2

How is equity in education changing?

This chapter examines trends in equity in education. It focuses on three areas: cognitive achievement, socio-emotional well-being and educational attainment. The chapter discusses disparities in student performance related to socio-economic status and how those differences evolve over time. It also explores students' sense of belonging at school, their beliefs about their own academic abilities, and their expectations for their future. The chapter considers how educational attainment in countries has changed over recent decades and what that means for social (educational) mobility across generations.

Notes regarding Cyprus

Note by Turkey: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognized by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

A note regarding the Russian Federation concerning Survey of Adult Skills (PIAAC) data

Readers should note that the sample for the Russian Federation does not include the population of the Moscow municipal area. The data published, therefore, do not represent the entire resident population aged 16-65 in Russia but rather the population of Russia excluding the population residing in the Moscow municipal area.

More detailed information regarding the data from the Russian Federation as well as that of other countries can be found in the Technical Report of the Survey of Adult Skills (OECD, 2016[11]).

A note regarding Israel

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

A note regarding Lithuania

Lithuania was not an OECD member at the time of preparation of this publication. Accordingly, Lithuania is shown as a partner country and is not included in the OECD average.

This document, as well as any data and map included herein, are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

What the data tell us

- Equity in science, reading and mathematics performance has improved across PISA cycles, on average across OECD countries. In seven countries (Chile, Denmark, Germany, Mexico, Montenegro, Slovenia and the United States) equity in achievement improved in all three core subjects; but in 14 countries equity did not improve in any subject.
- Differences in achievement related to socio-economic status grow over students' lives. On average across 11 OECD countries with comparable data, the magnitude of the achievement gap during childhood is about two-thirds as large as the gap observed during adolescence. Inequalities also grow, although less markedly, between adolescence and early adulthood.
- Disparities related to socio-economic status in students' psychological well-being, as measured by students' science self-efficacy and career expectations, are large even when comparing students with the same cognitive achievement. Disparities in social well-being, as measured by students' sense of belonging at school, are smaller and tend to disappear once performance differences are taken into account.
- On average across countries that participated in the Survey of Adult Skills (PIAAC), 41% of adults completed a higher level of education than their parents did (upward educational mobility), 48% attained the same highest level of education as their parents (no mobility), and 11% attained a lower level of education than their parents (downward mobility).
- The probability of completing tertiary education among adults with low-educated parents was 18% among older adults (those born in the mid-1940s and 1950s) and 24% among younger adults (those born in the mid-1970s and 1980s). For adults with highly educated parents, the probability of completing tertiary education was 61% among older adults and 69% among younger adults.

EQUITY IN EDUCATION: A FRAMEWORK

Equity in education is examined in this report by looking at socio-economic disparities in students' education outcomes. Equity is greater when the relationship between students' outcomes and socio-economic status is weaker. This does not mean that all students have equal outcomes; indeed, some degree of inequality in education outcomes is to be expected in any school system. Equity means that whatever inequality exists between students in a school system, it is not related to students' socio-economic status (Willms, 2006[2]; Downey and Condron, 2016[3]; Roemer and Trannoy, 2015[4]).

The terms "equity" and "equality" are often confused but they do not mean the same thing. Equity in education is synonymous with equality of education opportunities, thus inequity implies a lack of fairness. Inequality is not necessarily unfair, as differences in student outcomes might be due to differences in students' efforts, interests, talents or even luck. However, as this report shows, in

practice, a large part of the inequality in students' outcomes is indeed related to socio-economic status, and is thus an equity issue that calls for better education policies and practices. Policies that improve equity in education are those that level the playing field among students of different socio-economic status, so that all students get a fair chance to succeed in school and in their future life.

This report considers socio-economic disparities in three kinds of education outcomes: cognitive achievement, social and emotional well-being, and educational attainment.

Students' cognitive achievement (also referred to as "performance") is measured by PISA scores in science, reading and mathematics. Students participate in PISA when they are 15 years old. However, in certain sections of the report, cognitive achievement is also considered at earlier and later ages. This is important because social inequities in performance develop early and continue to grow during later stages of life. Data from international studies other than PISA – notably the Trends in International Mathematics and Science Study (TIMSS), for data on 4th-grade students, and the Survey of Adult Skills, a product of the OECD Programme for the International Assessment of Adult Competencies (PIAAC), for data on adults aged 25 to 29 – are used in these analyses. Analyses explore how equity in performance has evolved over time in PISA-participating countries; how disparities in performance between advantaged and disadvantaged students develop and widen through students' lives; what factors make it more likely for disadvantaged students to perform as well as the best students in their own countries and attain good levels of performance in core subjects; and how a school's socio-economic profile relates to the performance of disadvantaged students.

Students' social and emotional outcomes (also referred to as "well-being") are measured using PISA data. PISA's student questionnaires collect information on variables such as students' self-efficacy, career expectations, and sense of belonging and social integration at school. Analyses explore how equity in students' well-being has evolved over time, and the extent to which disadvantaged students are socially and emotionally resilient. The report looks at students' well-being because socio-economically disadvantaged students not only tend to perform worse, academically, than advantaged students, but they are also less likely to enjoy a sense of belonging at school and to feel confident when faced with challenging evaluations and tasks (OECD, 2017[5]).

Disparities in a third kind of outcome, educational attainment, are also considered in the report. While cognitive achievement and well-being matter in themselves, they are also important because they influence student outcomes in post-secondary education and the labour market. Data from PISA are insufficient to determine educational attainment because the assessment measures proficiency among 15-year-old students, and many people continue their education well beyond this age. Differences between countries in average years of schooling completed are examined using data compiled by R. J. Barro and J. W. Lee (Barro and Lee, 2013[6]). The analyses also look at the highest level of education completed by adults in different countries, and whether or not this level is higher than the level attained by their parents (i.e. upward educational mobility). The analyses also consider whether differences in the attainment of tertiary education are related to differences in socio-economic status. These analyses are based on data from PIAAC, which surveys adults aged 26 to 65. The report also explores cross-national

differences in social mobility based on student-level longitudinal data in five countries. It looks at disparities in the probability of earning a university degree and obtaining a skilled job by the age of 25, accounting for students' academic performance at 15.

Students' socio-economic status is measured using the PISA index of economic, social and cultural status (ESCS; Box 2.1). But in some cases, socio-economic status is measured by parents' education or by the number of books at home.

Box 2.1 **How PISA measures socio-economic status**

Socio-economic status is a broad concept that summarises many different aspects of a student, school or school system. In PISA, a student's socio-economic status is typically measured by the PISA index of economic, social and cultural status (ESCS).

ESCS is a composite score built by the indicators of three components via principal component analysis:

- Parents' highest level of education (PARED index[1])
- Parents' highest occupational status (HISEI index[1])
- Home possessions (HOMEPOS index[1]), a proxy measure for family wealth that includes the following items:
  - availability of country-specific household items, such as a subscription to a daily newspaper, an MP3 player, high-speed Internet connection or other
  - the number of books at home
  - other educational resources available in the home, such as a computer that can be used for school work or specific educational software.

Information about PARED, HISEI and HOMEPOS for each student was collected through the student questionnaire, a survey that students answered after completing the PISA cognitive assessment.

The rationale for using these three components is that socio-economic status is usually regarded as being based on education, occupational status and income. As no direct income measure is available from the PISA data, the availability of household items is used as a proxy for family wealth.

The ESCS is constructed to be internationally comparable. The values of the ESCS scale are standardised to have a mean of zero and a standard deviation of one for the population of students in OECD countries, with each country given equal weight (for a more technical description of how the index is computed, please see *PISA 2015 Technical Report* [OECD, 2017[7]]).

The ESCS index makes it possible to draw comparisons between students and schools with different socio-economic profiles. The higher the value of ESCS, the higher the socio-economic status.

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For the purposes of this report, ESCS is used in the analysis to distinguish among students who are:

- **socio-economically advantaged**: those who are among the 25% of students with the highest values on the ESCS index in their country or economy
- **socio-economically disadvantaged**: those whose values on the ESCS index are among the bottom 25% within their country or economy
- **socio-economically average**: those whose values on the ESCS index are in the middle 50% within their country or economy.

Following the same logic, **schools** are classified as **socio-economically advantaged, disadvantaged or average** within each country or economy based on their students' mean values on the ESCS index.

An index of economic, cultural and social status has been used since the first PISA assessment (PISA 2000). However, the components of ESCS and the scaling model have changed over cycles, meaning that values on the ESCS index are not directly comparable across cycles. In order to allow for trend analyses, in PISA 2015, the ESCS was computed for the current cycle and also recomputed for earlier cycles using a similar methodology (see *PISA 2015 Technical Report* [OECD, 2017[7]]).

This measure of socio-economic status captures multiple relevant dimensions of an individual's economic and social position relative to others in society, and can be easily compared within and between countries for various PISA cycles. In addition, with the rescaling of ESCS from previous cycles in 2015, valid comparisons can be made across time. However, differences in results between PISA analyses and national research for specific countries may still be observed for a number of reasons, including discrepancies in sampling, weighting, measurement, variable construction and estimation methods.

1. Please refer to the *PISA 2015 Technical Report* (OECD, 2017) for detailed information on these components.

Source: OECD (2017), *PISA 2015 Technical Report*, OECD Publishing, Paris.

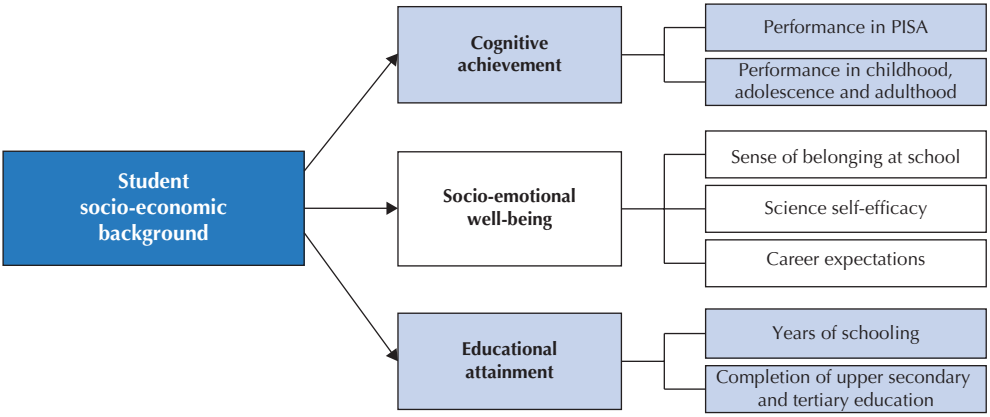
HOW IS EQUITY IN EDUCATION CHANGING?

Has equity in education increased, decreased or remained stable over the past few decades? This chapter examines the evolution of socio-economic inequalities in education. It contains three sections, each describing equity in a different education outcome: cognitive achievement, socio-emotional well-being and educational attainment. These outcomes are examined using the measures shown in Figure 2.1.

Trends in cognitive achievement are examined in the first section. Education matters in the labour market, and in other domains of life, partly because it leads to the acquisition of more, and more advanced, knowledge and cognitive skills. Socio-economic gaps in cognitive achievement are evident among 15-year-old students, as PISA results show, but the size of these gaps differs

greatly among countries and, as shown here, they are not fixed over time. Furthermore, socio-economic inequalities in student achievement are observed much earlier than age 15, and they continue to evolve throughout later stages of students' lives. The emergence and evolution of achievement gaps is examined in this chapter by comparing disparities during childhood, adolescence and young adulthood, using data from the Trends in International Mathematics and Science Study (TIMSS), the OECD Programme for International Student Assessment (PISA) and the OECD Programme for the International Assessment of Adult Competencies (PIAAC).

Figure 2.1 ■ **Equity in education outcomes**



Student well-being is a more recent focus of research in international studies of education. A quality educational experience also involves the acquisition of social and emotional competencies. PISA conducted a review of student well-being in 2015 (OECD, 2017[7]), but earlier PISA cycles included indicators of some aspects of well-being, particularly students' psychological and social health, thus allowing for an analysis of trends in equity in these outcomes. The fourth section of the chapter examines disparities related to socio-economic status in sense of belonging at school, students' self-efficacy and career expectations.

Equity in educational attainment is the focus of the fifth section of the chapter. The expansion of access to primary, secondary and tertiary education that has occurred around the world since the middle of the 20th century suggests that more education opportunities are available today than were available in the past. But are these new opportunities allocated more equitably among students from different backgrounds? The literature is inconclusive about this, with some studies finding "persistent inequality" over time (Shavit and Blossfeld, 1993[8]; Pfeffer, 2008[9]), while other studies find signs of equalisation in educational attainment (Breen et al., 2009[10]; Dorius, 2013[11]). This chapter examines whether there has been a change over time in the extent to which students from wealthier countries and socio-economically advantaged families are more likely than students from developing countries and disadvantaged families to progress in school and attain higher academic degrees.

Findings in this chapter show that, on average across OECD countries, equity in education is increasing in some dimensions but not in others. Socio-economic disparities in science, reading and mathematics achievement have declined over PISA cycles, albeit by small margins, on average across OECD countries. In terms of students' psychological well-being, inequities in students' science self-efficacy are large and have remained so over the years, but inequities in students' career expectations have narrowed. Inequities in students' sense of belonging at school are small and have not changed much over the PISA cycles. Finally, large socio-economic differences in educational attainment, for example, in the completion of tertiary degrees, have not narrowed over the past few decades, despite the expansion of education observed during this period.

Average trends do not necessarily reflect the reality of individual countries. Providing a detailed explanation for the trends observed in different countries and economies goes beyond the scope of this report. A number of different factors are surely at play, such as changes in education policy and practice (particularly those aimed at compensating for differences in students' socio-economic status) or broader changes in society, such as trends in income inequality and immigration, among others. Additional information on five countries (Australia, Canada, Denmark, Switzerland and the United States) for which longitudinal data exist is provided in Chapter 5. Further research is needed in order to contextualise these findings and develop possible explanations for the trends observed.

