3

The socio-demographic distribution of key information-processing skills

This chapter examines differences in skills proficiency between different groups of individuals, defined by age, gender, socio-economic status, educational attainment, and immigrant and language background. The main focus of the analysis is on literacy proficiency; results for numeracy are generally similar, and are discussed in detail when this is not the case. Results for problem solving in technology-rich environments are discussed separately.

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.

Knowing the proficiency levels of different subgroups of the population makes it easier for policy makers to target policy interventions, and to identify strengths and weaknesses of particular policies. To this end, this chapter tries to identify the groups that may be at particular risk of suffering from low proficiency in literacy, numeracy and/or problem-solving skills. A lack of information-processing skills could be a major obstacle to full participation in modern societies and could lead to social and economic exclusion and marginalisation.

OVERVIEW OF SOCIO-DEMOGRAPHIC DIFFERENCES IN PROFICIENCY

Figure 3.1 presents an overview of proficiency differences associated with various socio-demographic characteristics, as revealed in the Survey of Adult Skills, a product of the OECD Programme for the International Assessment of Adult Competencies (PIAAC). The bars show raw (unadjusted) differences, while the dots represent adjusted differences, estimated after accounting for the impact of other background characteristics.[1] While the analysis focuses on literacy proficiency, results for numeracy are generally similar.

Of all the socio-demographic characteristics examined in this chapter, educational attainment has the strongest relationship with proficiency, both before and after accounting for the influence of other socio-demographic characteristics. When considering educational attainment, the adjusted differences are generally close to the unadjusted differences, meaning that background characteristics like age, gender or family background have little impact on the strength of the relationship between educational attainment and proficiency. In fact, accounting for differences in educational attainment generally results in a much weaker association between proficiency and other background characteristics. In other words, while education explains a substantial part of the difference in proficiency between older and younger adults, the opposite is not true: differences in proficiency among adults with different levels of education remain substantial, even after taking account of age.

Among the main findings discussed in this chapter:

- The largest gaps in literacy proficiency are usually related to differences in educational attainment, with tertiary-educated 25-65 year-olds scoring some 60 points higher, on average, than adults in this age group who have not attained an upper secondary qualification. The magnitude of the gap varies from more than 100 score points in Singapore, to about 30 to 40 score points in the Russian Federation[2] and Greece.

- Proficiency is strongly related to age. Cognitive abilities are generally found to peak between the mid-20s and the early 30s and then gradually decline (see Desjardins and Wanke, 2012; Paccagnella, 2016, and references therein); proficiency in information-processing skills follows a similar trajectory. In the Survey of Adult Skills, older adults (55-65 year-olds) scored almost 30 points below 25-34 year-olds, on average. However, there is substantial variation in the strength of the relationship between proficiency and age across countries. This suggests that the evolution of proficiency over a lifetime is not determined solely by biological factors. Accounting for other background characteristics – notably, education – strongly reduces observed age-related differences in proficiency, especially in countries/economies that expanded access to higher education over the past three decades.

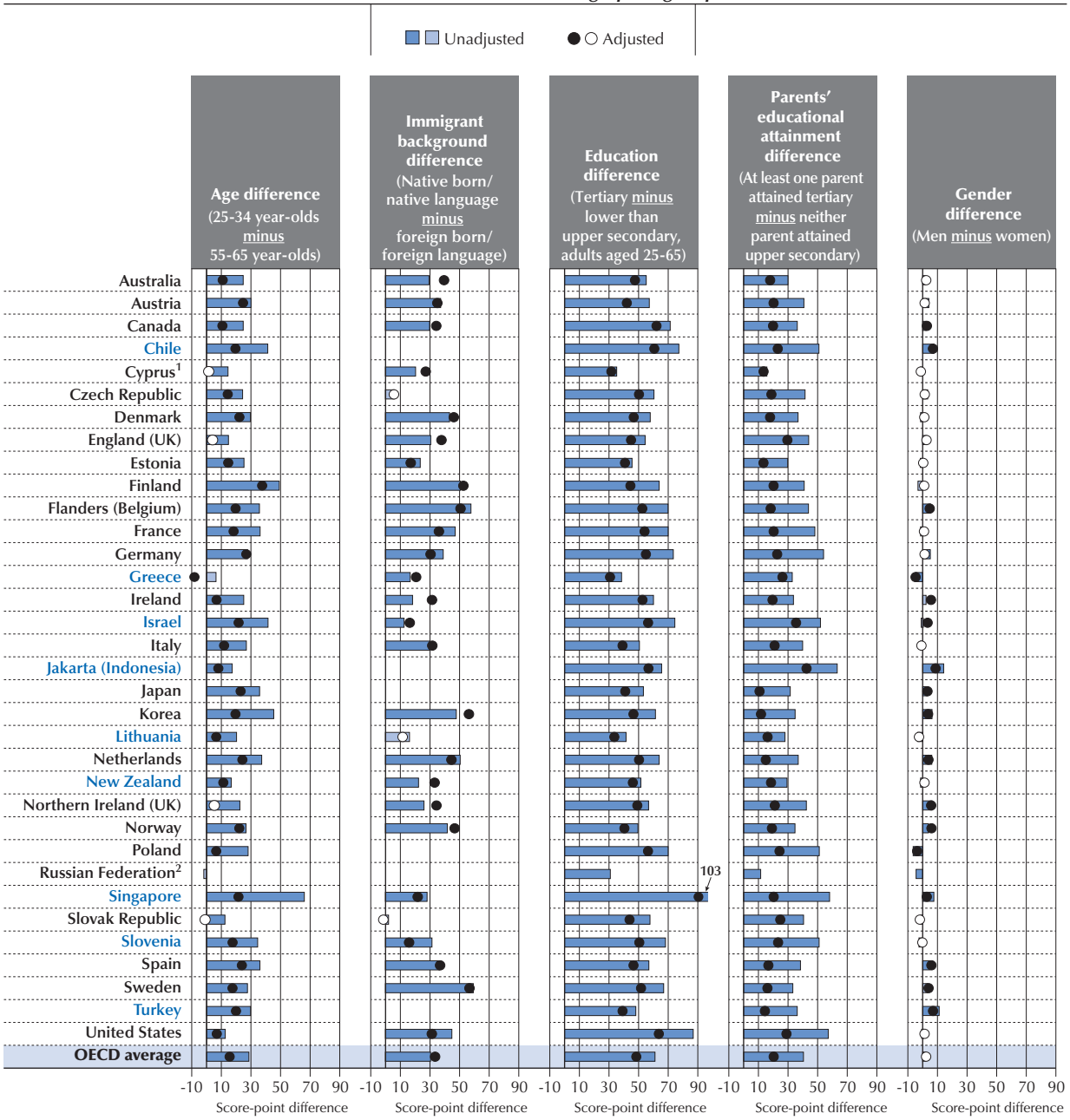
- The difference in literacy proficiency between men and women is negligible. In numeracy, men have a more substantial advantage, scoring about 10 points higher than women, on average. Gender gaps in proficiency are more pronounced among older cohorts. This could reflect either the fact that gender gaps in educational attainment are wider, or that women's skills depreciate more over time, possibly because they participate less in the labour market.

- Native-born adults scored 24 points higher than foreign-born adults, on average. However, migrants whose native language is the same as that of the host country tended to score significantly higher than other migrants, and are often nearly as proficient as native-born adults. The magnitude of the differences, and the extent to which other background characteristics might account for them, varies enormously across countries/economies, reflecting countries'/economies' vastly different migration histories and policies.

- Socio-economic background exerts a significant influence on adults' proficiency in literacy. Having at least one parent with tertiary qualifications is associated with a 40 score-point advantage over adults with neither parent having attained an upper secondary degree. A significant portion of this difference (about half) is explained by other socio-demographic characteristics, most notably the fact that children of high-educated parents are themselves more likely to attain higher levels of education.

Figure 3.1 ■ **Socio-demographic differences in literacy proficiency**

Adjusted and unadjusted differences in literacy scores between contrast categories within various socio-demographic groups



Notes: Statistically significant differences are marked in a darker tone. Estimates based on a sample size less than 30 are not shown (i.e. immigrant background differences in Chile, Jakarta [Indonesia], Japan, Poland and Turkey). Unadjusted differences are the differences between the two means for each contrast category. Adjusted differences are based on a regression model and take account of differences associated with the following variables: age, gender, education, immigrant and language background and parents' educational attainment. Only the score-point differences between two contrast categories are shown, which is useful for showing the relative significance of each socio-demographic variable vis-a-vis observed score-point differences. All adjusted differences and immigrant background estimates for the Russian Federation are missing due to the lack of language variables.

1. *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 recognised 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.

2. See note at the end of this chapter.

Countries and economies are listed in alphabetical order.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Tables A3.1 (L), A3.2 (L), A3.5 (L), A3.9 (L), A3.12 (L) and A3.14 (L).

StatLink http://dx.doi.org/10.1787/888933365979

DIFFERENCES IN SKILLS PROFICIENCY RELATED TO EDUCATIONAL ATTAINMENT

Learning and skills development can take place in many different contexts and in many different forms. However, most knowledge and skills are acquired through education and training programmes delivered by educational institutions such as schools, colleges and universities. While children learn in their families, and adults continue to learn, develop and maintain skills in the workplace, schools and some adult training providers are the only institutions whose primary, explicit goal is to equip individuals with the proficiency in reading and numeracy they need in order to participate fully in society. The very existence of compulsory education indicates the importance attached to formal schooling, and the shared belief that it is the most effective vehicle for educating young people.

The link between education and proficiency is complex. Instruction is only one of the possible channels through which the two are related. People with higher innate ability are likely to be both more proficient in information-processing skills and to earn higher educational qualifications, in which case the direction of causality would run from proficiency to education, rather than the other way around. More highly educated individuals are also more likely to be employed, which gives them more opportunities to practice their skills and prevent (or slow) the decline in cognitive functions normally associated with ageing. This implies that people with different educational qualifications also differ in terms of other relevant characteristics associated with proficiency.

Moreover, educational qualifications are not perfectly comparable across countries, or over time. Countries differ in the selectivity of their education systems and in the content of curricula, especially at higher levels of education. Even within the same country, the changing nature of education systems and policies implies that an individual who earned a tertiary degree some 30 years ago probably had a very different experience in tertiary education than a more recent graduate.

The analysis of proficiency differences according to educational attainment is further complicated by the fact that, among the youngest age groups that participated in the Survey of Adult Skills, a sizeable share of respondents are still in education. For this reason, this section will analyse the proficiency of 16-24 year-olds separately. The core analysis of proficiency differences related to educational qualifications applies to the subsample of 25-65 year-olds.

Proficiency in literacy and numeracy among low- and high-educated adults

As expected, in all countries, high-educated 25-65 year-olds (those who have attained at least a tertiary degree) scored higher in both literacy and numeracy than adults with an upper secondary education as their highest level of attainment; and they, in turn, scored higher than adults who have not completed upper secondary education (hereafter "low-educated adults"). Across OECD countries and economies participating in the survey, tertiary-educated adults scored 292 points on the literacy scale, on average, while adults with upper secondary education scored 264 points, and low-educated adults scored 231 points. On average, 42% of low-educated adults scored at or below Level 1, more than double the proportion of upper secondary graduates at that level (slightly below 20%). Less than 10% of tertiary-educated adults scored below Level 2, and 21% scored at Level 4 or 5. The score differences by educational attainment are generally even larger in the case of numeracy proficiency (see Tables A3.3 [L] and A3.3 [N]).

Figure 3.2 shows both average literacy proficiency by level of educational attainment (in the left panel) and proficiency differences between tertiary-educated adults and adults without an upper secondary education (on the right). Countries/economies differ to a great extent along both dimensions.

