olds by Proficiency Level in Reading, PISA 2009*



Source: Authors based on PISA datasets

FIGURE 10 *PISA performance 2003-2009 by Quintiles of Socioeconomic Index*



Source: Authors based on PISA datasets

[10] A practical way to control for differences in performance caused by peer effects is to introduce variables capturing average characteristics of the students at the school level.

[11] The design of the education system can affect peer group effects to some extent. The Bank has carried out a study of international evidence on social stratification and school choice, and pointed to some lessons for Turkey (WB, 2013). Further work in this area is planned to deepen our understanding of the issues.

the cross-sectional dimension of the data. As shown in Table 1, variables such as teaching practices and learning strategies do not account for much of the improvement in learning outcomes between 2003 and 2009. However, below we show that they matter significantly in a cross-sectional comparison of student performance within and between schools.

Importance of Individual Student Characteristics and Peer Effects

17. **A range of models was used to measure the effect of the student's family characteristics and school-level peer effects on his or her performance,** and the results are presented in Table 3. The individual socioeconomic index accounts for 20 percent of the variance (model 1 in Table 3), while the average socioeconomic index (a measure of peer effects) at the school level accounts for 36 percent (model 4 in Table 3). Controlling for gender, age, and individual socioeconomic index (model 2) explains 26 percent of the variance at the individual level but up to 41 percent (model 5) of the variance when the school average socioeconomic index is also included.[12] Overall, this means that the size of the individual student effects on PISA performance is somewhat lower than the peer effects in Turkey.

18. **Education policy can affect learning outcomes both through a direct impact of the quality of teaching and learning materials and through influencing the social stratification of schools.** In many countries, and Turkey is no exception, the education system consists of a range of schools of different quality, at the top of which are a network of selective schools (either private or public). Local regulations and customs can play a role in minimizing or reinforcing the differences between these schools. These differences are reflected in the peer effect on student performance on PISA. In most countries in Europe, the weight of individual factors (the family's age, gender, and socioeconomic index) on a student's performance is in a band around 20 percent (31 percent for the OECD as a whole), while Turkey is at the upper end with 41 percent for individual and school level socioeconomic factors. We return in the next Section to study school characteristics and social stratification in greater detail so that we can compare Turkey to other OECD countries to identify the direction of policy change.

TABLE 3 *Share of the Variation in Reading Performance Explained by Age, Gender, and Socioeconomic Index of the Student's Family*

Model	(1)	(2)	(3)	(4)
Individual socioeconomic index	Yes	Yes		Yes
Gender		Yes		Yes
Age		Yes		Yes
School average socioeconomic index			Yes	Yes
Share of variation explained	0.20	0.26	0.36	0.41

Source: Authors' elaboration
Note: See Annex 3 for a technical discussion

Importance of School Characteristics

19. **PISA data contain a wealth of information about schools that can be affected by policy and can be useful to flag relevant policy recommendations** (see Table 2 in Annex 1). However, the data need to be taken with caution as they do not make it possible to identify any causal relationships between school practices and student performance.[13] Another caveat is that for PISA the information is provided by school principals who may under-represent or over-represent some behaviors/information due to strategic reasons. Nevertheless, the correlation that emerge from the PISA data between school level characteristics and student performance can shed some light on which policies promise the highest potential impact.[14]

[12] It is notable that the share of the variance explained by both individual and school-level factors together (model 4) is less than how much individual (model 1) and the average socioeconomic index at the school level (model 3) explain separately. This occurs because individual and school characteristics are correlated. The correlation between the socioeconomic index at the individual level and averaged at the school level was 0.60 in Turkey in 2009.

[13] This issue is not relevant when one looks at the relationships between characteristics such as age, gender, socioeconomic factors, because such variables are given and are a priori exogenous to performance. As a consequence, there is clearly a causal link between age for example and performance.

[14] To be as unbiased as possible given available information, each regression included controls for age, gender, and socioeconomic index, mother tongue, school environment, rural/urban differences, and region.

20. **Crowded classes may be hampering educational quality in Turkey.** The 2009 PISA results were significantly lower in schools that have a large number of students per teacher. Moreover, this effect may have large implications on inequities across schools as: (i) each additional student per teacher is associated with a reduction of 0.8 points in the school's reading score and (ii) student-teacher ratios vary and can be very high in some schools. Moreover, the negative impact of high student-teacher ratios is 50 percent larger in math and science, and this effect remains significant once differences in school types are taken into account.

21. **However, average student-teacher ratios in Turkey are not unusually high.** Turkey's average student-teacher ratio (around 18 students per teacher) is about normal for European countries. Almost one fifth of Turkish students attend schools with student-teacher ratios of over 25, and in 3 percent of Turkish schools, the student-teacher ratio exceeds 39 students per teacher. There is even a school in the Turkey PISA sample that reports having a ratio of 65 students per teacher. This most likely reflects the relative shortage of teachers in remote villages and smaller towns. Turkey already has a point system to incentivize teachers to teach in remote areas, and these results suggest closing the gap in teachers available across locations in Turkey could significantly reduce inequalities in educational outcomes. Interestingly, there is no statistical link in Turkey between student-teacher ratios and the shortage of teachers as reported by principals. In addition, these reported teacher shortages have not been shown to be correlated with students' PISA performance, which suggests that principals do not recognize these shortages as a major issue. At the national level, Turkey should target its efforts on reducing student-teacher ratios on those 20 percent of schools where the student-teacher ratio is over 25. A nation-wide reduction in average student-teacher ratios would be expensive and unlikely to have much impact.

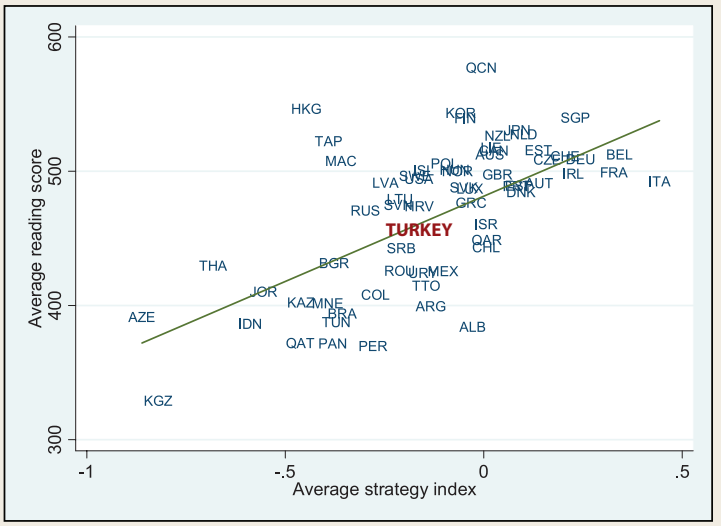
22. **The availability of educational materials is also not correlated with schools' PISA performance.**[15] This may indicate that availability of educational resources is considered not a major bottleneck, however the quality of teaching materials is not currently measured in PISA and leaves open the question of the quality and effective use of these educational materials.

23. **The school and classroom environment affect student performance.** First, the disciplinary climate (the frequency and severity of classroom disruptions by students) plays a major role in students' academic performance, both at the individual and the school levels. In schools where the disciplinary climate is better, student performance on PISA is also higher. It makes sense to consider the impact of the disciplinary climate at the school level as discipline and rules enforcement depends not only on each individual teacher but also on school management. In fact, the disciplinary climate plays a much stronger role at the school level than at the individual level. The total effect of discipline on performance is very large – an improvement of one national standard deviation in the disciplinary climate is associated with an average gain of 31 points in reading, 35 in math, and 28 in science. The average disciplinary climate in Turkey's schools was slightly above the OECD average in 2009.

24. **Teachers' practices also affect student performance.** Although the PISA survey does not allow us to measure or monitor teachers' practices, it contains a few variables that can be considered as proxies. One indicator is the promotion by teachers of students' reading. In Turkey, this is clearly associated with significant gains in reading, with an improvement of one national standard deviation being associated with a gain of 9 points in students' reading scores. Given this evidence, it would be desirable to have more robust measures of teaching practices and their effect on student achievements, so that best practice examples could be disseminated throughout the country.

[15] No actual measure is included in PISA, but an indicator from the subjective answers of principals was built and used in the analysis.

