STUDENT PERFORMANCE IN GEORGIA ACCORDING TO THE PROGRAMME FOR INTERNATIONAL STUDENT ASSESSMENT (PISA)

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OUTLINE

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EXECUTIVE SUMMARY

The purpose of this report is to undertake a thorough review of the Programme for International Student Assessment's (PISA) data on Georgia from 2009, in order to inform the drafting of national policy on preschool, primary and secondary education.

OVERALL PERFORMANCE AT PISA

The PISA Plus Report of 2009 showed that only 38% of students in Georgia are estimated to have a level of proficiency in reading literacy that is at or above the baseline level needed to participate effectively and productively in life. The majority of students therefore perform below the baseline level of proficiency in reading.

In mathematics, more than 40% of students are unable to answer familiar context questions, identify information and make simple procedures. Only 31.2% of students are proficient in mathematics at least to the baseline level at which they begin to demonstrate the kind of skills that enable them to use mathematics in ways considered fundamental for their future development.

As regards science, only 34% of students are proficient at least to the baseline level at which they begin to demonstrate the science competencies that will enable them to participate actively in life situations related to science and technology. In spite of these low levels of proficiency in reading, mathematics and science, Georgia has some of the lowest levels of differentiation between schools. This means that there is little educational inequality among different schools in Georgia.

Since the main objective of Georgia's education strategy is to provide each citizen with the opportunity to fully realize her or his potential regardless of age, ethnicity or social standing, it is important to analyse the low learning results of the PISA study. Determining the causes of students' underachievement in Georgia, as well as factors enhancing the quality of their education, will help to identify the best policy options towards improving education in the country.

INVESTIGATING INEQUITY IN PERFORMANCE

This study focuses on identifying variables that affect equity in performance. The most significant variables that we were able to isolate are as follows: gender, school location, linguistic background, learning material, and preschool attendance.

Across all PISA and CEE/CIS[1] countries, girls perform better than boys. In Georgia, girls outperformed boys on PISA tests by an average of 61 score points in reading. The difference between girls and boys is significant in science and in reading, but not in mathematics, where boys and girls perform similarly.

Regarding the school location, data show that there is a significant difference between living in a large city as compared to other locations. Students from large cities perform considerably better than those from towns and villages. Apart from the school location, students' linguistic background also has a significant impact on their achievements: students who do not speak Georgian at home have lower results than their peers not only in reading, but also in mathematics and science.

We also studied the impact of possessing learning materials on students' achievements. Even if the difference is not statistically significant, students who own the appropriate textbooks perform better than those who do not.

Preschool attendance seems to be of special significance in explaining some differences in performance. Data show that students who attended at least one year of preschool perform better than others.

1 Central and Eastern Europe and the Commonwealth of Independent States.

STUDENTS AND SCHOOLS FACTORS AFFECTING STUDENTS' PERFORMANCE

Having conducted a literature review and an analysis of the secondary data, the main factors to explore that are impacting students' performance are:

At the micro level:

- The lack of non-Georgian language textbooks and manuals;
- Teachers' qualifications, especially language qualifications;
- Teachers' practices in the classroom;
- The learning time of students.

At the macro level:

- The low level of spending on education;
- A lack of diversity in the types of secondary education provided, in particular the near absence of vocational and technical education programmes;
- The country's linguistic diversity;
- Curricula content, including different requirement levels as compared with the PISA tests, and the level of school autonomy.[2]

Across all PISA and PISA+ countries, Georgia has one of the largest gender gaps in reading. In the final model, the gender coefficient is -31.8 when controlling for other variables. This gap is the equivalent to the difference to almost an entire school year, according to the OECD estimate of 39 points (2009).

We have also observed that students from families which invest in cultural possessions (such as books and art) perform better than their peers. However, material wealth (in terms of non-cultural items) is negatively associated with school performance, a result which is very specific to Georgia when comparing the literature on other countries.

While the individual monitoring policies of head teachers do not improve results, a head teacher's approach to solving problems facing teachers within the classroom seems to have a positive impact on students' results.

SYSTEM-LEVEL FACTORS AFFECTING STUDENTS' PERFORMANCE

School characteristics, including class size, repetition rate, and the proportion of female teachers, do not appear to have a significant effect on reading scores, and therefore were not subject to further analysis.

On the contrary, variables referred to as school selection variables in the PISA methodology, including the gross enrolment rate, the percentage of pupils in private education, and the percentage of pupils enrolled in Technical Vocational Education and Training (TVET), positively influence learning achievements. Consequently, this should encourage education policymakers to increase the number of private schools and technical or vocational programmes, and to reduce the number of students not attending school.

The availability of school resources appears to have a positive correlation with students' performance, and we can therefore infer that increased spending in education will lead to improved performance in school, although international literature does not show a straightforward relationship between education spending and test scores.

Centralized systems, where schools have little autonomy to hire teachers or choose textbooks, tend to have lower test scores. As such, accountability variables, including school policies in managing tests and teachers' performance, appear to have a negative effect on test scores.

2 The new curriculum introduced in 2011 gave teachers the freedom to develop 40% of classroom materials independently. School autonomy in curricula content in other countries has shown to have a positive impact on results. The old curriculum used in 2009 did not allow for such autonomy.

The effects of the PISA variables collected through the school questionnaire are consistent with those found in other OECD and UNICEF publications. However, this secondary analysis has highlighted several factors that are specific to Georgia:

- A large gender gap in favour of girls;
- The low provision of private education;
- Underdeveloped vocational/technical education programmes;
- A low education budget;
- Ageing teachers.

Given the findings outlined above, it is possible to develop a set of policy recommendations.

AN OVERVIEW OF POLICY RECOMMENDATIONS

1. Develop preschool and early childhood education.
2. Deliver pre-primary education in the main minority languages spoken in Georgia (Russian, Armenian, Azerbaijani) in order to facilitate the transition into primary education and learning in the Georgian language.
3. Encourage and monitor the introduction of the new curriculum (revised in 2010).
4. Develop strategies to fight absenteeism and motivate students to attend school.
5. Investigate the reasons behind absenteeism to determine whether in-school or systemic education quality issues are the principal push factors, or if issues outside school are affecting attendance.
6. Given the complexity of the Georgian language and the fact that 29% of the population does not speak Georgian at home, more time should be devoted to language and reading, especially in the early grades of school.
7. Learning in the early grades is crucial for education quality and should be monitored though Early Grade Reading Assessment (EGRA) and Early Grade Mathematics Assessment (EGMA).
8. Re-examine the status of teachers, alongside teacher training activities, to ensure their competence, and give them the motivation and adequate training to provide students with a high quality of education.
9. Revise the policy on determining teachers' salaries and average class size.
10. Allocate a higher spending budget to education, and revise the education budget structure to allow for an increase in teachers' salaries and/or more spending on quality inputs, including textbooks, teacher training, and school infrastructure.
11. Encourage the provision of private education.
12. Develop technical and vocational education programmes.
13. Ensure that every schoolchild has the textbooks needed to learn, and that these textbooks are adapted to the child (i.e. in the language in which she/he learns).
14. Rehabilitate schools damaged during the 2008 conflict by providing better equipment and adequate learning materials, including laboratories, and libraries.
15. Carefully monitor the school environment to prevent violence of any kind.
16. Encourage teachers to develop critical thinking among the students and train them to do so.
17. Further develop ICT programmes to enhance students' education and teacher training facilities.

CHAPTER 1
AN OVERVIEW OF GEORGIA EDUCATION SYSTEM

A BRIEF INTRODUCTION TO GEORGIA

Georgia is a country in the South Caucasus region which gained independence in 1991 following the collapse of the Soviet Union. The country experienced a major policy shift in 2003 following the Rose Revolution, and since then major reforms have been undertaken to improve economic growth. However, an armed conflict with Russia in 2008 undermined the country's nascent economic recovery. The impact of the conflict was significant, leading to the internal displacement of 15,912 people within Georgia and causing damage to infrastructure, including schools.

Georgia is a multilingual and multi-ethnic country, and home to 26 ethnic groups. Georgians are the predominant ethnic group, while minority ethnicities include Azerbaijanis, Armenians, Russians, Abkhazians, Ossetians, Greeks, Jews and Yezidi Kurds. An estimated 30% of the population speak a language other than Georgian as their mother tongue. Other languages used are: Russian (9%), Armenian (7%), Azerbaijani (6%) and other (7%).[3] The official language is Georgian, but according to Article IV of the Law on General Education, ethnic minorities also have the right to receive instruction in their native languages in secondary school.

ORGANIZATION OF THE SCHOOL SYSTEM

The 2005 Law on General Education established a twelve-year cycle of school education, and made education compulsory from the age of 5. Georgia's general education system is divided into three stages: primary education (grades 1 to 6), basic education or lower secondary (grades 7 to 9) and upper secondary education (grades 10 to 12). Formal vocational education and training (VET) is split into two stages: initial vocational education (apprenticeship) and higher VET. The education system in Georgia falls under the responsibility of the Minister of Education and Sciences (MES), together with four deputy ministers.

Most relevant indicators

Georgia has a strong literacy tradition: literacy rates among adults (ages 15 and older) in Georgia are 99.7% for women and 99.8% for men, while literacy rates among young people (ages 15–24) are 99.9% and 99.8% for women and men, respectively.[4]

According to UNESCO's definition, literacy is the "ability to identify, understand, interpret, create, communicate, compute and use printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society." According to this definition and considering the high literacy rates, Georgia's students should perform well at PISA and other international assessments, in spite of the low ranking achieved in the CEE/CIS region in international studies. Therefore, this discrepancy needs to be investigated.

In 2009, Georgia's net enrolment rate in primary education for both genders was almost 100 percent, as was the transition rate from primary to secondary education.[5] Despite these positive indicators, the Committee on the Rights of the Child expressed concern about the progressively higher dropout rates in later stages of schooling in Georgia, particularly in rural areas.[6] The table below gives an overview of the most relevant indicators:

3 L'aménagement linguistique dans le Monde, Université de Laval. Available from: http://www.axl.cefan.ulaval.ca/

4 UNESCO Institute for Statistics (UIS), UIS statistics in brief: Education (all levels) profile: Georgia. UIS Data Centre, (2009). Available from: http://stats. uis.unesco.org/unesco/TableViewer/ document.aspx?ReportId=121&IF_ Language=eng&BR_Country=2720&BR_ Region=40505

5 UNESCO, World Data on Education, 2010/2011.

6 Update on the Situation of Children in Georgia, UNICEF, 2011. Available from: http://unicef.ge/index.php?m=114

Table 1: Core education indicators

Georgia		Year
Expenditure on education as percentage of total government expenditure (%)	7.7	(2009)
Expenditure on secondary education as percentage of total expenditure on education (%)	29	(2011)
GER in pre-primary education (%)	57.9	(2008)
School life expectancy, primary to lower secondary (years)	9.5	
Percentage of enrolment in private secondary schools (%)	6.4	(2009)
Gross lower secondary graduation rate across all programmes (%)	94.5	
Pupil/teacher ratio in secondary schools	7.5	
Total percentage of trained teachers in lower secondary schools (%)	94.5	(2009)
Total adult (15+) literacy rate (%)	99.7	
Total youth (15-24) literacy rate (%)	99.8	
GDP per capita, PPP (constant 2005 international $)	4,319	
Annual population growth rate (%)	0.68	(2011)
Rural population (%)	47.2	
Percentage of technical/vocational programmes in secondary education (%)	0.15%	(2009)

Source: UNESCO via the Edstats web site, November 2013.

As the table indicates, very few students are enrolled in VET. Taking into account the students' level and the needs of the labour market in Georgia, VET programmes should be much more developed.

Teachers

Primary teachers are typically trained at colleges, while higher institutions offer training for all levels of education. Teachers receive at least four years of training in the form of a bachelor degree programme, and are required to gain three to six months teaching experience in schools, depending on their field of specialization. In order to graduate, they then have to pass between two and four state examinations, and to submit a final dissertation. Primary school teachers are mainly women, although the number of male teachers increases at later stages of education. According to the MES, there were 79,891 general education teachers in 2009/2010, of which 68,587 were women. The average age of teachers is 40-45 years.[7]

The private sector in the education system emerged at the beginning of the 1990s. The percentage of private enrolment increased from 2.4% in 2001 to 6.4% in 2009.

Infrastructure

The instability of the 1990s and the 2008 conflict led to the destruction of many school facilities. To ameliorate infrastructure problems, major improvement works have been undertaken towards the rehabilitation of schools as part of the President's state programme, entitled "Iakob Gogebashvili – Rehabilitation of Public Schools in Georgia".[8] As part of the programme, over GEL 390 million was spent on school building restoration and repair works between 2007 and 2011. According to the MES, 2,462 general education schools were registered in the academic year 2009/2010.

7 UNESCO, World Data on Education, 2010/2011.

8 Available from: http://www.mes.gov.ge/upload/multi/geo/1195558807_National%20Mega%20Project%20of%20the%20President%20of%20Georgia%20%93Iakob%20Gogebashvili%20%96%20Rehabilitation%20of%20Public%20Schools%20of%20Georgia%94.pdf

RECENT REFORMS AND STRATEGIES

The main reform implemented in recent years is the General Law on Education of 2005, which accelerated the transition to a decentralized management system. Educational institutions now have greater autonomy to adapt their training to the needs of students. The National Curriculum and Assessment Center, established in April 2006, finalized the new curriculum and textbooks in 2010, all of which are designed to encourage an interactive education as opposed to the rote learning of facts.