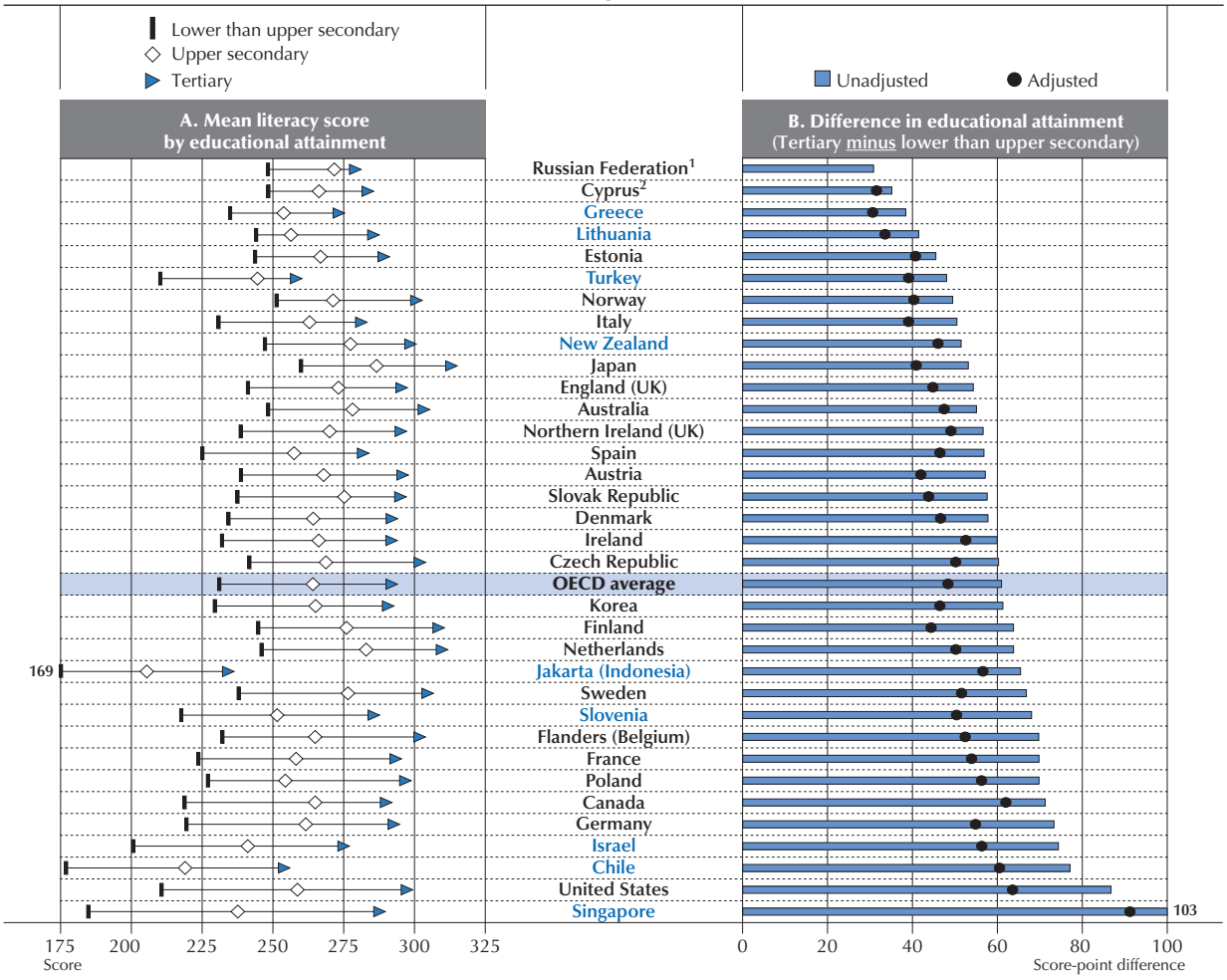
Low-educated adults in Chile, Israel, Jakarta (Indonesia), Singapore and Turkey scored particularly poorly (see Table A3.3 [L]). In Chile, 87% of adults without upper secondary education scored at or below Level 1; in Jakarta (Indonesia), 90% of such adults scored at that level. This is particularly significant, given that in Chile low-educated adults make up 32% of the total population, compared to 21% in Singapore and 13% in Israel (see Table B3.1). In Jakarta (Indonesia), low-educated adults represent almost 40% of the total population. In Lithuania and New Zealand, low-educated adults scored above the average: fewer than one in three scored at or below Level 1, and about a quarter scored at or above Level 3.

In Chile and Turkey, the vast majority of tertiary graduates scored below Level 3 in literacy; less than 5% scored at Level 4 or 5. Similar results were obtained by tertiary graduates in Jakarta (Indonesia). The literacy proficiency of tertiary graduates is only slightly better in Greece and Israel, where about 50% of tertiary graduates scored below Level 3 and less than 15% scored at Level 4 or 5. In contrast, the proficiency of tertiary graduates in Lithuania, Singapore and Slovenia is close to the international average,[3] while it is almost 10 points above average in New Zealand, where 26% of tertiary graduates scored at Level 4 or 5 (compared to an average of 21% among OECD countries/economies participating in the survey).

Singapore stands out as the country in which the difference in proficiency between high- and low-educated 25-65 year-olds is greatest – around 100 score points. This is mainly due to the comparatively low performance among low-educated adults. The same explanation applies to the large differences found in Chile, Israel and the United States. By contrast, higher educational attainment is much less closely associated with high proficiency in Greece, Lithuania and Turkey. However, in Lithuania, only 6% of adults reported that they had low educational attainment, a share much smaller than in most other countries and economies that participated in the Survey of Adult Skills. In Lithuania, the difference in proficiency between tertiary-educated adults and those with upper secondary as their highest level of attainment is close to the international average. In Greece and Turkey, the relatively small differences in proficiency between high- and low-educated adults are mainly due to low proficiency among tertiary graduates. In Jakarta (Indonesia), the difference between high- and low-educated adults is similar to the international average: across all levels of educational attainment, literacy proficiency is below the international average by roughly the same amount (approximately 60 score points).

Figure 3.2 ■ **Differences in literacy proficiency, by educational attainment**

Adults aged 25-65



Notes: All differences in Panel B are statistically significant. Unadjusted differences are the differences between the two means for each contrast category. Adjusted differences are based on a regression model and take account of differences associated with other factors: age, gender, immigrant and language background and parents' educational attainment. Only the score-point differences between two contrast categories are shown in Panel B, which is useful for showing the relative significance of educational attainment vis-a-vis observed score-point differences. Lower than upper secondary includes ISCED 1, 2 and 3C short. Upper secondary includes ISCED 3A, 3B, 3C long and 4. Tertiary includes ISCED 5A, 5B and 6. Where possible, foreign qualifications are included as the closest corresponding level in the respective national education systems. Adjusted difference for the Russian Federation is missing due to the lack of language variables.

1. See note at the end of this chapter.

2. See note 1 under Figure 3.1.

Countries and economies are ranked in ascending order of the unadjusted differences in literacy scores (tertiary minus lower than upper secondary).

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Tables A3.1 (L) and A3.2 (L).

StatLink http://dx.doi.org/10.1787/888933365986

Accounting for other socio-demographic characteristics tends to reduce the gap in proficiency associated with educational attainment. In all countries/economies, adults with high educational attainment tend to come from advantaged backgrounds, or have other characteristics that tend to be positively associated with literacy proficiency. The effect of such other background characteristics, however, is weak, and does not vary greatly from one country to another. This is further evidence of the strong link between formal education and proficiency in information-processing skills.

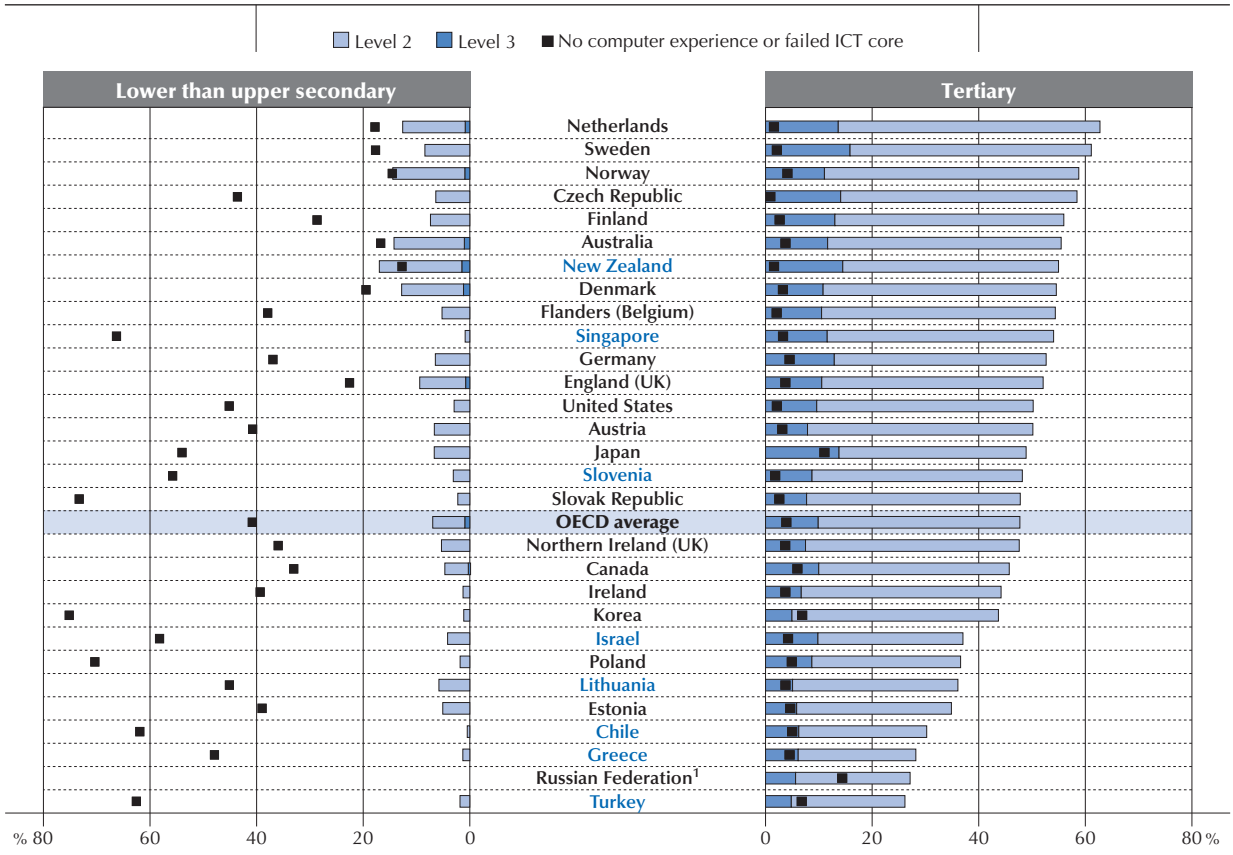
Proficiency in problem solving in technology-rich environments among low- and high-educated adults

The proficiency advantage among high-educated adults is even more striking when looking at proficiency in problem solving in technology-rich environments (Figure 3.3). Only about 7% of low-educated adults scored at Level 2 or 3 on the problem-solving assessment, compared to 48% of adults who had attained tertiary education.

In this respect, between-country/economy differences are small. The share of low-educated adults showing high proficiency in problem solving in technology-rich environments is below 3% in a large and diverse group of countries that includes Chile, Greece, Ireland, Korea, Poland, Singapore, the Slovak Republic, Turkey and the United States, and exceeds 10% in only five countries (Australia, Denmark, the Netherlands, New Zealand and Norway).

Figure 3.3 ■ **Problem-solving proficiency, by educational attainment**

Percentage of low- and high-educated adults scoring at Level 2 or 3 in problem solving in technology-rich environments or having no computer experience (adults aged 25-65)



Notes: Percentages on the problem solving in technology-rich environments scale are computed so that the sum of percentages for the following mutually exhaustive categories equals 100%: opted out of the computer-based assessment; no computer experience; failed ICT core test; below Level 1, Level 1, Level 2 and Level 3. For more detailed results for each category, see corresponding table mentioned in the source below. Lower than upper secondary includes ISCED 1, 2 and 3C short. Upper secondary includes ISCED 3A, 3B, 3C long and 4. Tertiary includes ISCED 5A, 5B and 6. Where possible, foreign qualifications are included as the closest corresponding level in the respective national education systems. Cyprus,[2] France, Italy, Jakarta (Indonesia) and Spain did not participate in the problem solving in technology-rich environments assessment.