FIGURE 11 *Knowledge of Efficient Learning Strategies and Average PISA Score*



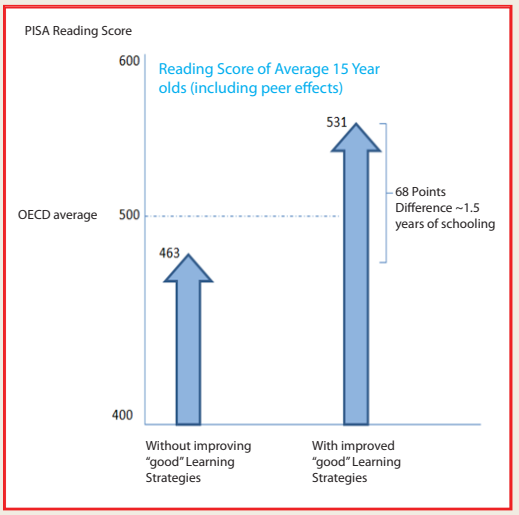
Source: Authors based on PISA datasets

25. **Students in Turkey who report having been taught "good" learning strategies tend to achieve better results.** This is consistent with results found for other OECD countries (see Figure 11). In PISA, students report their awareness and use of various learning strategies, and the OECD recruited a panel of experts to construct indices of these strategies based on students' responses about how well they: (i) memorized; (ii) elaborated; (iii) controlled; (iv) structured; (v) understood; and (vi) summarized information.[16] In Turkey, an increase about one standard deviation in these OECD indexes would increase average performance by 24 points for the understanding and remembering techniques[17] and by 23 points for the summarizing ones.[18]

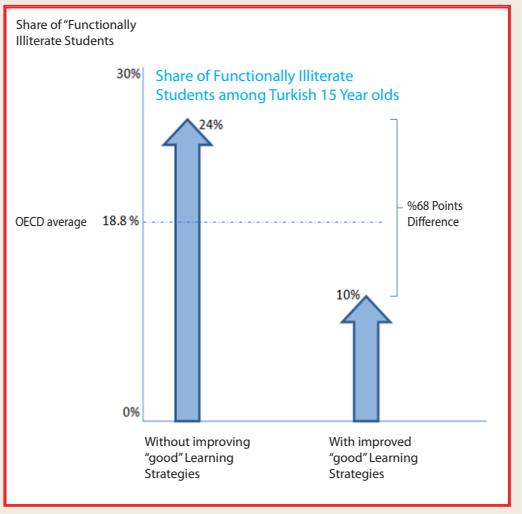
26. **Students perform better not only when they are aware of the best learning strategies but when their peers are aware of them as well.** Learning strategies play a bigger role at the school level than at the student level (see Figure 12). Two-thirds of the benefits of the learning strategies actually operate through peer effects. When a student learns how to learn, this awareness will benefit his peers more than himself. This suggests that there is still considerable potential for encouraging more Turkish teachers to teach students these methods. In total, an increase of one national

FIGURE 12 *The Projected Effect of "Good" Learning Strategies on Turkey's PISA Results*

A: Increasing PISA Reading Scores



B: Reducing the Share of "Functionally Illiterate" Students among 15-year-olds



Source: Authors based on PISA datasets

[16] OECD (2010), p. 112.

[17] The average PISA score in reading was about 475 points in 2009.

[18] As better students are likely to use more than one relevant strategy at the same time, the impact of all of these has been tested together. The combined effect of the two indices of learning strategies is to increase average PISA scores by 28 points.

standard deviation in students' awareness of efficient learning strategies would increase the average reading score in Turkey by 68 PISA points (or the equivalent of almost one and a half years of schooling), with a 95 percent confidence interval between 55 and 81 PISA points. Moreover, if all Turkish students had at least an average knowledge of these efficient strategies, the share of the functionally illiterate would drop from 25 percent to 10 percent.

27. **In the area of school autonomy, those schools in Turkey with the most control over the curriculum, its resources, or the selection of students did not perform significantly better than others.** One cannot draw statistical inference from this simple correlation about the importance of school autonomy.[19] But the results are not inconsistent with the recent literature on school autonomy. Thus, a recent study[20] showed that schools tend to benefit from having more autonomy only when a strong accountability system is already in place. According to OECD (2011a) and results from rigorous impact evaluation studies (Barrera-Osorio et al, 2009; Clark, 2009; and Machin and Vernoit, 2010 and 2011), countries in which schools have greater autonomy over what is taught and over how students are assessed tend to perform better than those in which schools are more centrally managed. This is also the case for countries where schools make their students' achievement data publicly available and have considerable autonomy over how to allocate their resources. In countries where there are no such accountability arrangements, schools with greater autonomy over their resource allocations tend to perform worse.

Importance of early childhood education

28. **According to cross-country PISA evidence, substantial gains in educational outcomes may result from an expansion of early childhood education, as foreseen by the Turkish authorities.** On average across all of the 65 PISA 2009 participating countries, one year of pre-school was correlated with 23 additional points in the country's average PISA score, while more than one year of pre-school appeared to be associated with 44 additional points. As with the effects of learning strategies, two-thirds of this impact flows through peer effects and is not captured directly by the student who attended pre-school. Using these estimates, Turkey's average score in reading would jump by 32 PISA points if 100 percent of its students could benefit from more than one year of pre-school (with a 95 percent confidence interval ranging from 21 to 43 PISA points). Scores in math and science would improve by 23 PISA points with a 95 percent confidence interval ranging from 13 to 32 PISA points.

29. **Encouraging children to start school at an earlier age by effectively reducing the entrance age to grade 1 could also bring benefits to Turkey.** Starting school at a later age has a negative effect on academic performance, an effect which has been found in many countries. On average across all of the PISA 2009 participating countries, a one-year delay in starting school decreased a country's academic performance by 14 points. The school entrance age of the student cohort tested by PISA in 2009 was 6.8 years. Since then it has declined to 6.2 years for the 2012 cohort and is likely to fall further in 2013 given government policy changes in 2012. A decline from 6.8 years to 6 years is associated with an increase in the country's reading results by 10 PISA points. Recent reforms to boost early school entry are likely to show up in improved PISA scores in the future.

II.C Turkey's Inequalities in a Regional and National Perspective

30. **In every educational system, children from disadvantaged socioeconomic backgrounds tend to perform worse than**

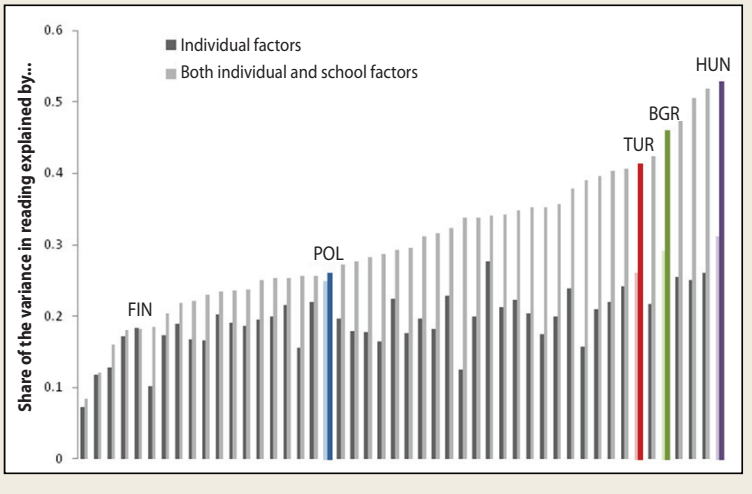
[19] When comparing countries, the OECD found that educational systems that promote school autonomy tend to perform better academically. The absence of a statistical link between autonomy and results within Turkey does not contradict this general finding. First, the degree of autonomy of schools may be insufficiently diverse to allow statistical inference. Second, it would be necessary to control for many unobservable characteristics of schools, for example, by using a randomized impact evaluation, to do a proper assessment.

[20] Hanushek et al (2011).

students who have benefitted from better social conditions. Poorer children have less access to educational resources (such as books) and cultural goods, and, because their parents have little education themselves, their children receive little benefit from that education. Therefore, inequalities in academic performance induced by individual differences are to a certain extent inevitable, are hard to minimize, and are contingent on initial socioeconomic inequalities.[21]

31. **However, education policy can offset (at least partially) other aspects of the system that can induce inequalities.** In particular, those educational systems that segregate students from different socioeconomic levels into different schools or classes tend to have the largest inequalities of academic performance among their students. Limited coverage of pre-primary education, a variable entrance age for primary schools, the frequent use of grade repetitions, the use of entrance exams to select students, and the use of streaming according to ability levels are all examples of practices that can result in highly stratified student populations across schools and thus widen inequalities in academic performance due to dominant peer effects.

FIGURE 13 *Share of Variation in Reading Scores Explained by Individual Factors / in PISA 2009 for Participating Countries*



Source: Authors based on PISA datasets

[21] See OECD (2010).

32. **In Turkey, inequalities of opportunity due to socioeconomic differences are large compared to other OECD countries.** Figure 13 presents the share of the variance in reading performance explained by individual factors (age, gender, and socioeconomic index) and school factors (socioeconomic index) for several countries. It appears that individual factors explain a large share of Turkey's academic performance – around 26 percent versus 21 percent in the OECD as a whole. This situation can be explained by the fact that socioeconomic inequalities are greater in Turkey than in the average OECD country. Moreover, once school socioeconomic factors are taken into account, the total weight of socioeconomic factors on students' performance in Turkey appears to be one of the highest in all of the PISA participating countries – 41 percent of the variance as opposed to 21 percent in the average EU country.