TRENDS IN EQUITY IN COGNITIVE ACHIEVEMENT

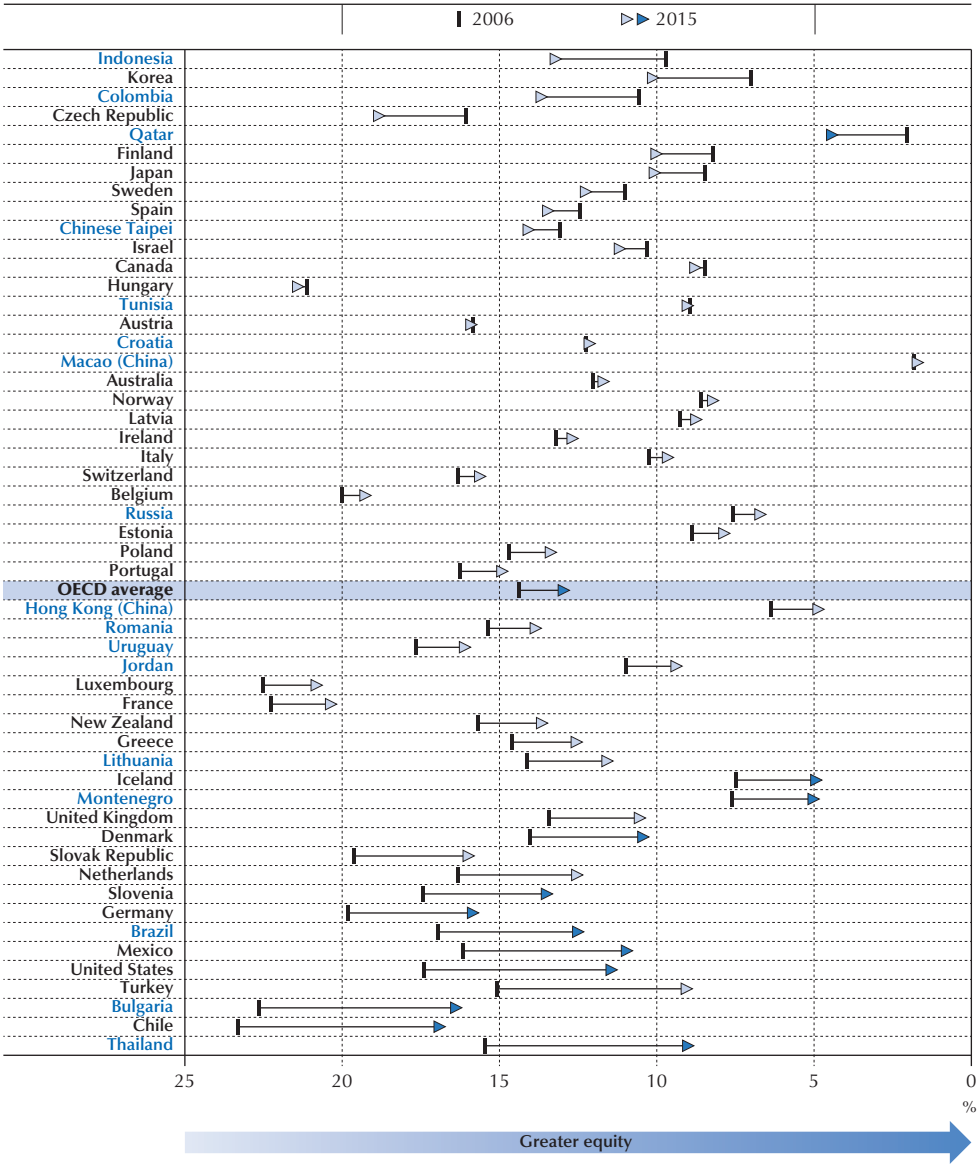
In all countries and economies that participated in PISA 2015, and in the three core cognitive domains assessed in PISA (science, reading and mathematics), students of higher socio-economic status scored better than students of lower socio-economic status. However, in some countries and economies student performance can be predicted solely by students' socio-economic status more accurately than in other countries. There are also large differences among countries in the size of the gap in achievement between advantaged and disadvantaged students. Furthermore, the size of this gap varies over the course of students' lives, as students complete the transitions from childhood (primary school) to adolescence (secondary school) to young adulthood (tertiary education and the labour market). Last but not least, levels of equity in student achievement have changed over the past 15 years in many countries that participated in PISA. In other words, the influence of socio-economic background on student achievement, although strong everywhere, is far from deterministic and fixed. There is much that teachers and educators, school communities, policy makers, families and students themselves can do to compensate for and overcome the inequity in education opportunities that socio-economically disadvantaged students often face (see Chapter 1 on policy implications).

Socio-economic disparities in student achievement

Science was the main domain of assessment in PISA 2015 and in PISA 2006. Over this period, equity in science achievement, as measured by the strength of the socio-economic gradient (see Box 2.2), improves slightly. In 2006, on average across OECD countries, 14.4% of the variation in students' science performance was explained by students' socio-economic status, whereas in PISA 2015, 12.9% was – a small, but statistically significant, change of 1.4 percentage points in the direction of greater equity.

Figure 2.2 ■ **Change between 2006 and 2015 in equity in science performance**

Percentage of variation in science performance explained by students' socio-economic status

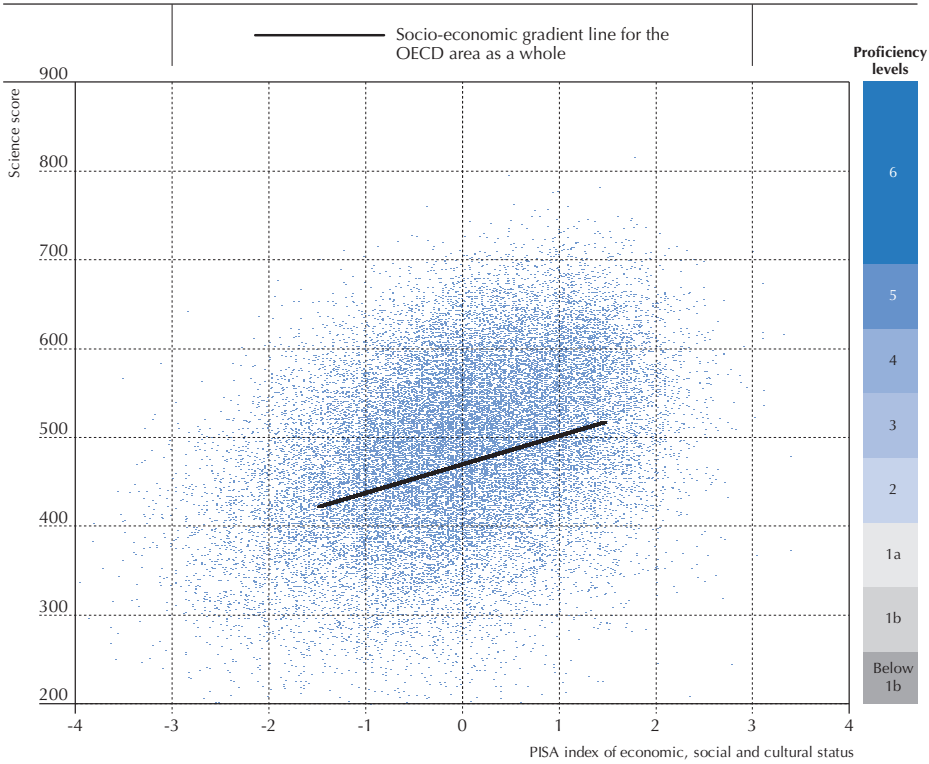


Notes: Socio-economic status is measured by the PISA index of economic, social and cultural status of students.
Statistically significant differences between 2006 and 2015 are shown in dark blue.
Countries and economies are ranked in descending order of difference between 2006 and 2015 in the percentage of variation in science performance explained by students' socio-economic status.
Source: OECD, PISA 2006 and PISA 2015 Databases, Table 2.2.
StatLink https://doi.org/10.1787/888933830158

Box 2.2 The socio-economic gradient: Measuring socio-economic inequalities in cognitive achievement

A common measure used in PISA reports to examine the level of equity of education systems is the so-called "socio-economic gradient". The socio-economic gradient captures the average association between students' scores in PISA assessments and students' socio-economic status, as measured by the PISA index of economic, social and cultural status, or ESCS (Box 2.1 describes how the ESCS index is computed). This gradient can be represented graphically, as in Figure 2.3, as the straight line that best fits the heterogeneous combinations of scores and socio-economic status among students.

Figure 2.3 ■ Students' socio-economic status and average performance across OECD countries



Note: Each dot represents an OECD student picked at random out of ten OECD students.
Source: OECD, PISA 2015 Database.
StatLink https://doi.org/10.1787/888933830177

The socio-economic gradient provides two key pieces of information: the slope and the strength of the relationship between student achievement and the ESCS index.

...

The *slope* of the gradient line indicates how many score points in a PISA assessment are associated with a one-unit increase in the ESCS index. On average across OECD countries in PISA 2015, one point in the ESCS index was associated with 38 score points in the science assessment – more or less equivalent to one year of school instruction (see Box I.2.1 in OECD, 2016[12]). The slope of the gradient was much steeper than average – meaning that the extent of inequality attributable to socio-economic status was greater – in the Czech Republic and France, where the score difference was greater than 50 points. Countries and economies where the slope of the gradient was flatter than average – meaning that there was greater equity – include Algeria, Hong Kong (China), Kosovo, Macao (China), Mexico and Tunisia, where the difference associated with socio-economic status was less than 20 score points (Table 2.1).

The *strength* of the socio-economic gradient is the percentage of variation in student performance accounted for by students' socio-economic status (a.k.a. coefficient of determination or "R squared"). This measure describes the extent to which student performance can be predicted based solely on the family's socio-economic status. If a larger percentage of the variation in performance is related to students' socio-economic status, it means that students' success in school depends more on family factors and other "accidents of birth" over which students have no control, and less on students' own actions, talents and effort.

On average across OECD countries in 2015, students' socio-economic status accounted for 13% of the variation in science performance (Table 2.2) (OECD, 2016[12]). In the countries with the least equity in student achievement, socio-economic status accounted for about 20% of the variation in science scores; in Ciudad Autónoma de Buenos Aires (Argentina) (hereafter "CABA [Argentina]"), 26% of the variation was related to socio-economic status. In the countries and economies with greater equity, socio-economic status accounted for about 5% of the variation in student performance. In Macao (China), socio-economic status accounted for 2% of the variation, and in Algeria it accounted for only 1% of the variation.

Source: OECD (2016), *PISA 2015 Results (Volume I): Excellence and Equity in Education*, http://dx.doi.org/10.1787/9789264266490-en.

Between 2006 and 2015, equity in science performance improved in 11 countries and economies that participated in both PISA cycles: Brazil, Bulgaria, Chile, Denmark, Germany, Iceland, Mexico, Montenegro, Slovenia, Thailand and the United States. In nine of these countries, no drop in mean science performance or in the percentage of top-performing students was observed during the period. This shows that equity in student achievement can be improved without damaging the quality of the system or penalising more advanced students. However, this is not always the case. In Iceland, the mean science score dropped by 18 points during the period while in Slovenia the share of top performers in science shrank by 2.3 percentage points.

Only in Qatar did equity in science performance worsen during the period. No changes were observed in 40 countries and economies that participated in the two PISA cycles.

Equity in reading achievement has also improved. The percentage of variance in reading scores accounted for by differences in students' socio-economic status decreased by 2.4 percentage points between 2000 and 2015, on average across OECD countries with comparable data[1] (see Figure 2.4). In PISA 2000, 14.3% of the variation in student performance was related to socio-economic status. Between 2000 and 2009, the two cycles when reading was the main domain of assessment in PISA, the level of equity in reading remained about the same. But in PISA 2015, 11.9% of the variation in reading scores was accounted for by differences in students' socio-economic status, less than in 2009 and 2000.

Between 2000 and 2015, equity in reading performance improved in 11 out of 35 countries and economies with comparable data. The largest improvements were observed in Germany and the United States, where the relationship between socio-economic status and reading performance weakened by 10 percentage points or more. In Chile, Germany and Israel, equity in reading performance and the average level of reading performance improved during this period; in Australia equity improved while average reading performance declined. Inversely, in Belgium the influence of socio-economic status on performance strengthened during this period.

Equity in mathematics achievement also improved over PISA cycles, as shown in Figure 2.5. Between 2003 and 2012, the two PISA cycles in which mathematics was the main domain assessed, the percentage of variation in mathematics performance accounted for by socio-economic status decreased by 2.2 percentage points (it was 16.9% in 2003 and 14.7% in 2012), on average across OECD countries with comparable data. This average trend towards equity in mathematics performance continued in PISA 2015, when differences in students' socio-economic status accounted for only 13.1% of the variation in mathematics scores, on average across OECD countries with comparable data.

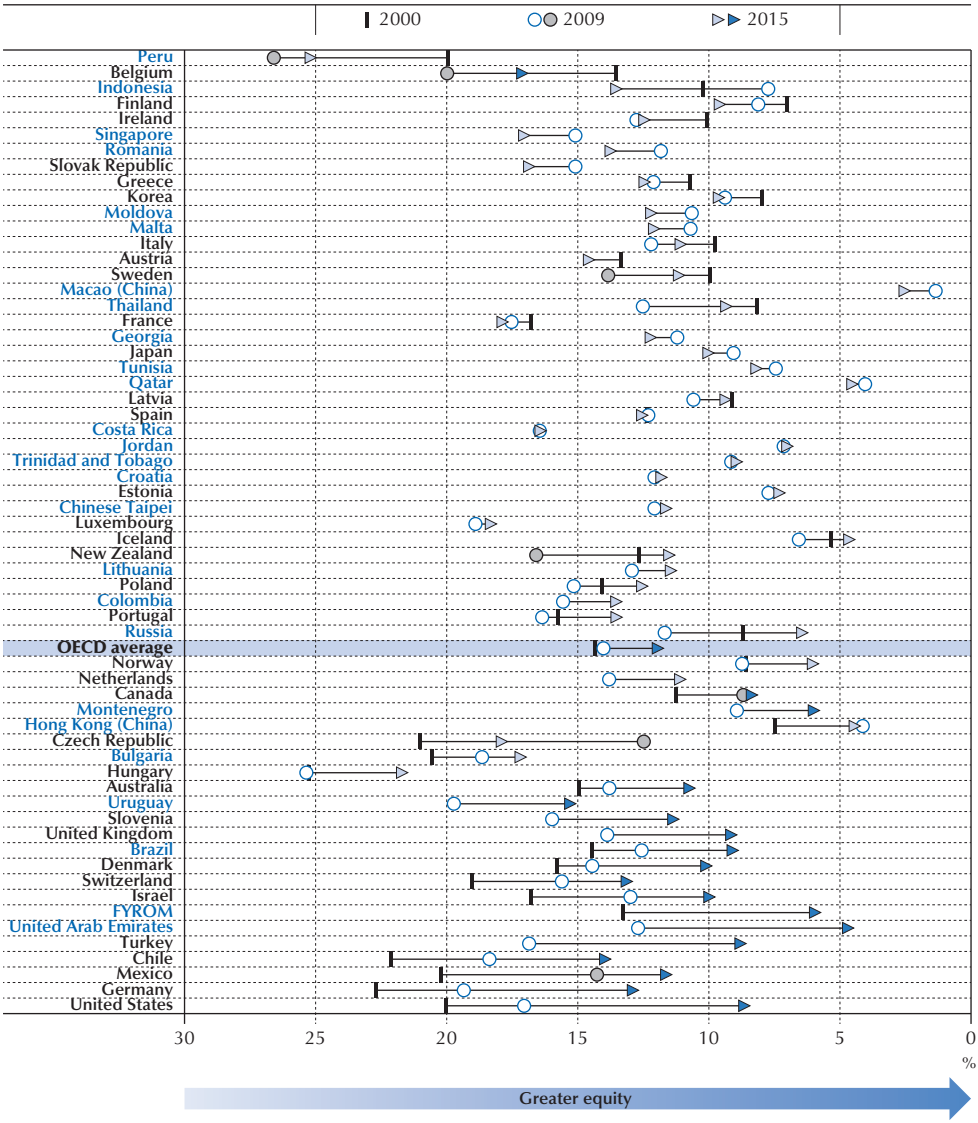
Between 2003 and 2015, 15 out of 38 countries with comparable data improved equity in mathematics performance. In Turkey, the improvement in equity in mathematics performance was the largest (a change of 14.7 percentage points); in Germany too the change was large (10 percentage points). In some countries (e.g. Italy, Mexico), improvements in equity were accompanied by improvements in mathematics performance, while in others (e.g. Belgium, the Netherlands, New Zealand, the Slovak Republic) performance declined as equity improved. By contrast, equity worsened in Indonesia, where the variation accounted for by socio-economic status increased by 9.8 percentage points between 2003 and 2015 – from 6.3% to 16.1%.