1. See note at the end of this chapter.

2. See note 1 under Figure 3.1.

Countries and economies are ranked in descending order of the combined percentages of adults with tertiary attainment scoring at Level 2 or 3.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A3.3 (P).

StatLink http://dx.doi.org/10.1787/888933365994

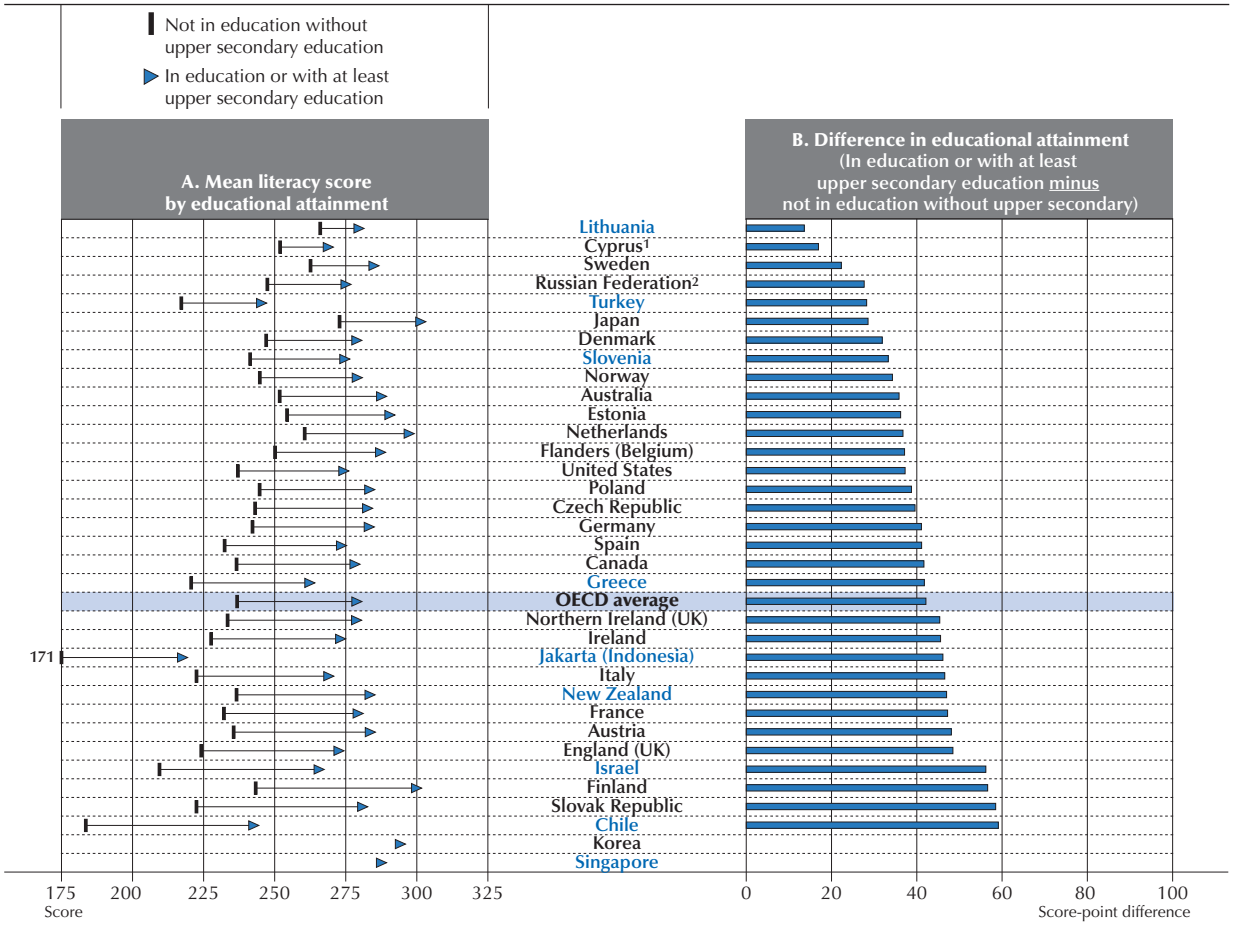
There is much more variation at the bottom of the proficiency distribution, however. An average of 41% of low-educated adults reported having no experience at all with ICTs, or failed the ICT core test. This share ranges from more than 70% in Korea, Poland and the Slovak Republic, to around 60% in Chile, Israel, Singapore, Slovenia and Turkey, to 48% in Greece, to below 20% in a large number of countries, including New Zealand, Norway and Sweden.

When looking at high-educated adults, the opposite pattern emerges: between-country/economy differences are much more pronounced at the top than at the bottom of the proficiency distribution. The share of tertiary-educated adults who failed the ICT core test, or who reported having no ICT experience, ranges from 2% in New Zealand and Slovenia to 7% in Turkey (and 12% in Japan). By contrast, less than 30% of high-educated adults in Greece and Turkey scored at Level 2 or higher, compared to between 54% and 63% in ten other countries/economies, including Australia, the Netherlands, New Zealand, Singapore and Sweden.

Skills and education among younger adults

In most countries, young adults (16-24 year-olds) are at a stage of their life when they make choices with significant long-term implications for their educational careers. While the situation in each country is different, it is usually between the ages of 16 and 24 that participation in education ceases to be compulsory, and young people have to decide whether or not to stay in school, whether or not to complete upper secondary education, and whether or not to enrol in higher education.

Figure 3.4 ■ **Differences in literacy proficiency by educational attainment, young adults aged 16-24**



Notes: All differences in Panel B are statistically significant. Estimates based on a sample size of less than 30 are not shown in Panels A and B (Korea and Singapore). Upper secondary includes ISCED 3A, 3B, 3C long and 4. Where possible, foreign qualifications are included as the closest corresponding level in the respective national education systems.

1. See note 1 under Figure 3.1.

2. See note at the end of this chapter.

Countries and economies are ranked in ascending order of the differences in literacy scores (In education or with at least upper secondary education minus not in education without upper secondary).

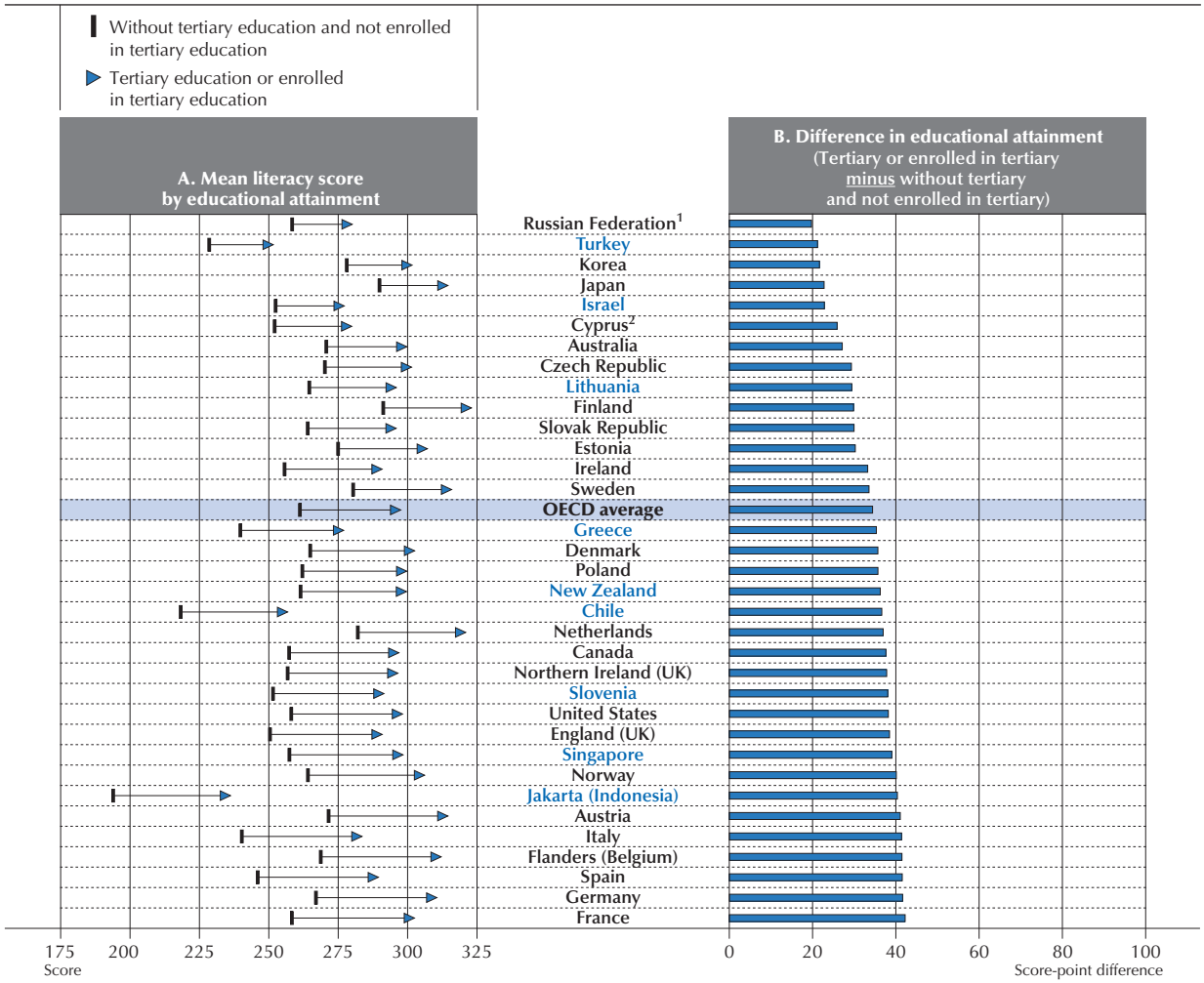
Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A3.4 (L).

StatLink http://dx.doi.org/10.1787/888933366007

In many countries, students also have to choose whether they want to enrol in an academically-oriented or in a vocational programme. Although it is theoretically possible to go back to school at any time, from a practical point of view many of the choices made in young adulthood tend to be irreversible.

Given the dynamic nature of this phase of life, particularly the transitions from one level of education to another and from education into the labour market, this subsection takes a closer look at the proficiency of 16-24 year-olds. In this analysis, the population is divided in three broad groups, reflecting three key transition points in young people's educational careers. The first group is composed of early school leavers, i.e. those who left formal education without an upper secondary degree. The second group is composed of those who completed upper secondary education, but decided not to enrol in tertiary education. The third group comprises young adults who are either enrolled in tertiary education or who have already earned a tertiary qualification. When looking at this latter group, the analysis will be restricted to 20-24 year-olds, because country differences in the typical age at which students graduate from upper secondary school would generate large (and somewhat artificial) differences in the share of 16-19 year-olds who are enrolled in tertiary education.

Figure 3.5 ■ **Differences in literacy proficiency by educational attainment, young adults aged 20-24**



Notes: All differences in Panel B are statistically significant. Tertiary includes ISCED 5A, 5B and 6. Where possible, foreign qualifications are included as the closest corresponding level in the respective national education systems.

1. See note at the end of this chapter.

2. See note 1 under Figure 3.1.

Countries and economies are ranked in ascending order of the differences in literacy scores (Tertiary or enrolled in tertiary minus without tertiary and not enrolled in tertiary).

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A3.4 (L).

StatLink http://dx.doi.org/10.1787/888933366017

In many countries, leaving education before earning an upper secondary qualification is a significant and worrying phenomenon. In 2013, enrolment rates among 15-19 year-olds averaged 84% across OECD countries/economies, but ranged from well above 90% in Ireland and Slovenia, to 69% in Turkey and 65% in Israel (OECD, 2015a). In the Survey of Adult Skills, early school leavers are identified as 16-24 year-olds who have not attained an upper secondary qualification and who are not currently enrolled in formal education. Using this definition, an average of 10% of 16-24 year-olds are early school leavers, ranging from 1% in Singapore, to about 5% in Israel and Slovenia, 23% in Spain and 31% in Turkey. The share of early school leavers (18%) is also relatively high in Jakarta (Indonesia) (Table B3.2).