33. **Turkish schools are much more socially stratified than schools in the average OECD country, and students tend to attend schools that are socially homogeneous.** In most countries, students tend to go to school with peers from similar backgrounds, which results in the socioeconomic index at the individual level being correlated with the same index averaged at the school level. Figure 14 shows the correlation between the socioeconomic index at the individual and at the school level. A correlation of 0 means that all students are randomly assigned to schools, while a correlation of 1 means that the students are segregated according to their socioeconomic level. Figure 14 shows that schools in Turkey are much more stratified than those in the average OECD country.

34. **In Turkey, there are several types of upper secondary schools and average performance in PISA of these school types is quite different.** At least ten different streams or programs can be identified from the PISA 2009 sampling of schools, including vocational, technical, science, and others. As can be seen in

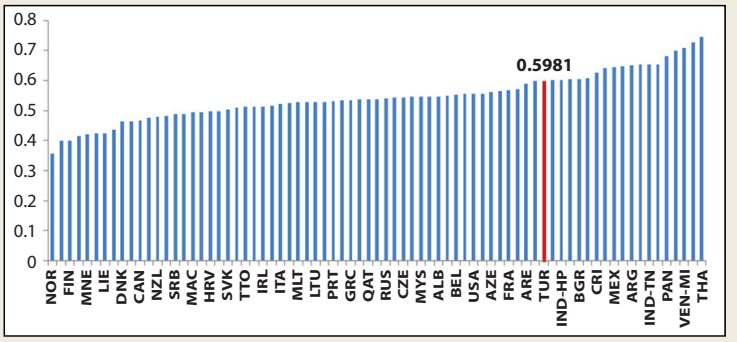
Figure 15, there are considerable differences in academic performance between students in the different streams at the age of 15. Students in the best program – science high schools – had PISA scores that were on average 147 points higher than students in the stream with the lowest scores – vocational schools. This gap represents more than three years of schooling.

35. **These differences in the performance of the students in these various streams can be attributed to a large extent to the selection process.** As shown in Figure 16, the best programs are also the ones that welcome students who did not repeat any grades during primary school, while the streams with the lowest performing students tend to contain students who repeated grades. As the streaming occurs only one year prior to the age at which most students are tested in PISA, it is likely that differences in achievement are more reflective of the way in which students are selected in the streaming process than any innate differences in the quality of the upper secondary programs.

36. **Streaming is also to some extent the reason behind school stratification in Turkey.** As shown in Figure 17, students from different socioeconomic levels are not uniformly distributed among streams. Half of the students that enter the vocational and technical streams, which are those for which the PISA scores are lowest, are from the lowest (first and second) quintiles. Only 8 percent of the students in these streams come from the top quintile. Conversely, students in the most elite streams, the Anatolian general high schools and the science high schools, are overwhelmingly from the upper socioeconomic levels, with 65 percent of the students in the science high schools coming from the top (fifth) socioeconomic quintile. Thus, access to the elite streams is highly skewed toward the upper social classes, which contributes to the social stratification of schools.

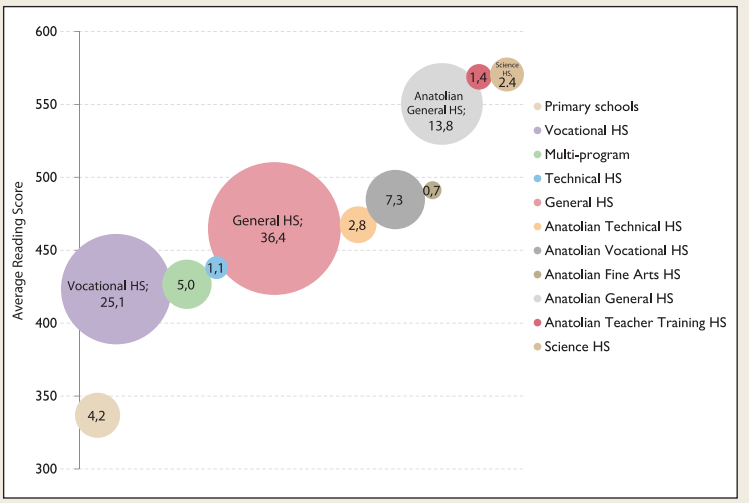
37. **In addition, the most elite streams seem to have the best education environment, which reinforces these inequalities of opportunity.** The education environment encompasses teacher practices, the disciplinary

FIGURE 14 *Social Stratification in the PISA 2009 by Countries*



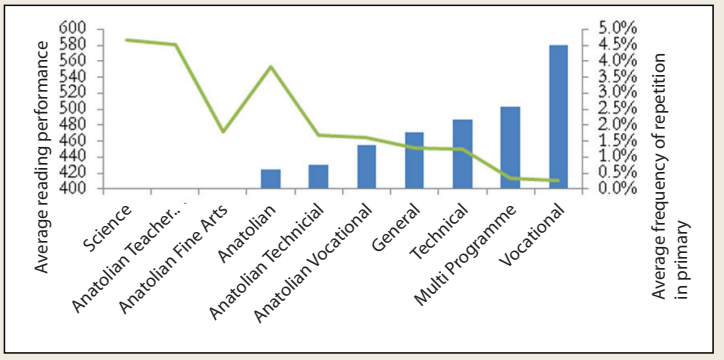
Source: Authors based on PISA datasets

FIGURE 15 *Average Performance in Reading among Students by School*



Source: Authors based on PISA datasets

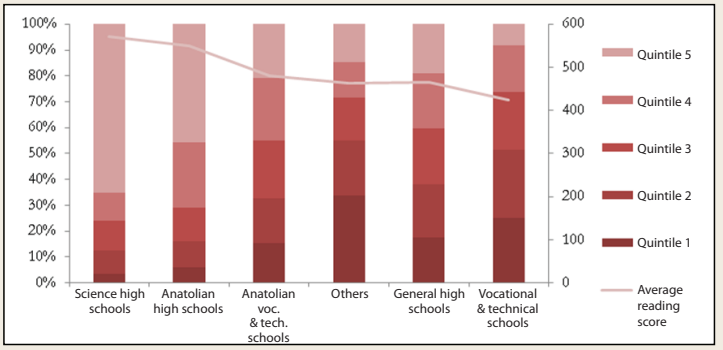
FIGURE 16 *Average Performance in Reading and Average Number of Repetitions in Primary School among Students in Each Program*



Source: Authors based on PISA datasets

climate, and the transmission to students of the best learning strategies. The quality of the teaching environment varies significantly from one stream to another. Because of these inequalities, otherwise similar students (after controlling for all other factors) will score 23 points more on the PISA reading test if they attend a science high school than if they attend a vocational school.

FIGURE 17 *Distribution of PISA 2009 Students by Quintile of Socioeconomic Background and Type of Program*



Source: Authors based on PISA datasets

38. **The selection process that streams students into different kinds of upper secondary schools according to their abilities is likely to have an effect on their academic performance.** The streaming process occurs in the 9th grade however the prospect of this streaming is likely to increase performance inequalities much earlier in the school cycle. Indeed, the limited number of available places in the elite programs fuels competition between students. It also creates an artificial threshold of performance below which students are not admitted into the elite schools. This is likely to create three undesirable effects. First, it may discourage children from the lower socioeconomic quintiles who start too far from the threshold and are unlikely to be able to compete with children from better-off families. Second, the competition is likely to spur middle and upper class families into investing extra money in their children's education by employing private tutors. Third, it may also prompt parents from the higher quintiles to segregate their children from those from less favored households as early as the primary level in an acknowledgement of the importance of peer effects for students' academic performance. As a result, the streaming process probably exacerbates school stratification throughout the education cycle, even though it only begins at the end of lower secondary school. International evidence confirms that early tracking hampers results for the less favored students without inducing a noticeable improvement in the performance of the students from more prosperous social backgrounds. Therefore, bringing forward the age at which students are streamed would very likely not only increase inequalities but also eventually cause the average student performance to deteriorate.

BOX 2 ***Abolishing selection and introducing comprehensive secondary schools: The success of Poland's reforms***

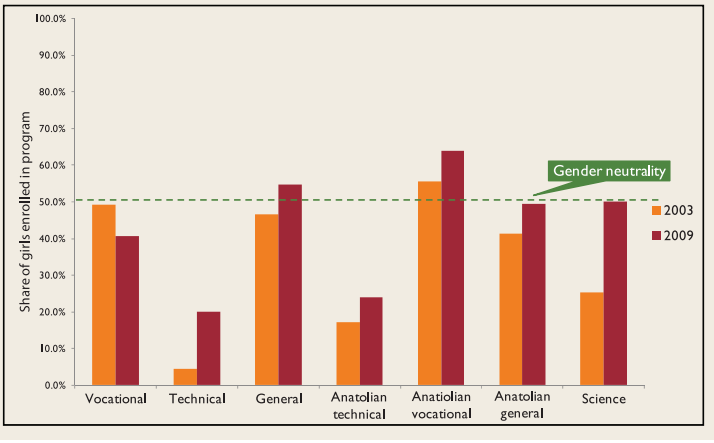
In 1999, Poland reformed its basic education system in order to raise the level of education in society, increase educational opportunities, and improve the quality of education. The new government at that time restructured basic education by converting the old 8-year primary school that was followed by early vocational tracking, into a 6-year primary education followed by three years of lower 3 general secondary education. Only after 9 years of schooling would a decision about what type of upper secondary education – academic or vocational – be undertaken. In other words, the new system postponed the choice of type of curriculum at the secondary level (general or vocational) for one year. This structural change was accompanied by curricular reform. A concept of core curricula was developed which aimed to provide schools with extensive scope of autonomy and responsibility. A system of examination and tests at the end of primary and lower secondary were introduced.