To further its reform efforts, in 2007 the Georgian government adopted a Consolidated Education Strategy and Action Plan (2007-2011).[9] More recently, the MES has developed an Education Strategy for 2010-2015.[10] This strategy focuses on education quality enhancement through initiatives such as:

- **A new National Curriculum**: the new curriculum was finalized in September 2010, and has been in operation since 2011. It will remain unchanged for five years. Contrary to previous curricula, only 60% of the curriculum is compulsory, so that teachers now have the opportunity to develop 40% of the materials they teach independently (increased school autonomy).
- **A new system of knowledge evaluation**: as of the 2010/2011 academic year, a new system of knowledge evaluation has been introduced in general public schools. It is comprised of three compulsory components, while students' trimester grades are now affected by their attendance in class.
- **School textbooks**: as of the 2010/2011 academic year, the State now provides free textbooks to every schoolchild from socially-vulnerable families. Moreover, second-hand textbook stores have been created and a supplementary history textbook about Georgia has been introduced.
- **ICT and English language education**: in 2010/2011, the MES piloted a new project to enhance English language education and to integrate modern IT technologies into the learning process. At the same time, English is now a compulsory subject for public school pupils from the first grade and upwards.
- **Teachers**: a voluntary certification programme will be completed by 2014. By then, all teachers wishing to do so must have obtained the new certification. The incomes of all certified teachers will be increased. An Institute of mentor-teachers is being created to prepare a new generation of teachers with the help of more experienced ones. A Teacher Code of Ethics has been adopted, and new teacher training centres are due to open.
- **Special profile schools**: specialized schools will be created, which will feature intense courses covering specific subjects.

9 Georgia: Consolidated Education Strategy and Action Plan (2007-2011), UNICEF, 2007. Available from: http://planipolis.iiep.unesco.org/upload/Georgia/Georgia%20Consolidated%20Education%20Strategy%20and%20Action%20Plan%202007-2011.pdf

10 Education Strategy, 2010-2015, the Ministry of Education and Science of Georgia.

CHALLENGES

Since the main objective of the new education strategy is to provide each citizen with the opportunity to fully realize her/her potential regardless of age, ethnicity or social standing, it is important to thoroughly analyse the low learning results of the PISA study. Determining the causes of students' underachievement in Georgia, as well as factors enhancing the quality of their education, will help to identify the best policy options to improve education in the country.

Given the factors described above, the main avenues to explore appear to be as follows:

- Low levels of government spending on education;
- A lack of diversity in the types of secondary education provided, in particular the near absence of vocational and technical education programmes;
- The country's linguistic diversity;
- Curricula content, including different requirement levels as compared with the PISA tests, and the level of school autonomy;
- The percentage of compulsory curricula: the new curriculum introduced in 2011 allows teachers to develop 40% of classroom materials independently. This has been shown to have a positive impact on students' results in other countries. The curriculum used in 2009 did not allow for such autonomy;
- A lack of non-Georgian language textbooks and manuals: as shown in other studies, the availability of textbooks in minority languages has an impact on students' achievements;
- Teachers' qualifications, especially language qualifications.

In Chapters 2 and 3, this report will present Georgia's overall performance in PISA, and will investigate inequity in performance. Chapter 4 will examine the micro data concerning students and schools to identify areas for improvement, while Chapter 5 will analyse system-level factors and will identify potential problems in Georgia's education system that explain the low performance of Georgia's students.

CHAPTER 2
OVERALL PISA PERFORMANCE

WHAT IS PISA/PISA+?

As described on the OECD website, PISA "is an international study which aims to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students. Since the year 2000, a group of fifteen-year-olds is selected at random to take tests every three years in the key subjects: reading, mathematics and science, with focus given to one subject in each year of the assessment. The students and their school principals also fill in background questionnaires to provide information on the students' family background and the way their schools are run. In some countries and economies parents also fill in a questionnaire.

The tests are designed to assess to what extent students at the end of compulsory education can apply their knowledge to real-life situations and are equipped for full participation in society. In addition, given the fact that PISA collects data every three years, countries and economies participating in successive surveys can compare their students' performance over time and assess the impact of education policy decisions". [11]

Sixty-five countries or economies participated in PISA 2009, including all 34 OECD countries, in addition to 31 partner countries and economies. All 65 participants conducted the PISA 2009 tests in the same year. The PISA Plus 2009 project included ten additional countries which administered the same test in 2010, including Georgia.

Table 2: Mean performance in reading, mathematics and science literacy, PISA 2009

	Reading	Math	Science
Estonia	501	512	528
Poland	500	495	508
Slovenia	483	501	512
Hungary	494	490	503
Czech Republic	478	493	500
Slovakia	477	497	490
Latvia	484	482	494
Lithuania	468	477	491
Croatia	476	460	486
Russian Federation	459	468	478
Turkey	464	445	454
Serbia	442	442	443
Bulgaria	429	428	439
Romania	424	427	428
Montenegro	408	403	401
Moldova	388	397	413
Kazakhstan	390	405	400
Azerbaijan	362	431	373
Albania	385	377	391
Georgia	**374**	**379**	**373**
Kyrgyzstan	314	331	330
CEE/CIS mean	**438**	**445**	**449**
EU	**486**	**493**	**503**

11 Available from: http://www.oecd.org/pisa/aboutpisa/

This study reveals that students in Georgia attained a mean sore of 374 on the reading literacy scale, well below the mean score of 486 among EU countries, and below the mean score of 438 among CEE/CIS countries. As such, Georgia has a statistically lower average compared to mean scores among CEE/CIS and EU countries in reading literacy.

In mathematics, the mean literacy score seems to be higher than that of reading, but nevertheless it is statistically similar. As with reading literacy, EU countries performed better than CEE/CIS countries in mathematics. The mean score for EU countries in mathematics is 493, whereas CEE/CIS countries have a mean score of 445, a difference of 48 points and the same difference between CEE/CIS and EU countries in reading. Thus, Georgia has a statistically lower average compared to mean scores among CEE/CIS and EU countries in mathematics.

The mean science literacy score for students in Georgia is a little lower than in reading and mathematics, but the average scores are not statistically different across subjects.

EU countries also performed better than CEE/CIS countries in science. The mean score of EU countries in science was 503, whereas CEE/CIS countries have a mean science literacy score of 449, a difference of 54 points. Meanwhile, Georgia also has a statistically lower mean score as compared to mean scores among CEE/CIS and EU countries in science.

In the CEE/CIS region, only Kyrgyzstan has lower mean scores in reading, mathematics, and science literacy than in Georgia.

Reading

The mean scores obtained by students in Georgia allow us to compare them with their peers in other countries, but do not inform us of their actual literacy levels. To better understand students' level, we also need to consider the percentage of students attaining a minimum competency in reading. This percentage is calculated according to PISA's reading literacy scale for students. This scale is divided into seven different levels (please see Annex 2 for more information), with level 2 used as baseline level for effective and productive participation in society.

As regards Georgia, the PISA Plus Report (PISA 2009) indicates that only 38% of students are estimated to have a proficient level in reading literacy. The majority of students therefore perform below the baseline level of proficiency in reading. The table below gives us information on the percentage of students attaining each level in Georgia.

Table 3: Reading performance on the PISA scale - percentage of students

Level	Level description	Per cent (%)	Standard error
BELOW LEVEL 1B	The student is unable to perform basics tasks in PISA's reading survey.	**13.5**	**0.91**
LEVEL 1B	The student can locate a single piece of information in a short, simple text.	**20.0**	**0.93**
LEVEL 1A	The student can locate one or more pieces of information to recognize the main idea, or connect ideas presented in the text with everyday situations.	**28.5**	**0.82**
LEVEL 2	The student can locate pieces of information which may need to meet several conditions, recognize the main idea, understand relationships, and interpret parts of the text.	**24.1**	**0.94**
LEVEL 3	The student can locate information which must meet multiple conditions, demonstrate detailed understanding of the text, and deal with competing information or information that has been negatively formulated.	**11.2**	**0.68**

Level	Level description	Per cent (%)	Standard error
LEVEL 4	The student can locate and organize several pieces of information, interpret nuances of language, and understand long and complex texts with unfamiliar structures.	**2.3**	**0.37**
LEVEL 5	The student can locate and organize several pieces of deeply embedded information, critically evaluate or hypothesize on material in the text by drawing on specialized knowledge, and demonstrate a full and detailed understanding of the text.	**0.3**	**0.10**
LEVEL 6	The student can make several detailed and precise inferences, comparisons or contrasts, understand an unfamiliar idea with competing information, and demonstrate a sophisticated understanding of the text.	**0.0**	**0.00**

Source: PISA findings.

From this table, it can be seen that 62% of students in Georgia perform below the baseline Level 2 in reading literacy, but also that no student achieves above Level 5. Most students in Georgia are therefore unable to act effectively and productively in society, according to PISA's criteria. Therefore, in terms of the proportion of students not achieving the baseline level in reading literacy, Georgia is among the poorest performers in the region, ranking just above Azerbaijan (73%) and Kyrgyzstan (84%), and far below the mean of 48% for UNICEF Programme countries.

The PISA evaluation also develops profiles of students via student questionnaires. The questionnaire is designed to identify students' learning profiles, and considers two aspects:

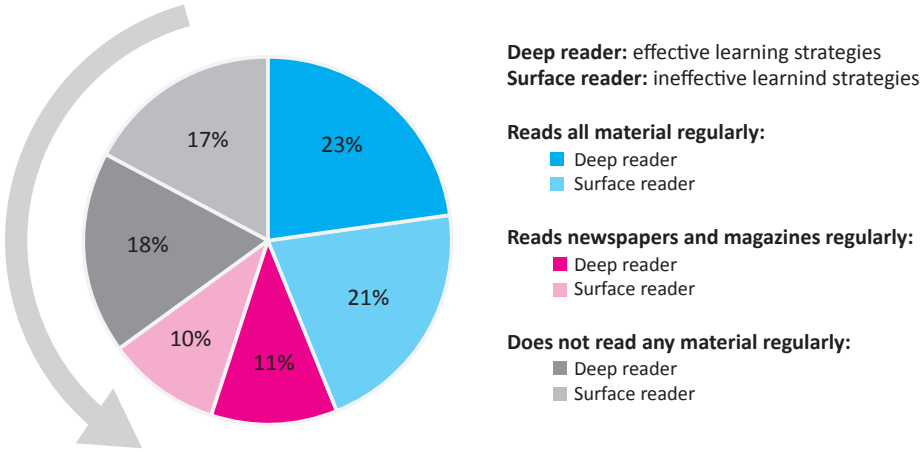
- Effective learning strategies; and
- Frequency of reading a range of materials**.**

Students are then divided between:

- *Deep reader*: those with a good and effective learning strategy;
- *Surface reader*: those without a good learning strategy;
- *Wide reader*: those who read a range of materials regularly;
- *Narrow reader*: those who read only magazines or newspaper regularly;
- *Highly restricted reader*: those who do not read any materials regularly.

The graph below shows the diversity of students' profiles in Georgia.

Graph 1: Reading profiles of students in Georgia



Source: ACER report.

44% of students in Georgia reported that they read many materials regularly. In all, 65% of students read regularly while 35% of students do not read any material regularly. This is an important factor in understanding the percentage of those with a minimum level of proficiency in reading (38%).

Mathematics

PISA also devised a mathematics scale, divided into 6 levels, which can be used to examine the level of competency in mathematics among students in Georgia (please see Annex 4 for an in-depth description of the scale). Again, Level 2 is used as a baseline level at which students are considered to have achieved a minimum competency in mathematics.

Table 4: Mathematics performance on the PISA scale – percentage of students

Level	Level description	Per cent (%)	Standard error
BELOW LEVEL 1	The student was unable to perform basics tasks in PISA's mathematics survey.	**40.3**	**1.43**
LEVEL 1	The student can answer questions set in familiar contexts, identify information and perform simple procedures.	**28.4**	**1.01**
LEVEL 2	The student can interpret and recognize situations in direct inference contexts, use basic algorithms, formulae, procedures or conventions, and make direct and literal interpretations of the results.	**20.1**	**0.90**
LEVEL 3	The student can execute clearly described procedures, interpret and use representations of different sources, and briefly communicate interpretations, results and reasoning.	**8.1**	**0.63**
LEVEL 4	The student can use models effectively for complex concrete situations with constraints, make assumptions, integrate representations, and construct and communicate explanations and arguments based on their interpretations.	**2.4**	**0.37**
LEVEL 5	The student can develop and work with models in complex situations, identify constraints and specify assumptions, and select, compare and evaluate appropriate problem solving strategies.	**0.5**	**0.17**

Level	Level description	Per cent (%)	Standard error
LEVEL 6	The student can conceptualize, generalize and utilize information based on investigations and modelling of complex problems situations, communicate actions, reflections, on their findings, interpretations, arguments, and the appropriateness of these to the original situation.	**0.1**	**0.07**

Source: PISA findings.

As in reading, students in Georgia experience several problems in mathematics. More than 40% of students achieve below Level 1. Just 31.2% of students are proficient in mathematics at least to the baseline level at which they begin to demonstrate the kind of skills that enable them to use mathematics in ways considered fundamental for their future development (Level 2 and upwards).

Georgia is the second lowest performing country in mathematics, with 68% of students performing below level 2. Therefore, in terms of the proportion of students not achieving the baseline level in mathematics literacy, Georgia ranks just above Kyrgyzstan (87%) and far below the mean percentage of 53% across UNICEF Programme countries.

Sciences

Table 5: Science performance on the PISA scale – percentage of students

Level	Level description	Per cent (%)	Standard error
BELOW LEVEL 1	The student was unable to perform basics tasks in PISA's science survey.	**33.4**	**1.30**
LEVEL 1	The student has limited scientific knowledge that can only be applied in familiar contexts, and can present scientific explanations that are obvious.	**32.2**	**0.81**
LEVEL 2	The student has adequate scientific knowledge to provide possible explanations in familiar contexts or draw conclusions based on simple investigations, and is capable of direct reasoning, literal interpretations of the results of scientific inquiry, or technological problem solving.	**23.6**	**0.95**
LEVEL 3	The student can identify clearly-described scientific issues in a range of contexts, select facts and knowledge to explain phenomena, and apply simple models or inquiry strategies.	**8.8**	**0.73**
LEVEL 4	The student can work effectively with situations and issues, make inferences about the role of science or technology, select and integrate explanations from different disciplines of science or technology, and link them to life situations.	**1.7**	**0.31**
LEVEL 5	The student can identify the scientific component of many complex life situations, apply scientific concepts and knowledge, compare, select and evaluate appropriate scientific evidence, and can construct explanations based on evidence and arguments based on critical analysis.	**0.2**	**0.11**

Level	Level description	Per cent (%)	Standard error
LEVEL 6	The student can consistently identify, explain and apply scientific knowledge in a variety of complex life situations, link different information sources and explanations to justify decisions, use scientific knowledge and develop arguments in support of recommendations and decisions in personal, social or global situations.	**0**	**0**

Source: PISA findings.

