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PISA as a Study of Student Resilience

INTRODUCTION

Educating children and youth is a global imperative: ensuring the academic success of all students is necessary to meet the growing demands of a dynamic global economy and to promote individuals' wellbeing and quality of life. Academic achievement can also promote social mobility. Students who are equipped with greater skills and knowledge are more likely to enter careers that can help them exit a cycle of deprivation and low aspirations by improving their economic and social conditions (Hout and Beller, 2006). Education can improve not only an individual's life chances, but also the conditions of future generations: better educated parents generally have children who are healthier, who perform better at school and who have better labour market outcomes.

At present, many children struggle to master basic literacy and numeracy skills, especially students who face challenging economic and social circumstances. Nevertheless, there are some socio-economically disadvantaged students who are able to overcome their personal challenges and perform well at school. Here the focus is on this too often overlooked group of students: those disadvantaged students who are resilient – *i.e.* students who come from a relatively disadvantaged socio-economic background and yet exhibit relatively high levels of achievement. Resilient students may be a small minority, but they may also be crucial to our understanding of the characteristics and contexts that make a positive difference in the lives of vulnerable populations.

This report explores the factors and conditions that could help more students succeed at school despite challenging socio-economic backgrounds. It does this by studying resilient students and what sets them apart from their less successful peers. Understanding how educational systems can support disadvantaged students and help them "beat the odds" to succeed in school is a central challenge facing education policymakers, school administrators and teachers today.

The Programme for International Student Assessment (PISA), conducted by the Organisation for Economic Co-operation and Development (OECD), offers an opportunity to study resilient students across many countries. The assessment examines how well 15-year-old students are able to use the knowledge and skills they have gained to solve standardised tasks in reading, mathematics and science as they approach the end of secondary school. It also collects contextual information about the students, their families and their schools (Box 1.1). In 2006, 57 countries and more than 400 000 students participated in PISA.

SOCIO-ECONOMIC BACKGROUND AND ACADEMIC SUCCESS

The relationship between socio-economic background and student achievement is well documented and indicates that students from more advantaged backgrounds perform better at school. Since the publication in the 1960s of the landmark Coleman Report on equality and educational opportunity (Coleman *et al.*, 1966), numerous international and country-specific studies have reported a significant association between students' socio-economic background and their achievement at school (notable examples include Baker, Goesling and Letendre, 2002; and Crane, 1996). Recent evidence shows that the situation has not changed much over the past half century, with socio-economic background still one of the strongest correlates of academic performance (Sirin, 2005; OECD, 2001; OECD, 2004; OECD 2007a).

One of the key findings of the Coleman report was that school-level inputs were only weakly associated with student outcomes. More recent studies however suggest that schools do have a role to play in promoting student achievement (examples include Fuller and Clarke, 1994; Goldhaber and Brewer, 1997; Hanushek, 1986; and Wößmann, 2003). Notable examples of school-level factors that have a positive effect on achievement are smaller class sizes, teacher quality and peers' success (Hanushek *et al.*, 2002; Rivkin *et al.*, 2005).

Box 1.1 Key features of PISA 2006

Content

- Although the main focus of PISA 2006 was science, the survey also covered reading and mathematics. PISA considers students' knowledge in these areas not in isolation, but in relation to their ability to reflect on their knowledge and experience and to apply them to real world issues. The emphasis is on the mastery of processes, the understanding of concepts and the ability to function in various situations within each assessment area.
- The PISA 2006 survey also, for the first time, sought information on students' attitudes to science by including questions on attitudes within the test itself, rather than only through a complementary questionnaire.

Methods

- Around 400 000 students were randomly selected to participate in PISA 2006, representing about 20 million 15-year-olds in the schools of the 57 participating countries.
- Each participating student spent two hours carrying out pencil-and-paper tasks. In three countries, some students were given additional questions via computer.
- PISA contained tasks requiring students to construct their own answers as well as multiple-choice questions. These were typically organised in units based on a written passage or graphic, of the kind that students might encounter in real life.
- Students also answered a questionnaire that took about 30 minutes to complete and focused on their personal background, their learning habits and their attitudes to science, as well as on their engagement and motivation.
- School principals completed a questionnaire about their school that included demographic characteristics as well as an assessment of the quality of the learning environment at school.