In seven countries – Chile, Denmark, Germany, Mexico, Montenegro, Slovenia and the United States – equity in achievement improved over PISA cycles in all three domains (science, reading and mathematics).

In 14 countries and economies – Estonia, Finland, France, Hong Kong (China), Hungary, Ireland, Japan, Lithuania, Luxembourg, Macao (China), Romania, Spain, Sweden and Tunisia – equity did not improve over PISA cycles in any of the cognitive domains assessed.

Figure 2.4 ■ **Change between 2000 and 2015 in equity in reading performance**

Percentage of variation in reading performance explained by students' socio-economic status



Notes: Socio-economic status is measured by the PISA index of economic, social and cultural status of students.

Statistically significant differences between 2000 and 2009 are shown in grey.

Statistically significant differences between 2000 and 2015 are shown in dark blue.

For countries/economies that did not participate in 2000, statistically significant differences between 2009 and 2015 are shown in dark blue.

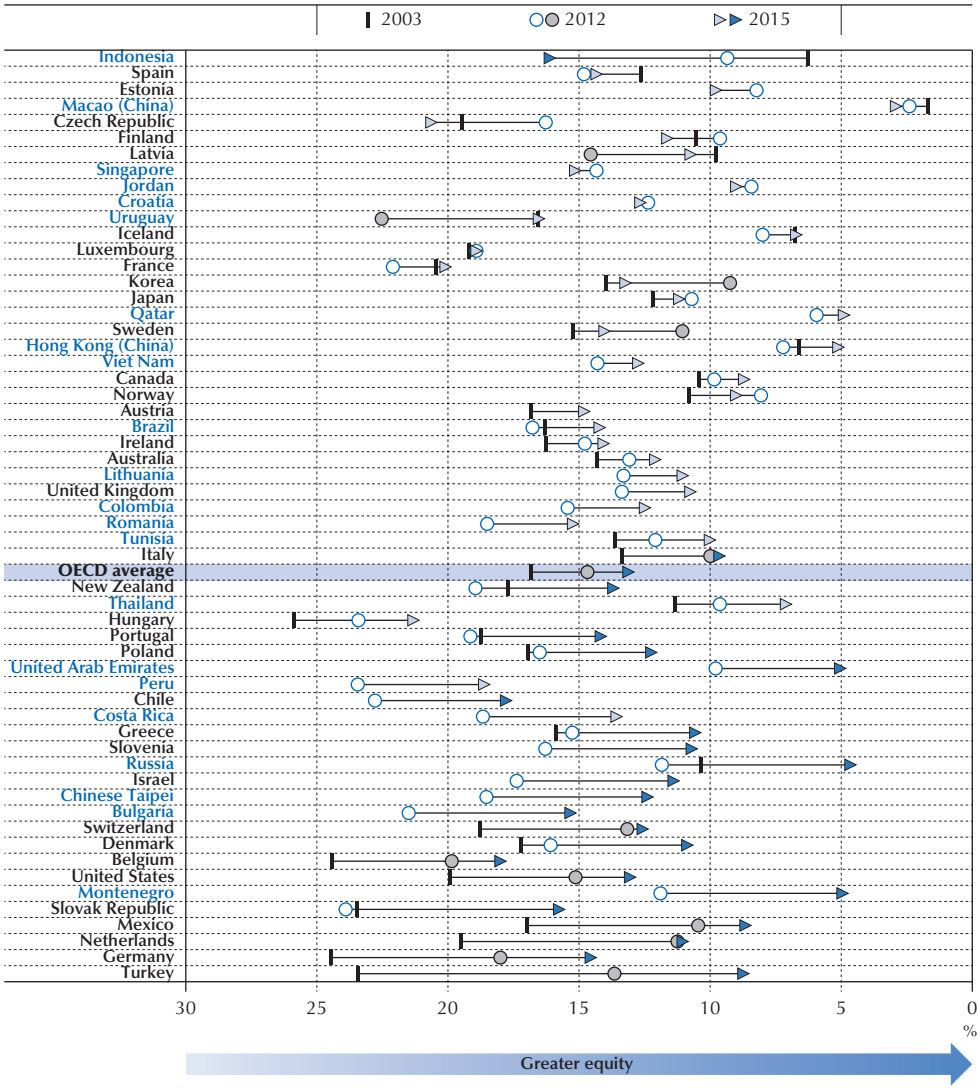
Countries and economies are ranked in descending order of difference between 2000 and 2015 (or between 2009 and 2015 if 2000 is missing) in the percentage of variation in reading performance explained by students' socio-economic status.

Source: OECD, PISA 2000, PISA 2009 and PISA 2015 Databases, Table 2.4.

StatLink https://doi.org/10.1787/888933830196

Figure 2.5 ■ **Change between 2003 and 2015 in equity in mathematics performance**

Percentage of variation in mathematics performance explained by students' socio-economic status



Notes: Socio-economic status is measured by the PISA index of economic, social and cultural status of students.
Statistically significant differences between 2003 and 2012 are shown in grey.
Statistically significant differences between 2003 and 2015 are shown in dark blue.
For countries that did not participate in 2003, statistically significant differences between 2012 and 2015 are shown in dark blue.
Countries and economies are ranked in descending order of difference between 2003 and 2015 (or between 2012 and 2015 if 2003 is missing) in the percentage of variation in mathematics performance explained by students' socio-economic status.
Source: OECD, PISA 2003, PISA 2012 and PISA 2015 Databases, Table 2.3.
StatLink https://doi.org/10.1787/888933830215

Genesis and growth of the achievement gap during students' lives

When do socio-economic inequalities in student performance first appear, and how do they evolve over students' lives?

Fifteen-year-old students' performance, as measured by PISA, is the result of a combination and accumulation of multiple factors and experiences. Differences in PISA scores are influenced mainly by characteristics of students and their families, by the learning environment in schools, and by the policies and institutional characteristics of school systems.

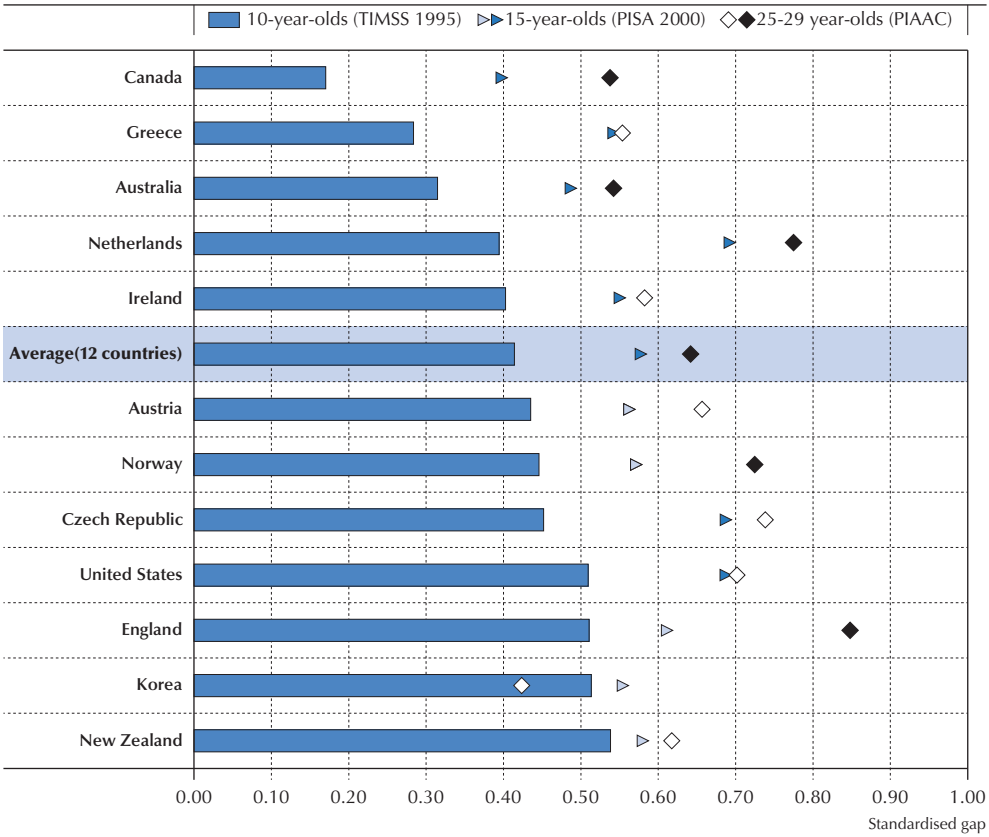
What happens at early stages of students' lives affects what happens at later stages, as research on life learning has extensively shown (DiPrete and Eirich, 2006[13]; Entwisle, Alexander and Olson, 2005[14]). Whereas the previous section focused on differences in performance over time (for different cohorts), this section focuses on the evolution over students' lives (for a single cohort). This is done by comparing the size of the socio-economic gap in cognitive achievement for the proxy of a single cohort of students, born in or around 1985, that took part in three different international studies: the Trends in International Mathematics and Science Study (TIMSS) in 1995, when these students were in grade 4 of primary school and were around 10 years old; PISA 2000, when these students were around 15 years old and in secondary school; and the Programme for the International Assessment of Adult Competencies (PIAAC), when members of this cohort were young adults between the ages of 25 and 29 (the PIAAC data collection occurred between 2011 and 2015).[2] Although the same individual students were not necessarily sampled in each of the three studies, the data compiled through these studies is representative of this birth cohort at the level of the population for the countries that took part in these three studies.[3]

Data to conduct this analysis is available for 12 countries, all of them OECD countries. Cognitive achievement and socio-economic background are the two variables of interest in the analysis. To measure cognitive achievement, TIMSS and PISA provide scores (plausible values) for their mathematics assessments and PIAAC provides scores (plausible values) for its numeracy assessment. The scores of these studies are not directly comparable because each study uses its own scoring scale. To allow for comparability among the studies, the scores of each study were transformed into standardised scores using the means and standard deviations for each country in each study. The number of books present in the student's or respondent's home was used to measure socio-economic status – a measure common to all three studies (none of the other components of socio-economic status [see Box 2.1 for details] is available in the three studies). In the Survey of Adult Skills (PIAAC), adult respondents were asked to estimate the number of books that were available in their home when they were 16 years old.

Results can be found in Figure 2.6. The figure presents the difference in mathematics achievement between individuals who had more and individuals who had fewer than 100 books in their home (i.e. the socio-economic gap). For each country in the analysis, the figure shows the socio-economic gap (in standardised scores) when students were about 10 years old (as measured in TIMSS 1995),[4] when students were around 15 years old (as measured in PISA 2000) and when students were 25-29 years old (as measured in PIAAC).

Figure 2.6 ■ **Socio-economic disparities in mathematics performance over students' lifetime**

Difference in mathematics achievement between individuals who had more and those who had fewer than 100 books in their home



Notes: The standardised gap refers to the difference in the mean scores of individuals with more than 100 books in the home and individuals with fewer than 100 books, divided by the pooled standard deviation.

Statistically significant differences between 15-year-olds (PISA) and 10-year-olds (TIMSS) are shown by the dark blue triangles.

Statistically significant differences between 25-29 year-olds (PIAAC) and 10-year-olds (TIMSS) are shown by the black diamonds.

There are no statistically significant differences between 25-29 year-olds (PIAAC) and 15-year-olds (PISA).

Only countries with available data are included.

Countries are ranked in ascending order of the gap in TIMSS.

Source: IEA, TIMSS 1995 dataset. OECD, PISA 2000 database and PIAAC dataset (Rounds 1 and 2), Table 2.5.

StatLink https://doi.org/10.1787/888933830234

The size of the socio-economic gap in mathematics achievement is already large by the time students are in primary school, and it grows substantially in later years. On average across the 12 OECD countries with comparable data, the standardised gap in mathematics scores associated with having more books at home was 0.41 around the age of 10. It increased to 0.58

age 15, and then it grew further to reach 0.64 between the ages of 25 and 29. The socioeconomic gap grew by a larger margin between TIMSS and PISA (the average difference between the two assessments is 0.16 standardised score point), than between PISA and PIAAC (average difference is 0.06 point). In other words, more than two-thirds of the achievement gap observed at age 15, and about two thirds of the achievement gap observed among 25-29 year-olds was already seen among 10-year-olds.

The socio-economic gap in mathematics performance among 10-year-olds (as measured by TIMSS; the blue bars in Figure 2.6) was largest in England, Korea, New Zealand and the United States (standardised gap greater than 0.5 point); it was smallest (less than 0.3 point) in Canada and Greece.

By the time this cohort of students reached age 15 and was assessed by PISA, the achievement gap had grown, relative to that observed in the TIMSS assessment, in 7 out of the 12 countries under study. The standardised gap in mathematics achievement among 15-year-old students (as measured by PISA; the white diamonds in Figure 2.6) grew the most (more than 0.2 point) in Canada, the Czech Republic, Greece and the Netherlands; and it grew an average amount in Australia, Ireland and the United States.

When the cohort members were young adults (aged 25-29), inequity in mathematics achievement among them had become even greater. The standardised socio-economic gap in numeracy, as measured by PIAAC, grew, relative to the gap observed in TIMSS, in five out of the 12 countries. Growth in the gap was largest (greater than 0.3 point) in Canada, England and the Netherlands, and smallest (less than 0.3 point) in Australia and Norway.