Figure 3.4 shows that leaving the education system without earning an upper secondary qualification is strongly associated with large deficits in literacy proficiency compared with young people who had attained an upper secondary education. The average gap is about 40 score points, which is larger than the score-point difference separating tertiary-educated from upper secondary-educated 25-65 year-olds. On average, early school leavers scored 237 points on the literacy scale, meaning that they barely attained Level 2; in Chile, Greece, Israel, Turkey and Jakarta (Indonesia), the average scores were below 225 points. In no country was the average score of early school leavers high enough to place them at proficiency Level 3. The largest differences in literacy proficiency (around 60 score points) between early school leavers and other 16-24 year-olds are found in Chile, Finland, Israel and the Slovak Republic; in Lithuania, the gap is less than 15 score points.

Young adults (20-24 year-olds) enrolled in tertiary education, or who have already earned a tertiary degree, are more proficient than their peers of the same age who didn't enter higher education (Figure 3.5). The average difference is about 34 score points, which is slightly less than the 39 score-point difference that separates 25-65 year-olds with and without a tertiary degree (see Table A3.4 [L]). But this may be an underestimation of the proficiency gap between the two groups, since many 20-24 years-old are still working to complete their tertiary degree, and one could expect the gap to grow with each year spent in tertiary education.

DIFFERENCES IN SKILLS PROFICIENCY RELATED TO AGE

The evolution of proficiency in information-processing skills over a lifetime can be thought of as the result of distinct and conceptually separate processes. First, there is a "natural", or biological, process by which cognitive abilities are developed as people grow and mature, and then inevitably decline because of ageing. However, this process can be influenced considerably by individual choices, such as pursuing higher education and/or a particular career and practicing information-processing skills both in and outside the workplace. Moreover, the extent to which such individual choices affect the age-proficiency profile varies across countries, because of differences in the quality of education, the quality of and access to lifelong learning, industry structure and labour market institutions, to name just a few factors.

The Survey of Adult Skills offers a snapshot of the proficiency level of adults of different ages at a particular point in time, and therefore does not allow for tracking how the proficiency of the same age cohorts evolves over time. As a result, it is not possible to disentangle age effects (i.e. the consequences of growing older), cohort effects (the consequences of being born at different times) and period effects (the consequences of influences that vary through time, such as economic recessions).

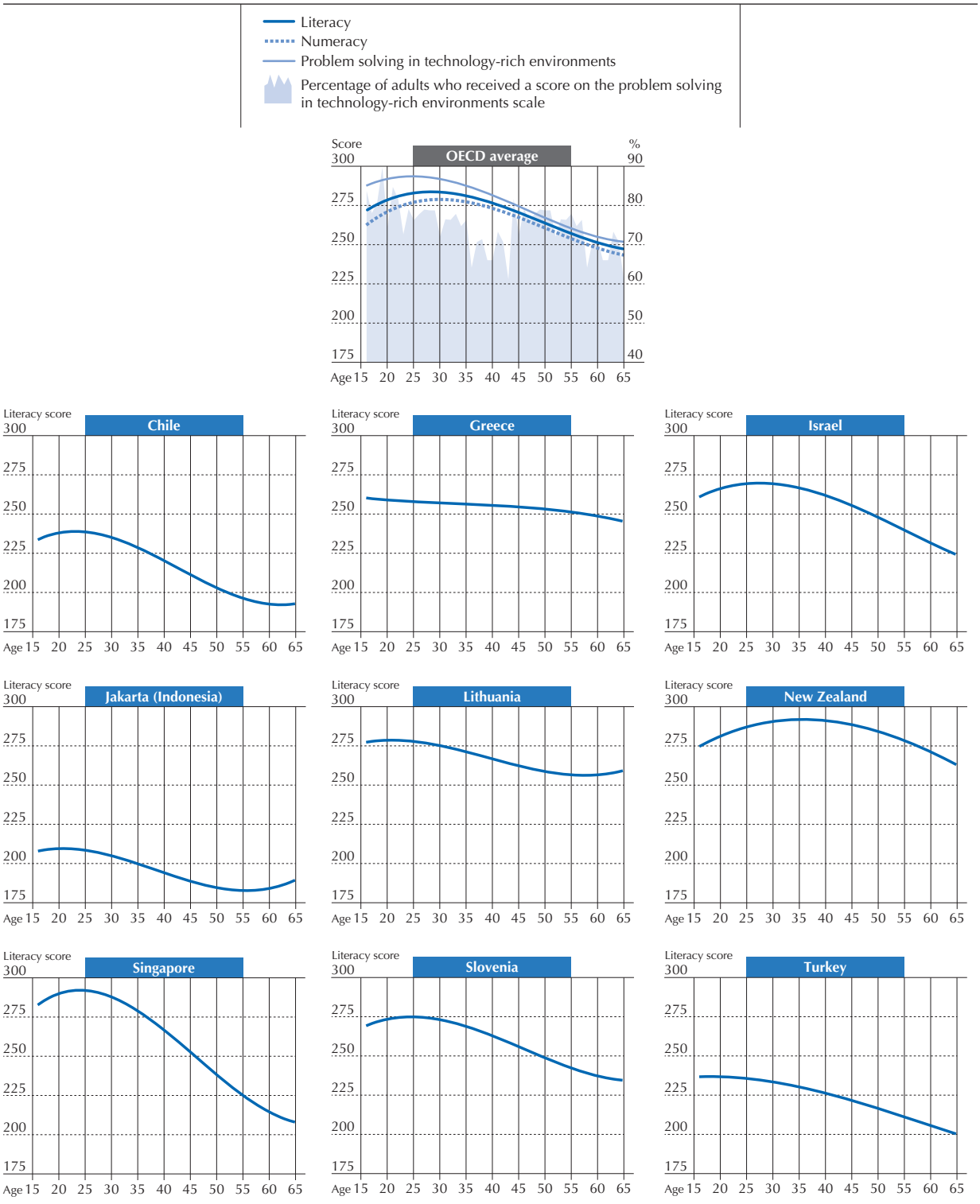
In spite of these limitations, observed age differences as measured in the Survey of Adult Skills still provide useful information to policy makers. Between-country comparisons, coupled with detailed knowledge of how policies and institutions evolved in individual countries/economies, can help identify where strengths and weaknesses lie. On an even more basic level, understanding how information-processing skills are distributed among different age groups can help to target policies more accurately to particularly vulnerable individuals. Foreign-born adults are excluded from the analysis below because the demographic structure of the immigrant population tends to be different from that of native-born adults.

Figure 3.6 plots the average age-proficiency profile in literacy and numeracy in the OECD countries/economies that participated in the Survey of Adult Skills. It also plots the country-specific profiles in literacy proficiency for the nine Round-2 countries/economies.[4] The age-proficiency profiles vary considerably across countries although, on average and in the majority of countries, proficiency tends to peak at around age 30, and then gradually declines with age (Desjardins and Warnke, 2012; Paccagnella, 2016).

Unlike the profile found in most countries, in Lithuania, Slovenia and Turkey, there seems to be very little improvement in proficiency between the ages 16 and 30. This is also the case in Jakarta (Indonesia). Various factors could explain this pattern, from entry rates into tertiary education, to quality of education, to the extent to which earlier years in the labour market are conducive to the development of proficiency in information-processing skills. In Greece, a small decline in proficiency between the ages of 16 and 25 is observed, after which the age-proficiency profile is unusually flat before a small and gradual decline in proficiency begins at around age 55.

Figure 3.6 ■ **Relationship between skills proficiency and age**

Trend scores by age, foreign-born adults excluded



Notes: A cubic specification of the trend curves is found to be most accurate in reflecting the distribution of scores by age in most countries/economies. Results account for cross-country differences in OECD average scores by age cohort. Foreign-born adults are excluded from the analysis. See corresponding tables mentioned in the source below for regression parameters and significance estimates. Only countries and economies participating in the second round of the survey are shown. Similar results for the countries and economies participating in the first round are available in OECD (2013), Figure 5.2b (L).

Countries and economies are listed in alphabetical order.

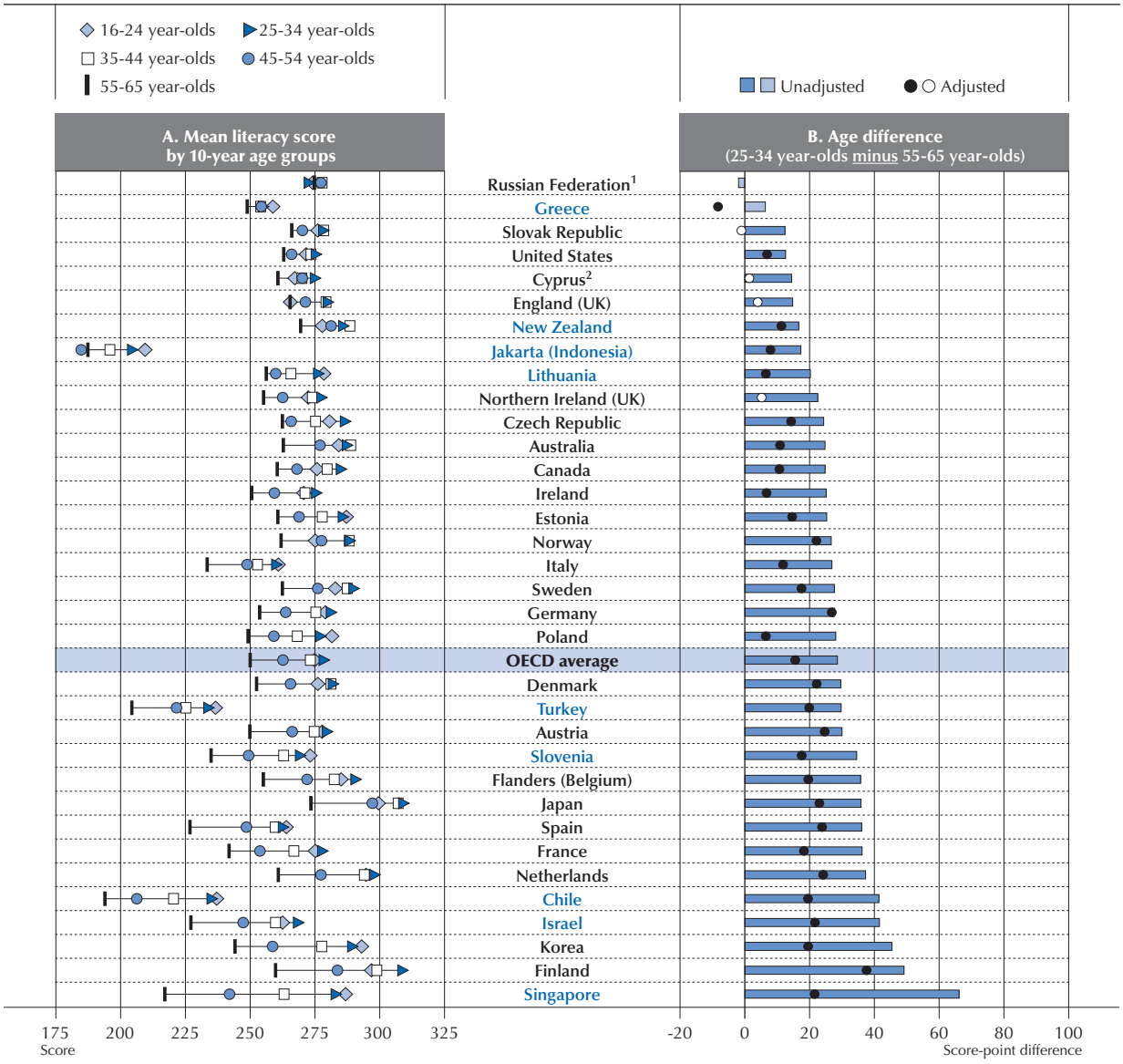
Source: Survey of Adult Skills (PIAAC) (2012, 2015), Tables A3.6 (L), A3.6 (N) and A3.6 (P).