From this table, it can be seen that students in Georgia perform better in sciences than in mathematics, with only 33% performing below Level 1 compared to 40% in mathematics. However, 66% of students achieve less than Level 2, considered the baseline level at which they begin to demonstrate the science competencies that will enable them to participate actively in real-life situations related to science and technology. We also observe that no student achieves higher than Level 5.

As with reading and mathematics, students in Georgia rank at the lower end of the spectrum in terms of science literacy, performing better than those in Azerbaijan (70%) and Kyrgyzstan (82%), but not meeting the mean of 47% of students achieving less than the baseline Level 2 across UNICEF programme countries.

VARIATIONS IN PERFORMANCE

The variation in students' performance is similar across all subjects. The variations in student performance can be divided into variance between schools and variance within schools. The question that interests us for the purpose of our research is: are variations in performance generated by differences between schools, or by differences between students?

In Georgia, the between-school variance is only 22% of the total variance. Compared to other CEE/CIS countries, there is relatively little variation in performance associated with schools, with Poland displaying the lowest between-school variance at 20%, and Turkey the highest at 97% (please see Annex 5, Graph 2, for more information).[12]

Therefore, Georgia is among the countries with the lowest between-school variance, making the Georgian system more equitable than in other countries. However, it is important to note that this equity is owing to the overall low performance of most schools in Georgia.

OTHER INTERNATIONAL/NATIONAL ASSESSMENTS CONDUCTED

In 2006, Georgia participated for the first time in an international assessment exercise, the Progress in International Reading Literacy Study (PIRLS), which is administered to pupils in the 4th grade. It also participated in the Trends in International Mathematics and Science Study (TIMSS) 2007,[13] which is administered to students in the 8th grade. According to the National Examination Center website of the MES, a total of 9,000 students, 1,400 teachers and 152 schools took part in the Study in Georgia.[14]

While overall CEE/CIS countries performed better in TIMSS than they do in PISA survey, students in Georgia nevertheless are among the lowest performers in the TIMSS survey compared to their counterparts in other CEE/CIS countries (please see Annex 3, Graph 3, for more information).

12 It is worth noting that certain types of schools were excluded from the data collection, and that very few private schools exist in Georgia, a feature generally associated with better performance.

13 There are differences in methodology between PISA and TIMSS. The TIMSS tests are based on curricula, while the sample design, response rates, type of test (the proportion of multiple choice and open-ended questions), and the question-response models applied to the data all differ. It is useful to compare Georgia's results at PISA and TIMSS as they target the same population (students aged 15 or in grade 8).

14 Available at: http://www.naec.ge/?lang=en-GB

NATIONAL ASSESSMENT RESULTS

A National Assessment of 4th graders, carried out in 2003 by the National Examinations Center, was based on the framework and methodology of the PIRLS 2002. The 2003 assessment indicated large disparities in learning outcomes in Georgia. For example, the results of the Georgian language tests were significantly better in cities and valley regions than in villages and mountain regions, while girls outperformed boys in every part of the Georgian language tests. Furthermore, nearly 50% of grade 4 pupils were found to be unable to master the topics included in the mathematics syllabus, and just 42% of pupils were ready to continue to grade 5 in the Georgian language. Writing skills were also "very poorly developed".[15]

FINDINGS FROM CHAPTER 2

- While CEE/CIS countries produce on average lower results than OECD countries, Georgia is among the lowest performers among CEE/CIS countries.
- In terms of reading literacy, only 38% of students in Georgia are estimated to have a level that is at or above the baseline level needed to participate effectively and productively in life.
- In terms of mathematics literacy, only 31.2% of students in Georgia are estimated to have a level that is at or above the baseline level at which they begin to demonstrate the kind of skills that enable them to use mathematics in ways considered fundamental for their future development.
- In terms of science literacy, only 34% of students are proficient at least to the baseline level at which they begin to demonstrate the science competencies that will enable them to participate actively in real-life situations related to science and technology.
- The variations in students' performance in Georgia is much lower than in other CEE/CIS countries
- Regardless of the type of system used to evaluate performance (PISA, TIMMS, PIRLS etc.), Georgia still ranks among the countries with the lowest scores, indicating that the education system has significant weaknesses that need to be addressed.

15 World Data on Education, 2010/2011.

CHAPTER 3
INVESTIGATING INEQUITY IN PERFORMANCE

The previous section revealed the deficiencies in student performance in reading, mathematics and science in Georgia. Georgia ranks as one of the lower performing countries both among PISA and PISA+ participating countries, as well as among CEIS countries. In order to explain this low performance and to provide recommendations towards improving Georgia's education system, it is necessary to take a closer look at certain issues.

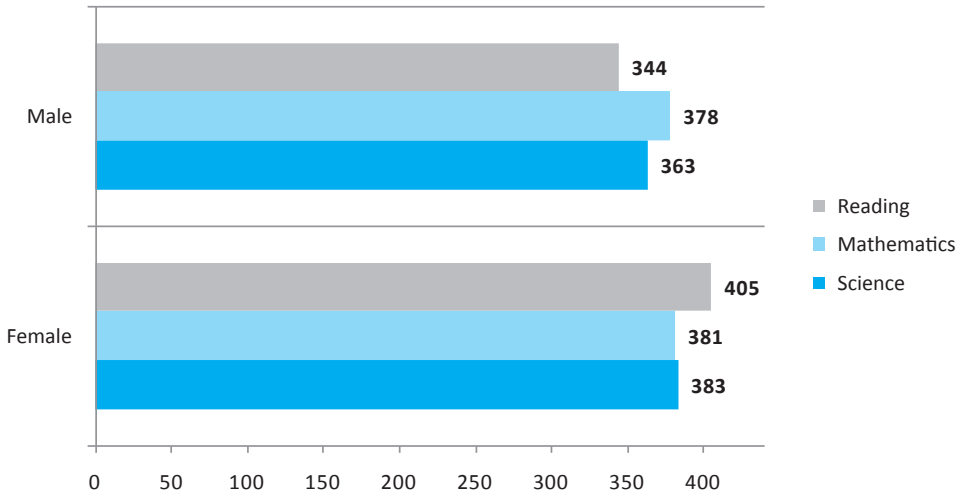
The following paragraphs highlight the most significant variables in explaining the inequity in performance among students in Georgia. We shall attempt to describe and analyse the effect of these variables on students' performance.

GENDER DIFFERENCE

In all PISA and CEE/CIS countries, girls performed better than boys. In Georgia, girls outperform boys by an average of 61 score points in reading. Girls also perform better than boys in science, although the difference is not significant in mathematics.

This figure compares the difference in scores between girls and boys in the three tests:

Graph 2: Average PISA test scores by gender

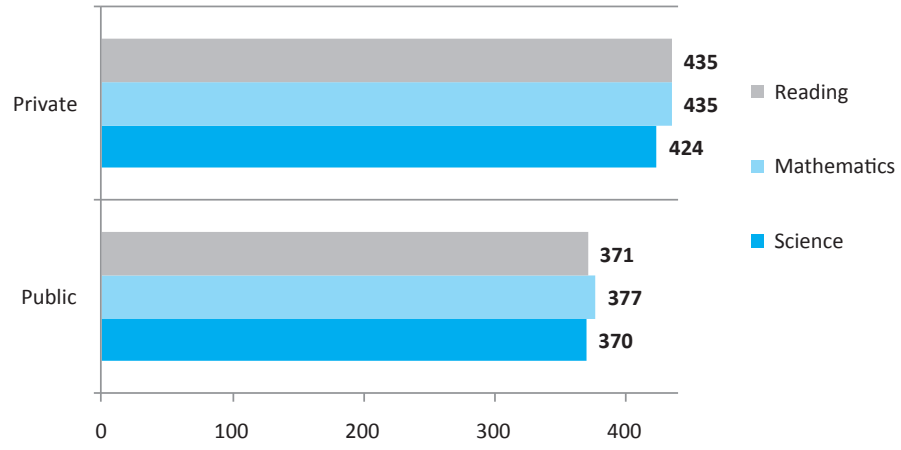


Source: Interactive PISA data selection.

SCHOOL TYPE AND LOCATION

In the PISA sample for Georgia, most of the schools selected were public, and only 5% were private schools. However, when comparing test scores by school type, there is a marked difference between students from public and private schools.

Graph 3: Average PISA test scores by school type

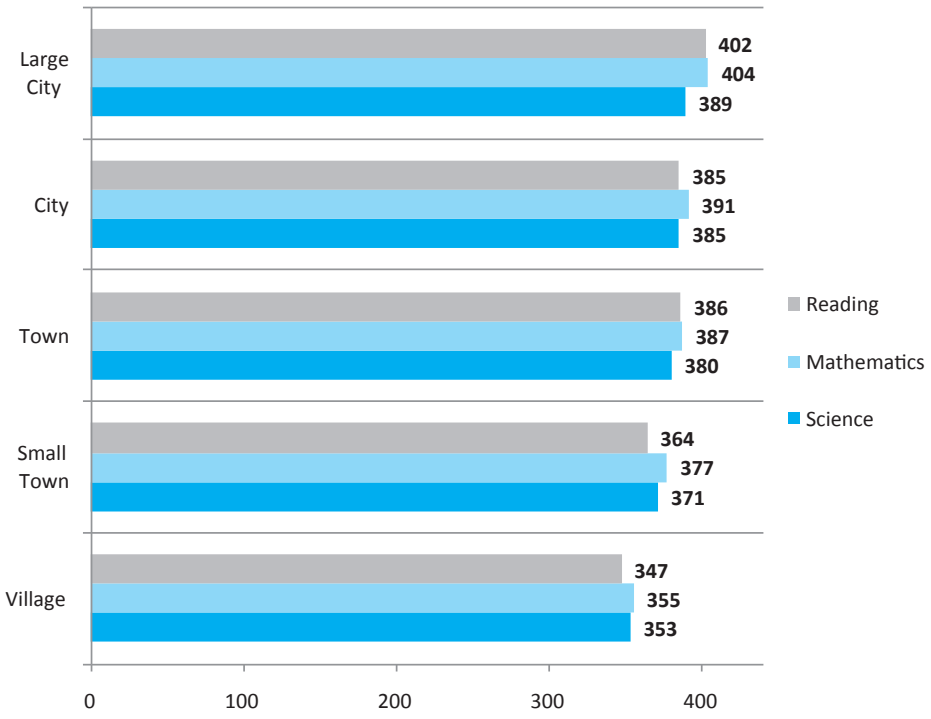


Source: Interactive PISA data selection.

This graph demonstrates that private schools tend to perform better than public schools, with public schools obtaining a mean score of 371 compared to a mean score of 435 among private schools. In particular, attending a private school seems to correlate positively with an increased reading performance, after accounting for socioeconomic and demographic factors (OECD, 2009).

School location also generates inequity in performance. PISA results highlight differences in performance according to the size of the settlement in which a school is located. As such, the larger the population size of a city, the better the students perform at PISA, as results are significantly higher in larger cities than in villages.

Graph 4: Average PISA test scores by school location (with confidence intervals)

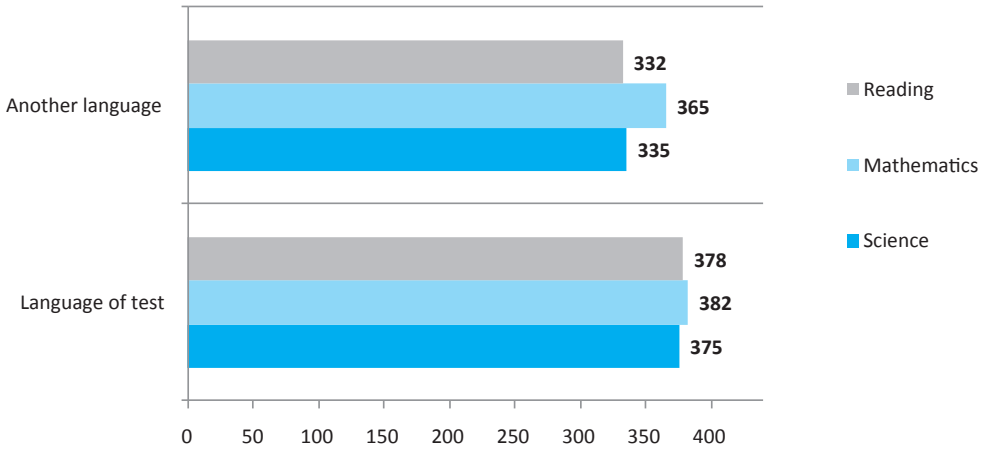


Source: Interactive PISA data selection.

ETHNIC AND LINGUISTIC BACKGROUND

The PISA test language in Georgia is Georgian. In the PISA sample, only 2.3% of students do not speak Georgian at home (schools where Azerbaijani or Armenian was the language of instruction, as well as all schools in the regions of Abkhazia or South Ossetia, were excluded from the assessment).[16] The results of the PISA assessment indicate that students who do not speak Georgian at home produce significantly lower results in all three domains as compared to students who speak Georgian at home.

Graph 5: Average PISA test scores by language spoken at home

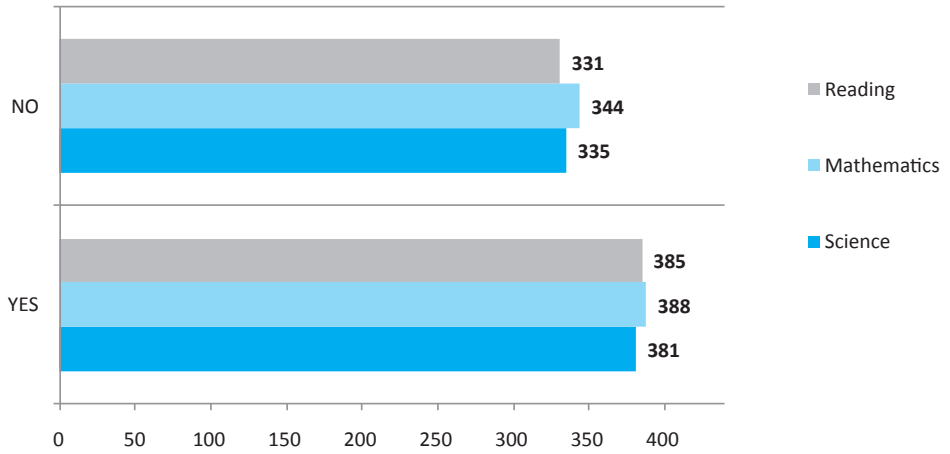


Source: Interactive PISA data selection.