Outcomes

- A profile of knowledge and skills among 15-year-olds in 2006, consisting of a detailed profile for science, and an update for reading and mathematics.
- Contextual indicators relating performance results to student and school characteristics.
- An assessment of students' attitudes to science.
- A knowledge base for policy analysis and research.
- Trend data on changes in student knowledge and skills in reading and mathematics.

Future assessments

- The PISA 2009 survey will return to reading as the major assessment area, while PISA 2012 will focus on mathematics and PISA 2015 once again on science.
- Future tests will also assess students' capacity to read and understand electronic texts – reflecting the importance of information and computer technologies in modern societies.

STUDENT RESILIENCE

Hundreds of research studies spanning four decades have chronicled the association between socio-economic background and student outcomes, but only a few have looked specifically at students who, despite coming from disadvantaged backgrounds, exhibit high levels of academic achievement (Finn and Rock, 1997; Rouse, 2001; Waxman and Huang, 1996). The educational research literature calls these students resilient because they overcome adversity to achieve academic success.

Resilience has been the subject of study in both the psychology and education fields. Several definitions of resilience have been proposed in the psychological literature. Although definitions vary widely depending on the specific context of empirical and theoretical studies, resilience generally involves the study of individuals who succeed despite encountering significant adversity (Luthar *et al.*, 2000). The lack of consensus on a definition of resilience is matched by the lack of consensus on *i)* the roots of resilience, *ii)* the factors associated with resilience, *iii)* whether resilience is the result of the interaction between individuals and the context in which they operate and *iv)* whether resilience can be promoted through concerted effort. While the exact definition of resilience also varies in the educational literature, both theoretical and empirical studies on student resilience examine disadvantaged students who, despite their background, exhibit high academic performance. Often these studies use relative outcomes on achievement tests to identify resilient students (examples include Connell *et al.*, 1994; Lee *et al.*, 1991; Rouse, 2001; Waxman and Huang, 1996). Others use achievement in combination with other characteristics, such as daily homework and motivation (see for example Finn and Rock, 1997; Padron *et al.*, 2000).

Both theoretical explorations and empirical analyses of resilience in the education literature have explored a wide range of school and student characteristics which may contribute to students beating the odds (for a good overview of the theoretical literature see Masten, 1994). Empirical studies indicate that resilient students may approach learning differently from other students: they generally put more effort in their studies and have a higher level of homework completion (Finn and Rock, 1997; Lee *et al.*, 1991). They display greater preparation and participation in class work and come to class on time more frequently (Finn and Rock, 1997). They make better use of their time both during and after school hours (Lee *et al.*, 1991), they participate more in extracurricular activities (Catterall, 1998) and they display greater engagement in academic activities (Catterall, 1998; Borman and Overman, 2004). Psychologically, resilient students tend to have a higher sense of self-esteem (Connell *et al.*, 1994; Borman and Overman, 2004), higher self-efficacy (Borman and Overman, 2004; Shumow *et al.*, 1999) and a greater sense of control over success and failure in school than their non-resilient counterparts (Connell *et al.*, 1994). Resilient students come from disadvantaged families by definition, but they tend to enjoy greater than average parental involvement (Shumow *et al.*, 1999; Connell *et al.*, 1994) and watch television less (Catterall, 1998), a possible indication of greater parental supervision.