StatLink http://dx.doi.org/10.1787/888933366025

Proficiency in literacy and numeracy among older and younger adults

Figure 3.7 presents average proficiency among different age groups (left panel) and differences in literacy proficiency among 55-65 year-olds and 25-34 year-olds, i.e. the two age groups that, in most countries, show the lowest and the highest literacy proficiency, respectively (right panel). While there are some countries/economies where 16-24 year-olds scored higher than 25-34 year-olds, the differences in proficiency between these two age groups are generally small, at less than five score points in Chile, Greece, Jakarta (Indonesia), Lithuania, Singapore and Turkey. In most countries/economies, however, 25-34 year-olds have higher average proficiency than 16-24 year-olds, with a difference of about seven points in Israel and New Zealand, and well above 10 points in England (United Kingdom), Finland and Norway.

Figure 3.7 ▪ **Age differences in literacy proficiency**



Notes: Statistically significant differences in Panel B are marked in a darker tone. Unadjusted differences are the differences between the two means for each contrast category. Adjusted differences are based on a regression model and take account of differences associated with other factors: gender, education, immigrant and language background and parents' educational attainment. Only the score-point differences between two contrast categories are shown in Panel B, which is useful for showing the relative significance of age vis-a-vis observed score-point differences. Adjusted difference for the Russian Federation is missing due to the lack of language variables.

1. See note at the end of this chapter.

2. See note 1 under Figure 3.1.

Countries and economies are ranked in ascending order of the unadjusted difference in literacy scores (25-34 year-olds minus 55-65 year-olds).

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Tables A3.1 (L) and A3.5 (L).

StatLink http://dx.doi.org/10.1787/888933366032

The literacy proficiency of 55-65 year-olds is particularly low in Chile, Israel, Singapore and Turkey. In these countries, the share of older adults who scored at or below Level 1 on the literacy scale ranges from 44% in Israel to 73% in Chile (Table A3.7 [L]). Similar results were recorded in Jakarta (Indonesia), where 76% of adults aged 55-65 scored at or below Level 1. In New Zealand the share is 16%, well below the international average of 28%, and one of the smallest shares among all the countries that participated in the survey. New Zealand had the largest share (slightly above 10%) of older adults who scored at Level 4 or 5.

In Chile and Turkey, adults aged 25-34 have particularly low levels of literacy proficiency: some 40% of them scored at or below Level 1 (the OECD average is less than 15%). The share is even higher in Jakarta (Indonesia), at 66%. In Greece, around 25% of 25-34 year old adults scored at or below Level 1. In New Zealand and Singapore, adults in the same age group scored above the average, although well below the best-performing adults of the same age in Finland, Japan and the Netherlands. This difference in proficiency is due to both a larger share of individuals scoring at the bottom of the proficiency distribution, and a smaller share attaining the highest levels of proficiency.

Interpreting age differences in literacy proficiency is complicated by the fact that, inevitably, age differences include both age and cohort effects. The relative strength of cohort effects is likely to vary widely across countries because the expansion of education opportunities (an important determinant of cohort effects, although not the only one) occurred in different countries at different points in time. This is clearly seen in the right panel of Figure 3.7, where adjusting for other characteristics (including educational attainment) has different effects on the magnitude of differences related to age.[5]

Adjusted and unadjusted age differences in literacy proficiency are, in fact, similar in Germany, New Zealand and Norway, where differences in educational attainment between 55-65 year-old and 25-34 year-old adults are not very large. In Germany, the share of tertiary-educated adults is very similar in the two age groups; in New Zealand and Norway, this share is larger among 25-34 year-olds by 8 and 10 percentage points, respectively (Table B3.4).

By contrast, in Chile, Korea, Lithuania, Poland and Singapore, adjusted differences are much smaller than unadjusted differences. These are all countries in which tertiary graduation rates increased by more than 20 percentage points over the recent past. In Chile and Lithuania, the share of tertiary-educated adults aged 25-34 is around 20 percentage points larger than the share of tertiary-educated adults aged 55-65; in Korea, the share is 46 percentage points larger, and in Singapore it is 53 percentage points larger.

In Israel, there is no large difference in educational attainment between the two age groups. Rather, adjusted differences in literacy proficiency are much smaller than unadjusted differences because of the difference in the share of foreign-born adults in the two age groups. Only 47% of 55-65 year-olds in Israel are native speakers born in the country (compared to 86%, on average across OECD countries/economies participating in the survey), while 73% of 25-34 year-olds are (Table B3.6). The picture is even more striking in Singapore, where only 15% of older adults are native speakers born in the country, while 67%, although born in the country, are not native speakers in the language of the assessment (which was English). Among 25-34 year-olds, the former share increases to 27%, and the latter decreases to 45%.

The two most extreme cases (Germany and Singapore) illustrate how the expansion of education generates cohort effects that deeply influence the observed age differences in cross-sectional data. In Germany, the levels of educational attainment among 25-34 year-olds are virtually identical to those among older adults. In both age groups, some 35% have a tertiary degree, about 55% are upper secondary graduates, and 10% did not complete upper secondary education (Table B3.1). In Singapore, the share of tertiary-educated adults is 21% among 55-65 year-olds, but increases to 74% among 25-34 year-olds (Table B3.4). Meanwhile, the share of adults who have not attained upper secondary education has shrunk from 40% to just below 5%.

Nevertheless, educational attainment does not explain everything. Cognitive decline related to ageing, as well as cohort effects related to unobservable factors, such as quality of schooling, still play a significant role, although to different extents in different countries. As a result, adjusted differences in age-proficiency profiles average about 16 score points, ranging from -8 points in Greece to 38 points in Finland. The negative estimate in Greece is due to the fact that the large expansion in education (only 15% of 25-34 year-olds have not completed upper secondary education, compared to 50% of older adults) has not translated into an improvement in literacy proficiency. In Greece, 25-34 year-olds scored only six points higher than 55-65 year-olds did.

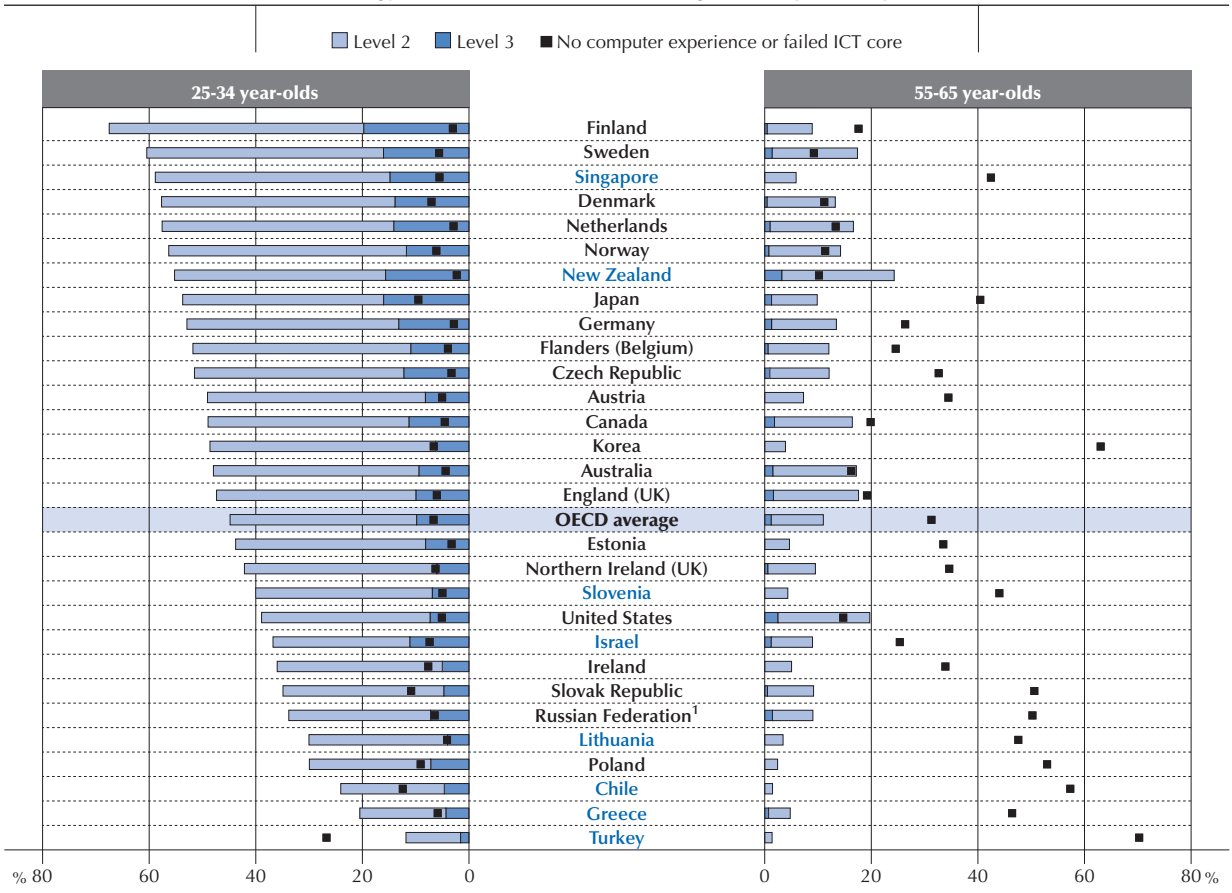
Proficiency in problem solving in technology-rich environments among older and younger adults

Age-related differences are even more pronounced when it comes to proficiency in problem solving in technology-rich environments. This assessment relied on familiarity with ICTs to a greater extent than the assessments of literacy and numeracy. Given that the widespread use of ICTs is a relatively recent phenomenon, older adults were clearly in a position of relative disadvantage compared to younger adults, as indicated by the large share of 55-65 year-olds who skipped the problem-solving assessment because of lack of computer experience, or because they failed the ICT core test. Moreover, the rate of penetration of ICTs varies widely across countries. Although levels of use are converging, between-country differences remain.

This is well illustrated in Figure 3.8. On average, some 45% of 25-34 year-olds scored at Level 2 or 3 in the problem-solving assessment, compared to only 11% of older adults. Proficiency in problem solving in technology-rich environments among younger adults varies widely across countries. In Chile, Greece and Turkey, between 12% and 24% of respondents scored at Level 2 or 3, compared to 55% or more in Denmark, the Netherlands, New Zealand, Norway, Singapore and Sweden, and to 67% in Finland. In New Zealand, 24% of older adults scored at Level 2 or 3, but in most other countries this share was smaller than 10%.

Figure 3.8 ■ **Problem-solving proficiency among younger and older adults**

Percentage of adults aged 25-34 and 55-65 scoring at Level 2 or 3 in problem solving in technology-rich environments or having no computer experience



Notes: Percentages on the problem solving in technology-rich environments scale are computed so that the sum of percentages for the following mutually exhaustive categories equals 100%: opted out of the computer-based assessment; no computer experience; failed ICT core test; below Level 1, Level 1, Level 2 and Level 3. For more detailed results for each category, see corresponding table mentioned in the source below. Cyprus,[2] France, Italy, Jakarta (Indonesia) and Spain did not participate in the problem solving in technology-rich environments assessment.

1. See note at the end of this chapter.

2. See note 1 under Figure 3.1.

Countries and economies are ranked in descending order of the combined percentages of adults aged 25-34 scoring at Level 2 or 3.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A3.7 (P).