LEARNING RESOURCES

Learning resources usually have a significant impact on students' performance. As previously noted in Chapter 1, a lack of textbooks seems to be a critical factor affecting learning results in Georgia. The following graph describes the relationship between textbook possession and school results, based on students' accounts of the textbooks they possess.

Graph 6: Average PISA test scores by school books in possession



Source: Interactive PISA data selection.

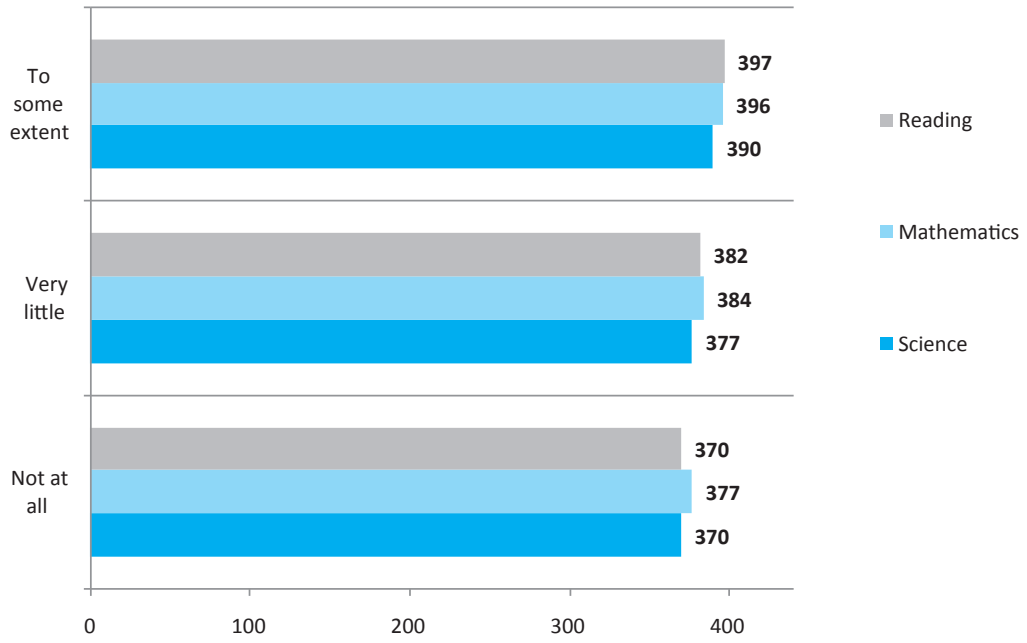
16 UNICEF regional publication.

Thus, students who claim to own textbooks perform better at school than students who do not. Moreover, the difference is quite significant, with an increase in 54 points in reading, 44 points in mathematics, and 46 points in science for those students who possess textbooks.

TEACHER TRAINING AND QUALIFICATIONS

PISA does not collect data on teachers, so its assessment of the impact of teachers' training cannot be rigorously assessed. However, schools where the capacity to provide instruction was hindered by a lack of qualified teachers display lower results than others. This result may be due to the small percentage of schools that reported having a lack of qualified teachers. Nevertheless, the question of teachers' training and qualifications requires further investigation.

Graph 7: Average PISA test scores by lack of qualified maths teachers (as identified by school head)

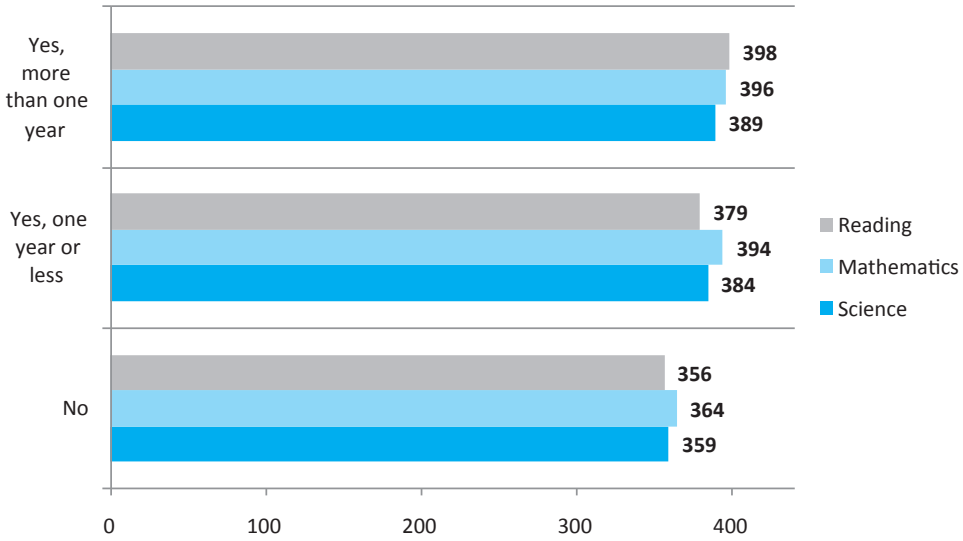


Source: Interactive PISA data selection.

PRESCHOOL ATTENDANCE

Different studies have shown that preschool attendance has a significant impact on learning performance in later stages of education. Preschool education is not yet fully developed in Georgia, and 32.3% of students did not attend preschool. However, students who attended at least one year of preschool (47.7%) perform better than others. The difference is significant: for example, those who attended preschool achieve on average 42 points more than their peers in reading.

Graph 8: Average PISA test scores by preschool attendance



Source: Interactive PISA data selection

FINDINGS FROM CHAPTER 3

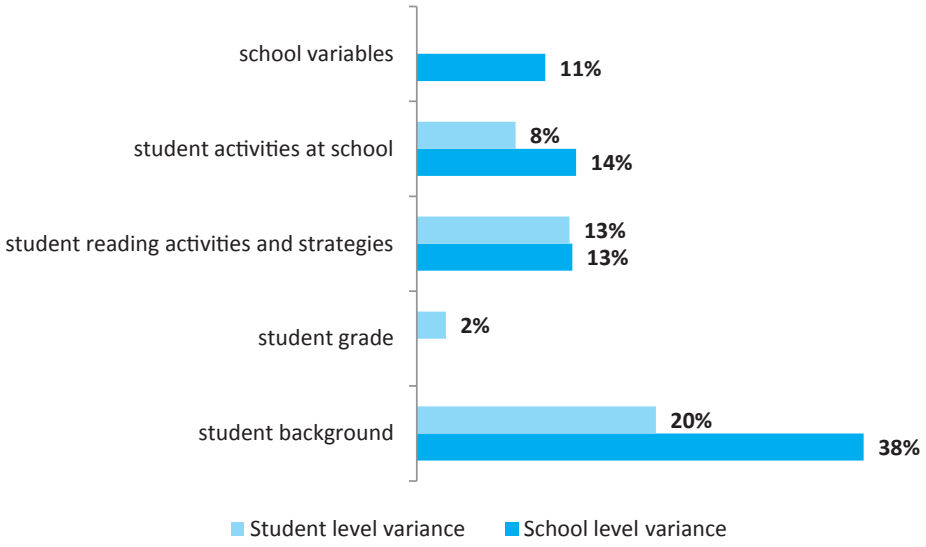
- The difference between girls and boys is significant for reading and science, but not for mathematics.
- Students in private schools perform far better than their peers in public schools, even when controlling for the socioeconomic backgrounds of pupils.
- Students in schools located in villages and small towns perform similarly in all three tests. However, there is a significant difference in performance between students from large cities and those from elsewhere.
- Students who do not speak Georgian at home (2.3% of the sample) produce significantly lower results in reading, mathematics and sciences as compared to their peers.
- The lack of available textbooks has a significant effect on students' performance.
- Schools where the qualifications of teachers are perceived as problematic achieve lower results in mathematics.
- Students who have attended preschool education achieve better results than those who have not.

CHAPTER 4
STUDENTS AND SCHOOLS FACTORS AFFECTING STUDENTS' PERFORMANCE

In this section we will examine the role that student-related and school-related factors play in affecting students' performance. A description of the methodology used in analysing data is provided in Annex 1.

The graph below shows the contribution of different categories of factors in influencing students' performance, each of which needs to be studied.

Graph 9: Relative contribution to variance



Source: Authors

As demonstrated in the graph above, school variables have little effect on students' performance. In particular, as noted in the ACER report, school assessment and accountability policies do not have a significant effect on reading performance. In Georgia, there is a positive correlation between attendance at a private school and reading performance, even after socioeconomic and demographic factors have been accounted for. The low percentage of overall private enrolment, among other causes, could explain the poor performance of students in Georgia. This issue is discussed further in Chapter 5.

The ACER report noted a significant, positive relationship between reading performance and the following factors:

- student-teacher relations;
- the disciplinary climate (based on the student and school average);
- the role of teachers in stimulating students' engagement in reading (based on the student and school average);
- learning time in a language;
- the proportion of students who attended preschool education for more than one year.

PISA MULTILEVEL DATA MODEL FOR GEORGIA

We developed the following analysis to enable us to identify more precisely the factors affecting students' performance in Georgia. This table displays the variables used in the model, as classified by category, and their effect on reading performance (based on the coefficient estimate).

Table 6: Final multilevel model explaining reading performance

Category	Variable name	Variable label	Coeff. Estimate	Standard error	DF	t value	Pr > |t|
	Intercept***		366.83	36.2881	222	10.11	<.0001
Student's background	ESCS***	**Economic, Social and Cultural Status**	15.2297	1.7044	4400	8.94	<.0001
	CULTPOSS***	Cultural possessions	5.7397	1.3731	4400	4.18	<.0001
	HOMEPOS***	Home possessions	-12.9711	1.8294	4400	-7.09	<.0001
	ST22Q01***	**Number of books**	6.6493	0.8465	4400	7.85	<.0001
	HEDRES**	Learning resources	3.5822	1.5216	4400	2.35	0.0186
Individual characteristics	ST04Q01***	Gender	-31.7954	2.0756	4400	-15.32	<.0001
	GRADE***	Grade	14.8137	2.2026	4400	6.73	<.0001
Reading activities and strategies	JOYREAD***	Pleasure in reading	21.9278	1.5962	4400	13.74	<.0001
	ONLNREAD***	Online reading	4.0764	0.938	4400	4.35	<.0001
	UNDREM***	**Memorization strategies**	11.7869	1.0774	4400	10.94	<.0001
	METASUM***	Metacognitive strategies for reading	12.1766	1.0979	4400	11.09	<.0001
Student activities in school	DISCLIMA***	Discipline climate	7.0437	1.1733	4400	6	<.0001
	STIMREAD***	Stimulating reading	4.9972	0.7902	4400	6.32	<.0001
	Rfs***	Reading for school	-5.8218	0.4702	4400	-12.38	<.0001
	Extension***	Extension	-10.334	1.0657	4400	-9.7	<.0001
	Remedial***	Remediation	-5.2776	0.7177	4400	-7.35	<.0001
Learning time	LMINS***	Reading learning time	0.1739	0.03843	4400	4.52	<.0001
	MMINS***	Maths learning time	0.1656	0.04267	4400	3.88	0.0001
School variables	TCHPARTI**	Teachers' participation	-5.8249	2.2962	4400	-2.54	0.0112
	m_escs***	School socioeconomic status	23.8803	3.9624	4400	6.03	<.0001
	m_disclima***	School climate	21.8313	5.7284	4400	3.81	0.0001
	m_lmins**	School reading time	0.3152	0.14	4400	2.25	0.0244
	m_mmins	School maths time	-0.2698	0.1657	4400	-1.63	0.1036

AIC:52350, AICC : 52350, BIC : 52439, -2log likehood : 52298

Significance levels: *** 1 percent. – ** 5 percent. – * 10 percent.

Source: Authors.

STUDENTS' BACKGROUND

Two individual variables concerning students were of particular interest for this study: the gender of the student and her/his grade (as an indicator of late entry into school). Among all PISA and PISA+ countries, Georgia has one of the highest gender gaps in reading. In the final model, the coefficient of gender is -31.8 when controlling for other variables. This is close to the gap created by the difference in an entire school year (39 points) according to the OECD 2009 report.

These results demonstrate that, aside from different levels of engagement in reading, individual strategies and the prevalence of personal or school reading, there is a behavioural difference between girls and boys that impacts school performance.

When the school grade was introduced into the models, we found that this variable only accounts for 2% of students' performance, with little between-school variance. In other words, the distribution in performance of students by grade across schools are similar.

Family background

An index of a student's social, economic and cultural status was constructed using five items to measure family wealth, the presence of cultural possessions in the home, and the presence of educational resources in the home.[17]

Those five variables account for 38% of between-school variance and 20% of within-school variance. All five variables have a highly significant impact on school performance. When studying students of a given socioeconomic status and in a given school, an increase in the number of books and learning resources is associated with better performance. Students whose family invests in cultural possessions, such as books and art, produce better results than others. However, material wealth (non-cultural items) is negatively associated with school performance, a result very specific to Georgia as compared to studies undertaken on other countries.

Reading activities and strategies

In the third model of analysis, reading activities and strategies were introduced.[18] These strategies include the pleasure derived from reading, the prevalence of online reading, memorization or synthesis strategies, and teachers' strategies to assist reading. This group of variables accounts for 13% of variance in results both at the school and student level. Developing a taste for reading among school students must be made a priority in primary and secondary education. Given the significance of the METASUM and UNDREM variables, it is important that teachers help students to develop mega-cognitive strategies to improve reading. Online reading does have a significant effect, but to a lesser extent where compared to other activities. The decrease in between-school variance shows that schools differ from one school to another when considering these indicators.

Given the introduction of ICT in schools, further strategies must be developed to strengthen the efficiency of online reading and to extend opportunities to read outside of school.