Jakubowski et al (2011) used the variation created by the policy change in 1999 to test the impact on test scores over time. Specifically, they estimated a difference in difference model that compared the change in test scores of the likely vocational school students that were able to study in the general, academic track because of the change in school policy. The purpose of the study was to explain the significant improvement in international achievement tests by Poland in recent years. They found, on average, that the reform was associated with significant improvements. In math, Poland improved its score by 0.25 of a standard deviation. In reading the increase is 0.28 of a standard deviation. In science, the scores increased by 0.16 of a standard deviation. They confirmed these results using an evaluation model – propensity score matching and differences in differences to create counterfactual scores for the group of likely vocational students in subsequent years – and the OECD's Program for International Student Assessment (PISA), an internationally comparable standardized student test conducted every three years totest reading, mathematics and science achievement of 15-year-olds, data for 2000, 2003 and 2006, using 2000 as the baseline since most of the existing students were continuing their lower secondary schooling under the old system.

They explored threats to identification using among other things decomposition analysis. They concluded that the reform was associated with an improvement in likely vocational students' scores of about 100 points, or a whole standard deviation. They explored the implications using as well a 2006 special application of PISA in Poland to 16 and 17 year-olds, and warn of the dangers of early vocationalization.

39. It is noteworthy that streaming has become more gender-neutral in Turkey. Figure 18 shows the share of girls enrolled in the different streams according to PISA 2003 and 2009, and it can be seen that all types of streams (with the exemption of vocational schools) are moving closer to gender neutrality. In general in Turkey, the gender enrollment gap has been reduced since 2003 but still remains with a secondary net enrolment rate of 69 percent for boys against 66 percent for girls as of 2012. At the same time, there is a reverse achievement gap between girls and boys attending school: (i) girls were ahead in grade attainment in 2003 and this is even more true in 2009; (ii) girls outperform boys in reading and science but they underperform in math; and (iii) the gender performance gap has been growing since 2003 in favor of girls (see Figures 2 – 4 in Annex 1).

FIGURE 18 ***Share of Girls Enrolled by Stream, PISA 2003-2009***



Source: Authors based on PISA datasets

Chapter III: Areas of Policy Focus

40. **The preceding analysis suggests that the main areas where further improvements are needed are encouraging an earlier start in school, improving teaching methods, and reducing inequalities of opportunities in upper secondary education:**

a. **Encouraging an earlier start in school.** According to PISA, across OECD countries one year of pre-school was correlated with 34 additional points in reading, and around two-thirds of this impact was due to peer effects. On the basis of these estimates, if 100 percent of the students could attend a good quality pre-school for one year, Turkey's average score in reading would increase by 24 points;[22] scores in math would improve by 22 points;[23] and scores for science would increase by 29 points.[24] Also, for the 15-year-olds who were tested in Turkey in 2009, the average age of starting first grade was 6.8 years. Estimates show that bringing the average starting age closer to 6 could improve reading results by 10 PISA points, with a 95 percent confidence interval ranging from 8 to 12 PISA points. The Bank has already undertaken a detailed analysis of the early childhood education sector in Turkey, and its main recommendations can be found in the World Bank report on early childhood education in Turkey, but they are summarized in section III.A below.[25]

b. **Improving teaching methods:**

i. **Promoting the use of effective learning strategies:** An analysis of the PISA results indicates that learning in Turkey's schools could be significantly improved if all students were taught how to use the most effective learning strategies. As in other PISA countries, Turkish students who report having been taught the use of "good" learning strategies (those used to understand, remember, and summarize information) tend to produce better test results. In Turkey, estimates show that an increase of about one standard deviation of the OECD indexes related to the use of the effective learning strategies would increase average student performance by 24 points for the understanding and remembering techniques and by 23 points for the summarizing techniques. Two-thirds of the benefits of these effective learning strategies actually operate through peer effects. In total, an increase of just one standard deviation in the number of students that are taught these techniques would increase the average reading score in Turkey by 68 points (or the equivalent of almost one and a half years of schooling) with a confidence interval at 5 percent level between 55 and 81 PISA points. Moreover, if all Turkish students had at least an average amount of knowledge of those techniques, the share of the "functionally illiterate" would drop from 25 percent to 10 percent.

[22] With a 95 percent confidence interval ranging from 16 to 32 PISA points.

[23] With a 95 percent confidence interval ranging from 12 to 32 PISA points

[24] With a 95 percent confidence interval ranging from 20 to 38 PISA points

[25] World Bank (2012).

ii. **Improving classroom practice:** Teachers' practices play a significant role in how students learn in Turkey. PISA measures teachers' practices in three dimensions: (i) the disciplinary climate; (ii) the quality of teacher-student relationships; and (iii) the stimulation of students' reading. By improving these teaching practices within the classroom by one standard deviation, Turkey's scores in the three PISA disciplines would increase by about 11 points.

c. **Reducing inequalities of opportunities in upper secondary education:** In Turkey, students in the best program had PISA scores that are equivalent to about additional three years of schooling than students in the streams with the lowest score. The selection process that streams students into different types of upper secondary schools according to their abilities is likely to have an effect on their academic performance not only at the secondary level but also in earlier stages in the school cycle.

III.A Encouraging an Earlier Start in Schools

41. **A recent Bank's report on "Expanding and Improving Early Childhood Education in Turkey" (World Bank, 2012) points out that early childhood development (ECD) interventions have been shown to yield many direct and indirect benefits to society.** First, investing in children early in their developmental cycle (from the time of conception to 6 years of age) yields the highest returns in terms of their economic productivity relative to investments later in life. Second, they provide a mechanism to enhance equity, as focused early childhood interventions targeted at the vulnerable segments of population have been known to reduce the intergenerational transmission of poverty. Third, ECD policies can greatly improve the personal development and life skills of young children and increase the opportunities available to them later in life by, for example, increasing rates of childhood survival and school readiness. Lastly, policies that focus on young children can have positive externalities that benefit other members of these children's families, as well as society as a whole. The report also shows that among ECD interventions, Turkey until recently has lagged in particular in the provision of early childhood education (ECE), and summarizes recent government efforts to address this challenge.

42. **The report outlined four broad categories of recommendations for increasing the effectiveness of Turkey's ECE program which are key to encourage an earlier start in schools.** The first category focuses on ensuring equity in access to ECE services by targeting public spending in a progressive manner, in other words, by targeting the disadvantaged groups within the population. The second encourages the Government to put systems in place that will enhance the quality and accountability in Turkey's ECE subsector. The third advises policymakers how to make ECE management more effective by increasing the involvement of private and not-for-profit actors in the sector. The last category of recommendations describes the levels of financing that will enable ECE programs to achieve Turkey's ambitious goals of expanding ECE coverage. Specifically the recommendations are:

- *Target spending in a progressive manner:* The ECE expansion strategy will be more equitable and will have a greater impact if funds allocated to this initiative are distributed progressively. This can be done in two ways:

  a) Targeting low-enrollment provinces; and
  b) Targeting poor households to ensure equity in access.

- *Systematically assess and enforce national quality standards:* To ensure high quality service provision, the Government could systematically assess and enforce standards on the curriculum, infrastructure, teacher qualifications, teacher training, teaching materials, and educational supplies. The Government could also develop a system for assessing such outcomes as school readiness among ECE students. Some tools for doing this include:

  a) School self-evaluations in which schools would evaluate their own performance every year against national standards; and
  b) School external evaluations in which schools would be evaluated every three years by peers and expert groups,

including assessing such outcomes as children's school readiness.

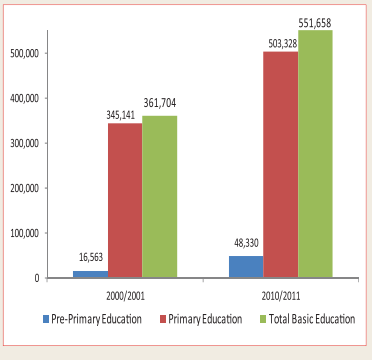
- *Involve private and not-for-profit actors in the ECE system:* While the bulk of services will have to be delivered by the public sector, the effectiveness of ECE provision can be enhanced by involving the private sector and non-governmental organizations (NGOs). Non-governmental actors and public-private partnerships can support and complement the Government of Turkey's efforts to provide ECE services, deliver targeted support, produce innovative media programs, and conduct external evaluations.