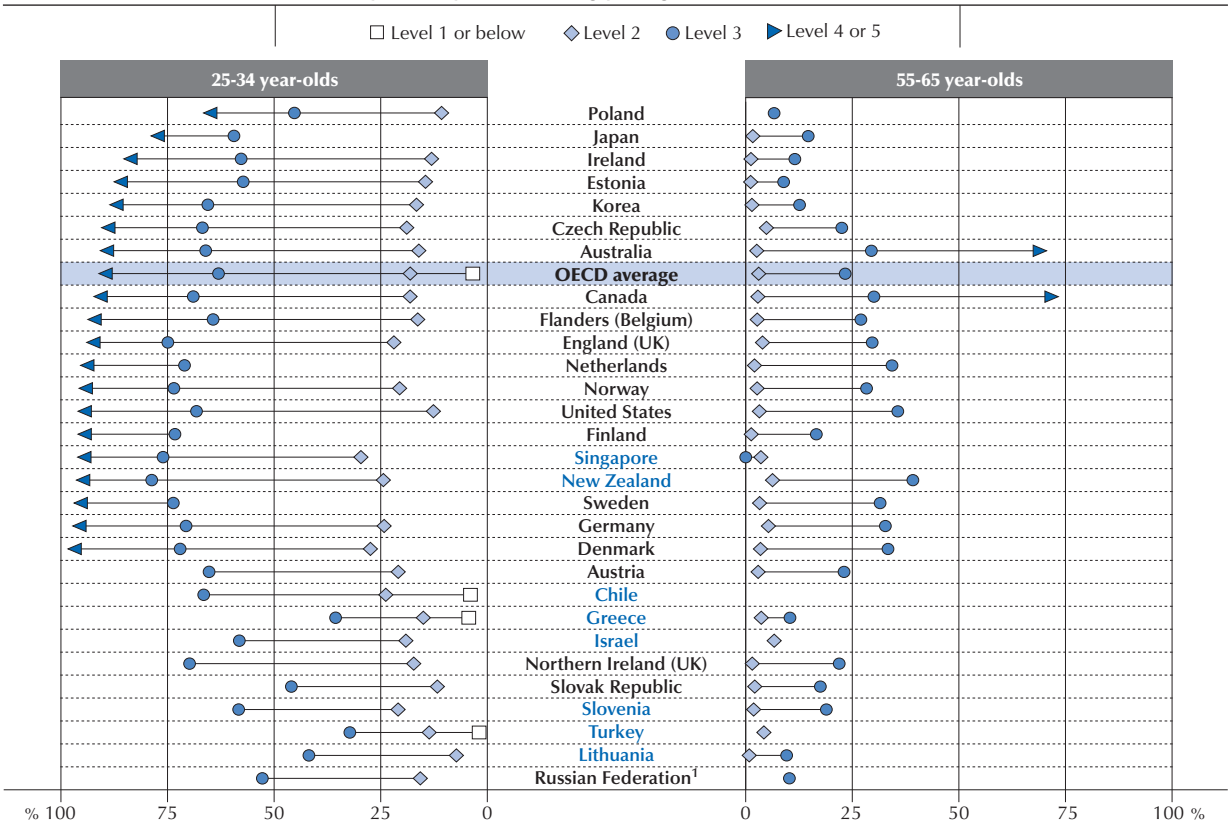
StatLink http://dx.doi.org/10.1787/888933366049

At the same time, few 25-34 year-olds skipped the problem-solving assessment because of a lack of computer experience, or because they failed the ICT core test (well below 10% in most countries, although 27% in Turkey). Lack of familiarity with ICTs, however, constituted a major obstacle for older adults. On average, 32% of 55-65 year-olds were not able to take the assessment; but this share ranges from about 10% in New Zealand and Sweden to almost 50% in Greece and Lithuania, almost 60% in Chile, and 71% in Turkey.

Age differences in familiarity with ICTs are also likely to influence the relationship between proficiencies across domains. Figure 3.9 shows the share of 25-34 year-olds and 55-65 year-olds who scored at Level 2 or 3 in problem solving in technology-rich environments, by level of literacy proficiency (the scope of the analysis is limited by small samples in a number of countries). As expected, at every level of proficiency, 25-34 year-olds are much more likely than older adults to score at Level 2 or 3 in the problem-solving assessment. On average, 90% of 25-34 year-olds who scored at Level 4 or 5 in literacy, and more than 60% of those who scored at Level 3, also scored at Level 2 or 3 in the problem-solving assessment. Even among those who only scored at Level 2, almost one in five reached high levels of proficiency in problem-solving (actual probabilities varying from 7% in Lithuania to almost 30% in Singapore). Given that older adults are much less likely to attain high levels of proficiency in problem solving, the relationship between literacy and problem-solving proficiency turns out to be stronger among older adults. In fact, moving from Level 2 to Level 3 on the literacy scale is associated with a more than seven-fold increase (from 3% to 23%) in the probability of a 55-65 year-old scoring at Level 2 or 3 in problem solving; among 25-34 year-olds, the corresponding increase in probability is less than four-fold (from 18% to 63%, on average).

Figure 3.9 ■ **Relationship between literacy and problem solving in technology-rich environments, by age**

Percentage of adults scoring at Level 2 or 3 in problem solving in technology-rich environments, by literacy level among younger and older adults



Notes: Cyprus,[2] France, Italy, Jakarta (Indonesia) and Spain did not participate in the problem solving in technology-rich environments assessment. Estimates based on low sample size are not shown.

1. See note at the end of this chapter.

2. See note 1 under Figure 3.1.

Countries and economies are ranked in descending order of the percentage of adults aged 25-34 scoring at Level 2 or 3 on the problem solving in technology-rich environments scale among adults of the same age scoring at Level 4 or 5 on the literacy scale.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A3.8 (L).

StatLink http://dx.doi.org/10.1787/888933366059

DIFFERENCES IN SKILLS PROFICIENCY RELATED TO GENDER

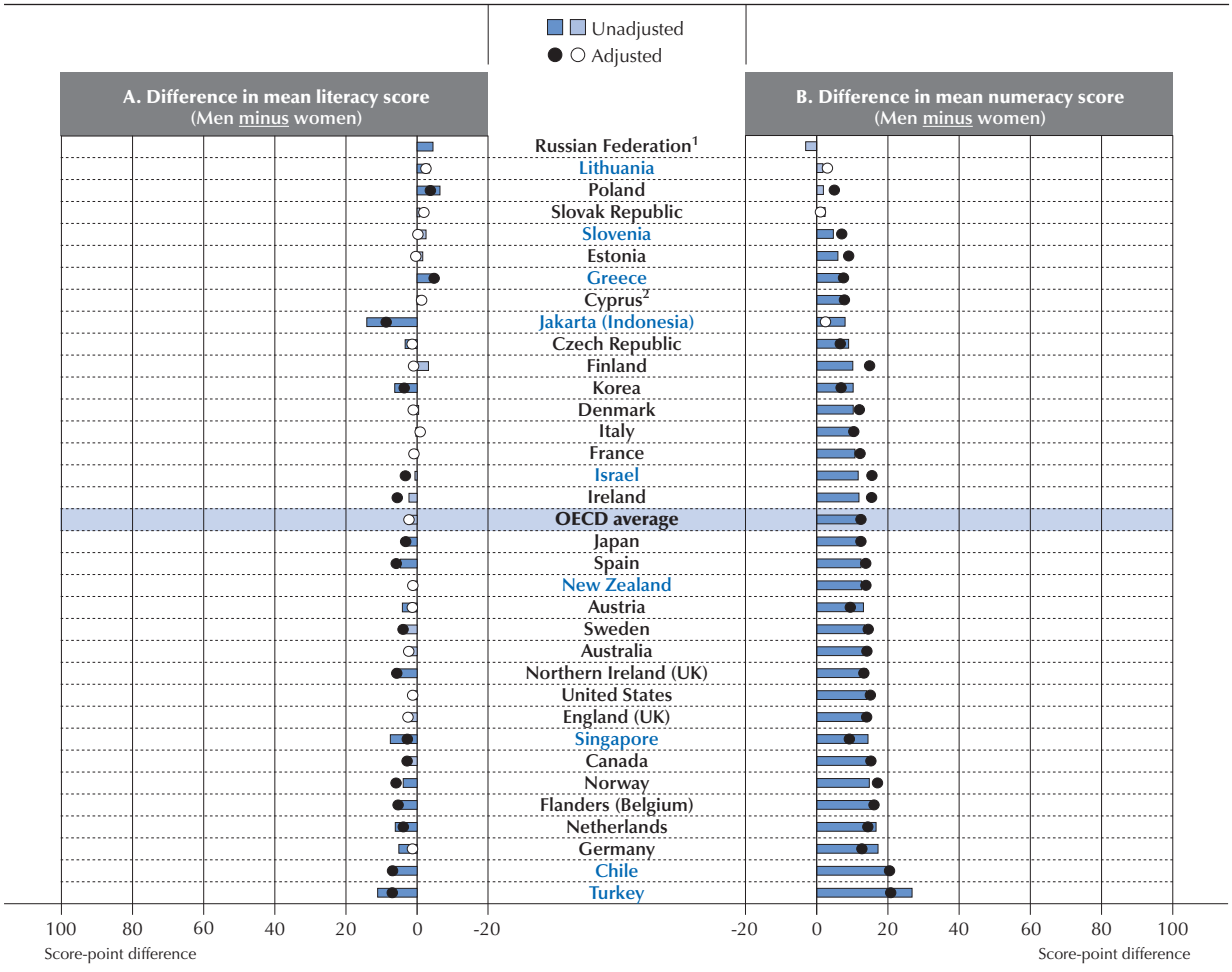
The expansion of education in many countries over the past decades not only raised the populations' average level of schooling, but also resulted in a substantial narrowing of the gender gap in educational achievement. Girls outperform boys in reading at age 15, and are more likely to enrol in tertiary education (OECD, 2015b).

The Survey of Adult Skills shows small gender differences in literacy proficiency, and larger differences in numeracy, where men have a clear advantage. Given that gender gaps in educational attainment have shrunk considerably over the past few decades, differences in skills proficiency are much more pronounced among older adults, and are almost non-existent among younger adults.

Proficiency in literacy and numeracy among men and women

Figure 3.10 clearly shows that in most countries there is no significant difference in literacy proficiency between men and women. Even in countries/economies where a statistically significant difference can be detected, the gap is small: men have an advantage of 11 score points in Turkey and of 8 score points in Chile, while women score about 5 points higher than men in Greece and 6 points higher than men in Poland. The largest difference is recorded in Jakarta (Indonesia), where men have a 14-point advantage over women.

Figure 3.10 ■ **Gender differences in literacy and numeracy proficiency**



Notes: Statistically significant differences are marked in a darker tone. Unadjusted differences are the differences between the two means for each contrast category. Adjusted differences are based on a regression model and take account of differences associated with other factors: age, education, immigrant and language background and parents' educational attainment. Adjusted difference for the Russian Federation is missing due to the lack of language variables.

1. See note at the end of this chapter.

2. See note 1 under Figure 3.1.

Countries and economies are ranked in ascending order of the unadjusted difference in numeracy scores (men minus women).