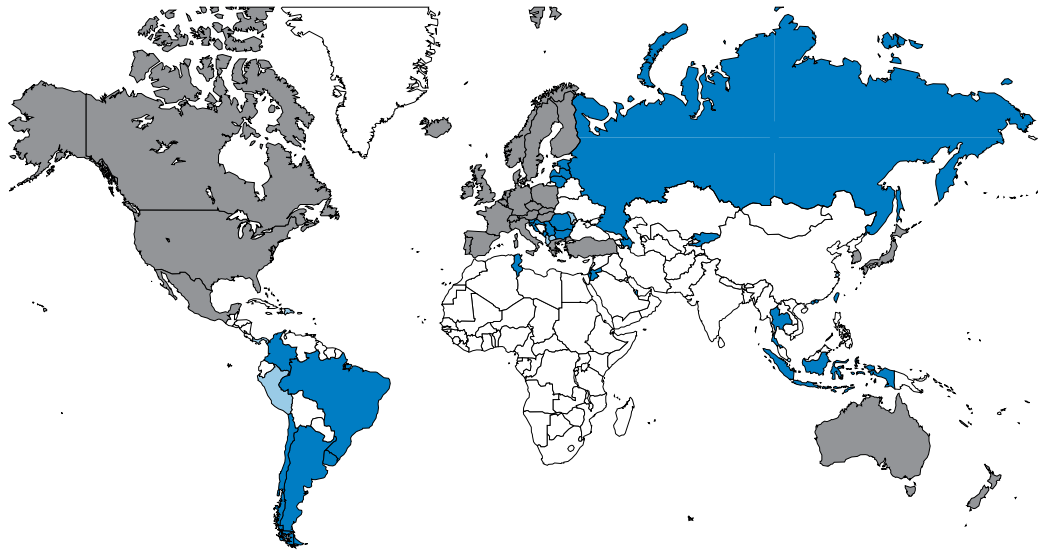
Findings from the studies reported above describe the features of resilient students using country-specific data, mostly from the United States, and thus may not be informative in settings that differ because of culture, institutions, economic development or educational systems. A cross-country analysis of student resilience can illuminate the stability of relationships across different settings and whether the key features associated with being a resilient student differ across countries.

THE PROGRAMME FOR INTERNATIONAL STUDENT ASSESSMENT (PISA) AS A STUDY OF STUDENT RESILIENCE

PISA is particularly suited for a cross-country investigation of student resilience: no other survey on academic achievement has the same breadth in terms of geographical coverage while containing rich information on the socio-economic circumstances of surveyed populations. In the 2006 cycle, nationally representative samples of 15-year-old students from all 30 OECD countries and 27 partner countries took part in the

PISA assessment (see Figure 1.1). This report uses data from all PISA 2006 participating countries except Liechtenstein and Qatar.[1] The PISA survey and assessments are specifically designed and tested to ensure comparability across countries. Most importantly for this study, PISA includes two key variables that enable the identification of resilient students: an index summarising the socio-economic background of individual students and measurements of students' literacy skills in science, mathematics and reading.

Figure 1.1
A map of PISA countries and economies



OECD countries*

Australia
Austria
Belgium
Canada
Czech Republic
Denmark
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Japan
Korea
Luxembourg
Mexico
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States

Partner countries and economies in PISA 2006

Argentina
Azerbaijan
Brazil
Bulgaria
Chile
Colombia
Croatia
Estonia
Hong Kong-China
Indonesia
Israel
Jordan
Kyrgyzstan
Latvia
Liechtenstein
Lithuania
Macao-China
Montenegro
Qatar
Romania
Russian Federation
Serbia
Slovenia
Chinese Taipei
Thailand
Tunisia
Uruguay

Partner countries and economies in previous PISA surveys or in PISA 2009

Albania
Costa Rica
Dominican Republic
Georgia
Himachal Pradesh-India
Kazakhstan
Macedonia
Malaysia
Malta
Mauritius
Miranda-Venezuela
Moldova
Netherlands-Antilles
Panama
Peru
Shanghai-China
Singapore
Tamil Nadu-India
Trinidad and Tobago
United Arab Emirates
Viet Nam

** These are the countries that were members of the OECD at the time of the PISA 2006 main data collection in 2006*

The PISA index of economic, social and cultural status is a comprehensive measure of socio-economic background. The indicator captures students' family and home characteristics that describe their socio-economic background. It includes information about parental occupational status and highest educational level, as well as information on home possessions, such as computers, books and access to the Internet (for additional information see OECD, 2007, Annex A1). Index values are standardised such that the mean

is equal to zero and the standard deviation equals one across all students in OECD countries. Therefore, a negative value on the economic, social and cultural status index means that the student's socio-economic background is below that of the OECD average student. The more socio-economically disadvantaged students are the lower are the values on the economic, social and cultural status index.