In Austria, the Czech Republic, Greece, Ireland, Korea, New Zealand and the United States, changes are observed that suggest larger inequities in mathematics achievement at later periods of students' lives (with the exception of a seemingly narrower gap among young adults in Korea). However, in these countries, none of the differences is statistically significant, thus it is unclear whether the observed changes are real or are the result of measurement errors.

These results provide evidence for at least three conclusions with implications for policy makers and educators. First, the fact that socio-economic differences in performance are so prominent early on, when students are only 10 years old, underscores the impact of family background, early childhood education, and primary schools in the genesis of the large socio-economic inequalities in achievement that PISA finds among adolescents and PIAAC finds among young adults.

Second, in most countries, inequalities in achievement grow by a much larger margin between primary and secondary school than between secondary school and young adulthood. This underscores the importance of policies and practices that affect students' performance during adolescence. OECD and PISA reports examining the policies and practices used in successful schools offer suggestions about what can be done to address the inequalities that seem to become more entrenched during primary and secondary school (OECD, 2016[15]; OECD, 2012[16]). For example, targeting professional resources, such as qualified teachers, in schools that have large proportions of low-performing and socio-economically disadvantaged students, or limiting stratification practices, such as early tracking, ability grouping or grade repetition in favour of more inclusive approaches to address classroom heterogeneity, could improve equity in student performance.

Third, a number of countries have unique profiles that are not adequately captured by the average patterns. In-depth research into these cases might provide further insights into the mechanisms through which inequality in achievement emerges and develops. Evidence acquired through this research could inform the design of effective policies. These unique patterns are found in Korea, for example, where inequalities in achievement narrow considerably between adolescence and early adulthood. They are also found in Canada, where performance inequalities in childhood are smaller than those observed in other countries, and in England, where inequality in performance grows markedly between adolescence and adulthood.

TRENDS IN EQUITY IN STUDENTS' WELL-BEING

Students' well-being, as defined and measured in PISA, has four main dimensions: social, psychological, physical and cognitive (OECD, 2017[7]). A large part of PISA information about students' well-being was collected for the first time in 2015, during the most recent cycle of PISA. Because the purpose of this chapter is to understand trends in inequalities in students' well-being related to socio-economic status, only a handful of measures for which there are data from more than one PISA cycle are included here. This section focuses on two dimensions: students' psychological and social well-being.

Students' social well-being refers to the quality of students' social lives. It includes students' relationships with their family, their peers and their teachers, and how they perceive their social life in school (Pollard and Lee, 2003[17]). In this section, students' social well-being is examined by looking at students' sense of belonging at school.

Students' psychological well-being refers to students' views about life, their engagement at school, and the goals and ambitions they have for their future. In this section, two measures of students' psychological well-being are considered: science self-efficacy and career expectations.

Sense of belonging at school

Students' sense of belonging at school is the extent to which students feel accepted by and connected to their peers, and part of the school community. A sense of belonging gives students feelings of security, identity and community which, in turn, support academic, psychological and social development. A lack of connectedness can adversely affect students' perceptions of themselves, their satisfaction with life, and their willingness to learn and put effort into their studies (Baumeister and Leary, 1995[18]; Ma, 2003[19]).

In 2015, as in 2012 and 2003, PISA measured sense of belonging directly by asking students to report whether they "strongly agree", "agree", "disagree" or "strongly disagree" that they feel they belong at school. On average across 28 OECD countries with comparable data, the share of students who reported that they feel they belong at school was 81% in PISA 2003 and PISA 2012, but 73% in PISA 2015 – a significant drop (Table 2.6). In Australia, Brazil, Hungary, Italy, Mexico, the Russian Federation (hereafter "Russia"), the Slovak Republic, Thailand and Uruguay, the share of students who reported that they feel they belong at school dropped by 15 percentage points or more between 2003 and 2015. By contrast, in Indonesia, the share of students who reported feeling a sense of belonging at school increased by about 24 percentage points during the same period; in Belgium, Hong Kong (China), Korea, the Netherlands and Spain, the share also grew, but by smaller margins.

Students from socio-economically advantaged families enjoy a stronger sense of belonging at school than disadvantaged students. However, the disparity is not large because most disadvantaged students feel they belong at school. In PISA 2015, on average across OECD countries, 77% of advantaged students reported that they feel they belong at school, whereas some 69% of disadvantaged students so reported. Thus, the socio-economic gap in sense of belonging at school was 8 percentage points, on average across OECD countries (Table 2.6).

In most countries, there has been little change over time in the socio-economic gap in students' sense of belonging, as shown in Figure 2.7. On average across OECD countries, in PISA 2003 the socio-economic gap in students' sense of belonging at school was 7 percentage points (76% of disadvantaged students and 83% of advantaged students reported feeling a relatively strong sense of belonging at school), roughly the same gap observed in PISA 2015. Between 2012 and 2015, the socio-economic gap in the sense of belonging at school widened by 2 percentage points, on average across OECD countries.

In Bulgaria, Japan, the Netherlands and Portugal, the socio-economic gap in sense of belonging at school narrowed over PISA cycles, while in Australia, Brazil, New Zealand, Singapore, the Slovak Republic and Sweden the gap widened.

Interestingly, in most countries, socio-economic differences in sense of belonging at school disappear once student performance is taken into account (Table 2.7). This suggests that disadvantaged students who score higher enjoy a similarly strong sense of belonging at school as their more advantaged peers. It also shows that these differences in sense of belonging at school are relatively small.

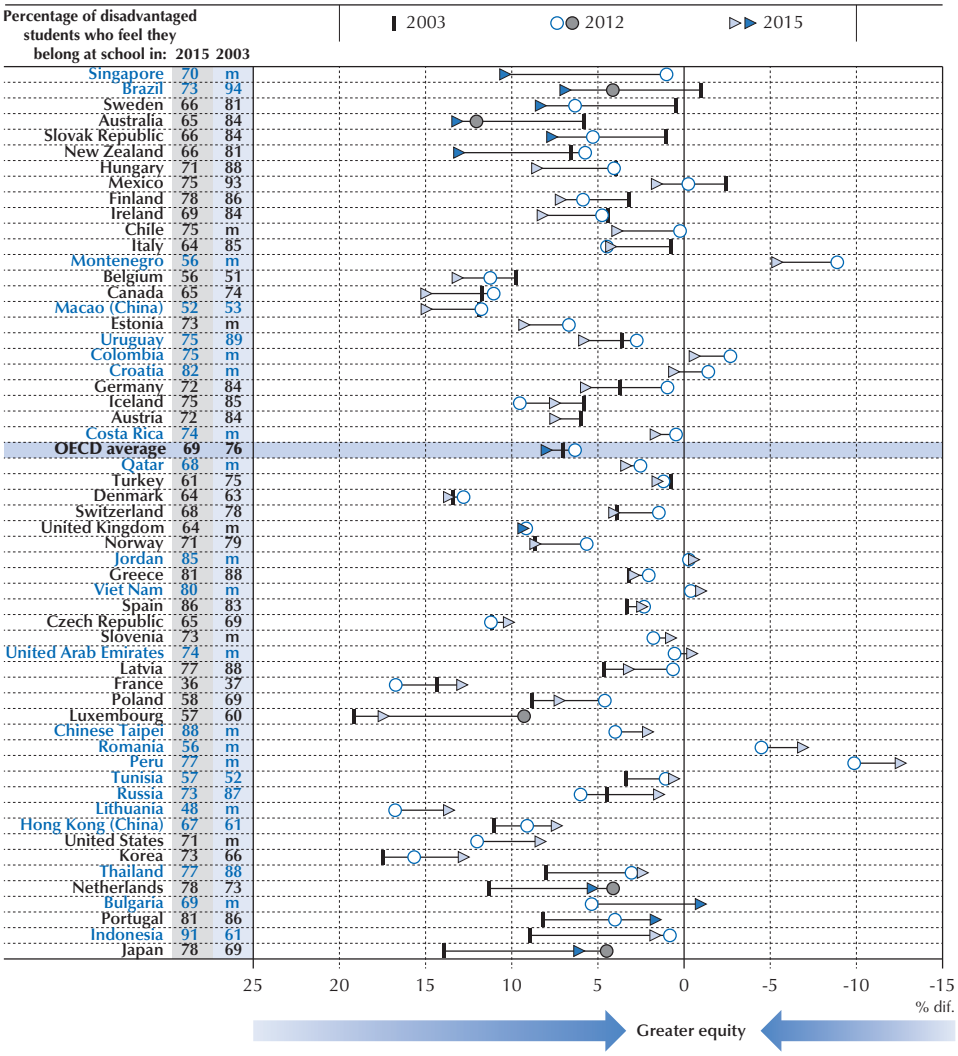
Science self-efficacy

Self-efficacy describes the strength of students' belief that they can perform tasks similar to those tested in cognitive assessments. A student with a high level of self-efficacy believes that, through her or his own actions, she or he can achieve goals or produce desired effects. Self-efficacy is thus a powerful incentive to act and to persevere in the face of difficulties (Bandura, 1997[20]).

In 2006 and 2015, PISA measured students' self-efficacy in science by asking students to answer the following question: "How easy do you think it would be for you to perform the following tasks on your own?" Tasks included: "Explain why earthquakes occur more frequently in some areas than in others"; "Describe the role of antibiotics in the treatment of disease"; "Identify the science question associated with the disposal of garbage"; "Predict how changes to an environment will affect the survival of certain species"; "Interpret the scientific information provided on the labelling of food items"; "Discuss how new evidence can lead you to change your understanding about the possibility of life on Mars"; and "Identify the better of two explanations for the formation of acid rain". Students were not asked to solve any of these tasks; rather, they were asked to report whether: "[I] could do this easily"; "[I] could do this with a bit of effort"; "[I] would struggle to do this on my own"; or "[I] couldn't do this". Students' responses to these questions were used to build the index of science self-efficacy, a single measure of students' overall level of self-efficacy in science.[5]

Figure 2.7 ■ **Change between 2003 and 2015 in sense of belonging at school, by socio-economic status**

Difference between the percentage of socio-economically advantaged and disadvantaged students who feel they belong at school



Notes: Socio-economic status is measured by the PISA index of economic, social and cultural status of students.

Statistically significant differences between 2003 and 2015 (or 2012 and 2015 for countries not included in 2003) are shown in dark blue.

Statistically significant differences between 2003 and 2012 are shown in grey.

The percentage of socio-economically disadvantaged students who feel they belong at school in PISA 2003 and PISA 2015 is shown next to the country/economy name.

Countries and economies are ranked in descending order of the difference between 2003 and 2015 (or between 2012 and 2015 if 2003 is missing) in the gap between advantaged and disadvantaged students.

Source: OECD, PISA 2003, PISA 2012 and PISA 2015 Databases, Table 2.6.

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Socio-economic disparities in self-efficacy are large and widespread across countries. The level of science self-efficacy, as measured by the index of science self-efficacy, was higher among advantaged students than among disadvantaged students in each of the 52 countries and economies that participated in both PISA 2006 and PISA 2015 (see Figure 2.8).

In fact, in every country and economy that participated in PISA 2015, students from advantaged families reported higher levels of self-efficacy, even after science performance is taken into account (Table 2.9). In other words, even when comparing students whose science knowledge and skills are demonstrably similar, advantaged students are more confident in their ability to solve science problems than disadvantaged students.

Socio-economic disparities in science self-efficacy have remained relatively stable over PISA cycles. On average across OECD countries, the difference between advantaged and disadvantaged students in the index of science self-efficacy did not change between 2006 and 2015.

However, changes are observed in certain countries. In 15 countries (Bulgaria, Chile, Colombia, Germany, Hungary, Indonesia, Mexico, Montenegro, Poland, Qatar, Romania, Switzerland, Thailand, Turkey and the United Kingdom), equity in self-efficacy improved between 2006 and 2015, meaning that the socio-economic gap in the index of science self-efficacy narrowed.

Equity in science self-efficacy deteriorated in four countries and economies: Belgium, Croatia, Estonia and Chinese Taipei. In these education systems, the socio-economic gap in science self-efficacy widened between 2006 and 2015.

Career expectations

Students with more ambitious education and career expectations tend to put more effort into their studies and school experience. Moreover, defining career plans during adolescence motivates students into pursuing their goals (Marks, 2010[21]; Saha and Sikora, 2008[22]). Some studies also suggest that adolescents have become more ambitious in recent decades (Goyette, 2008[23]; Reynolds et al., 2006[24]).

In the PISA 2015 student questionnaire, as in the PISA 2006 questionnaire, students were asked: "What kind of job do you expect to have when you are about 30 years old?" This was an open question, meaning that no response categories were provided and students were able to answer freely using their own words. Responses were coded to four-digit ISCO (International Standard Classification of Occupations) codes and then mapped to the ISEI (International Socio-Economic Index of occupational status) index (Ganzeboom and Treiman, 2003[25]). Higher scores in the ISEI index indicate higher occupational status.