Student activities in school and learning time

Questionnaires submitted by students also included a number of school variables, including: whether teachers stimulate students to engage in reading, reading activities in school, remediation, and learning time. This group of variables accounts for 14% of the variance among schools and 8% of the variance among students. Participation in remedial or extension activities is associated with a lower performance in reading tasks. This does not mean that these activities have a negative impact on reading, but that underachievers are enrolled in such activities. Stimulating children to derive pleasure from reading, the disciplinary climate in schools, and reading activities centred on explaining causes, behaviours or objectives are all associated with a higher performance in reading.

17 ESCS index (Economical, Social and Cultural Status); CULTPOSS (Cultural possession); HOMEPOS (material wealth); ST22 (number of books); HEDRES (learning resources).

18 These indicators have been standardized with the OECD data (with a mean of 0 and a standard deviation of 1) in order to compare the regression coefficients.

School variables

Some school variables were introduced. As in most countries, the average school socioeconomic status (SES) and disciplinary climate are associated with a substantially higher reading performance. Teachers' participation appears to lead to a decrease in test scores, a result that needs to be investigated further. Moreover, in schools where head teachers admitted to having a lack of qualified teachers to some extent (3.6%), the students' mean score in reading was 397. This is higher than the mean score of 370 in reading among students in schools where head teachers said they do not lack of qualified teachers.

Learning time

According to the UNICEF report from 2013, on average, students in the CEE/CIS region devote more time to science (3 hours and 35 minutes) than to mathematics or language of instruction (about three hours each). Spending more time reading at school is associated with a higher reading performance.

School management

The approach of head teachers to solving teachers' problems in their classroom seems to have a positive impact on students' results. In schools where head teachers claim to try to resolve issues facing teachers (34%), students score on average 385 reading, or 25 points more than students in schools where head teachers do so rarely. The difference is similar in mathematics and science (please see Annex 3).

FINDINGS FROM CHAPTER 4

- Among all PISA and PISA+ countries, Georgia has one of the highest gender gaps. In the final model, the coefficient of gender is -31.8 when controlling for other variables, close to the gap created by the difference in an entire school year (39 points) according to the OECD 2009 report.
- School grade has a moderate impact on student performance (accounting for 2% of variation among students).
- Developing a taste for reading must be made a priority in primary and secondary education. Teachers must help students to develop meta-cognitive strategies to improve reading.
- Increased learning time in reading is associated with higher reading performance.
- Students whose family invest in cultural possessions have better results than those that do not. However, material wealth (non-cultural items) is negatively associated with school performance, a result very specific to Georgia as compared to studies undertaken on other countries.
- Student reading activities improve their reading level.
- Student-teacher relations and a sound disciplinary climate favourably impact reading, while a teacher's attempts to stimulate students' engagement in reading has a positive effect on their reading performance.
- One year or more of preschool attendance and time spent learning the language of instruction both have a positive impact on reading scores.
- The approach taken by head teachers to solve problems facing teachers in the classroom has been shown to increase test scores.

CHAPTER 5
SYSTEM-LEVEL FACTORS AFFECTING STUDENTS' PERFORMANCE

Having analysed factors influencing performance at the level of schools and students, macro or system-level indicators need to be examined to identify areas for improvement, as well as best practices towards enhancing Georgia's education system. Therefore, it is necessary to consider what conditions enable an efficient and equitable learning environment. While previous chapters have focused on variations among schools and students within Georgia, this chapter will analyse between-country variance to determine system-level factors that are impeding students' performance in Georgia.

In addition to the school and student survey, the OECD, in collaboration with Eurostat and UNESCO, collects data at the country- or system-level, known as the UNESCO-UIS/OECD/EUROSTAT database, or UOE. Unfortunately, PISA+ countries (including Moldova and Georgia) do not feature in this database, and Georgia is not included in UNICEF's regional analysis for system-level data.

However, since Georgia shares many similarities with other CEE/CIS countries, the findings from the UNICEF publication are presented below. The macro level data from Georgia is then analysed according to a more comprehensive framework of system-level indicators that includes socio-cultural factors. Several policy indicators are then identified as potential factors that might improve the quality of Georgia's education system.

FINDINGS FROM THE UNICEF REGIONAL PUBLICATION

The OECD observes that increasing the quality of teaching is more effective in improving student outcomes than reducing class size, noting that systems that prioritize teachers' pay over smaller classes tend to achieve higher levels of performance. Countries that grant greater autonomy to schools in designing their curricula, deciding which courses to offer, establishing student assessment policies, and selecting course content and textbooks tend to produce better results in reading than those that do not. In spite of this, there is no correlation at the country level between performance and autonomy in resource allocation.

Moreover, schools with better disciplinary climates, more positive behaviours among the teaching staff and better teacher-student relations tend to achieve higher scores in reading.[19]

LITERATURE REVIEW OF SYSTEM-LEVEL FACTORS

The indicators mentioned below all belong to the system management or governance category, although it is also important to consider socioeconomic indicators such as GDP per capita and expenditure in education.

Using a dataset featuring middle and high income countries, Hanushek & Kimko (2000) tested the macroeconomics variables of the pupil/teacher ratio and expenditure in education, but found that these variables did not have a significant effect on student performance. Meanwhile, Lee & Barro (2001) demonstrated that the pupil/teacher ratio, spending on education and teacher salaries have a positive impact on students' acquisitions. In a study by Verhoeven & Tiongson (1999), the authors highlighted the importance of distinguishing results according to countries' varying economic status (GDP per capita). In addition to the factors listed above, SIDI (2012) showed the importance of such demographic and sociolinguistic variables as population size, rate of population growth, and language diversity in a country.

In their study, SIDI & VARLY (2012) also considered the accessibility of information technologies (including the Internet) in countries, a factor which at the macro level has a significant, positive correlation with student's performance, while noting its correlation with GDP. In the study, overall governance is measured using the Transparency International Corruption Perceptions Index (hereinafter referred to as the Transparency Index), although the effect of this variable was not found to be significant. The study also included the proportion of

19 UNICEF (2013).

female teachers, as this has been shown to be a good predictor of primary education performance in low- and middle-income countries. Meanwhile, while developing countries spend a lot of resources on education, the impact is often low due to the lack of research into identifying the real problems facing educational performance (Glewwe, Hanushek, Humpage, & Ravina, 2011).

According to Hanushek, Link, & Woessmann (2012), school autonomy improves students' performance in well-developed systems, but not in underdeveloped ones. This finding comes from a panel study of PISA data from 42 countries between 2000 and 2009, in which countries are categorized according to income classes. The study calculated the index of school autonomy by measuring the decision-making autonomy of head teachers in different areas. Hanushek, Link, & Woessmann (2012) found that increasing autonomy, especially in decisions related to academic content, have a negative impact on students' results in low income countries. However, in high-income countries, increased autonomy over academic content, personnel, and budgets were found to positively impact students' achievements. In the context of Georgia, the authors suggested that the flexibility and autonomy given to schools with regards the content of the new curriculum should be properly monitored, and that the impact of the 2010 curriculum reform on teaching practices and students' results should be evaluated further.

Finally, Hanushek & Ludger (2005) have found that grouping students by ability early on in primary education increases educational inequality in secondary school, while Jens Henrik Haahr (2005) has shown that educational inequalities do not improve students' performance.

GEORGIA'S SITUATION IN CONTEXT

A database of PISA and PISA+ countries was created that included the variables indicated above and that featured indicators relevant to the Georgian context, such as the youth unemployment rate and the percentage of pupils enrolled in vocational or technical education (VET). All indicators were calculated as averages over the period from 2005 to 2009, since Georgia took the PISA test in 2010. CEE/CIS countries that are OECD member states are included in the OECD grouping.

Table 7: Georgian indicators compared to other CEE/CIS and OECD countries (2005-2009)

Indicators	Georgia	CEE/CIS average	OECD average
School resources			
GDP per capita, PPP (constant 2005 international $)	**4,319**	**9,476**	**29,647**
Public expenditure on education as % of total government expenditure	**8.2**	**13.3**	**13.1**
Educational expenditure in secondary school as % of total educational expenditure	**37.0**	**39.5**	**39.5**
Demographic variables and country development			
Total population	**4,388,500**	**16,443,339**	**35,760,110**
Annual population growth %	**0.4**	**0.2**	**0.7**
Language diversity (0 = low diversity; 1 = high diversity)	**0.6**	**0.5**	**0.3**
Internet users (per 100 people)	**10.4**	**27.4**	**63.1**
Transparency Index (0 = highly corrupt; 100 = very clean)	**52.0**	**38.7**	**67.4**
School selection			
Gross enrolment ratio	**85.8**	**91.6**	**103.1**
% of private enrolment (secondary)	**4.9**	**2.2**	**16.1**
% of pupils enrolled in technical and vocational education	**1.8**	**17.2**	**25.0**
School characteristics			
Pupil/teacher ratio in secondary school	**7.5**	**10.8**	**12.7**

Indicators	Georgia	CEE/CIS average	OECD average
Total % of students repeating a year in secondary school (all grades)	**0.3**	**1.0**	**3.5**
% of female teachers in secondary school	**85.6**	**74.6**	**61.2**
Unemployment			
Unemployment among females, 15-24 years old	**34.8**	**22.0**	**15.6**
Unemployment among males, 15-24 years old	**28.9**	**20.6**	**14.9**

Source: Please see Annex 1, Table 1, for response rates and sources.

Georgia's GDP per capita is US$4,319, less than half the CEE/CIS average. GDP per capita has a positive correlation with test scores, both as a cause and effect, since the state of a country's economy affects educational investment in education. In turn, this can impact students' performance and affect their ability to contribute to the development of the country's economy.

On average, CEE/CIS countries spend almost twice as much as Georgia in education, while the share of the education budget devoted to secondary education is almost the same. Between 2005 and 2009, only 8.2% of the government's budget was allocated to education in Georgia, a figure far below the international benchmark. The 2008 war generated an increase in military spending, but this does not appear to have affected the education budget according to a dataset from the Université de Sherbrooke. Nevertheless, the 2008 conflict certainly affected school infrastructure and educational resources. As a result, it is anticipated that the war had an impact on young people's morale and schooling, and consequently their PISA test scores.

The unemployment rate among 15-24 years old is much higher than in CEE/CIS and OECD countries (34.8% for female and 28.9% for males). The language diversity index (from SIL) is slightly higher in Georgia compared to other CEE/CIS countries, and considerably higher than in OECD countries. This indicator accounts for 10% of the variance in country scores, and offers a partial explanation as to why CEE/CIS countries, and Georgia in particular, have lower test scores than OECD countries. The Transparency Index (an indicator of governance) is on average higher in Georgia than in other CEE/CIS countries, meaning there is less corruption in Georgia, while the proportion of Internet users is very low (10.4%).

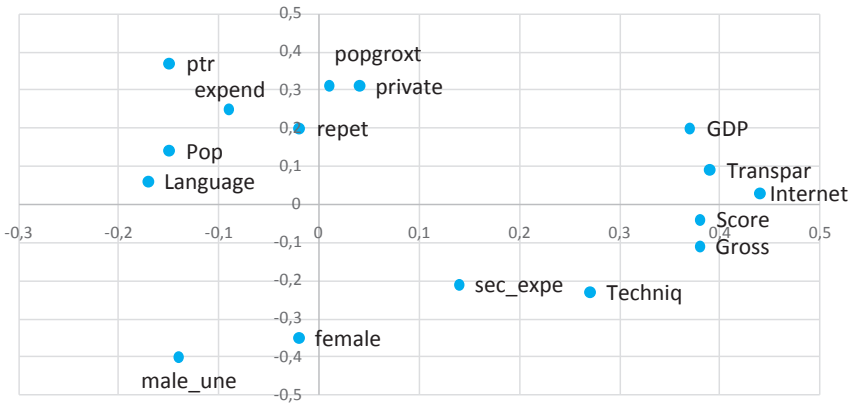
All the indicators relating to a country's socioeconomic background are featured in the statistical model as control variables. Education management indicators are then introduced to the model, including the following: the pupil/teacher ratio, the rate at which school children repeat a year in school, the percentage of female teachers, the percentage of private schools, the percentage of students in VET, and indicators relating to school autonomy and accountability, as measured at the school-level in the PISA data collection.

In CEE/CIS countries, the proportion of private schools is small compared to the OECD region. As usual, private schools tend to outperform public schools, which goes some way in explaining why CEE/CIS PISA test scores are on average lower than in the OECD region. Meanwhile, only 1.8% of pupils are enrolled in technical and vocational education programmes in Georgia.

MULTIVARIATE ANALYSIS

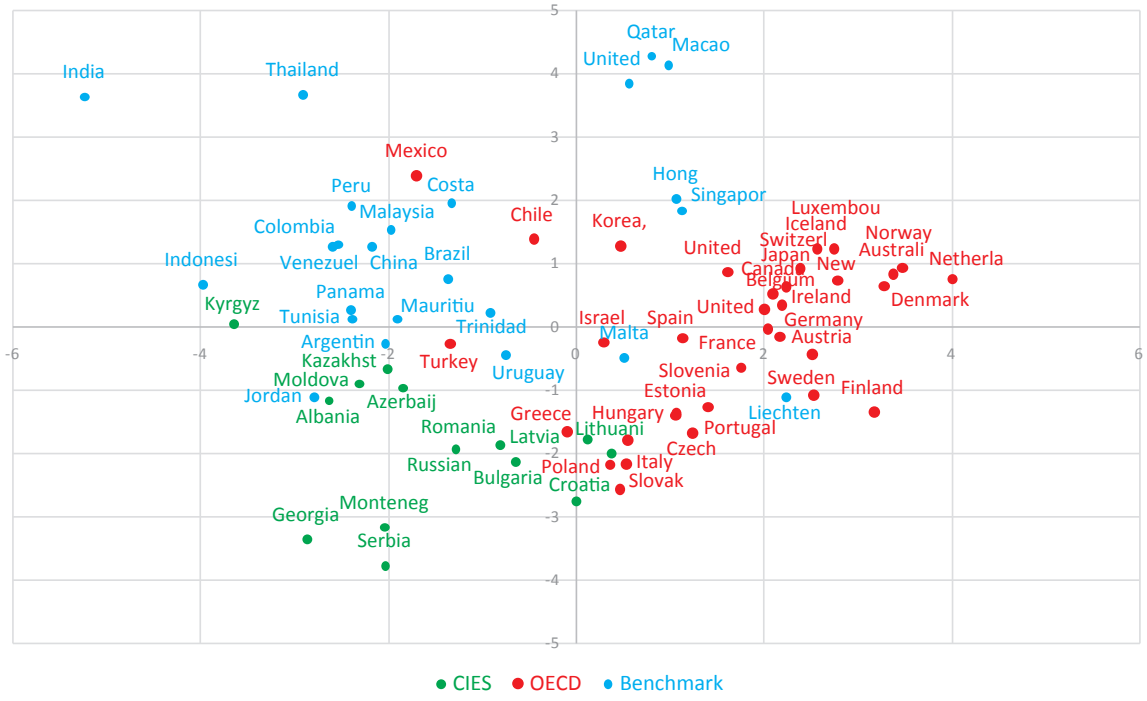
A principal component analysis (PCA) has been conducted for the variables included in the table above, allowing us to summarize all the input variables and locate countries according to their factorial space. In the graph below, the horizontal axis of the PCA includes PISA test score, the gross enrolment ratio, the GDP, as well as other indicators related to socio-economic development (including unemployment), and can be referred to as the *quality of development* (including educational development) axis. The vertical axis includes several variables that summarize education spending and demography. These two axes are very effective in identifying the position of countries according to different groupings, as well as individually.