The assessment component of the PISA survey evaluates students' ability to apply their knowledge and skills to real-life situations. It covers three domain areas: reading, mathematics and science. In 2006, the PISA assessment focused on science and gathered a rich set of information on factors potentially related to academic success in this particular subject. Consequently, this report emphasises science literacy both in defining resilient students and in considering which approaches to learning may be particularly associated with resilience. The report also compares resilience in science to resilience in reading and mathematics. PISA assesses students' science literacy by testing their ability to perform scientific tasks in a variety of situations. In 2006, a large portion of the tasks were designed to measure students' performance in relation to science competencies and scientific knowledge (for more information see OECD, 2007, Chapter 2). Students' performance on these tasks was used to create standardised scales, constructed such that the average OECD student score was 500 points with a standard deviation of 100 points. This means that about two-thirds of students in the OECD countries scored between 400 and 600 points.

PISA also collects data on many of the variables the literature suggests may be important in understanding and promoting student resilience, such as students' approaches to learning, motivation and self-concept. By exploring the association between performance and such variables, this report seeks to provide policymakers with insights as to the policies and programs that are likely to foster academic success among their most challenging student populations. PISA includes many, but not all, the variables that have been shown to be associated with resilience in previous research. Important factors that are not included in PISA are student participation during class time, information on teachers' characteristics and information on specific policies and programmes which countries or schools may have implemented to promote resilience among disadvantaged students. Furthermore, using PISA, it is only possible to define resilience in terms of achievement in the PISA assessment - other outcome variables such as course grades, truancy, grade repetition and dropout rates are not available at the level of the individual student.

A final limitation of the report is that the PISA data only allow for the construction of a descriptive picture of resilience at a single point of time. As such, findings in this report cannot be interpreted through causal lenses (*i.e.* specific student approaches to learning cause resilience). Rather this report highlights important associations between variables (*i.e.* specific student approaches to learning are associated with or correlated with or related to resilience). In this way, the analysis provides new information and insights into patterns of and differences in student resilience across participating countries. As part of PISA 2006, 16 countries implemented an additional parent questionnaire. While the role of parents in resilience is important, this report however does not include any information from these data. The parent data for students from disadvantaged socio-economic backgrounds is limited and any analysis would have relied on an insufficient number of observations.

STRUCTURE OF THE REPORT

The rest of this report is organised as follows.

Chapter 2 presents two complementary approaches used to report on student resilience. The chapter also identifies as a suitable comparison group: those students who are also disadvantaged but do not achieve academic success and analyses those features that characterise resilient and disadvantaged low-achieving students. The first approach builds on an international benchmark of resilience, comparing students of similar socio-economic background across countries. An international perspective, however, provides

limited analytical power to draw insights for policies aimed at fostering resilience. The second approach tackles this limitation by providing a country-specific definition. This definition provides no internationally comparable data on the extent of resilience across countries, but it does deliver important insights on policy levers that are associated with more resilience in different educational systems. Thus, the rest of the report builds on this second approach to draw insights for policy for all of the countries and economies participating in PISA.

Chapter 3 explores the within-country association of student and school characteristics with resilience. The chapter compares resilient students to their disadvantaged low-achieving peers in terms of these characteristics and predicts the probability that disadvantaged students will be resilient depending on their characteristics and the environment in their schools.

Chapter 4 extends the analysis presented in Chapter 3 and attempts to capture the association between student and school characteristics with performance. The chapter looks at the varying relationships between student and school variables and performance and addresses the question of which student and school characteristics might help disadvantaged students close the performance gap with more advantaged students.

Chapter 5 summarises the key findings from this analysis and highlights several implications for educational policy and practice. The analysis focuses on the proximate outcomes through which policies and programmes may improve performance of socio-economically disadvantaged students and help them beat the odds.

Note

1. The exclusion of these two countries reflects data limitations. In the case of Liechtenstein, the sample was too small to produce reliable indicators for resilient students. In the case of Qatar, data on student socio-economic background were not sufficiently reliable to carry out a rigorous analysis of resilience.