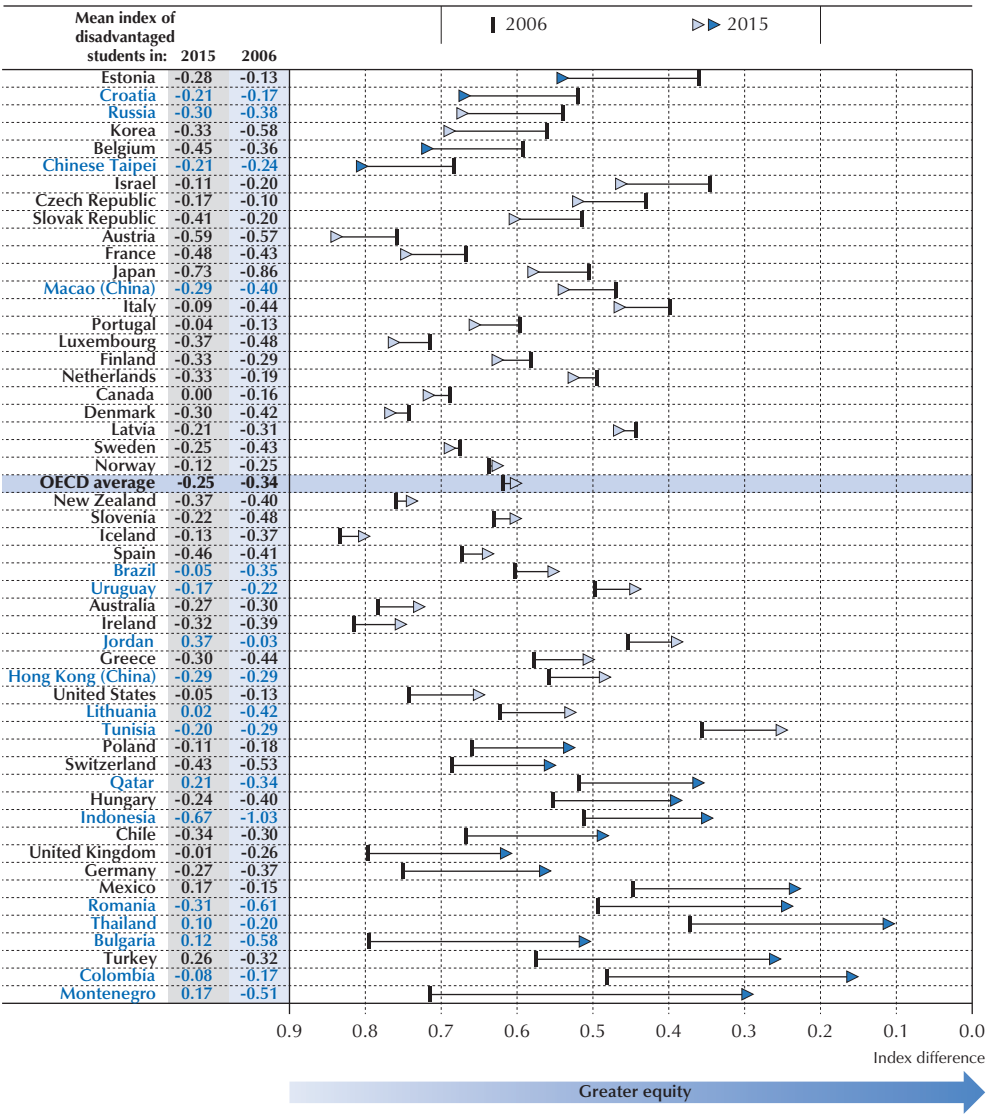
In every country and economy that participated in PISA 2015, socio-economically advantaged students expected to be employed in occupations of higher social status than disadvantaged students (a difference of 50.2 points in the ISEI index, on average across OECD countries). In all OECD countries except Israel, socio-economic differences in career expectations were significant, even after accounting for students' performance in science (Table 2.11).

The socio-economic gap in career expectations was marginally larger in PISA 2006 than in PISA 2015, as shown in Figure 2.9. This narrowing of the gap over the past decade reflects a greater increase among disadvantaged students than among advantaged students in OECD countries in expecting to work in a high-status career, although more students in both socio-economic groups expected a high-status career in 2015 than did in 2006.

Figure 2.8 ■ Change between 2006 and 2015 in science self-efficacy, by socio-economic status

Difference between socio-economically advantaged and disadvantaged students in the index of science self-efficacy

	Mean index of disadvantaged students in: 2015	2006
Estonia	-0.28	-0.13
Croatia	-0.21	-0.17
Russia	-0.30	-0.38
Korea	-0.33	-0.58
Belgium	-0.45	-0.36
Chinese Taipei	-0.21	-0.24
Israel	-0.11	-0.20
Czech Republic	-0.17	-0.10
Slovak Republic	-0.41	-0.20
Austria	-0.59	-0.57
France	-0.48	-0.43
Japan	-0.73	-0.86
Macao (China)	-0.29	-0.40
Italy	-0.09	-0.44
Portugal	-0.04	-0.13
Luxembourg	-0.37	-0.48
Finland	-0.33	-0.29
Netherlands	-0.33	-0.19
Canada	0.00	-0.16
Denmark	-0.30	-0.42
Latvia	-0.21	-0.31
Sweden	-0.25	-0.43
Norway	-0.12	-0.25
OECD average	**-0.25**	**-0.34**
New Zealand	-0.37	-0.40
Slovenia	-0.22	-0.48
Iceland	-0.13	-0.37
Spain	-0.46	-0.41
Brazil	-0.05	-0.35
Uruguay	-0.17	-0.22
Australia	-0.27	-0.30
Ireland	-0.32	-0.39
Jordan	0.37	-0.03
Greece	-0.30	-0.44
Hong Kong (China)	-0.29	-0.29
United States	-0.05	-0.13
Lithuania	0.02	-0.42
Tunisia	-0.20	-0.29
Poland	-0.11	-0.18
Switzerland	-0.43	-0.53
Qatar	0.21	-0.34
Hungary	-0.24	-0.40
Indonesia	-0.67	-1.03
Chile	-0.34	-0.30
United Kingdom	-0.01	-0.26
Germany	-0.27	-0.37
Mexico	0.17	-0.15
Romania	-0.31	-0.61
Thailand	0.10	-0.20
Bulgaria	0.12	-0.58
Turkey	0.26	-0.32
Colombia	-0.08	-0.17
Montenegro	0.17	-0.51



Notes: Socio-economic status is measured by the PISA index of economic, social and cultural status of students.

Statistically significant differences between 2006 and 2015 are shown in dark blue.

The average value in the index of science self-efficacy for socio-economically disadvantaged students in PISA 2006 and PISA 2015 is shown next to the country/economy name.

Countries and economies are ranked in descending order of difference between 2006 and 2015 in the gap between advantaged and disadvantaged students.

Source: OECD, PISA 2006 and PISA 2015 Databases, Table 2.8.

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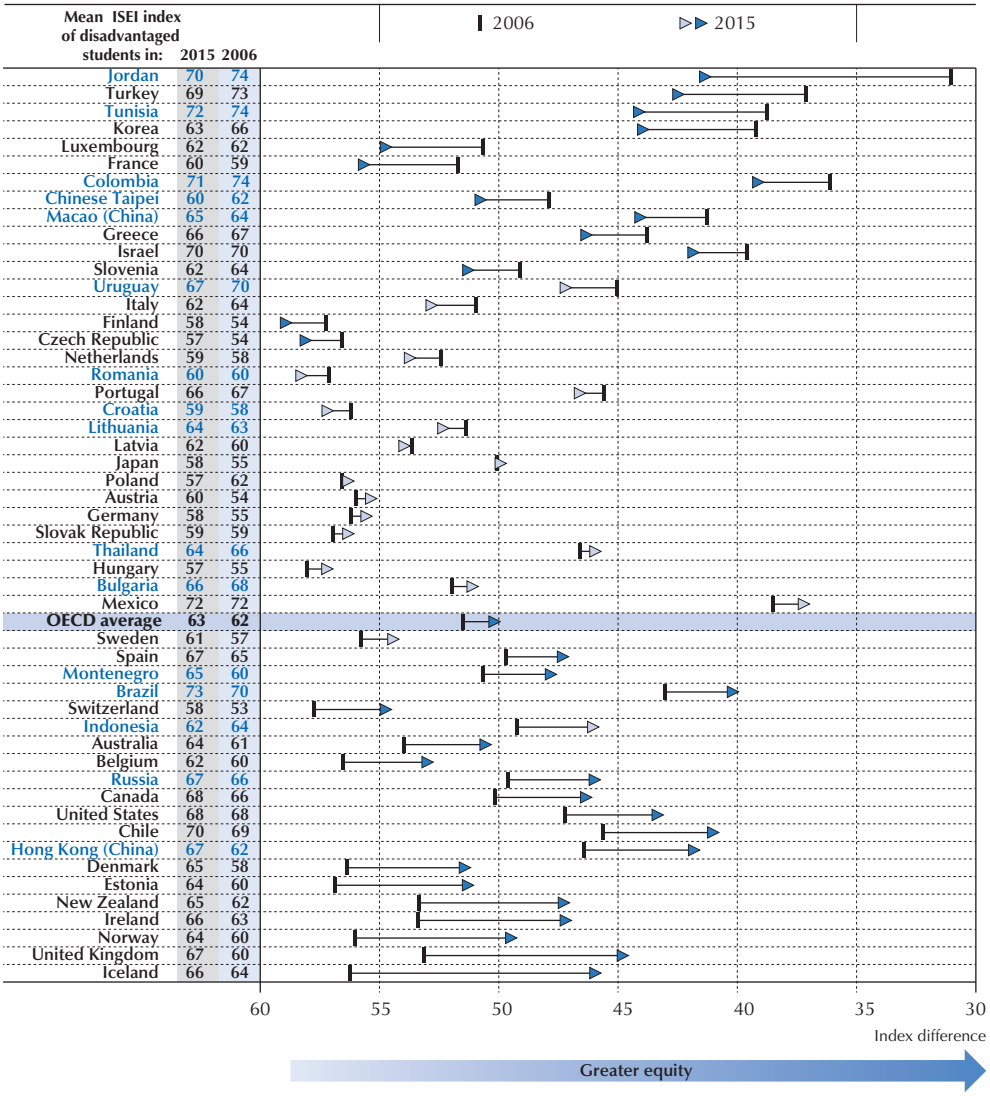
Figure 2.9 ■ Change between 2006 and 2015 in career expectations, by socio-economic status

Difference between socio-economically advantaged and disadvantaged students in the International Socio-Economic Index of occupational status (ISEI)



Notes: Socio-economic status is measured by the PISA index of economic, social and cultural status of students.

Statistically significant differences between 2006 and 2015 are shown in dark blue.

The average value in the ISEI index for socio-economically disadvantaged students in PISA 2006 and PISA 2015 is shown next to the country/economy name. Higher ISEI values indicate higher occupational status.

Countries and economies are ranked in descending order of the difference between 2006 and 2015 in the gap between advantaged and disadvantaged students.

Source: OECD, PISA 2006 and PISA 2015 Databases, Table 2.10.

StatLink https://doi.org/10.1787/888933830291

In addition to the average trends across OECD countries, different trends are observed between countries. The socio-economic gap in career expectations narrowed between 2006 and 2015 in 18 of the 51 countries and economies with comparable data. By contrast, the gap widened in 14 countries.

TRENDS IN EQUITY IN EDUCATIONAL ATTAINMENT

The analyses of trends in disparities in educational attainment related to socio-economic status tell two larger stories. The first is a story of expansion in access to education. During the past century, the average level of education increased steadily in countries all over the world, including both wealthier and developing countries. This has allowed a large share of individuals born in recent decades to attain higher levels of education than those attained by their parents, i.e. to experience upward educational mobility.

The second story, however, is one of inequities in attainment that persist over time despite the expansion of access to education. Even among younger cohorts, socio-economically advantaged people have greater chances of completing higher levels of education than disadvantaged people.

In other words, absolute levels of educational attainment have increased over time on average across populations and among different socio-economic groups. However, differences between people in high- and low-income countries, and between advantaged and disadvantaged people, in the likelihood of attaining higher levels of education have remained significant over time.

Box 2.3 **Measuring trends in educational attainment**

Data from PISA are insufficient to determine educational attainment because the assessment measures proficiency among 15-year-old students, and many people continue their education well beyond this age. Consequently, two additional sources of data are used to examine educational attainment in this chapter.

A standard way to measure attainment is to count the total number of years of schooling completed by an individual. Educational attainment is here understood as each progression to the next grade. Aggregating data on years of schooling at the national level allows for comparisons between countries. The most complete international dataset of historical trends in average years of schooling is the one compiled by R. J. Barro and J. W. Lee (Barro and Lee, 2013[6]). This dataset is used in this section to examine trends in equity in educational attainment among countries.

In addition to being a continuous sequence of grades, schooling is organised in longer periods of time that group several grades and are certified with a diploma (e.g. primary, secondary, tertiary degrees). Measuring attainment by looking at the highest level of education an individual completed is important for two reasons: because it implies the skills students have acquired, and because the degrees earned at those levels are a pre-requisite for further education and entry into certain occupations and professions (Bills, 2003[26]). The Survey of Adult Skills (PIAAC) (OECD, 2016[1]) collects data on educational

...

attainment in this way for survey respondents and respondents' parents. PIAAC data is used in this section to analyse trends in equity in educational attainment within countries.

Source: Barro, R. and J. Lee (2013), "A new data set of educational attainment in the world, 1950–2010", *Journal of Development Economics*, http://dx.doi.org/10.1016/J.JDEVECO.2012.10.001.

Bills, D. (2003), "Credentials, Signals, and Screens: Explaining the Relationship Between Schooling and Job Assignment", *Review of Educational Research*, http://dx.doi.org/10.3102/00346543073004441.

OECD (2016), *Technical Report of the Survey of Adult Skills (PIAAC)*, OECD, Paris http://www.oecd.org/skills/piaac/PIAAC_Technical_Report_2nd_Edition_Full_Report.pdf.

Equity among countries in average years of schooling

Average educational attainment has been increasing in countries in every region of the world and among people of all income levels for decades. However, the pace of growth has not been the same everywhere. Wealthier regions have generally seen faster increases in attainment than poorer regions, and thus gaps in average education levels among countries have persisted over time.

Figure 2.10 shows the evolution over the 20th century in the average years of schooling completed by adults (age 25 or over) in 128 countries. Countries are grouped according to their level of per-capita income (World Bank, 2017[27]). All OECD countries are included in the high-income group, except Mexico and Turkey, which are part of the upper-middle-income group. Partner countries and economies that have participated in PISA are included either in the high-income, the upper-middle-income or the lower-middle-income group.[6] Low-income economies include 20 countries that have not participated in PISA.

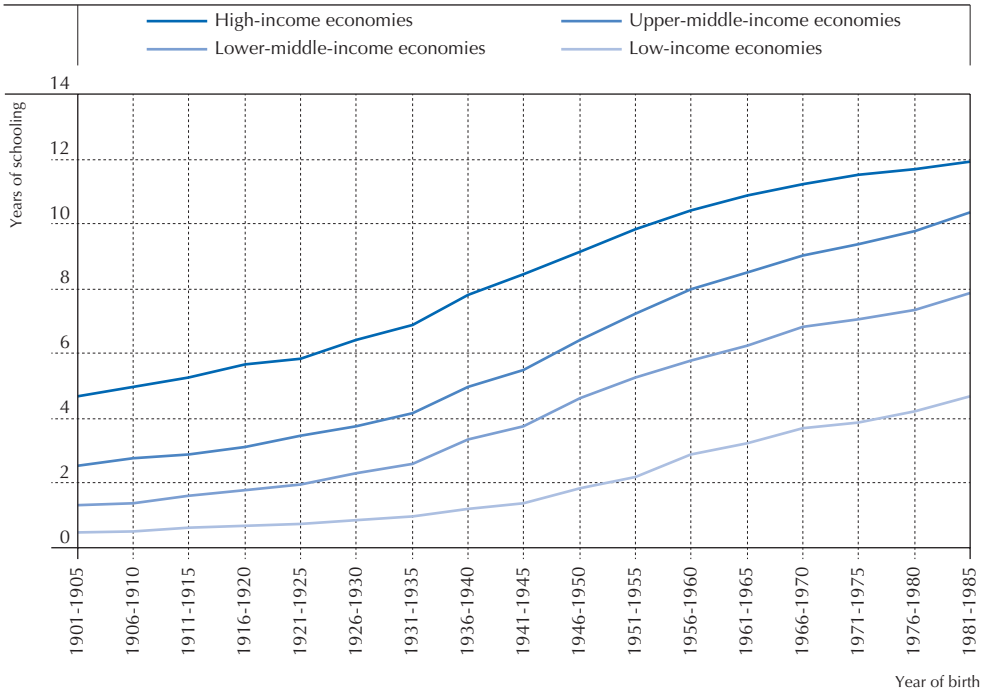
Up to the first decades of the 20th century, individuals attended school for only a few years. Adults born during the 1900s in high-income countries completed an average of about five years of schooling; in all other countries the average was less than three years. Towards the end of the century, adults in high-income countries completed an average of 12 years of schooling, those in upper-middle-income countries completed about 10 years, adults in lower-middle-income countries completed about 8 years, and those in low-income countries completed about 5 years of schooling, on average.