Graph 10: Principal component analysis (PCA) of contextual macro variables*



* Please see Annex 1 for definitions of variables

Graph 11: Representation of countries in principal component analysis (PCA)



As can be seen in the graph above, CEE/CIS countries (in green), and especially Georgia, are on the bottom left of the diagram, meaning that these countries have a lower *development quality* and spend less on education than the others. Other non-OECD and PISA+ countries (in blue) tend to have a similar *development quality* ranking to CEE/CIS countries, but face more demographic constraints and invest more resources in education than CEE/CIS countries do. The table below shows the variables that have a significant impact on PISA test scores, namely: GDP per capita, the percentage of Internet users, population size and growth, the rate at which school children repeat a year in school, the share of state expenditure on secondary education, and language diversity. The model explains 64% of variance between countries in students' performance. Of particular significance are GDP per capita, which accounts for 26% of the variance, and the degree of language diversity, which accounts for 10% of the variance. Thus, countries with a high degree of linguistic diversity and low GDP per capita, such as India, tend to have lower test scores.

PISA school-level indicators

Table 8: Percentage of pupils in school according to different PISA indicators

PISA indicators	Georgia	CEE/CIS Average	OECD Average
Students grouped by ability into different classes (for some subjects)	**9.1**	**16.7**	**37.4**
Teachers selected by national, regional or local authorities	**11.3**	**31.4**	**55.1**
National, regional or local authorities have authority to choose textbooks	**9.9**	**27.2**	**37.3**
Achievement data for accountability procedures used in evaluating teachers' performance	**91.1**	**86.9**	**44.2**
Achievement data for accountability procedures posted publicly	**22.3**	**51.3**	**36.4**
Test or assessment results used to monitor pupils' performance	**92.5**	**84.8**	**70.8**

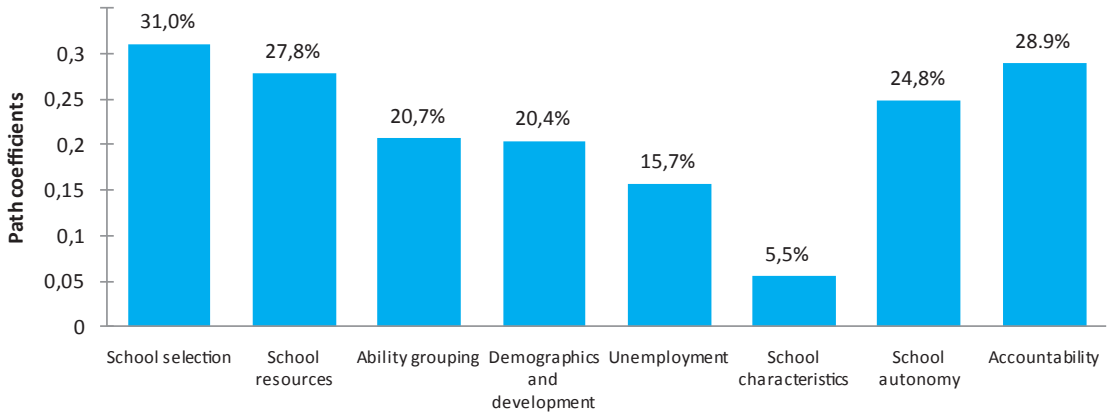
Compared to their peers in other CEE/CIS and OECD countries, students in Georgia are not often grouped by ability levels. Moreover, Georgian schools have more autonomy than other CEE/CIS countries, as national, regional or local authorities have less responsibility in hiring teachers and choosing textbooks. However, when compared to the OECD benchmark, school autonomy is lower in Georgia than in the CEE/CIS region on average.

With regards to the use of test and assessment results, only 22.3% of school stated that they post results publicly, while 91.1% use data to evaluate teachers' performance. Tests scores are used to monitor students' performance in 92.5% of schools in Georgia.

When the PISA variables are added to the multivariate models, school autonomy and accountability become noticeably significant, accounting for around 9% of the between-country variance.

In this case, partial least square regression models, which measure the relative contribution to variance of each category of factors, are a useful tool for presenting the role that individual indicators play.

Graph 12: Results from partial least square regression model



Partial least square (PLS) models allow us to group variables according to set classifications, and to evaluate the contribution of these groups of variables to the test score. The variables as they are grouped above follow the OECD PISA framework, adjusted for demographics, sociolinguistic and development indicators.

As can be seen, school characteristics such as class size, the repetition rate and the proportion of female teachers do not have a significant effect on reading scores. However, school selection variables, including the gross enrolment rate, the percentage of students attending private school and the percentage of pupils enrolled in TVET, do appear to influence the score. This should guide education policymakers to increase the number of private schools, increase the availability of technical or vocational programmes, and of course, to reduce the number of students not attending school. School resources are also a good way to improve student performance. It is clear that governments should spend more on education in order to get better results.

The effect of the PISA variables collected through the school questionnaire is consistent with those found in OECD or UNICEF publications. Grouping students according to their ability improves reading scores, while centralized systems where the school has little autonomy to hire teachers or choose textbooks tend to produce lower test scores. Finally, accountability variables, including school policies in managing tests and teacher performance, have negative effects on test scores.

FINDINGS FROM CHAPTER 5

- Georgia's GDP per capita is $4,319, less than half the CEE/CIS average.
- GDP per capita is correlated with test scores, both as a cause and consequence, since the state of the economy affects educational investment, potentially impacting student performance and affecting their ability to contribute to the economy.
- Over the period under study (2005-2009), the Government of Georgia allocated just 8.2% of its budget to education, a figure far below the international benchmark and CEE/CIS average.
- The 2008 war has led to increased military spending, but this has not affected the education budget.
- The language diversity index (from SIL) is a slightly higher in Georgia compared to other CEE/CIS countries, and considerably higher than in OECD countries. This indicator accounts for 10% of the variance in country scores, and offers a partial explanation as to why CEE/CIS countries, and Georgia in particular, have lower test scores than OECD countries.
- On average, Georgia has a higher Transparency Index (less corruption in governance) than other CEE/CIS countries
- The proportion of Internet users is very low (10.4%).
- Students in Georgia are not often grouped by ability levels, a characteristic which is associated with higher test scores.
- Georgian schools have more autonomy than in other CEE/CIS countries, since national, regional or local authorities have less responsibility in hiring teachers and choosing textbooks.
- The proportion of children attending private schools and the percentage of pupils enrolled in TVET has a positive impact on test scores and should be increased in Georgia.

CHAPTER 6
POLICY RECOMMENDATIONS

1. **Pre-primary school attendance**: Time spent in preschool and early childhood education must be increased. Results have shown that students enrolled for at least one year in preschool education perform better than their peers. The lack of preparedness for school has a significant impact on students' results, and this especially concerns students from ethnic and language minority communities. Increasing the enrolment rate in preschool of children from minority and/or disadvantaged backgrounds will improve their performance and help reduce inequity in education.

2. **National languages:** Pre-primary education should be delivered in different languages in order to facilitate the transition to primary education and learning in the Georgian language.

3. **School autonomy**: As described in the Regional UNICEF publication on PISA and after controlling for socio-demographic factors, it has been found that students perform better in countries where schools enjoy increased autonomy in designing their curricula, teaching materials and strategies. Therefore, it is important to pursue greater autonomy and decentralization in schools in order to improve the quality of education. Georgia's new curriculum, introduced in 2011, contains only 60% compulsory teaching material, and is a good initiative which needs to be encouraged and monitored.

4. **Overall learning time**: Absenteeism and learning time is a serious problem in Georgia. Students do not have the necessary learning time to acquire basic skills as defined by PISA. Therefore, it is necessary to develop strategies to fight against absenteeism and motivate students so that they obtain better results and do not drop out of school. The reasons behind absenteeism must be investigated to determine whether in-school or systemic issues concerning the quality of education are the principal push factors, or if issues outside school play a greater role. Measures must then be taken to tackle this phenomenon, which clearly has a negative impact on students' achievements.

5. **More time spent on language learning in secondary and primary education**: CEE/CIS countries and Georgia tend to spend more time studying the sciences to the detriment of students' language abilities. Given the complexity of the Georgian language and the fact that a significant portion of the population does not speak Georgian at home, more time should be devoted to language learning and reading, especially in the early grades.

6. **Monitor learning in the early grades**: Quality education starts in the first grade. Learning in the early grades is crucial for the overall quality of a student's education and should be monitored though Early Grade Reading Assessment (EGRA) and Early Grade Mathematics Assessment (EGMA).

7. **Teacher status**: Teachers in Georgia face problems in terms of their status. Salaries are low, and this encourages teachers to undertake additional teaching jobs in other (private) schools, or to provide paid, private tuition. Different studies have shown that increasing teachers' salaries have had more of an impact on students' performance than reducing class size. Therefore, the status of teachers should be re-examined, along with their training and qualifications, to ensure their competence and to give them the motivation and know-how to provide high-quality education.

8. **Re-examine policies on class size**: The pupil/teacher ratio is very low in secondary education, and is a deciding factor in determining the amount of teachers' salaries. Class size should not impact teachers' salaries, and this policy should be revised.

9. **Increase the education budget and revise its structure:** Georgia has among the lowest expenditures on education worldwide, and far below the international benchmark of 6% of GDP, a level Georgia attained back

in 1994. More of the budget should be allocated to education. A small increase in the class size would not impact education quality, but would liberate financial resources to allow for an increase in teachers' salaries and/or more expenditure on quality inputs, such as textbooks, teacher training, and school infrastructure.

10. **Encourage the development of private education**: The private education sector in Georgia is among the least developed in the CEE/CIS region, even though private schools usually outperform public schools. While the quality of public education must be ensured, it is also necessary to encourage the development of private schools in order to increase the supply of education and to better meet the specific needs of students (in particular language, special needs, and other requirements).

11. **Develop technical and vocational education programmes**: Technical and vocational education programmes are almost non-existent in Georgia at secondary education level. The unemployment rate is high among the 15-24 years old. In order to better match labour market needs, expand the learning opportunities of young people and increase their ability to contribute towards the Georgia economy, technical and vocational education programmes should be developed.

12. **Teaching materials/textbooks:** Ensure that every schoolchild has the textbooks he needs to learn, and that these textbooks are adapted to him (i.e. are provided in her/his learning language).

13. **Infrastructure and school environment**: It is important that the rehabilitation works of schools damaged during the 2008 conflict is pursued, and that these schools are better equipped to provide students with adequate learning materials (including laboratories and libraries). Attention must also be paid to the school environment, in particular to prevent any kind of violence taking place on school grounds.

14. **Critical thinking:** Although little information was available on curriculum content in Georgia, students' poor performance in PISA tests may be explained by the demands of the curriculum in Georgia. In general, not enough attention is paid to critical thinking in the programme and learning materials in CEE/CIS countries. Teachers should be encouraged to develop critical thinking among students and should be trained to do so.

15. **Develop use of ICT in education:** ICT programmes can be further developed to enhance pupils' learning experience and to provide training for teachers. This would be a cost effective solution to providing quality educational services to remote, rural schools, and would allow for efficient teacher training.

ANNEXES

ANNEX 1
METHODOLOGY OF DATA ANALYSIS

MICRO LEVEL DATA

In order to evaluate the effect of individual characteristics or school variables on students' performance, multilevel analyses were conducted. Unlike the least square regression method used to study the impact of an independent variable on a response variable across a number of schools, the multilevel method categorizes the variance created by the response variable into two groups, one relating to between-student variance and the other to between-school variance. This allows the researcher to distinguish the impact of independent variables according to their context. Moreover, these models measure the variability of the effect of individual variables between different schools. For example, the multilevel method makes it possible to distinguish the effect of socioeconomic status on students' performance for each school.

These complex models are implemented in several stages, as described below. The research questions were derived from the ACER PISA+ report, the regional UNICEF publication, the background paper for the CEE/CIS Call for Action (UNICEF), and from a literature review specific to Georgia conducted in Chapter 1. Other factors that are not included in the contextual framework of the PISA tests but which have a potential impact on students' performance are considered at the end of Chapter 5.

The first model is the *empty model* (M0), which does not include any independent variables, and which is used to divide variance into two groups: student-dependent variance and school-dependent variance. The variables relating to students are introduced first, starting with socioeconomic status, and school-related variables are added later. When conducting an analysis of a number of countries, it is possible to add a third, country-level group to take into account macro level factors affecting students' performance. This last method was not used in this report, although macro level variables were taken into account more generally by using PISA data, as well as other contextual indicators specific to the CEE/CIS region (please see Chapter 5 for more information).

The PISA Georgia dataset was analysed according the method described in the PISA data analysis manual, using SAS software. The data analysis steps are as follow:

- Correlations between reading scores and all available variables are calculated;
- Variables with a high degree of correlation with reading scores (over 0.15 or under -0.15) are kept in the study, while less significant variables are left out;
- If the variables in question are part of an index, the index is used;
- If several variables from one theme have a high degree of correlation with reading scores but do not belong to an index, then an index is created (for example: reading for school, remedial and extension);
- The internal consistency of each index is checked (according to Cronbach's alpha superior to 0.6);
- Student-related and school-related variables to be introduced into the model based on the research questions are chosen;
- Multiple imputation for missing values is carried out using average school values for student-level data;
- Sampling weights are normalized;
- The multilevel empty level model is created;
- The variables are added one by one in the models.