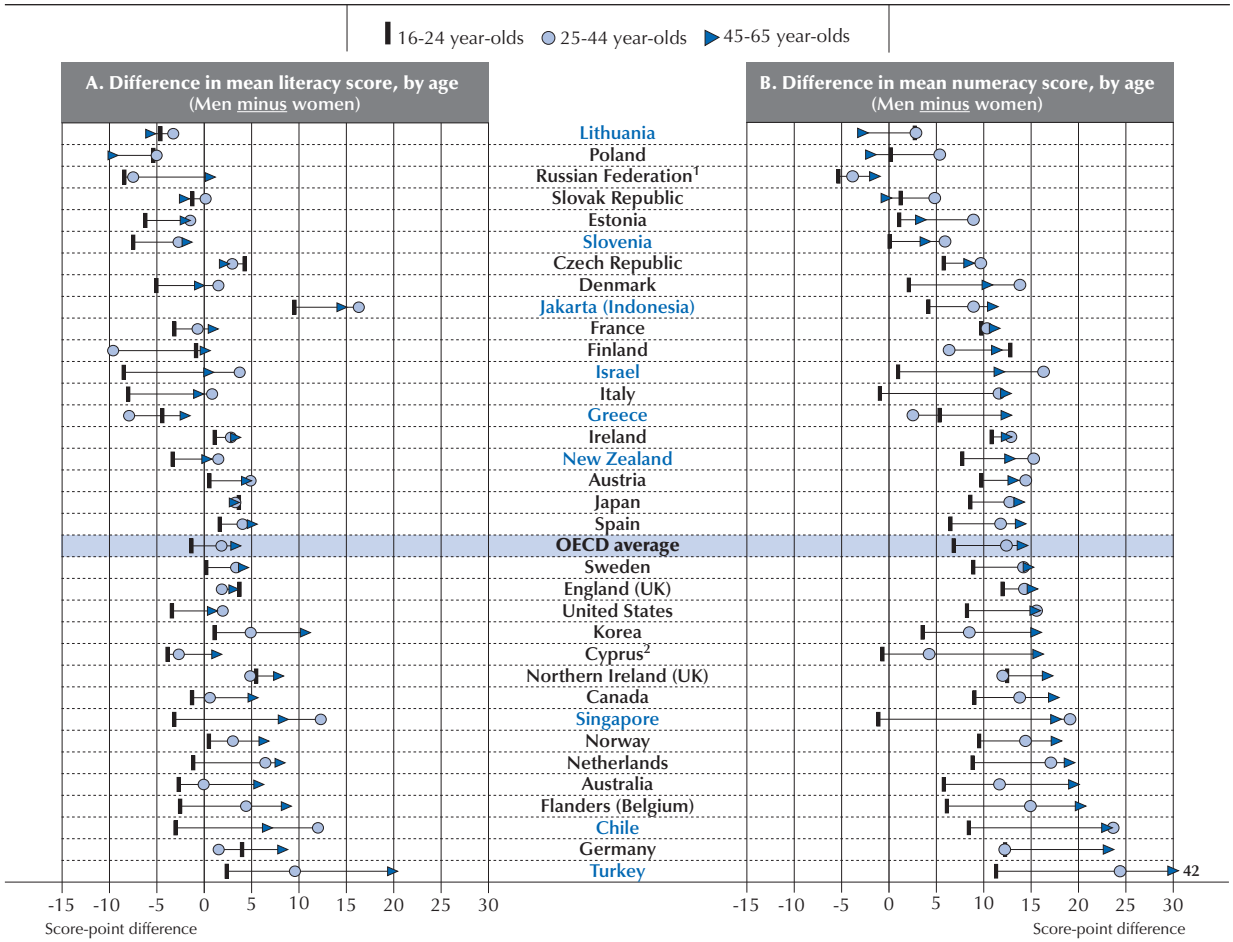
Source: Survey of Adult Skills (PIAAC) (2012, 2015), Tables A3.1 (L), A3.9 (L) and A3.9 (N).

StatLink http://dx.doi.org/10.1787/888933366065

When it comes to numeracy, though, the picture is different. In the vast majority of countries, men scored 12 points higher than women in the numeracy assessment, on average. Wider gender gaps (about 20 score points) are observed in Chile and Turkey, while in the Central and Eastern European countries of Estonia, Lithuania, Poland, Slovenia and the Slovak Republic, gender differences in numeracy proficiency are small. Only in Jakarta (Indonesia) are gaps smaller in numeracy (8 score points) than in literacy (14 score points).

The magnitude of the gender gaps in literacy and numeracy proficiency appears to be related to respondents' age. Especially in numeracy, gender gaps appear to be narrower among 16-24 year-olds and significantly wider among 25-44 and 45-65 year-olds (Figure 3.11). Age and cohort effects are both likely to play a role, but it is difficult to disentangle those effects. Accounting for differences in other observable characteristics, particularly educational attainment, generally leads to a small reduction of the gender gap among 45-65 year-olds, and to a small increase among 16-24 and 25-44 year-olds (Table A3.10 [N]).

Figure 3.11 ▪ **Gender gap in literacy and numeracy, by age**



1. See note at the end of this chapter.
2. See note 1 under Figure 3.1.

Countries and economies are ranked in descending order of the gender gap in numeracy among 45-65 year-olds.

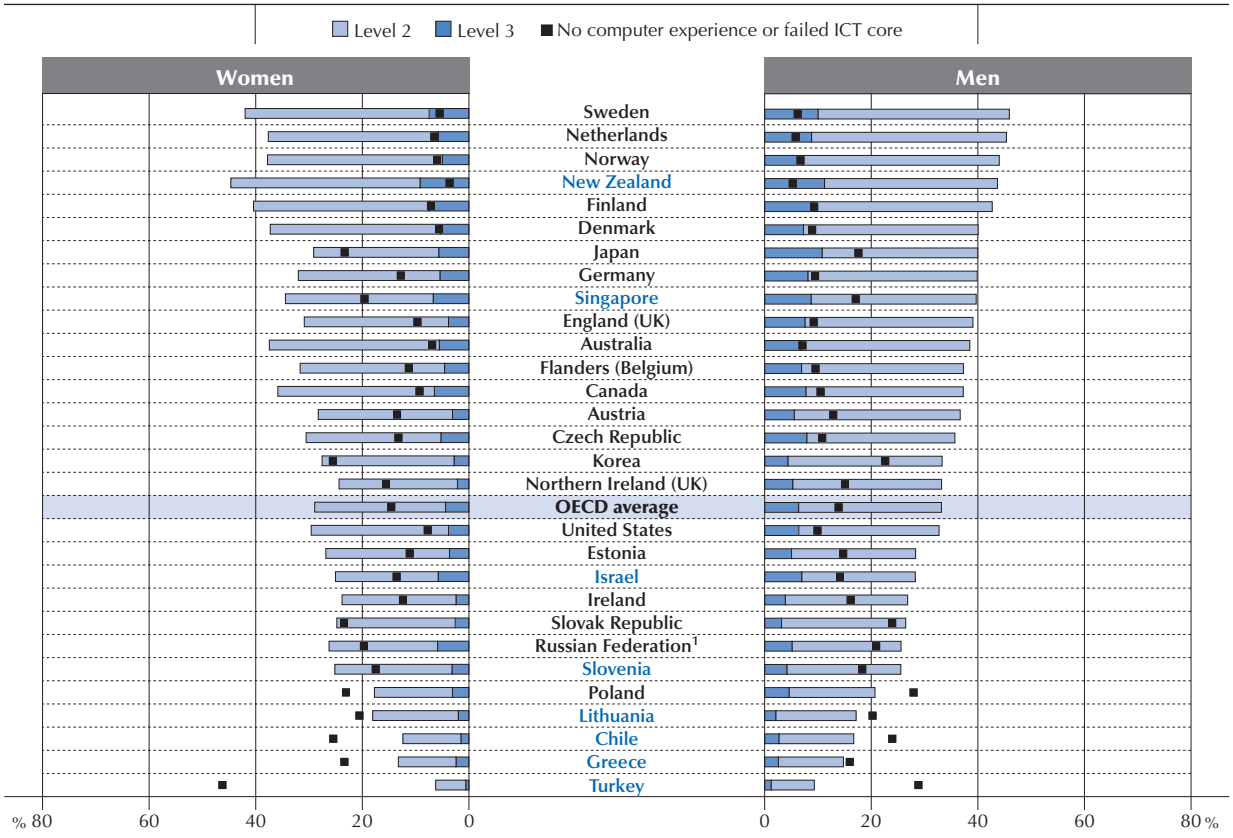
Source: Survey of Adult Skills (PIAAC) (2012, 2015), Tables A3.10 (L) and A3.10 (N).

StatLink http://dx.doi.org/10.1787/888933366071

The gender gaps observed among adults assessed in the survey differ from those seen among 15-year-old students assessed in the OECD Programme for International Student Assessment (PISA), where girls tend to have a clear advantage in reading, and boys a clear advantage in mathematics. The assessment of reading literacy and numeracy/mathematical literacy in PIAAC and PISA are based on slightly different conceptual frameworks, given the difference in the reference population. While this prevents a direct comparison of PISA and PIAAC scores, the frameworks are sufficiently similar to allow a qualitative comparison of gender gaps across the two surveys.

Figure 3.12 ■ **Problem-solving proficiency among women and men**

Percentage of women and men scoring at Level 2 or 3 in problem solving in technology-rich environments or having no computer experience



Notes: Percentages on the problem solving in technology-rich environments scale are computed so that the sum of percentages for the following mutually exhaustive categories equals 100%: opted out of the computer-based assessment; no computer experience; failed ICT core test; below Level 1, Level 1, Level 2 and Level 3. For more detailed results for each category, see corresponding table mentioned in the source below. Cyprus,[2] France, Italy, Jakarta (Indonesia) and Spain did not participate in the problem solving in technology-rich environments assessment.

1. See note at the end of this chapter.

2. See note 1 under Figure 3.1.

Countries and economies are ranked in descending order of the combined percentages of men scoring at Level 2 or 3.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A3.11 (P).

StatLink http://dx.doi.org/10.1787/888933366088

Comparing the two assessments gives a more complete picture of the evolution of gender differences in proficiency over a lifetime (acknowledging that cohort effects are also at work). It appears that gender gaps in literacy narrow (and are often reversed) as people age; in numeracy, men either retain or increase their advantage. These processes seem to stop once people complete their transition into adulthood: the gender gaps are of similar magnitude among 25-44 year-olds and 45-65 year-olds. Explaining these patterns is a subject for future research, and is outside the scope of this report. One possible explanation for the observed evolution of gender gaps is the higher employment rates among men than women (possibly for reasons unrelated to skills proficiency). Arguably, reading is a transversal skill that is practiced across a wide range of occupations, so that men may have more opportunities to practice their reading skills than women do. Men are also much more likely than women to pursue careers in fields that require more intensive use of numeracy skills – which may explain why they tend to retain or increase their advantage in numeracy.

Proficiency in problem solving in technology-rich environments among men and women

Gender differences in proficiency in problem solving in technology-rich environments are small, although men tend to have a slight advantage over women. On average, 33% of men scored at Level 2 or 3, compared to 29% of women. However, the proportions of men and women who have no computer experience, or who failed the ICT core test, is much more balanced, and is even slightly larger among men in a number of countries/economies. Only in Turkey, and to a lesser extent in Greece, are women significantly more likely to lack computer experience or to have failed the ICT core test.

DIFFERENCES IN SKILLS PROFICIENCY RELATED TO COUNTRY OF ORIGIN AND LANGUAGE

OECD countries have long aimed to better integrate immigrants into their societies. The global economic crisis and the recent influx of refugees have underscored the urgency of the need to improve integration, not only for the well-being of the immigrants population, but for the functioning and progress of society as a whole.

About 12% of the adults who participated in the Survey of Adult Skills were born in a different country from the one in which they currently reside (see Table B3.5). While foreign-born adults represent a negligible share of the population (below 5%) in many countries/economies (including Chile, Lithuania and Turkey), about 20% of the adult population in Ireland, Israel, Singapore and Sweden are foreign-born, as are more than 25% of adults in Australia, Canada and New Zealand.

Not only the size, but also the characteristics of the immigrant population differ widely across countries, mainly because of variations in policies that influence the composition of immigrant populations (in terms of both country of origin and educational background) across OECD countries, and in the processes that aim to integrate immigrants into the labour market and society.

It is hard to think of any successful package of integration policies that does not assign a crucial role to the acquisition and development of skills, particularly in the language of the host country. In this respect, the Survey of Adult Skills provides valuable information that can help policy makers to better understand the obstacles migrants face in integrating into their host communities.

Proficiency in literacy among native- and foreign-born adults

On average, foreign-born adults scored 24 points lower in literacy than native-born adults (Figure 3.13). This is a sizeable difference, equal to about half of the international standard deviation, and similar to the difference between tertiary- and upper secondary-educated adults. However, differences in countries' immigration-related policies are reflected in large between-country differences in immigrant adults' proficiency and in the gap that separates them from native-born adults.