- *Ensure adequate funding for ECE:* To achieve this ambitious policy agenda, the resources dedicated to ECE will need to be raised from the current level of 0.03 percent of GDP to 0.23 percent of GDP in 2014.

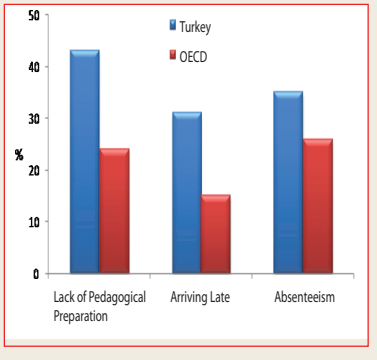
43. **Based on international best practices, the government might consider taking a dual-program approach built around the options outlined above to encourage an earlier start.** The report recommends two complementary programs to achieve this objective- a Core National Program, and Supplementary Provincial Program. The report recommends that the majority (85 percent) of the resources devoted to ECE in the coming years should be allocated to the Core National Program. The remaining resources (15 percent) would be allocated to the Supplementary Provincial Program. The report suggests that the Core National Program should have three components: (i) funding infrastructure and teachers in all provinces (55 percent of the budget); (ii) providing targeted subsidies for the poorest 40 percent of households in all provinces (25 percent of the budget); and (iii) devoting the rest (5 percent of the budget) to innovative schemes for improving quality and increasing accountability. The task of the Supplementary Provincial Program would then be to ensure equity of access to ECE in low-enrollment provinces and can consist of interventions that address province-specific binding constraints.[26]

FIGURE 19 *A Profile of Teachers in Turkey*

A: Teachers in Turkey



B: Main Teacher Practices Identified by Head Teachers as a Hindrance to Learning



Source: World Bank (2011) based on MoNE (2011) and OECD (2009)

III.B Improving Teaching Methods

44. **Over the past decade, both developed and developing countries have become increasingly concerned with raising the effectiveness of their teachers in classroom practice.** This interest seems to have been motivated by a growing body of research suggesting that teacher effectiveness is the most important school-based predictor of student learning and that several consecutive years of outstanding teaching can offset the learning deficits of disadvantaged students. This section explores research on this issue, examines the role played by teachers and teaching in Turkey's academic performance and presents some recommendations.

45. **Turkey's demographic profile means that unlike in most other OECD countries, its student population has been increasing for some time and will continue to grow in the near future.** The number of students in Turkey's basic education (primary and pre-primary levels) was more than 12 million as of 2011. In the last decade, more than 137,000 new children per year have entered the system, and Turkey's teaching workforce for basic education expanded by roughly 50 percent from just over 361,000 teachers in 2001 to more than 550,000 teachers in 2011 (see Figure 19). While this has gone hand in hand with overall improvements in educational outcomes, Figure 19 also shows that inappropriate teacher practices as reported by principals remain a

[26] Options could include: (i) implementing information campaigns and outreach to families; (ii) hiring extra staff to plan or deliver expansion targets; (iii) giving performance grants to schools when they reach their targets for increasing enrollments; and (iv) giving performance grants to sub-provinces if they succeed in increasing their pre-school enrollments.

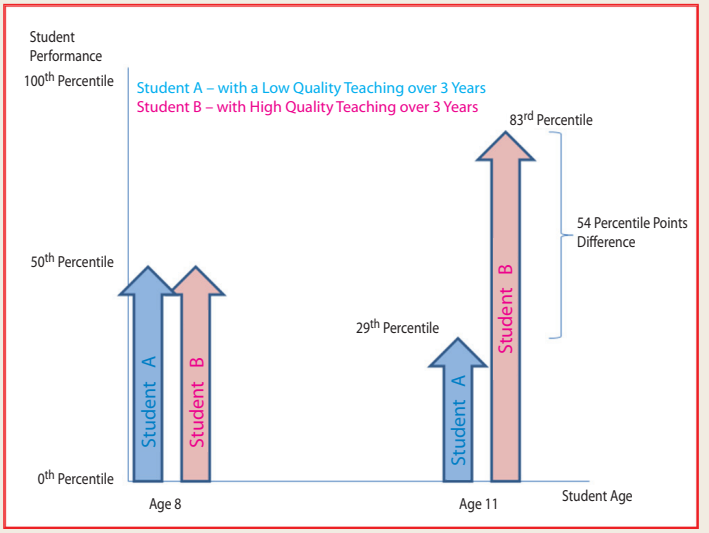
more important constraint in Turkey than in the average OECD country.[27]

46. **International evidence suggests that teaching quality is the main school-based predictor of student achievement and that several consecutive years of outstanding teaching can offset the learning deficits of disadvantaged students.**[28] One seminal paper[29] looked at the effect of quality of teaching on student performance in the US state of Tennessee. The authors found that the difference in the mean performance of an average 2nd grade student (measured by assessment results) of having high quality teaching[30] versus low quality teaching over three years is greater than 50 percentage points (as measured in Grade 5). As Figure 20 shows, not only does the average student with high quality teaching outperform the one with low quality teaching by over 50 percentage points, the performance of the student with low quality teaching actually falls by 21 percentage points over three years.

47. **Given this preliminary evidence, it is clear that good teaching is critical to increasing effective learning among Turkey's students. Teaching practices and classroom dynamics also play a significant role in how students learn in Turkey. An analysis of PISA results confirms this hypothesis for Turkey, and the analysis presented in Chapter 2 indicated how this process of improvement might be started. However, this is clearly not the whole picture.** Turkey's teacher policies and the actual practices being used in schools are also crucial determinants of effective learning in school. While studies around the world have documented the importance of teachers in student learning outcomes, much research remains to be done on the various policies that are most effective in attracting, retaining, training, and motivating teachers.

48. **Based on the analysis performed the report recommends the following two measures to promote excellence in teaching in Turkey: (i) Focus pre-service and in-service training of teachers on the effective use of "good" learning strategies in class and (ii) promote effective teachers' practices and classroom dynamics.**

FIGURE 20 *Effect of Teaching Quality on Student Performance*



Source: Based on Sanders and Rivers (1996)

- ***Recommendation 1: Focus pre-service and in-service training of teachers on the effective use of "good" learning strategies.*** Based on the discussion in this chapter, education policymakers in Turkey should review the country's teacher training programs to ensure that teachers are trained to promote the use of effective learning strategies by their students. Since this initiative is fundamental to promoting excellence in teaching, it is also important to consider teacher training in the wider context of teachers' careers and incentives. The training should incorporate a module to address the specific needs for effective learning strategies of disadvantaged students. Singapore is a case study of a country that has revised its teacher training as part of a wider reform of teachers' careers and incentive structure. This case study is presented in Box 3.

[27] Turkish school principals cite the lack of pedagogical preparation of teachers as key constraint to student learning. Specifically, 43 percent of Turkish teachers are in schools where the principal has reported that a lack of pedagogical preparation is a factor hindering instruction a lot or to some extent (see Figure 20 and OECD, 2009).

[28] Hanushekand Rivkin, 2006; Nye et al, 2004; Park and Hannum, 2001; Rivkin et al, 2005; Rockoff, 2004; Sanders, 1998; Sanders and Rivers, 1996; and Vignoles et al, 2000.

[29] Sanders and Rivers (1996).

[30] High quality teaching is defined as being done by a teacher in the top 20 percent of all teachers as measured by ability. Low quality teaching is defined as being done by a teacher in the bottom 20 percent of teachers as measured by ability.

BOX 3 ***Singapore-The Pursuit of Excellence in Teaching***

Singapore has introduced the "Education Service Professional Development and Career Plan" (Edu-Pac) for teachers to develop their potential and fulfill their aspirations. The Edu-Pac gives teachers a choice between three different career tracks: (i) a Teaching Track, where they specialize in teaching or pedagogy and can advance to be Principal Master Teachers; (ii) a Specialist Track, where they can specialize in areas where deep knowledge and skills are essential for breaking new ground in educational developments and in which they can advance to become a Chief Specialist; or (iii) the Leadership Track, which trains them to take on leadership positions in schools and the Ministry of Education's headquarters, and where they can advance to become the Director-General of Education (see Figure 21). These career tracks are associated with an Enhanced Performance Management System (EPMS). The EPMS is competency-based and defines the knowledge, skills, and professional characteristics appropriate for each track, thus making clear the expectations and kinds of behavior needed for success in each of the tracks. It is developmental in nature and supports teacher improvement and performance.

The EPMS process involves:

a. Performance planning: The teacher starts the year with a self-assessment and develops his/her goals for teaching, instructional innovations, improvements at the school, professional development, and personal development and meets with his/her reporting officer who is usually the Head of Department for a discussion about target setting and performance benchmarks.

b. Performance coaching: Performance coaching takes place throughout the year and particularly during a formal mid-year review where the reporting officer meets with the teacher to discuss progress and share needs and to coach and provide feedback and support.

c. Performance evaluation: At the end of the year, the reporting officer conducts the teacher's appraisal interview and reviews his/her actual performance against the performance plan. The reporting officer gives the teacher a performance grade, which affects the value of the teacher's annual performance bonus. It is also during the performance evaluation phase that decisions regarding the teacher's promotion to the next level are made based on "current estimated potential (CEP)." The reporting officer makes this CEP decision in consultation with senior staff who have worked with the teacher, and it is based on "observations, discussions with the teacher, evidence of portfolio, and knowledge of the teacher's contribution to the school and community."