MACRO LEVEL DATA

Partial least square modelling:

The PLS regression method is used to reduce the number of variables forming latent variables that reflect the information contained in a number of variables. It allows the researcher to group variables measuring the same quantity and to see the impact of the latter by using a simple regression model. The internal model links the manifest variables to the latent variable that represents them. This variable is created using an iterative algorithm (Sidi (2012)). The external model is located between the latent variables and the actual scores.

The variables are separated into blocks:

- School resources: includes GDP per capita and expenditure on education, especially secondary education.
- School selection: the measure of gross enrolment, the availability of private schooling and TVET for secondary school students.
- Demographics and development variables: a measure of social conditions, including total population, population growth, language diversity, internet use, and the transparency index (level of corruption).
- School characteristics: reflects the educational system, and includes the pupil/teacher ratio, rate of student repetitions of a school year, and the percentage of female teacher in secondary schools.
- Unemployment: specifically youth unemployment.
- The practice of grouping students according to ability.
- Accountability: includes teachers' performance and the use of in-school testing.
- School autonomy: includes the decision-making capacity of the head teacher in selecting teachers and textbooks.

It should be noted that in this regression, the country indicators are assumed to have been measured without any measurement or sampling error, which in fact is not the case. However, it was decided that taking errors into account would not have had a substantial effect on the results.

Graph 13: Macro data framework

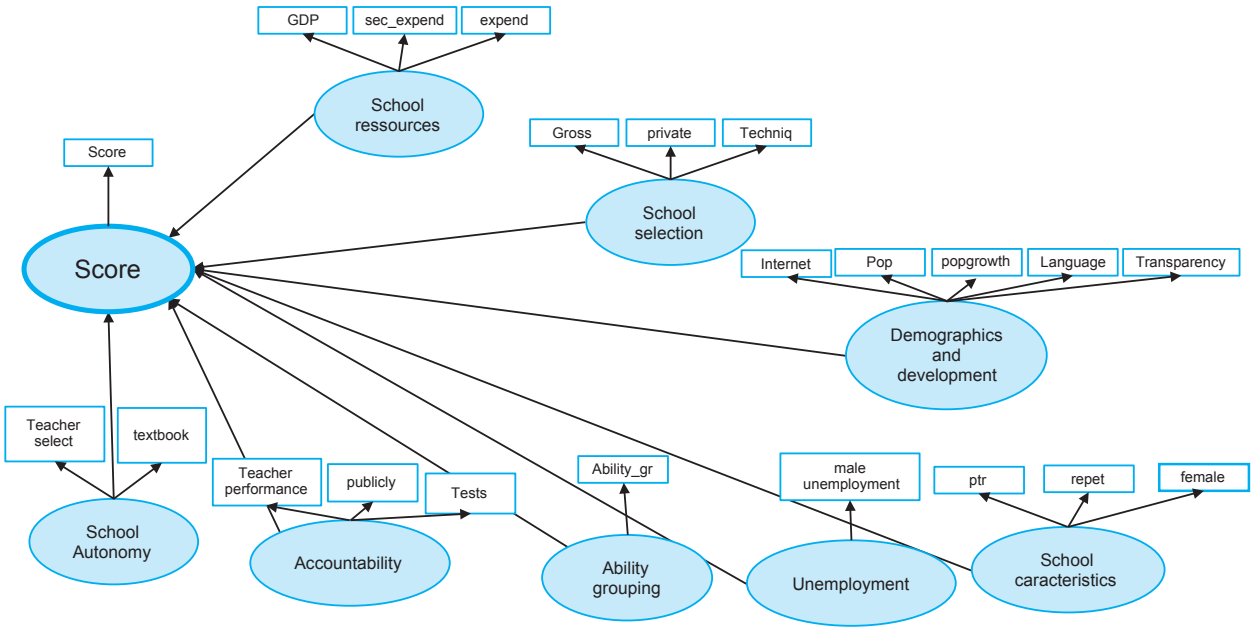


Table 9: Variables description for macro level data

Variables	Label	Response rate	Sources
Score	Reading score	100	PISA report
GDP	GDP per capita	95.8	Edstat query
Internet	Internet users (per 100 people)	95.8	Edstat query
Pop	Population, total	95.8	Unesco statistics
Ptr	Pupil/teacher ratio in secondary school	95.8	Edstat query
Repet	Total % of children repeating years in secondary school across all grades	95.8	Edstat query
Female	% of female teachers in secondary school	94.4	Edstat query
sec_expend	Educational expenditure on secondary school as % of total educational expenditure	95.8	Edstat query
Expend	Expenditure on education as % of total government expenditure	95.8	Edstat query
Private	% of enrolment in private secondary school	95.8	Edstat query
Popgroxth	Annual population growth %	95.8	Unesco statistics
Language	Language diversity index	95.8	Ethnologue
fem_unem	Unemployment among females	95.8	World bank
male_unemp	Unemployment among males	95.8	World bank
Gross	Gross enrolment ratio	97.2	Edstat query
Techniq	Technical/vocational enrolment in secondary school (ISCED 2 and 3) as % of total secondary enrolment (ISCED 2 and 3)	94.4	Edstat query
Transparenc	International Transparency Index	97.2	Transparency international
Ability_group	Students grouped by ability in some subjects	98.6	PISA RESULTS
Tea_select	Selecting teachers for hire	100.0	PISA RESULTS
textbook	Choosing which textbooks are used	100.0	PISA RESULTS
Tea_performance	Achievement data for accountability procedures used in evaluating teachers' performance	98.6	PISA RESULTS
publicly	Achievement data for accountability procedures posted publicly	98.6	PISA RESULTS
Tests	Test or assessment results used to monitor pupils' performance	97.2	PISA RESULTS

Table 10: **MCO Regression models of contextual variables**

	Estimated values of the parameters				
Variables	**Estimated parameters**	**test t**	**Pr > |t|**	**Tolérance**	**VIF**
Intercept	261.80762	3.5	0.001	.	0
GDP	0.00206	4.1	0.0001	0.3	4
Pop	9.05736E-08	3.6	0.0006	0.6	1.8
ptr	-0.85497	-0.6	0.5815	0.4	2.3
repet	-1.87976	-1.8	0.0807	0.8	1.3
female	0.71858	1.3	0.1901	0.5	2
sec_expend	-0.9788	-1.5	0.1401	0.7	1.4
expend	1.92891	1.4	0.165	0.6	1.8
private	0.37662	1.3	0.205	0.6	1.6
popgroxth	-7.74201	-3.1	0.003	0.4	2.4
Language	-43.79792	-2.5	0.0148	0.7	1.4
male_unemp	0.737	1	0.3249	0.6	1.7
GER	1.12017	2.4	0.0221	0.4	2.5
Techniq	0.55191	1.2	0.2367	0.5	1.9
Transparenc	0.30908	1	0.3352	0.4	2.8

$R^2 = 0.64$

ANNNEX 2
CRITIQUES OF PISA AND OTHER INTERNATIONAL ASSESSMENTS

Several critiques have been made of the PISA methodology (please see UNICEF publication page 23). Firstly, the absence of longitudinal performance data (both before and after testing) make it difficult to obtain a valid inference about the effects of school and system policies. Moreover, a teacher questionnaire is not included in the PISA, and teachers' practices are measured entirely through the responses from school heads and pupils. There is also a fairly substantial number of students for whom data is missing in the Georgia PISA data collection, including on critical issues such as private tuition.

According to Mortimore (2009), PISA is also limited in measuring what subjects are taught in schools (Mortimore, 2009). It does not take cultural differences and the fact that some languages are more difficult than others into account, including those with more irregular grammatical structures. PISA tests also do not consider national curricula, while the emphasis on asking questions which can be answered using common sense has been subject to much criticism. This study also found that PISA sampling is not always representative. As such, since PISA has become a reference material for measuring education outcomes, education policies can only be applied to the subjects that the survey centres on – namely reading, mathematics and science – causing other subjects to be ignored (Mortimore, 2009). Moreover, the PISA survey applies a cross-sectional design of people of a certain age, so comparisons in time can be biased as a result of an increase or decrease in migration, for example. The fact that the results are presented in tabular form to highlight comparisons between countries' rankings diverts attention away from factors related to education that ought to be the focus of the data.

Moreover, the dataset from Georgia has a high degree of exclusion at the school level in its sample, as all schools where Azerbaijani or Armenian is the language of instruction, as well as all schools situated in Abkhazia or South Ossetia, were excluded from the survey. Accordingly, only 88% of students in Georgia are represented in the survey.[1]

The Ministry of Education website does not mention the PISA results, while the Minister of Education is critical of the international survey, especially in terms of its timing.[2] It is regrettable that Georgia has decided not to take part in PISA 2012, which would enable the country to monitor changes brought about by its recent reforms in the education system. Instead, Georgia plans to participate in the PISA survey in 2015.

1 UNICEF regional publication.

2 Available from: http://www.mes.gov.ge/content.php?t=srch&search=national%20assessment&id=3424&lang=eng

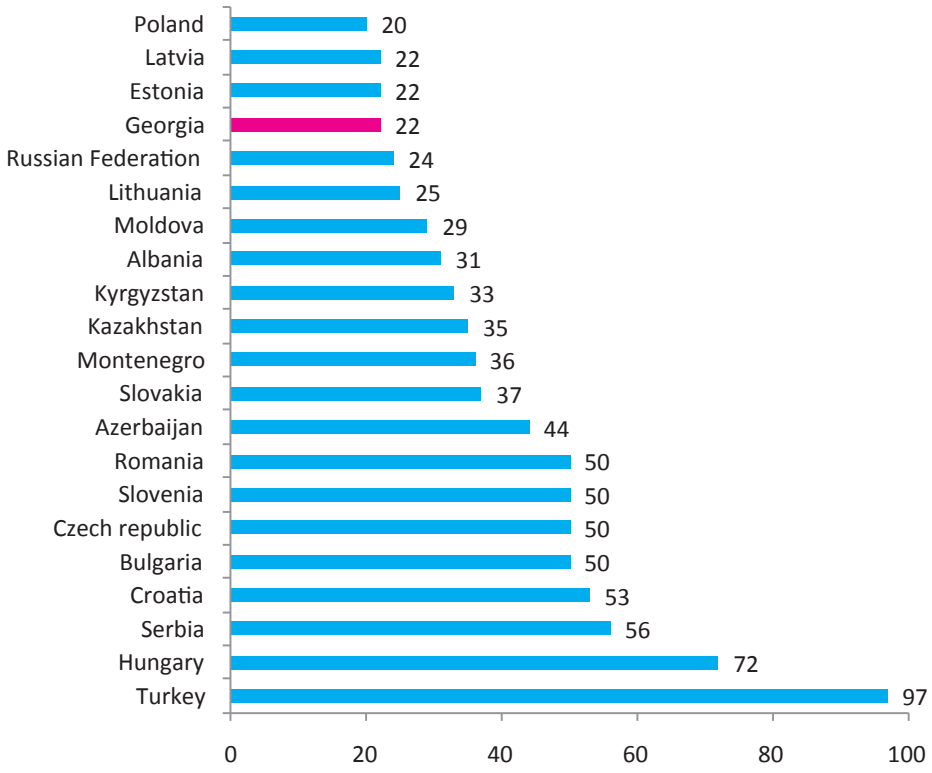
ANNEX 3
TABLES AND GRAPHS

Table 11: Reading performance domains: mean, Standard Error, and % of minimum competency

	Mean	Standard error (SE) mean	% of students attaining minimum competency
Access and Retrieve	357	3.49	34.9
Integrate and Interpret	385	2.59	40.8
Reflect and Evaluate	367	3.28	37.4
Continuous texts	381	2.88	40.8
Non-continuous texts	350	3.22	31.2

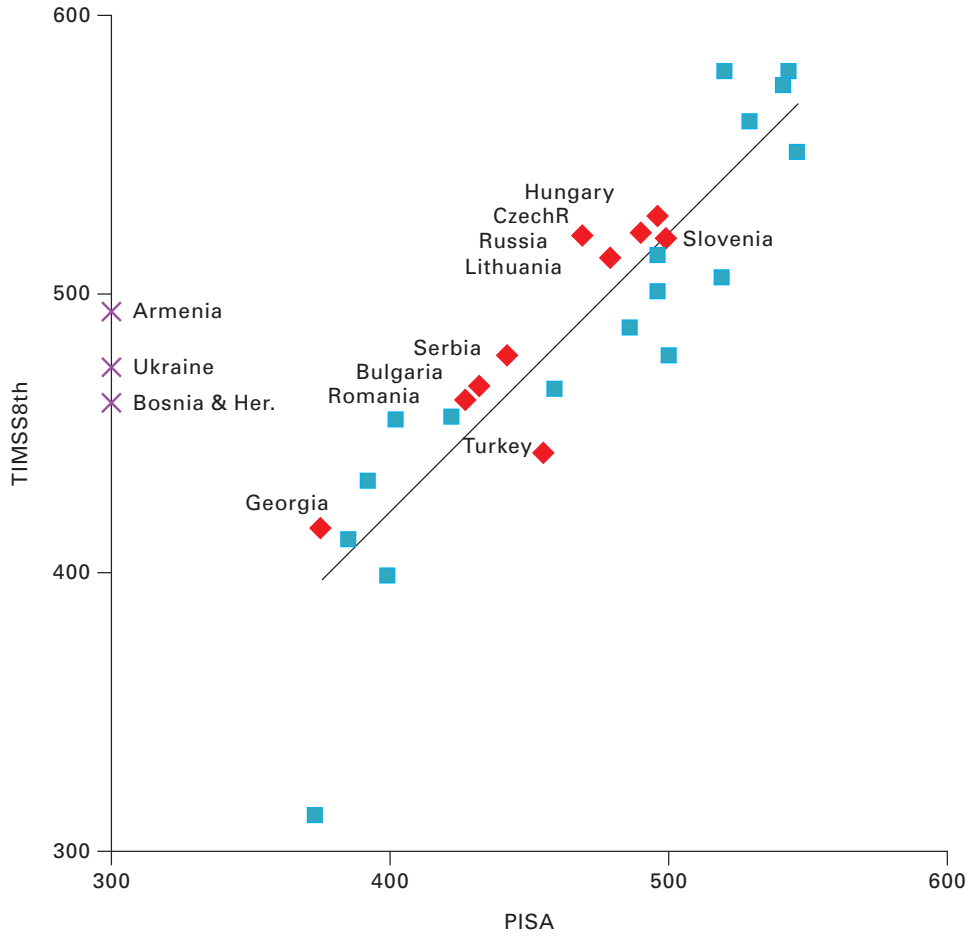
Source: PISA findings.