Even though educational expansion was a worldwide phenomenon over the past century, growth was faster in wealthier countries. As a result, the absolute gap in educational attainment between people living in the richest and those in the poorest countries increased. Earlier in the 20th century, individuals born in high-income countries had completed around four more years of school, on average, than those born in low-income countries. This gap widened slowly but steadily over time, so that for the generation born in the 1980s the gap had almost doubled.

Less of a difference is observed between high-income and upper-middle-income countries. The gap of about two years of schooling between these two groups of countries has remained more or less stable throughout the period.

Figure 2.10 ■ **Total years of schooling, by wealth of countries**

Years of schooling completed by 25-74 year-olds, by year of birth



Notes: Low-income economies are defined as those with a GNI per capita of USD 1 005 or less in 2016; lower-middle-income economies are those with a GNI per capita between USD 1 006 and USD 3 955; upper-middle-income economies are those with a GNI per capita between USD 3 956 and USD 12 235; high-income economies are those with a GNI per capita of USD 12 236 or more (World Bank, 2017[27]).

Sources: Based on Barro-Lee educational attainment dataset (February 2016); and World Bank Country and Lending Groups (reviewed on October 2017). See Table 2.12 for national data.

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Equity in the attainment of upper secondary and tertiary education

As discussed above, average levels of educational attainment rose worldwide during the past few decades, but more so in OECD countries than in developing countries. This means that there are more education opportunities today than in the past. But what has happened within countries? Have these opportunities been distributed more equitably across socio-economic groups in more recent decades? Has the expansion of access to education translated into greater equity in education opportunities? For example, are adults from different socio-economic backgrounds acquiring more, the same amount, or less education than their parents? Has the share of adults benefiting from upward educational mobility changed over the past decades?

In order to answer these questions, the analyses that follow use data from the Survey of Adult Skills (PIAAC). Survey respondents were between 26 and 65 years old at the time of the

interview.[7] Some 33 countries participated in the survey between 2008 and 2016. Countries participating in PIAAC include OECD countries (except Hungary, Iceland, Luxembourg, Mexico, Portugal and Switzerland), and four partner countries (Cyprus,[8] Lithuania, Russia[9] and Singapore).

In the analyses based on PIAAC data, socio-economic background is measured by parents' education. Adults from a socio-economically disadvantaged background are those whose parents completed less than upper secondary education; adults from a mid-level socio-economic background are those with at least one parent who had completed upper secondary education; and adults from an advantaged background are those with at least one parent who had completed tertiary education. Equity is the greatest when adults' educational "destinations" (i.e. their highest level of education) cannot be predicted based on their educational "origins" (i.e. their parents' education). By contrast, there is less equity in attainment when educational origins and destinations are more strongly related.

Educational mobility across generations

As shown in Figure 2.11, three types of educational mobility can be distinguished: individuals who attained higher levels of education than their parents (that is, who experienced upward educational mobility), lower levels of education than their parents (downward educational mobility), or the same level of education as their parents (no educational mobility).

Figure 2.11 ▪ **Highest level of education completed, by parents' education**
Percentage of adults 26 years or older, PIAAC average (33 countries)

Upward mobility | No mobility | Downward mobility

		Respondents' education			
		Less than upper secondary	Upper secondary	Tertiary	Total
Parents' education	Less than upper secondary	17	19	9	45
	Upper secondary	4	17	13	34
	Tertiary	1	6	14	22
	Total	22	42	37	100

Notes: Respondent's education is the highest level of education completed by the person responding to the Survey of Adult Skills (PIAAC).
Parents' education is the highest level of education completed by either the father or the mother of the respondent.
Tertiary education includes ISCED levels 5 (short-cycle tertiary education), 6 (bachelor's or equivalent level), 7 (master's or equivalent) and 8 (doctoral or equivalent).
Source: OECD, PIAAC dataset. See Table 2.17 for national data.
StatLink https://doi.org/10.1787/888933830329

On average across PIAAC-participating countries, 41% of adults achieved upward educational mobility. Individuals who attained higher levels of education than their parents can be categorised into three groups (the cells coloured in dark blue in Figure 2.11): respondents who completed upper secondary education and neither of whose parent had completed upper secondary school (19%); respondents who completed tertiary education and at least one of whose parent had completed upper secondary education (13%); or respondents who completed tertiary education and neither of whose parent had completed upper secondary education (9%). The latter group, although the smallest, is the most remarkable because it involves moving from the most disadvantaged educational origins (parents with less than upper secondary education) to the most advantaged educational destination (completing tertiary education).

However, the most frequently observed pattern of educational mobility is not upward mobility but no mobility: almost half of the respondents (48%; the white cells in Figure 2.11) attained the same highest level of education as their parents. This group includes adults with less than upper secondary education whose parents also did not complete upper secondary education (17%); adults who completed upper secondary education and have at least one parent who attained that level of education (17%); and adults who completed a tertiary degree and at least one of whose parents had also attained a tertiary degree (14%).

The share of respondents contending with downward educational mobility is considerably smaller (11%). The largest group is composed of adults with tertiary-educated parents who completed only upper secondary education themselves (6%), and adults who did not complete upper secondary education even though at least one of their parents had (4%). Rare are the adults with highly educated parents who did not complete upper secondary education.

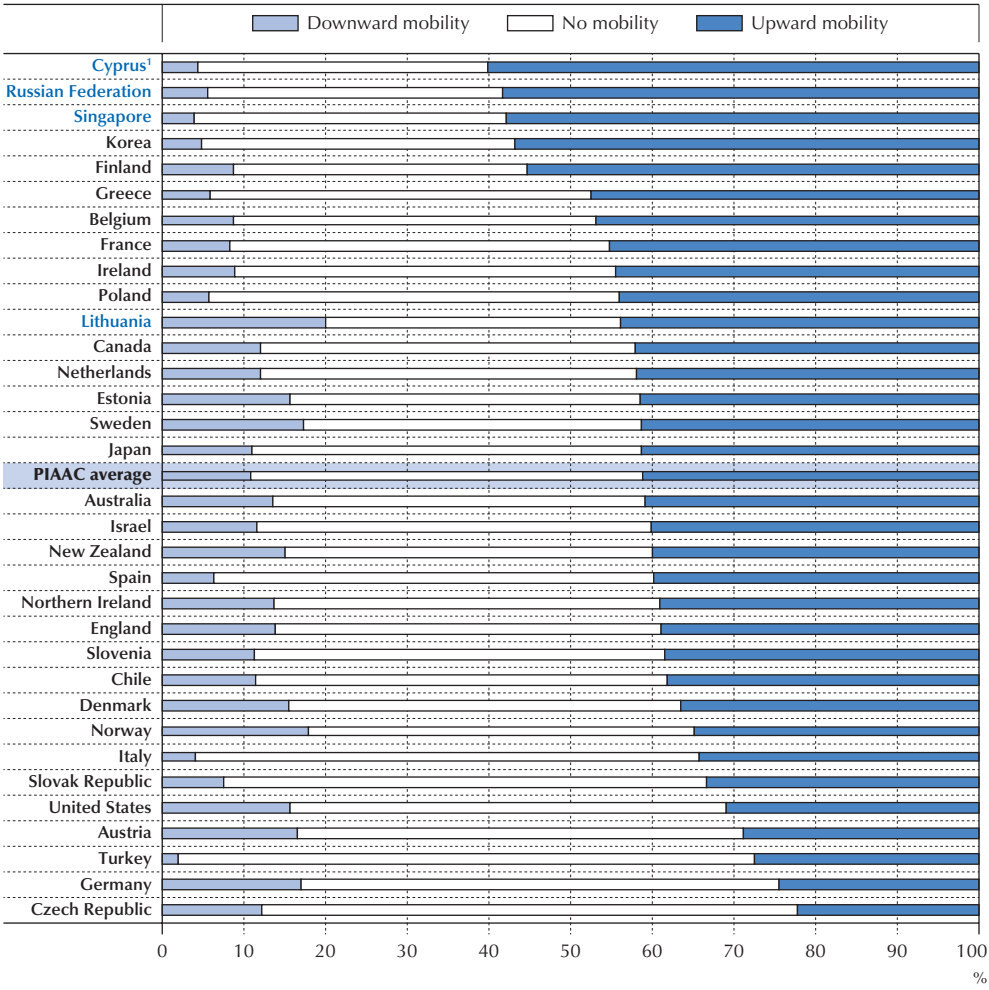
Levels of educational mobility vary across countries, as shown in Figure 2.12. In Finland, Korea, Russia and Singapore, more than one in two adults experienced upward educational mobility, according to PIAAC data. By contrast, in Austria, the Czech Republic, Germany and Turkey, fewer than one in three adults did so. Shares of downwardly mobile adults are larger (17% or more) in Germany, Lithuania, Norway and Sweden, and smaller (less than 5%) in Italy, Korea, Singapore and Turkey.

The share of upwardly mobile adults is larger than the share of downwardly mobile adults in all PIAAC-participating countries, even in those where upward educational mobility is comparatively rare and where downward mobility is comparatively common. This reflects the expansion in access to education across generations, or "educational upgrading", made evident by looking at populations' average years of schooling.

In Figure 2.11 above, the levels of education of PIAAC respondents and those of their parents are presented in the "Total" cells coloured in grey. Education levels are higher among respondents than among their parents: 22% of respondents attained less than upper secondary education as their highest level of attainment compared to 45% of parents who did so. Completion of upper secondary and tertiary education is far more frequent among respondents than among their parents.

Figure 2.12 ■ **Educational mobility, by country**

Percentage of adults 26 years or older who reported lower, the same or higher educational attainment than/as their parents



1. See notes at the beginning of this chapter.

Countries and economies are ranked in descending order of the percentage of respondents who experienced upward educational mobility.

Source: OECD, PIAAC dataset, Table 2.18.

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Has educational mobility changed over time? A way to answer this question using PIAAC data is to compare educational mobility rates across respondents from different age cohorts (Figure 2.13). The oldest PIAAC respondents, those who were between 56 and 65 years old at the time of data collection (which occurred between 2011 and 2015, depending on the country[10]), were born during the late 1940s and throughout the 1950s, and typically entered primary school during the

1950s and early 1960s. Those who continued studying completed tertiary education during the 1970s. At the other extreme, the youngest PIAAC respondents in the analysis, those who were around 26 years old at the time of the survey, were born between the second half of the 1970s and the end of the 1980s, and attended and completed tertiary education in the 2000s. Thus, Figures 2.13 to 2.17, about trends in equity in attainment, cover a period of several decades, and adults who were born and completed their education in the immediate aftermath of World War II to the present.

Figure 2.13 ■ **Educational careers across age cohorts**

Cohort	Age	Year of birth	Entered primary	Completed upper secondary	Completed tertiary
1	56-65	1946-59	1950s-early 60s	Late 1960s-early 70s	1970s
2	46-55	1956-69	1960s-early 70s	Late 1970s-early 80s	1980s
3	36-45	1966-79	1970s-early 80s	Late 1980s-early 90s	1990s
4	26-35	1976-89	1980s-early 90s	Late 1990s-early 2000s	2000s

Note: Respondents younger than 26 at the time of data collection are not included in the analysis. A first round of data collection in 25 countries occurred between August 2011 and March 2012. A second round of data collection in eight countries occurred between August 2014 and January 2015.
Source: OECD, PIAAC dataset.

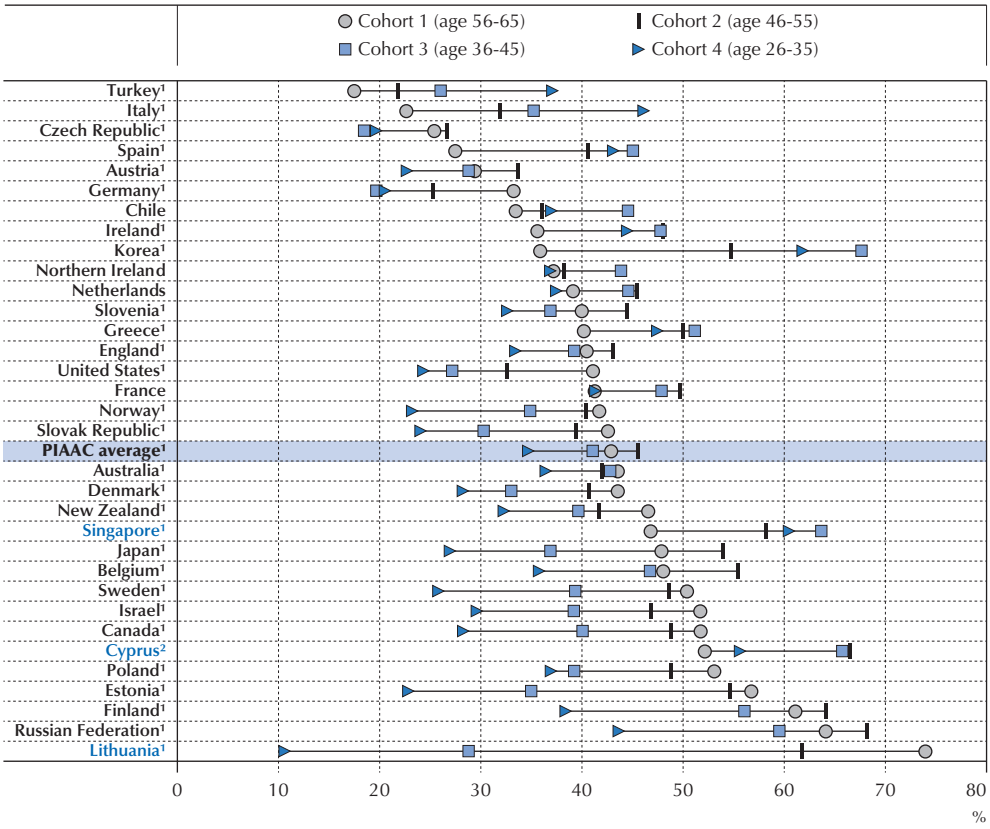
There has been considerable variation over the past few decades in the rates of upward educational mobility, as shown in Figure 2.14. On average across PIAAC-participating countries, the percentage of upwardly mobile adults was higher among older respondents (43% in oldest Cohort 1, 45% in Cohort 2) than among younger respondents (41% in Cohort 3, 35% in youngest Cohort 4). Upward educational mobility reached a peak in previous decades, among individuals born between the 1950s and 1960s (Cohorts 1 and 2), before a sharp decline began among individuals born in the 1970s and 1980s. If these average trends continue at the same pace, students who are completing their education today will be less likely to be upwardly mobile than the youngest adult respondents in PIAAC. This means that less than a third of the members of current and future generations would be expected to attain an educational level higher than that of their parents.[11]

Declining upward educational mobility is observed in 21 countries (see Figure 2.14). These are countries where the percentage of upwardly mobile adults was higher among the oldest cohort than among the youngest cohort in the study. In 11 of these countries (Canada, Denmark, Estonia, Israel, Lithuania, New Zealand, Norway, Poland, the Slovak Republic, Sweden and the United States) the share of upwardly mobile adults shrank gradually with each new cohort. In seven other countries (Austria, Belgium, England, Finland, Japan, Slovenia and Russia), as on

average for all PIAAC-participating countries, an increase in upward mobility between the first and the second cohorts was followed by a stronger decline among younger cohorts.