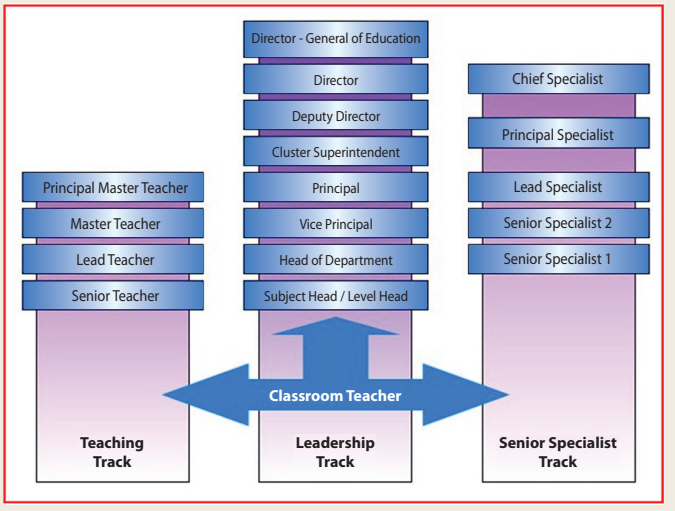
The professional development and training of teachers is a key component in the pursuit of excellence in education service delivery in Singapore. First of all, Singapore is very selective about choosing the right candidates for pre-service teacher training, focusing on their academic achievement, their communication skills, and their motivation for teaching. For every 100 applicants to teacher training colleges, only 20 get accepted, but almost 90 percent of those who are accepted graduate and enter the teaching force. Salaries are competitive with other professions. This selectivity has contributed to the reputation of teaching as a prestigious career. In line with several other high performing systems in the world, pre-service teacher training is highly centralized and quality controlled so that all teachers receive pre-service training at the National Institute of Education (NIE) at Nanyang Technological University in Singapore.

In-service teacher training and professional development is recognized as critical to ensuring that teachers keep up with rapid changes and continually improve their practice. Towards this end they are entitled to 100 hours of professional development every year. Teachers, in consultation with their performance coaches, can undertake courses at the NIE that may lead to diplomas or degrees participate in networks of teaching practices, access school-based teacher training from experts, or even take online courses. Schools also have dedicated funds that they can use to finance additional teacher professional development in addition to the specific requirements mandated by the central government.

Source: Singapore Ministry of Education website accessed on June 4, 2012, Lee and Tan (2010),World Bank (2010),OECD (2011b) Chapter 7, and Sclafani and Lim (2008).

– ***Recommendation 2: Promoting effective teachers' practices and classroom dynamics.*** It is critical to delve deeper into current teaching practices and classroom dynamics in Turkey's schools. One way of doing this that has been popular in other countries is by applying the Stalling method of classroom observations to a nationally representative sample of teachers to assess what makes teachers effective (see Box 4). This technique would make it possible to collect information on teachers' use of instructional time, materials, and core pedagogical practices, as well as their ability to keep students engaged in learning. This assessment would be a crucial input for policymakers when considering how best to modify teacher training and practice in Turkey.

FIGURE 21 *Teaching Career Paths in Singapore*



Source: Ministry of Education, Singapore

BOX 4 *The Stallings Method of Classroom Observation*

Getting Inside the Black Box

Student learning is the prime determinant of individual returns and economy-wide gains from education (Hahushek and Woessman, 2007). As teacher quality is the prime determinant of student learning, understanding what makes teachers effective in the classroom is of key importance. What the education literature indicates is that having materials and the teachers in the classroom are not enough. Education is the transformation of inputs into learning outcomes and this happens in the classroom. Therefore there is the need to have a tool for analyzing "the black box" of the classroom. The Stallings method is one of the observational procedures or techniques which have been widely used to understand what makes teachers effective in the classroom.

This is a quantitative method of measuring classroom behaviors from direct observations that specify both the events and behaviors that are to be observed and how they are to be recorded. The Stallings method "Classroom snapshot" instrument measures the following: (a) teacher's use of instructional time; (b) use of materials in the classroom, including information and communications technologies; (c) the domain of core pedagogical practices; and (d) the ability to keep students engaged. In its implementation 10 observations of each class are taken at regular intervals and coded using a standardized grid in a statistically representative sample of schools.

These interactive coding systems allow the observer to record nearly everything that students and teachers do during a given time interval. These interaction systems are very objective and typically do not require the observer to make any high inferences or judgments about the behaviors they observe in the classroom. In other words, these low-inference observational systems provide specific and easy identifiable behaviors that observers can easily code. The methods advantages are (i) reliability: its highly reliability across observers and countries; (ii) benchmarking: its results can be compared to US/OECD good practice indicators; (iii) simplicity: the method requires relatively short training to produce qualified observers; and iv) analytical power: Stallings variables are statistically representative of the education system and highly correlated with learning results.

Classroom observation has many valid and important educational purposes. Three important purposes or areas where systematic classroom observation has been widely used are: (1) description of instructional practices; (2) investigation of instructional inequities for different groups of students; and (3) improvement of teachers' classroom instruction based on feedback from individual classroom or school profiles.

III.C Reducing Inequalities of Opportunities in Upper Secondary Education

49. **In Turkey, a high-stakes centralized entrance exams for upper secondary schools leads to segregation of students both by Socio Economic Status (SES) and academic ability.**[31] Students in the best program – science and Anatolian high schools – had PISA scores that are equivalent to having about three additional years of schooling compared students in the streams with the lowest scores (i.e. vocational schools). The selection process that streams students into different types of upper secondary schools according to their abilities is likely to have an effect on their academic performance not only on that cycle but also in earlier stages in the school cycle.

- ***Recommendation: Continue expanding access to the best educational programs for students from all socio-economic backgrounds.*** Turkey has been expanding the share of students attending the best schools (Science and Anatolian high schools). At the same time the share of girls enrolled in those schools has increased and Turkey has now achieved gender neutrality in access to high quality secondary schools. Even with these improvements enrollment in these schools is skewed towards students from better off families. Expanding access to the best programs for all students would reduce performance gaps due to socioeconomic differences. This may require a review of the current system of entrance exams, which encourage out of class tutoring which only the middle and upper income families can afford (see World Bank, 2011). Another option is to increase the diversity of academic programs within schools. Some of less stratified countries of the OECD (Canada, Denmark, Finland, Iceland, New Zealand, Norway, Sweden and UK) may offer lessons for Turkey. These countries have only one type of school, in some cases allowing choice of academic programs within the school, which means that the stakes at play when moving to upper secondary education are not as high as those in Turkey, where an examination streams people into different types of schools that vary widely in terms of quality (World Bank, 2013).

[31] See section II.C for details.

BOX 5 ***School choice in secondary schooling***

Most countries apply rules that restrict school choice in secondary schooling. The most common criteria include location, whether there are siblings in the same school, academic record, admission test, financial status, and religious affiliation. However, in most cases these rules are combined into a more elaborate mechanism. New Zealand, for instance, has an open enrollment scheme, i.e. children are no longer guaranteed a place in their local school and oversubscribed schools are free to choose the selection criteria. In Finland, students that live in the school neighborhood have preference over others. Nonetheless, schools can apply their own criteria for those outside their catchment area. In Spain, oversubscribed schools follow an index at the individual level that accounts for proximity to residence, attendance of siblings, and family's financial situation. Finally, in the USA and England local authorities administer the school choice mechanism, which leads to wide variation of rules. Most imposed restrictions end up spurring certain degree of stratification by SES. The soaring prices of houses in districts with good schools are an example. Academic achievement can be highly correlated with SES. Hence, schools that select students based on the former generate high social stratification.