Graph 14: Percentage or variance in reading performance



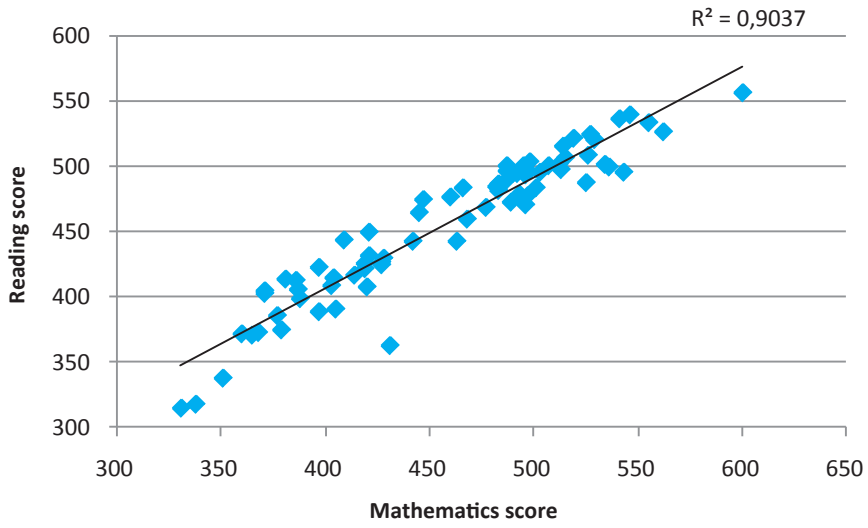
Source: PISA findings.

Graph 15: Mean performance in PISA 2009 and TIMSS 2007 (8th grade)



Source: UNICEF 2009 PISA report.

Graph 16: **The relationship between mathematics and reading test scores**



Graph 17: **The relationship between mathematics and science test scores**

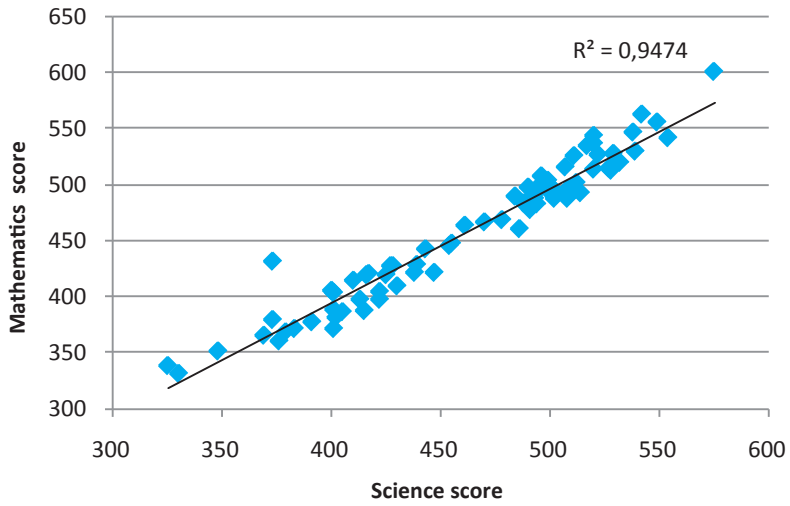


Table 12: PISA test scores by core demographic variables

			Reading		Mathematics		Science	
		Proportion	Mean	(SE)	Mean	(SE)	Mean	(SE)
Gender	Female	49.30%	405	3.02	381	3.09	383	3.03
	Male	50.70%	344	3.35	378	3.05	363	3.36
	Missing	na	na	na	na	na	na	na
School type	Public	94.40%	371	2.97	377	2.84	370	3.07
	Private	5.20%	435	12.3	435	15.3	424	9.28
	Missing	0.37%	na	na	na	na	na	na
School location	Village	34%	347	4,31	355	3,73	353	4,02
	Small Town	11,4%	364	7,88	377	9,24	371	9,25
	Town	21,1%	386	7,1	387	7,15	380	6,44
	City	7,96%	385	17,1	391	14,4	385	14,2
	Large City	25,3%	402	8,11	404	8,04	389	8,7
	Missing	0,29%	na	na	na	na	na	na
Language at home	Language of test	94.60%	378	-2.72	382	-2.77	375	-2.86
	Another language	2.28%	332	-17.4	365	-11.3	335	-14
	Missing	3.13%	321	-10.9	339	-8.21	346	-9.32
Having book	YES	86.30%	385	-2.82	388	-2.81	381	-2.89
	NO	9.80%	331	-5.71	344	-5.18	335	-5.43
	M	3.90%	266	-8.24	304	-7.4	287	-7.61
Lack of qualified teachers	Not at all	70.89%	370	4.11	377	4.06	370	3.87
	Very little	25.40%	382	6.07	384	5.86	377	5.67
	To some extent	3.60%	397	17.17	396	11.66	390	12.81
	A lot	0%	0	0	0	0	0	0
	M	0.11%	na	na	na	na	na	na
Preschool attendance	No	32.35%	356	3.97	364	3.69	359	3.84
	Yes, one year or less	13.59%	379	5.89	394	5.48	384	5.28
	Yes, more than one year	47.72%	398	3.06	396	3.17	389	3.54
	M	6.34%	293	5.95	312	6.44	308	6.43
"Perceived Hindrances to Student Learning - Student use of alcohol or illegal drugs"	Not at all	89,66%	375	3,33	381	3,15	374	3,09
	Very little	3,79%	377	16,87	379	17,24	375	14,63
	To some extent	0,38%	0	0	0	0	0	0
	A lot	4,27%	354	17,28	356	14,53	345	14,19
	Missing	1,89%	378	25,11	389	28,39	370	29,15

ANNEX 4
DEFINITION OF PISA PROFICIENCY LEVELS

READING PROFICIENCY LEVELS

Reading: Proficiency Level 6.

Tasks at this level typically require the reader to make multiple inferences, comparisons and contrasts that are both detailed and precise. They require demonstration of a full and detailed understanding of one or more texts and may involve integrating information from more than one text. Tasks may require the reader to deal with unfamiliar ideas, in the presence of prominent competing information, and to generate abstract categories for interpretations. Reflect and evaluate tasks may require the reader to hypothesize about or critically evaluate a complex text on an unfamiliar topic, taking into account multiple criteria or perspectives, and applying sophisticated understandings from beyond the text. A salient condition for access and retrieve tasks at this level is precision of analysis and fine attention to detail that is inconspicuous in the texts.

Reading: Proficiency Level 5.

Tasks at this level that involve retrieving information require the reader to locate and organize several pieces of deeply embedded information, inferring which information in the text is relevant. Reflective tasks require critical evaluation or hypothesis, drawing on specialized knowledge. Both interpretative and reflective tasks require a full and detailed understanding of a text whose content or form is unfamiliar. For all aspects of reading, tasks at this level typically involve dealing with concepts that are contrary to expectations.

Reading: Proficiency Level 4.

Tasks at this level that involve retrieving information require the reader to locate and organize several pieces of embedded information. Some tasks at this level require interpreting the meaning of nuances of language in a section of text by taking into account the text as a whole. Other interpretative tasks require understanding and applying categories in an unfamiliar context. Reflective tasks at this level require readers to use formal or public knowledge to hypothesize about or critically evaluate a text. Readers must demonstrate an accurate understanding of long or complex texts whose content or form may be unfamiliar.

Reading: Proficiency Level 3.

Tasks at this level require the reader to locate, and in some cases recognize the relationship between, several pieces of information that must meet multiple conditions. Interpretative tasks at this level require the reader to integrate several parts of a text in order to identify a main idea, understand a relationship or construe the meaning of a word or phrase. They need to take into account many features in comparing, contrasting or categorising. Often the required information is not prominent or there is much competing information; or there are other obstacles in the text, such as ideas that are contrary to expectation or negatively worded. Reflective tasks at this level may require connections, comparisons, and explanations, or they may require the reader to evaluate a feature of the text. Some reflective tasks require readers to demonstrate a fine understanding of the text in relation to familiar, everyday knowledge. Other tasks do not require detailed text comprehension but require the reader to draw on less common knowledge.

Reading: Proficiency Level 2.

Some tasks at this level require the reader to locate one or more pieces of information, which may need to be inferred and may need to meet several conditions. Others require recognising the main idea in a text, understanding relationships, or construing meaning within a limited part of the text when the information is

not prominent and the reader must make low level inferences. Tasks at this level may involve comparisons or contrasts based on a single feature in the text. Typical reflective tasks at this level require readers to make a comparison or several connections between the text and outside knowledge by drawing on personal experience and attitudes.

Reading: Proficiency Level 1a.

Tasks at this level require the reader: to locate one or more independent pieces of explicitly stated information; to recognize the main theme or author's purpose in a text about a familiar topic; or to make a simple connection between information in the text and common, everyday knowledge. Typically the required information in the text is prominent and there is little, if any, competing information. The reader is explicitly directed to consider relevant factors in the task and in the text.

Reading: Proficiency Level 1b.

Tasks at this level require the reader to locate a single piece of explicitly stated information in a prominent position in a short, syntactically simple text with a familiar context and text type, such as a narrative or a simple list. The text typically provides support to the reader, such as repetition of information, pictures or familiar symbols. There is minimal competing information. In tasks requiring interpretation the reader may need to make simple connections between adjacent pieces of information.

MATHEMATICS PROFICIENCY LEVELS

Math: Proficiency Level 6.

At Level 6 students can conceptualize, generalize and utilize information based on their investigations and modelling of complex problem situations. They can link different information sources and representations and flexibly translate between them. Students at this level are capable of advanced mathematical thinking and reasoning. These students can apply this insight and understanding along with a mastery of symbolic and formal mathematical operations and relationships to develop new approaches and strategies for attacking novel situations. Students at this level can formulate and precisely communicate their actions and reflections regarding their findings, interpretations, arguments, and the appropriateness of these to the original situations.

Math: Proficiency Level 5.

At Level 5 students can develop and work with models for complex situations, identifying constraints and specifying assumptions. They can select, compare, and evaluate appropriate problem-solving strategies for dealing with complex problems related to these models. Students at this level can work strategically using broad, well-developed thinking and reasoning skills, appropriately linked representations, symbolic and formal characterisations, and insight pertaining to these situations. They can reflect on their actions and formulate and communicate their interpretations and reasoning.

Math: Proficiency Level 4.

At Level 4 students can work effectively with explicit models for complex concrete situations that may involve constraints or call for making assumptions. They can select and integrate different representations, including symbolic representations, linking them directly to aspects of real-world situations. Students at this level can utilize well-developed skills and reason flexibly, with some insight, in these contexts. They can construct and communicate explanations and arguments based on their interpretations, arguments and actions.

Math: Proficiency Level 3.

At Level 3 students can execute clearly described procedures, including those that require sequential decisions. They can select and apply simple problem-solving strategies. Students at this level can interpret and use representations based on different information sources and reason directly from them. They can develop short communications reporting their interpretations, results and reasoning.

Math: Proficiency Level 2.

At Level 2 students can interpret and recognize situations in contexts that require no more than direct inference. They can extract relevant information from a single source and make use of a single representational mode. Students at this level can employ basic algorithms, formulae, procedures, or conventions. They are capable of direct reasoning and literal interpretations of the results.

Math: Proficiency Level 1.

At Level 1 students can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and to carry out routine procedures according to direct instructions in explicit situations. They can perform actions that are obvious and follow immediately from the given stimuli.

SCIENCE PROFICIENCY LEVELS

Science: Proficiency Level 6.

At Level 6, students can consistently identify, explain and apply scientific knowledge and knowledge about science in a variety of complex life situations. They can link different information sources and explanations and use evidence from those sources to justify decisions. They clearly and consistently demonstrate advanced scientific thinking and reasoning, and they demonstrate willingness to use their scientific understanding in support of solutions to unfamiliar scientific and technological situations. Students at this level can use scientific knowledge and develop arguments in support of recommendations and decisions that centre on personal, social or global situations.

Science: Proficiency Level 5.

At Level 5, students can identify the scientific components of many complex life situations, apply both scientific concepts and knowledge about science to these situations, and can compare, select and evaluate appropriate scientific evidence for responding to life situations. Students at this level can use well-developed inquiry abilities, link knowledge appropriately and bring critical insights to situations. They can construct explanations based on evidence and arguments based on their critical analysis.

Science: Proficiency Level 4.

At Level 4, students can work effectively with situations and issues that may involve explicit phenomena requiring them to make inferences about the role of science or technology. They can select and integrate explanations from different disciplines of science or technology and link those explanations directly to aspects of life situations. Students at this level can reflect on their actions and they can communicate decisions using scientific knowledge and evidence.

Science: Proficiency Level 3.

At Level 3, students can identify clearly described scientific issues in a range of contexts. They can select facts and knowledge to explain phenomena and apply simple models or inquiry strategies. Students at this level can

interpret and use scientific concepts from different disciplines and can apply them directly. They can develop short statements using facts and make decisions based on scientific knowledge.

Science: Proficiency Level 2.

At Level 2, students have adequate scientific knowledge to provide possible explanations in familiar contexts or draw conclusions based on simple investigations. They are capable of direct reasoning and making literal interpretations of the results of scientific inquiry or technological problem solving.

Science: Proficiency Level 1.

At Level 1, students have such a limited scientific knowledge that it can only be applied to a few, familiar situations. They can present scientific explanations that are obvious and follow explicitly from given evidence.

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