Figure 2.14 ■ **Change in upward educational mobility across age cohorts**

Percentage of 26-65 year-olds who attained a higher level of education than their parents did, by cohort



1. The difference between the oldest and youngest cohorts is statistically significant.

2. See notes at the beginning of this chapter.

Countries and economies are ranked in ascending order of the percentage of 56-65 year-olds (Cohort 1) who attained a higher level of education than their parents had.

Source: OECD, PIAAC dataset, Table 2.19.

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By contrast, in seven countries the share of upwardly mobile adults increased over time. In Italy, Singapore, Spain and Turkey, each successive cohort was generally more upwardly mobile than the preceding cohort. In Greece, Ireland and Korea, upward mobility increased over the first two or three cohorts then stabilised or declined slightly in the last cohort, but the trend for the period is positive.

Why do trends in upward educational mobility vary over time and across countries? The key explanatory factor is the timing of educational expansion. As discussed above, upward mobility occurs when an adult attains an education level higher than that of her or his parents. In this analysis, tertiary education is the highest education level under consideration; thus, individuals with tertiary-educated parents cannot experience upward educational mobility. This is partly an artefact of the way education categories were defined in this analysis; but it also reflects the real organisation of the education system and the fact that even the best-performing students do not continue studying indefinitely. Therefore, as a result of what could be called a "ceiling effect", countries in which upper secondary and tertiary education expanded earlier would be expected to have smaller or declining rates of upward mobility. By contrast, countries with lower levels of educational attainment among older cohorts will have more room to upgrade their populations' education level.

Take, for example, the seven countries with a positive trend in upward mobility mentioned in the paragraph above. These are countries where the massification of upper secondary education occurred more recently. In Greece, Ireland, Italy, Korea, Spain and Turkey, more than one in two adults born between the mid-1940s and late 1950s (members of Cohort 1, the oldest under study) attained only less than upper secondary education; in Italy and Turkey as few as about one in four did (Table 2.14). By comparison, in Germany and the United States, two countries that led the way in providing schooling for the masses, only about 10% of adults born in the mid-1940s to late 1950s completed their education before entering upper secondary school.

Another source of cross-national variation in upward mobility trends during the past few decades is the timing of the expansion of tertiary education. In Korea and Singapore, two countries where upward mobility has increased over time, the growth over recent decades in the percentage of tertiary-educated adults was the largest among all countries participating in PIAAC. Among adults born between 1946 and 1959 (members of Cohort 1), 21% in Singapore and 15% in Korea completed tertiary education; among those born between 1976 and 1989 (members of Cohort 4), 74% in Singapore and 64% in Korea completed that level of education. By contrast, on average across countries participating in PIAAC, the difference in the share of tertiary-educated adults between the youngest cohort (45%) and the oldest cohort (26%) was 19 percentage points, less than half of the increase in the share of tertiary-educated adults in the two Asian countries (see Table 2.14).

Similarly, in Greece, Italy, Korea, Singapore, Spain and Turkey, parents' education was very low among adults born between 1946 and 1959 (members of Cohort 1). More than three in four of these parents had completed less than upper secondary education; in Italy (92%) and Turkey (98%), more than nine in ten respondents had parents who had not completed upper secondary education (Table 2.16). This relative delay in securing access to and completing upper secondary education meant that a large part of the population in these countries was eligible to experience upward mobility in the following decades.

In countries where there is a decline in upward educational mobility, access to and attainment of upper secondary education expanded earlier. In Canada, Estonia, Germany, Israel, Lithuania, Poland, Russia and the United States, upper secondary schooling was nearly universal by the middle of the 20th century (i.e. at least 80% of respondents in these countries had completed

upper secondary school or attained higher levels of education; see Table 2.14). Similarly, parents' educational attainment was higher in these countries, among the oldest cohort, than on average in PIAAC-participating countries (Table 2.16).

Disparities in completing tertiary education related to parents' education

Analyses of educational mobility across generations can capture how much educational attainment has changed between one generation and the next (also known as "absolute" mobility), but it cannot determine whether all socio-economic groups are affected in the same way (a.k.a. "relative" mobility). For example, socio-economically disadvantaged adults who are upwardly mobile compared with their parents might, or might not, attain similar levels of educational attainment as advantaged adults.

Research suggests that inequity in attainment might persist despite educational expansion because individuals who are more socio-economically advantaged progress through the levels of education faster than or as fast as individuals from disadvantaged groups, thus retaining their relative advantage (Raftery and Hout, 1993[28]; Breen and Jonsson, 2000[29]). In this hypothesis, disadvantaged groups could gain access only once advantaged groups reached a level of "saturation" (access for all of their group members).

Yet, some countries might be more efficient than others in promoting access for disadvantaged students (Breen et al., 2009[10]). Furthermore, universal access is by definition a source of equity (and also of equality) in education opportunities. The universalisation of primary and secondary education is a reality in most OECD countries, but universal tertiary education is not. Also, "horizontal" disparities in the quality of education can persist in those levels of education that have become universal (Lucas, 2001[30]; Marteleto et al., 2012[31]; Gerber and Cheung, 2008[32]). Thus, compensating for the early effects of family background on students' academic performance and behaviours that influence attainment remains the fundamental equity challenge (Erikson et al., 2005[33]).

In all 33 countries that participated in the Survey of Adult Skills (PIAAC), adults with more-educated parents have considerably greater chances of completing tertiary education than adults with less-educated parents (Figure 2.15). On average across PIAAC-participating countries, adults with at least one tertiary-educated parent were 11 times more likely to complete tertiary education than adults whose parents had not completed upper secondary school.

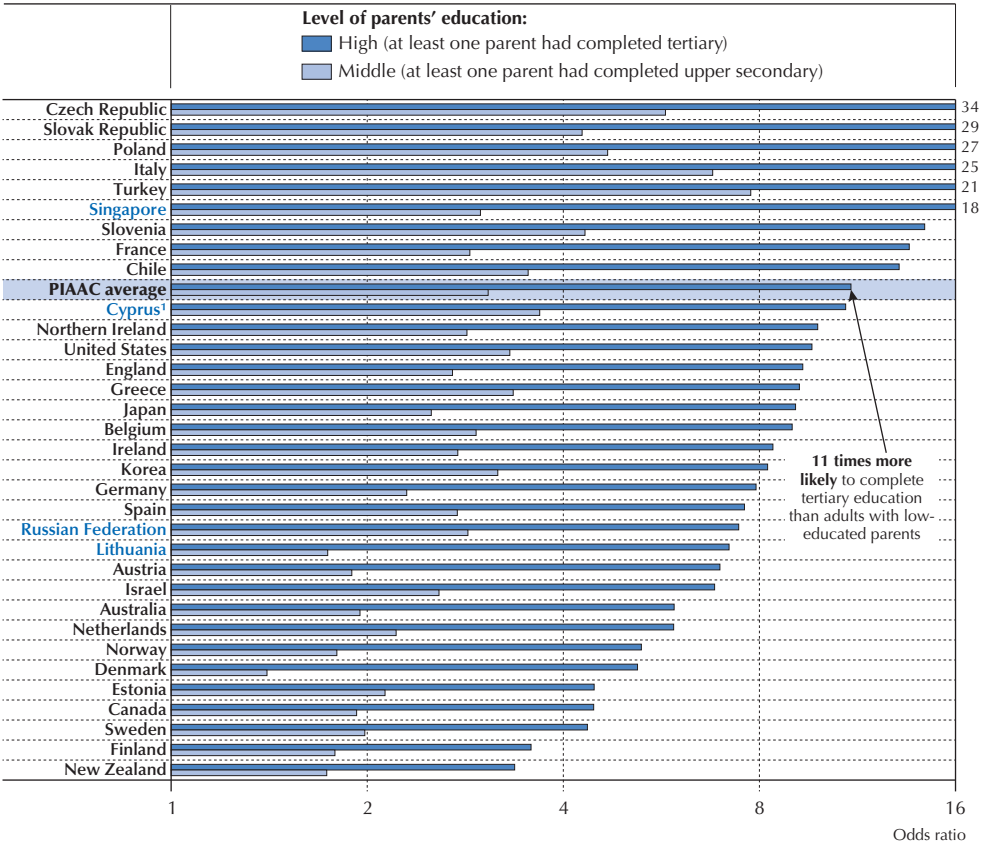
Relative disparities in attaining tertiary education are even more pronounced, in ascending order of magnitude, in Singapore, Turkey, Italy, Poland, the Slovak Republic and the Czech Republic. In these countries, adults with tertiary-educated parents were between 18 and 34 times more likely to complete tertiary education than adults with low-educated parents. Disparities are smaller, but still statistically significant, in Canada, Estonia, Finland, New Zealand and Sweden, where the odds of completing tertiary education were between three and five times greater among adults with highly educated parents than among adults with low-educated parents.

Adults with at least one parent who had completed upper secondary education were also more likely to complete tertiary education than those from families where neither parent had completed upper secondary school. On average across PIAAC-participating countries, adults with at least

one parent who had completed upper secondary education were three times more likely to complete tertiary education than adults with low-educated parents. In the Czech Republic, these adults were six times more likely to complete tertiary education; in Italy, they were seven times more likely, and in Turkey they were eight times more likely than adults with low-educated parents to complete tertiary education.

Figure 2.15 ■ **Likelihood of attaining tertiary education, by parents' education**

Increased likelihood of completing tertiary education among adults 26 years or older whose parents had attained a high or middle level of education, relative to adults with low-educated parents



1. See notes at the beginning of this chapter.

Note: All odds ratios are statistically significant.

Countries and economies are ranked in descending order of the increased likelihood of completing tertiary education among adults whose parents are highly educated, relative to adults with low-educated parents (neither parent completed upper secondary education).

Source: OECD, PIAAC dataset, Table 2.24.

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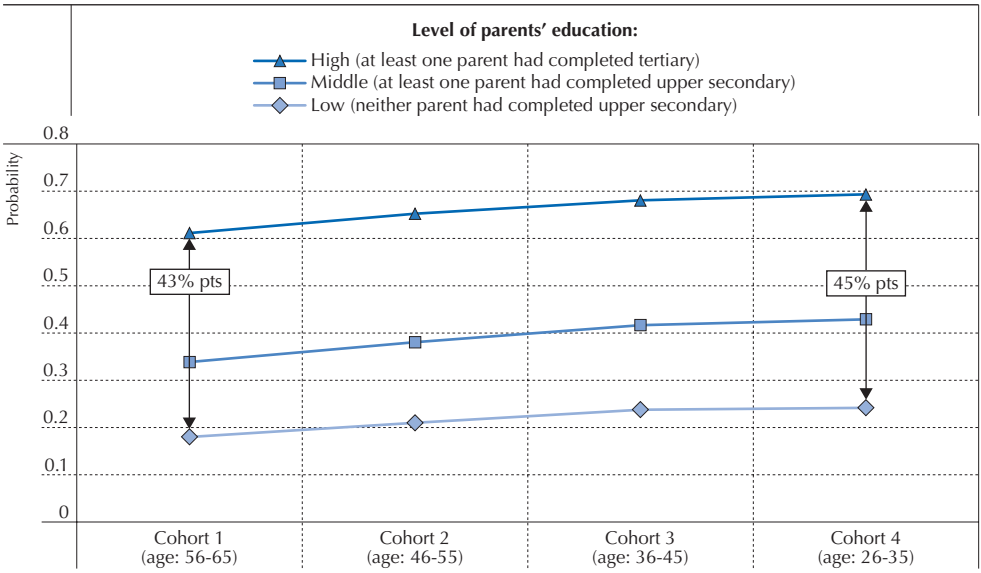
However, this does not mean that opportunities to attend and complete tertiary education did not improve over time for people from disadvantaged families. Education opportunities expanded for all socio-economic groups, on average across PIAAC-participating countries; but people with more-educated parents were more likely to seize those opportunities. To illustrate this point, Figure 2.16 presents the predicted probability of completing tertiary education among individuals with highly, middle- and low-educated parents among members of different age cohorts.[12]

On average across PIAAC-participating countries, the probability of completing tertiary education among adults with highly educated parents evolved from about 61% among the oldest cohort to 69% among the youngest cohort (Figure 2.16). Among adults with low-educated parents, the probability of attaining tertiary education was 18% among members of the oldest cohort, and 24% among those in the youngest cohort (an increase of 6 percentage points).

Because gains were larger among those with highly educated parents, the gap in tertiary attainment between adults with highly educated parents and those with low-educated parents grew over time. In the oldest cohort, the gap was 43 percentage-points wide, while in the youngest cohort, the gap was 45 percentage-points wide. Even if this difference is not very large, it suggests inequity in tertiary attainment increased moderately (or remained stable) over time.

Figure 2.16 ■ **Trends in likelihood of completing tertiary education, by parents' education**

Predicted probability of completing tertiary education among adults 26 years or older, PIAAC average (33 countries)



Note: Predicted probabilities are estimated based on a multivariate logistic regression with completing tertiary education as the outcome and parents' education and age-cohort as predictors.

Source: OECD, PIAAC dataset, Table 2.26.

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Adults whose parents had attained a middle level of education showed significant gains. Among adults with at least one parent who had completed upper secondary education, the predicted probability of completing tertiary education was 34% among the oldest cohort, and 43% among the youngest cohort, an increase of 9 percentage points over time (Figure 2.16). This suggests that the disparity between adults with middle-educated parents and those with highly educated parents remained stable during the past few decades, while the disparity between those with middle-educated parents and those with low-educated parents widened, on average across PIAAC-participating countries.