The less stratified countries contains several members of the OECD that may offer lessons for Turkey (Canada, Denmark, Finland, Iceland, New Zealand, Norway, Sweden and UK). These countries shared some characteristics. For example, all of them offer only one school type for 15 year-old students, while Turkey offers several types of schools. In Denmark, Finland, Iceland, Norway, Sweden and UK between 7 and 24 percent of the students attend schools where academic performance is considered for admission. Canada and New Zealand have 53 and 43 percent, respectively; while in Turkey that figure is 66 percent. It is interesting to observe, however, that a big share of the students in these countries (even higher than that in Turkey) is in schools that group by ability (within the school). In Finland selection into the academic track considers prior academic performance. However, vocational graduates can still pursue higher education. Sweden grants free school choice to parents, who can even use vouchers in private schools. Admissions are on a first-come-first-served basis. Finally, out of these eight comparators, five can't apply any selection criteria in lower secondary education, Finland and England consider academic performance, but Scotland doesn't apply any criteria. *The fact that all the comparison countries have only one type of school means the stakes at play when moving to upper secondary education are not as high as those in Turkey, where an examination streams people into different schools that vary widely in terms of quality.*

Source: World Bank (2013), "School Choice, Inequality and School Transitions- a short note for the Government of Turkey", World Bank: Washington D.C. (processed)

Summary of Recommendations

50. The report finds that the **main areas for further improvements** are

a. **Encouraging an earlier start in school:** According to PISA, across all OECD countries one year of pre-school was correlated with 34 additional points in reading, and around two-thirds of this impact was due to peer effects. On the basis of these estimates, Turkey's average score in reading would increase by 24 points if 100 percent of the country's students could attend a good quality pre-school for one year. Also, for the 15-year-olds who were tested in 2009, the average age of starting first grade was 6.8 years. Estimates show that bringing the average starting age closer to 6 could improve reading results by up to 10 points.

Recommendations:

- ❖ *Offer targeted support to expand enrolment in kindergarten to the lagging provinces.*
- ❖ *Ensure equity in access to ECE services by targeting the poorest household nationwide.*
- ❖ *Improve quality by rigorously monitoring, evaluating, and enforcing standards for pre-school education.*
- ❖ *Ensure adequate funding for ECE and involve private and not-for-profit actors in the ECE system.*
- ❖ *Reduce effective entrance age to Grade 1.*

b. **Improving teaching methods by:**

i. **Promoting the use of effective learning strategies:** An analysis of the PISA results indicates that learning in Turkey's schools could be significantly improved if all students were taught how to use effective learning strategies. As in other PISA countries, students who report having been taught "good" learning strategies (those used to understand, remember, and summarize information) tend to produce better test results. In Turkey, estimates have shown that an increase of about one standard deviation of the OECD indexes related to the use of the effective learning strategies would increase average student performance respectively by 24 points for the understanding and remembering techniques and by 23 points for the summarizing ones. Two-thirds of the benefits of the good learning strategies actually operate through peer effects. In total, an increase of just one standard deviation in the number of students that are taught these techniques would increase the average reading score in Turkey by 68 points (or the equivalent of almost one and a half years of schooling).

Moreover, if all Turkish students had at least the average amount of knowledge of these techniques, the share of the "functionally illiterate" would drop from 25 percent to 10 percent.

Recommendations:

❖ *Through pre-service and in-service training, train teachers to educate students in the use of effective learning strategies. This can be done separately or in the context of the wider reform of teacher career management and incentives.*

❖ *The training should incorporate a module to address the specific needs for effective learning strategies of disadvantaged students.*

ii. Improving classroom practice: Teachers' practices and classroom dynamics play a significant role in how students learn in Turkey. PISA measures teachers' practices in three dimensions: (i) the disciplinary climate; (ii) the quality of teacher-student relationships: and (iii) stimulation of student reading engagement. By improving these teaching practices within the classroom by one standard deviation, Turkey's scores in the three PISA disciplines would increase by about 11 points.

Recommendation:

❖ *Carry out a nationally representative assessment of teaching practices and classroom dynamics using the "Stalling method" of classroom observations.*

c. **Reducing inequalities of opportunities in upper secondary education:**

In Turkey there are several types of upper secondary schools and average performance in PISA of these school types is quite different. Students in the best program – science and Anatolian high schools – had PISA scores that are equivalent to about additional three years of schooling than students in the streams with the lowest scores (e.g. vocational schools). The selection process that streams students into different types of upper secondary schools according to their abilities is likely to have an effect on their academic performance not only on that cycle but also in earlier stages in the school cycle. It is noteworthy that streaming has become gender neutral in Turkey, with the share of girls increasing significantly in the best schools. Finally, some of less stratified countries of the OECD (Canada, Denmark, Finland, Iceland, New Zealand, Norway, Sweden and UK) may offer lessons for Turkey. These countries have only one type of school, in some cases allowing choice of academic programs within the school, which means that the stakes at play when moving to upper secondary education are not as high as those in Turkey, where an examination streams people into different types of schools that vary widely in terms of quality (World Bank, 2013).

Recommendation:

❖ *Continue expanding access to the best educational programs for students from all socio-economic backgrounds.*

Consider reducing the types of upper secondary schools in Turkey, while expanding the number of academic programs within schools.

Proposed Future Research Agenda

51. **The findings in this report could be usefully complemented with further research including:**

a. **A corroboration of PISA findings using other student assessments, such as TIMMS and national test results.** The use of additional student achievement scores could allow to test the robustness of the relative weights accorded to socio-economic and school specific effects and thus help policy makers identify measures to maximize learning opportunities for socio-economically disadvantaged students.

b. **An assessment of current teacher practice and classroom dynamics in Turkey's schools.** This would be based on an application of the Stallings method of classroom observations to a nationally representative sample of schools and its aim is to provide useful information to understand what makes teachers effective in the classroom. The following questions could be addressed: How much time teachers allocate to instruction within the classroom? What is their degree of use of available education materials? What is their overall domain of core pedagogical practices? How effective they are to keep students engaged? If the sample of schools to be used coincides with the ones used in national or international assessments (e.g. PISA or TIMMS), the analysis could also assess how teacher's instruction time correlates with student learning.

c. **A diagnostic on Teacher Career Management to assess current teacher management structures at the central, provincial and school level.** This analysis would be based on structured interviews with key informants from central, provincial and sub provincial levels, and the application of questionnaires to a sample of teachers. The analysis would attempt to address the following questions: How effectively do MoNE, Higher Education Council (YOK), and the Student Selection and Placement Center (OSYM) interact to prepare and select well-qualified teachers? What role does MoNE play in the recruitment, training, and management? How are teachers rewarded for good performance? The information collected from these sources could be complemented by de jure information collected by the application of the System Approach for Better Education Results (SABER) –a tool developed by the World Bank to benchmark teacher policies according to evidence-based global standards and best practice. The World Bank could also provide an in-depth look and draw lessons from country experiences of potential relevance for Turkey in the area of teacher career management (e.g. Singapore's Education Service Professional Development and Career Plan).

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Annex 1

TABLE 1 *Evolution of performance and inequalities in Turkey*

	Performance (average scores at national level)			Inequalities (Standard deviation at national level)			
	2003	2009	**Absolute change**	2003	2009	Absolute change	**Relative change**
Reading	441	464	**23**	88	79	-9	**-10%**
Math	423	445	**22**	101	89	-12	**-12%**
Science	434	454	**20**	89	76	-13	**-15%**

TABLE 2 *Analysis of the determinants of school quality*

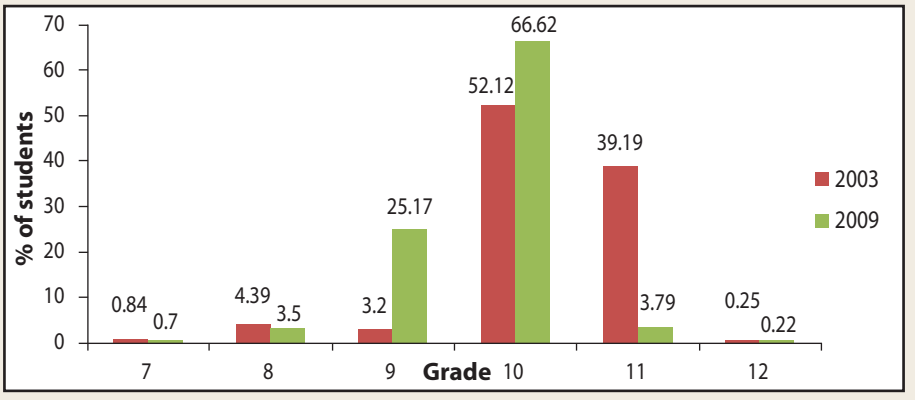
Model	(1)		(2)		(3)		(4)		(5)		(6)	
Dependant variable	Reading		Reading		Reading		Reading		Math		Science	
Teacher shortage	-0.7											
Student-teacher ratio	-0.8	**										
Share of certified teacher	20.2											
Teacher participation	-6.8	**										
Teacher behavior	-0.1											
Quality of Educational resources	1.5											
Disciplinary climate			2.0	*								
Disciplinary climate (school average)			29.4	***								
Student-teacher relationship			2.3	**								
Stimulation of reading			5.9	***								
Structure of lessons			-5.5	***								
Memorization strategy			-9.0	***								
Elaboration strategy			0.1									
Control strategy			12.8	***								
Summarizing strategy			14.5	***								
Understand & remembering strategy			9.5	***								
Teaching environment					6.6	***	7.1	***	4.3	*	4.2	*
Awareness of strategies (individual)					21.1	***	20.9	***	20.3	***	22.4	***
Awareness of strategies (school average)					47.3	***	43.5	***	78.9	***	57.5	***
School leadership							-0.2					
Autonomy in curriculum							2.6					
Autonomy in resources							-16.7					
Academic selectivity							3.0					
Assessments used to track progress							5.2					
Assessments compared to other schools							-2.2					
Achievement results public							-3.1					
Standardized tests							-2.3					
# observations	4967		4706		4706		4651		4706		4706	
Adjusted R2	0.43		0.55		0.58		0.58		0.61		0.57	

Source: WB staff calculations using PISA 2009. Effects are measured by a linear regression at the student level, when age, gender, socioeconomic index of both the pupil and the school (average index) and mother tongue are controlled for.