Some countries deviate from these average trends, however. Inequity in attainment of tertiary education (predicted values) increased more markedly in Chile, the Czech Republic, Ireland, Italy, Poland, Slovenia, Spain and Turkey (Table 2.26). In these countries the gap between those respondents with highly educated parents and those with low-educated parents widened by six percentage points or more between the oldest and youngest cohorts.

The largest decline in equity was observed in the Czech Republic. The difference in the predicted probability of completing tertiary education between adults with highly educated parents and those with low-educated parents increased by 11 percentage points. As shown in Figure 2.17, this widening of the gap was mainly due to recent gains among young adults with highly educated parents, and also to the lack of gains among adults with low-educated parents over the period. In the Czech Republic, only 14% of older adults completed tertiary education, but almost 30% of younger adults did (Table 2.21). This expansion mostly involved those with highly educated parents who already had a much higher likelihood of completing tertiary education than the rest of the Czech population.

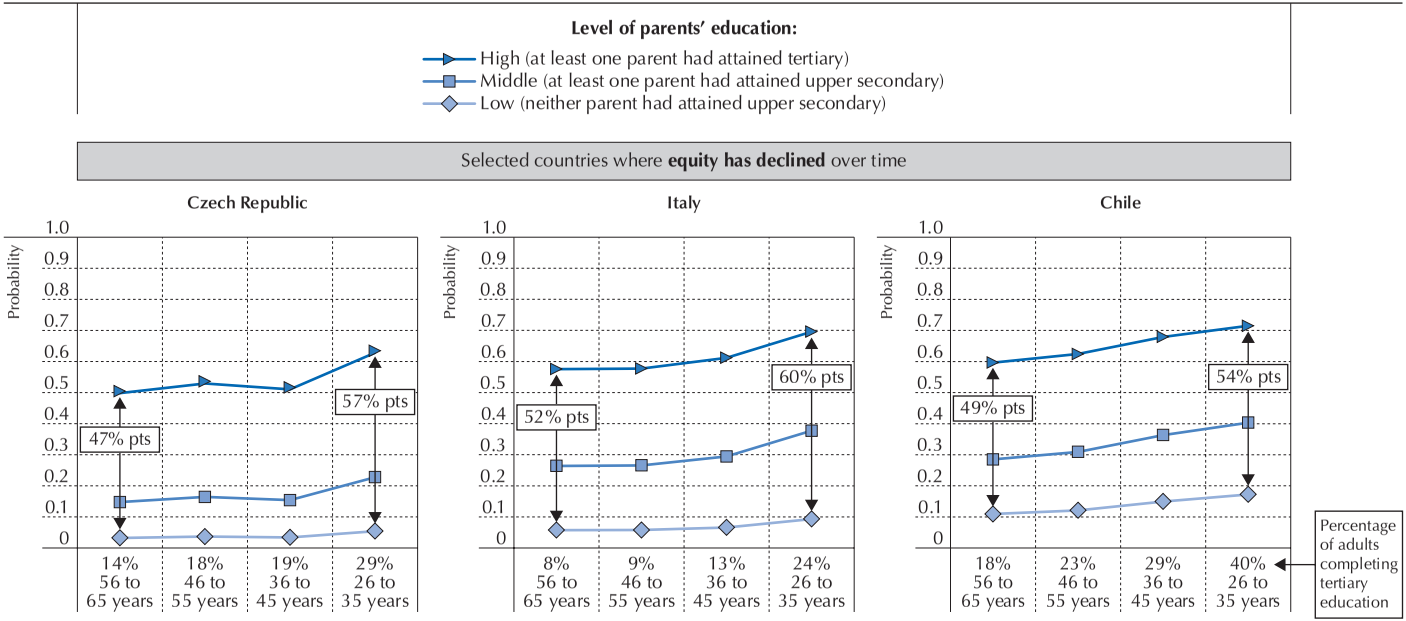
Italy and Chile provide two additional examples of how access to tertiary education can become more inequitable over time. In these countries inequity did not increase only among the youngest cohort, as in the Czech Republic, but started growing in older cohorts.

In Italy, the predicted probability of completing tertiary education improved over time among people of high and middle socio-economic status, and not as much among disadvantaged individuals (Figure 2.17). The average educational attainment in Italy is low by OECD standards: only 14% of Italian adults had earned a tertiary degree by the time of PIAAC data collection (Table 2.20). In previous decades, this share was even smaller: less than one in ten 56-65 year-olds in Italy completed tertiary education (Table 2.21). Younger Italians, those aged between 26 and 45 at the time of the survey, benefited from greater access to higher education.

In Chile, tertiary attainment rates improved with each successive cohort across all socio-economic groups, but the larger gains were observed among the middle and high socio-economic strata (Figure 2.17). Some 29% of adults in Chile held a tertiary degree at the time of PIAAC data collection – a larger share than in Italy and the Czech Republic (Table 2.20). A recent OECD review of education in Chile identified strengthening equity in access to higher education as one the main challenges for education policy in that country (OECD, 2017[34]).

Figure 2.17 [1/2] • **National trends in likelihood of completing tertiary education, by parents' education**

Predicted probability of completing tertiary education, selected countries



Note: The difference in the probability of completing tertiary education between adults 26 years or older with highly educated parents and adults 26 years or older with low-educated parents is shown in the text box for the oldest and the youngest cohorts.

Predicted probabilities are estimated based on a multivariate logistic regression with completing tertiary education as the outcome and parents' education and age cohort as predictors.

Source: OECD, PIAAC dataset, Tables 2.21 and 2.26.

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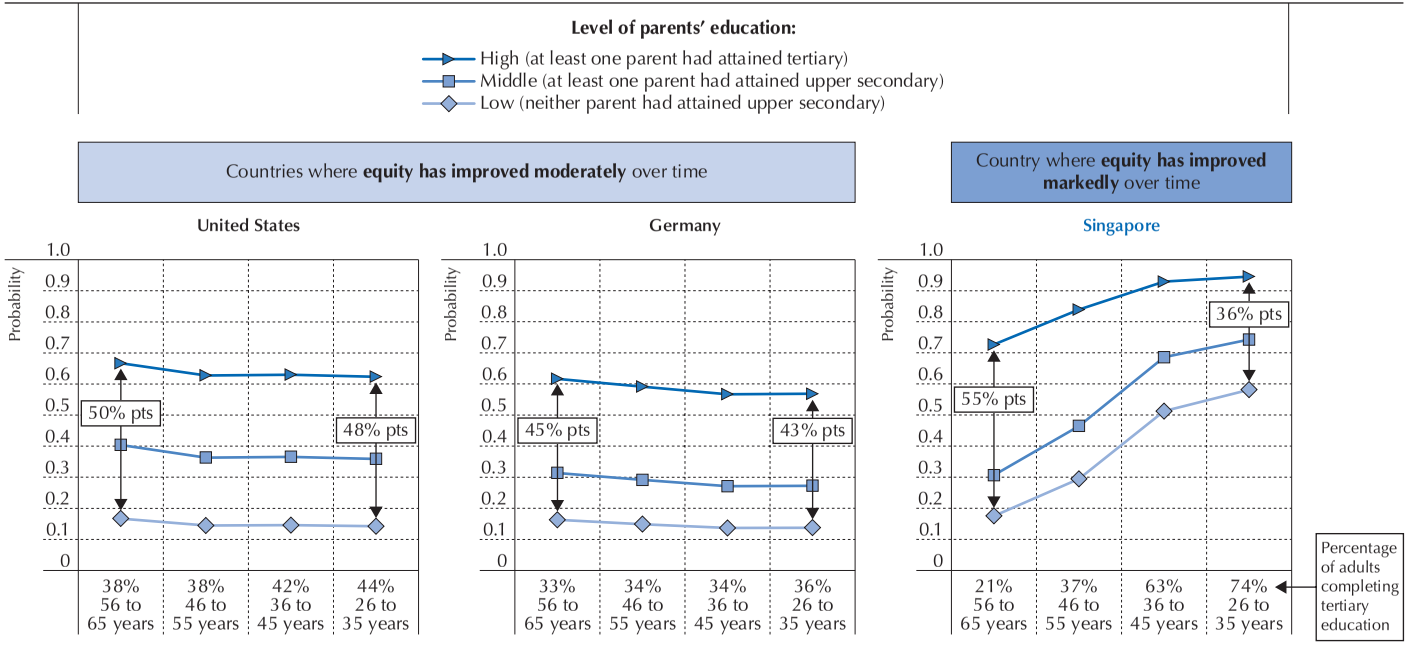
Figure 2.17 [2/2] • **National trends in likelihood of completing tertiary education, by parents' education**

Predicted probability of completing tertiary education, selected countries



Note: The difference in the probability of completing tertiary education between adults 26 years or older with highly educated parents and adults 26 years or older with low-educated parents is shown in the text box for the oldest and the youngest cohorts.

Predicted probabilities are estimated based on a multivariate logistic regression with completing tertiary education as the outcome and parents' education and age cohort as predictors.

Source: OECD, PIAAC dataset, Tables 2.21 and 2.26.

StatLink https://doi.org/10.1787/888933830424

By contrast, Singapore is the only country where equity in the attainment of tertiary education improved markedly over time, as show in Figure 2.17. In Singapore, the difference in the likelihood of completing tertiary education related to parents' education narrowed by 19 percentage points between the oldest and youngest cohorts. What is unique about Singapore are the enormous strides made by adults with low-educated parents. In Singapore, even disadvantaged adults in the two youngest cohorts were more likely than not to complete tertiary education (i.e. among those with low-educated parents, the probability of completing tertiary education was 51% for adults aged 36-45 and 58% for adults aged 26-35) (Figure 2.17). Arguably, this was possible because the stratum of socio-economically advantaged adults had already reached a "saturation" point in their access to tertiary education by the 1980s, when 86% of adults with tertiary-educated parents also completed tertiary education (Table 2.23).

Germany and the United States also show some minor increases in equity in tertiary attainment. What is interesting about these cases is that the probability of completing tertiary education decreased for German and American adults regardless of their parents' level of education. Greater equity is achieved because the decrease in likelihood is slightly greater for adults with highly educated parents than for adults with low-educated parents.

Neither Germany nor the United States saw a great expansion in access to tertiary education in the four decades prior to the Survey of Adult Skills. In Germany, 34% of respondents held a tertiary degree at the time of data collection (Table 2.20), and no difference in the share of the population with a tertiary degree is observed between the youngest and oldest cohorts (Table 2.21). In the United States, 40% of all respondents had completed tertiary education (Table 2.20), with a small increase between the older and younger respondents (Table 2.21).

Notes

1. Reading was the main domain of assessment in PISA 2000 and PISA 2009. The analyses in Figure 2.4 consider, first, changes that occurred between PISA 2000 and PISA 2015, because the purpose of the analysis is to observe trends over the longest possible period of time. For particular countries that did not participate in PISA 2000, changes occurred between PISA 2009 and PISA 2015 are considered. Similarly, in Figure 2.5 changes between PISA 2003 (when mathematics was the main domain of assessment for the first time) and PISA 2015 are considered, and data for PISA 2012 is used only for countries that did not participate in PISA 2003.

2. PIAAC collects data for respondents aged 16 and older. For this analysis, the sample was limited to the first age group in 5-year intervals (25-29). This means that the PIAAC results reported in this analysis refer to a wider age group than TIMSS and PISA results, which use a sample of students of roughly similar age.

3. This methodological design is called a "pseudo-cohort" analysis. For a similar analytical approach, see Borgonovi et al. (2017[35]).

4. TIMSS 1995 tested three separate populations. So-called "Population 1" included students enrolled in two adjacent grades that contained the largest proportion of 9-year-old students at the time of testing – third- and fourth-grade students (IEA, 1997[36]). In this analysis, the sample was restricted to students attending grade 4 of primary school, to capture more 10-year-old students. The average age of students in the sample for each country was the following (in years; standard errors in parenthesis): Australia: 10.25 (0.015); Austria: 10.46 (0.014); Canada: 10.02 (0.011); the Czech Republic: 10.42 (0.011); England: 10.04 (0.011); Greece: 9.61 (0.008); Ireland: 10.34 (0.016); Korea: 10.28 (0.009); the Netherlands: 10.26 (0.015); New Zealand: 9.98 (0.013); Norway 9.87 (0.008); the United States: 10.19 (0.011).

5. See *PISA 2015 Technical Report* (OECD, 2017[7]) for more details about this index.

6. OECD partners included in the high-income group are the following: Hong Kong (China), Lithuania, Macao (China), Malta, Qatar, Singapore, Chinese Taipei, Trinidad and Tobago, the United Arab Emirates and Uruguay. OECD partners included in the upper-middle-income group are the following: Albania, Algeria, Brazil, Beijing-Shanghai-Jiangsu-Guangdong (China), Bulgaria, Ciudad Autónoma de Buenos Aires (Argentina), Colombia, Costa Rica, Croatia, the Dominican Republic, the Former Yugoslav Republic of Macedonia (FYROM), Lebanon, Montenegro, Peru, Romania, Russia and Thailand. OECD partners included in the lower-middle-income group are the following: Georgia, Indonesia, Jordan, Kosovo, Moldova, Tunisia and Viet Nam.

7. PIAAC collects data on individuals as young as 16. However, the analysis in this chapter considers only individuals older than 25 at the moment of the survey to ensure that as many respondents as possible have reached their highest level of education. This is consistent with previous studies using a similar methodology (Pfeffer, 2008[9]).

8. See notes at the beginning of this chapter.

9. See the note at the beginning of this chapter.

10. The first round of PIAAC data collection occurred between August 2011 and March 2012 in the following 25 countries: Australia, Austria, Belgium (Flanders), Canada, Cyprus, the Czech Republic, Denmark, England, Estonia, Finland, France, Germany, Ireland, Italy, Japan, Korea, the Netherlands, Northern Ireland, Norway, Poland, the Russian Federation, the Slovak Republic, Spain, Sweden and the United States. The second round of data collection occurred between August 2014 and January 2015 in the following eight countries: Chile, Greece, Israel, Lithuania, New Zealand, Singapore, Slovenia and Turkey.

11. This analysis is based on a measure of educational attainment that considers three response categories (with completing tertiary as highest education level). Results may have been different if different levels or

kinds of tertiary education had been considered in the analysis, or if educational attainment was measured in terms of years of schooling.

12. Predicted values in Figure 2.16 are based on a regression model that estimates the likelihood of completing tertiary education by parents' education, after accounting for individuals' age cohort (Table 2.25). Having more highly educated parents increases the likelihood of completing tertiary education in all countries, even after accounting for age cohort (Table 2.25). Because predicted values are used only for illustration, the statistical significance of the difference in predicted values was not computed.

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