The indexes of "teaching environment" and "awareness of strategies" are computed as a weighted average using the multipliers estimated by the model (2). These indexes are rescaled such as their standard deviation at the National level is unity. Therefore, the estimated multipliers of these indices in the models (3) to (6) are the marginal effects of an increase of one standard deviation.

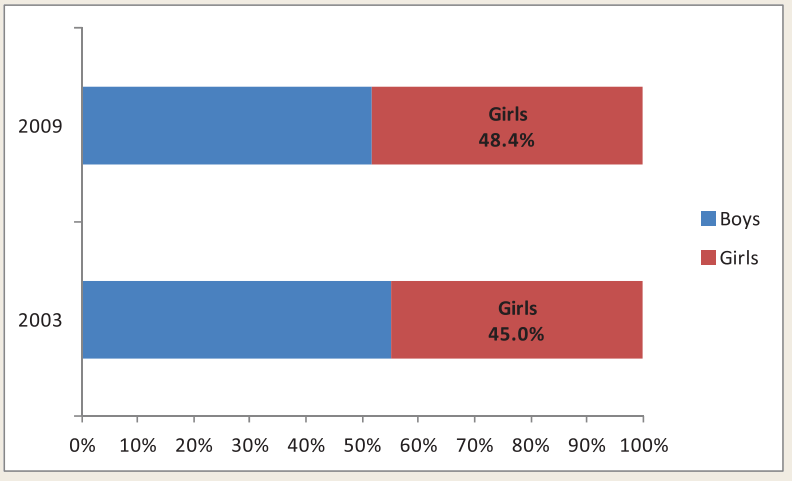
Standard errors are computed after clustering observations at the school level. Statistical significance at respectively the 0.1%, 1% and 5% level is indicated by ***,**, and *.

FIGURE 1 *Distribution by grade of the 15 year old according to PISA sampling*



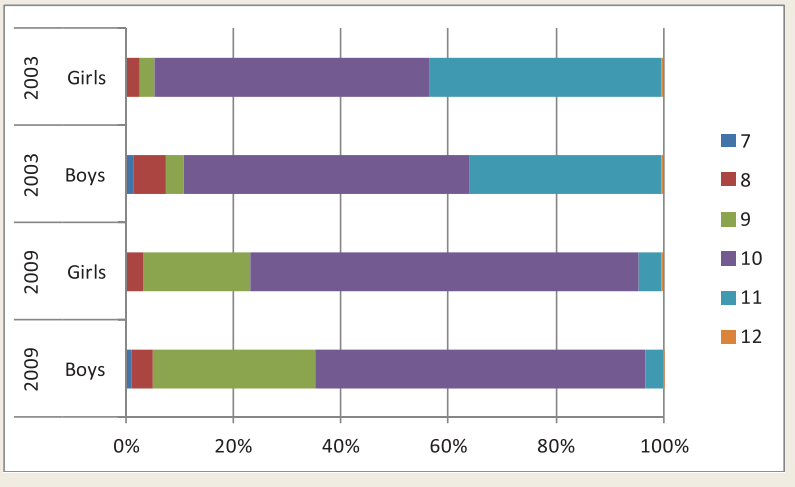
Source: Authors based on PISA datasets.

FIGURE 2 *Proportion of Girls and Boys in Turkey PISA sample, 2003 and 2009*



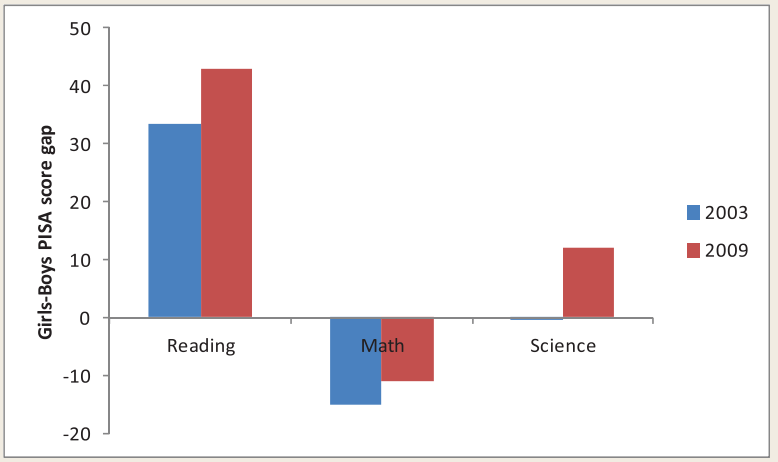
Source: Authors based on PISA datasets.

FIGURE 3 *Grade distribution in PISA sample in Turkey, 2003 and 2009 by gender*



Source: Authors based on PISA datasets.

FIGURE 4 *Relative performance by gender and subject, Turkey PISA 2003 and 2009*



Source: Authors based on PISA datasets.

Annex 2

Oaxaca-Blinder decomposition

One uses the underlying linear model to compute the Oaxaca-Blinder decomposition, with *Perf* the test score for reading, math or science, β the vector of returns that differ for 2003 and 2009, *X*, the vector of explaining variables and *c* an intercept that also differ for 2003 and 2009:

$$Perf_t = \beta t \; X_t + c_t + \varepsilon \qquad \text{(E1)}$$

The following explaining variables are included:

- Gender
- Grade
- Socioeconomic index at the individual level
- Average socioeconomic index at the school level
- Wealth index at the individual level
- Mother tongue
- Students' learning strategies (memorization, elaboration, and control)
- Teacher-students relation and disciplinary climate

Equation (E1) is estimated separately using 2003 and 2009 variables. One then uses the results to compute the Oaxaca-Blinder decomposition:

$$Perf_{09} - Perf_{03} = \underbrace{\left(\frac{\beta_{03} + \beta_{09}}{2}\right)(X_{09} - X_{0603})}_{\text{Changes in factors}} + \underbrace{\left(\frac{X_{03} + X_{09}}{2}\right)(\beta_{09} - \beta_{03})}_{\text{Changes in returns}} + \underbrace{c_{09} - c_{03}}_{\text{Change in effectiveness}}$$

Oaxaca-Blinder decomposition of the performance gap across countries

The approach is similar to the decomposition of performance gains. One uses the same underlying model described by equation (E1), except one compares Turkey in 2009 with a benchmarking country in 2009 rather than Turkey in 2009 versus Turkey in 2003. This gives the following model, with i denoting a country.

$$Perf_i = \beta_i X_i + c_i + \varepsilon \qquad \text{(E2)}$$

The corresponding Oaxaca-Blinder decomposition of the gap between Turkey and a benchmark country (BNC)

$$Perf_{TUR} - Perf_{BNC} =$$

$$\underbrace{\left(\frac{\beta_{TUR} + \beta_{BNC}}{2}\right)(X_{TUR} - X_{BNC})}_{\text{Gap due to factors}} + \underbrace{\left(\frac{X_{TUR} + X_{BNC}}{2}\right)(\beta_{TUR} - \beta_{BNC})}_{\text{Gaps linked to returns}} + \underbrace{c_{TUR} - c_{BNC}}_{\text{Effectiveness gap}}$$

Annex 3

Linear models can be used to measure the weight of students' characteristics on performance. Let us denote *a* the age, *g* the gender, m the mother tongue and *h* the socioeconomic index at the individual level and let us denote by $\overline{h}$ the average socioeconomic index at the school level. Let us denote by c a constant term and by ε a random term normally distributed.

Linear model 1 measures the effects of individual factors on reading performance:

Model 1: $Read = c + \eta h + \varepsilon$

The derived measure of the variance in the reading performance explained by age, gender and the individual socioeconomic index is then: $1 - \frac{V[\varepsilon]}{V[Read]}$.

Linear model 2 measures the effects of individual factors at the school level on reading performance:

Model 2: $Read = c + \alpha a + \gamma g + \varepsilon$

The derived measure of the variance in the reading performance explained by individual factors at the school level is then: $1 - \frac{V[\varepsilon]}{V[Read]}$.

Model 3: $Read = c + \eta \overline{h} + \varepsilon$

The derived measure of the variance in the reading performance explained by individual factors at the school level is then: $1 - \frac{V[\varepsilon]}{V[Read]}$.

Model 4: $Read = c + \alpha a + \gamma g + \eta h + \eta \overline{h} + \varepsilon$

The derived measure of the variance in the reading performance explained by individual factors at the school level is then: $1 - \frac{V[\varepsilon]}{V[Read]}$.