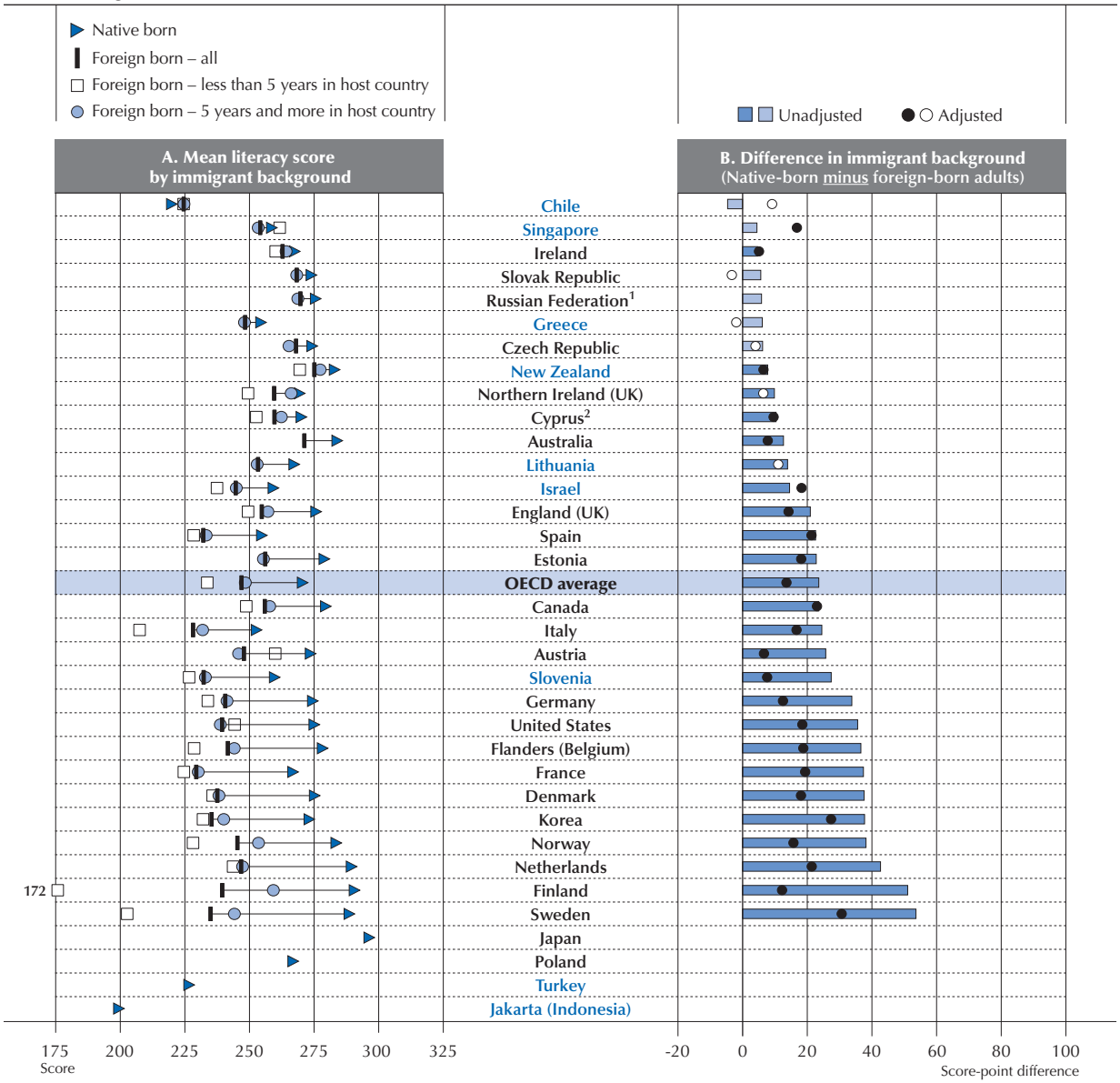
Foreign-born adults living in New Zealand scored 275 points, on average, in literacy. This is five score points above the international average for native-born adults, and around the level of proficiency of native-born adults in Denmark, Germany, Korea and the United States. Native-born adults in New Zealand scored only 8 points higher than foreign-born adults in the country. This difference is even smaller in Greece and Singapore, while it is about 15 points in Israel, and close to 30 points in Slovenia, where literacy proficiency among immigrants is one of the lowest across all countries/economies that participated in the Survey of Adult Skills.

In most countries, recent immigrants tend to score particularly poorly. This is likely because the more time spent in the host country, the better an immigrant's language skills, which is an important component of literacy proficiency as assessed in the Survey of Adult Skills. The only notable exception to this pattern is Singapore, where recent immigrants (those who have spent less than five years in the host country) scored almost 10 points higher than immigrants who have been in the country for more than five years, and three score points higher than native-born adults.

As noted above, knowledge of the host country's language is crucial for literacy proficiency. Language proficiency is often a key element of the points-based immigration programmes used in a number of OECD countries. Not surprisingly, Figure 3.14 shows that foreign-born adults whose native language is the same as the language of the assessment tend to perform much better than foreign-language immigrants. In fact, their proficiency level is often close to that of native-born, native-language adults. Foreign-born, native-language adults make up between 40% and 50% of the entire immigrant population in many countries, including Australia, England (United Kingdom), France, Greece, Lithuania and New Zealand. The share decreases to about 25% in Germany, Israel and the United States and to about 17% in Singapore and Slovenia (Table B3.5). On average, foreign-born native-language adults represent 4% of the entire population. This is twice the share of native-born foreign-language adults (2%), and half the share of foreign-born foreign-language adults. The share of foreign-born native-language adults over the entire population is above 10% in Australia, Estonia, Ireland and New Zealand, and about 8% in Canada and Spain. By contrast, it is below 2% in many other countries, including the Czech Republic, Denmark, Finland, Japan, Korea, Lithuania, Norway, Poland, the Slovak Republic and Turkey.

Restricting attention to native-language speakers (whether foreign- or native-born), foreign-born adults scored only seven points lower than native-born adults. They even scored slightly higher in a few countries/economies, namely Australia, Austria, Finland, Greece, Ireland, New Zealand and Northern Ireland (United Kingdom). Only in Estonia, France, Israel, Korea and the Netherlands, did foreign-born adults score much lower than native-born adults (a difference of more than 20 score points), despite the fact that they speak the language of the assessment as their mother tongue.

Figure 3.13 ■ **Differences in literacy scores between native- and foreign-born adults**



Notes: Statistically significant differences in Panel B are marked in a darker tone. Estimates based on a sample size of less than 30 are not shown in Panels A and B (Jakarta [Indonesia], Japan, Poland and Turkey). Unadjusted differences are the differences between the two means for each contrast category. Adjusted differences are based on a regression model and take account of differences associated with all of the following variables: age, gender, education, language background and parents' educational attainment. Estimates for the Russian Federation are missing due to the lack of language variables. Information about years since immigration is not available for Australia.

1. See note at the end of this chapter.

2. See note 1 under Figure 3.1.

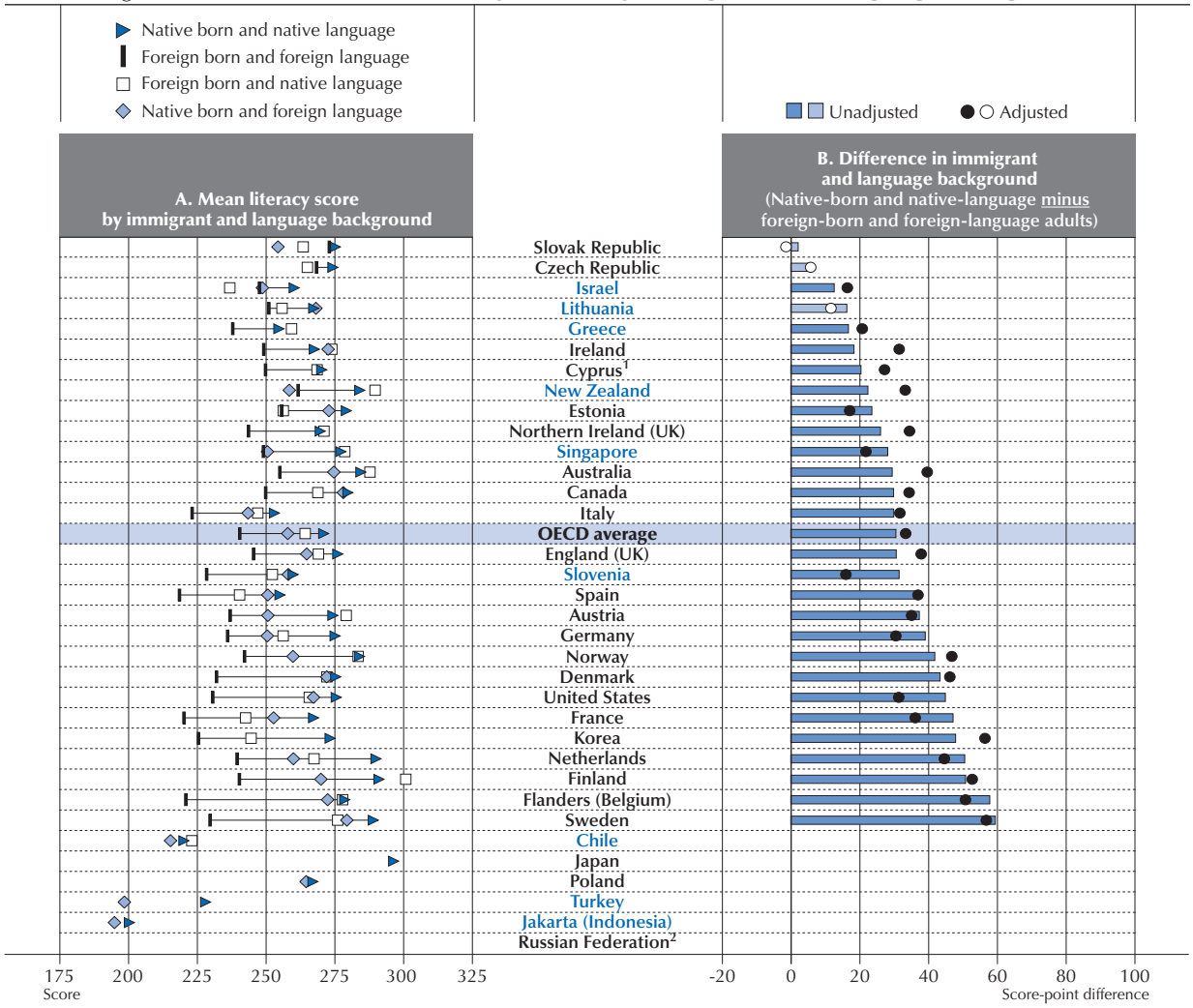
Countries and economies are ranked in ascending order of the unadjusted difference in literacy scores (native-born minus foreign-born adults).

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A3.12 (L).

StatLink http://dx.doi.org/10.1787/888933366090

Singapore is a unique case. Almost one in two native-born adults in Singapore are not native speakers of the language of the assessment (English, in this case). In fact, only 27% of the respondents in Singapore were classified as native speakers. This is very small compared to the proportions of native speakers in other countries, which is always above 75% (and about 90% on average). This explains why there is just a small gap in proficiency between foreign-born and native-born adults (presented in Figure 3.13), but a sizeable difference (almost 30 score points) between native and non-native English speakers (Figure 3.14). Indeed, there is no difference in proficiency between native- and foreign-born adults, once the language of origin is taken into account. Native-language speakers scored about 277 points, regardless of their country of origin, and both native- and foreign-born, foreign-language speakers scored about 250 points.

Figure 3.14 ■ **Differences in literacy scores, by immigrant and language background**



Notes: Statistically significant differences in Panel B are marked in a darker tone. Estimates based on a sample size less than 30 are not shown in Panels A and B (i.e. immigrant and language background differences in Chile, Jakarta [Indonesia], Japan, Poland and Turkey). Unadjusted differences are the differences between the two means for each contrast category. Adjusted differences are based on a regression model and take account of differences associated with all of the following variables: age, gender, education and parents' educational attainment. Only the score-point differences between two contrast categories are shown in Panel B, which is useful for showing the relative significance of an immigrant background vis-a-vis observed score-point differences. Native language refers to whether the first or second language learned as a child is the same as the language of assessment, and not whether the language has official status. Foreign language refers to whether the first or second language learned as a child is not the same as the language of assessment. Thus in some cases, foreign language might refer to minority languages in which the assessment was not administered. Estimates for the Russian Federation are missing due to the lack of language variables.

1. See note 1 under Figure 3.1.

2. See note at the end of this chapter.

Countries and economies are ranked in ascending order of the unadjusted difference in literacy scores (native-born and native-language minus foreign-born and foreign-language adults).

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Tables A3.1 (L) and A3.12 (L).

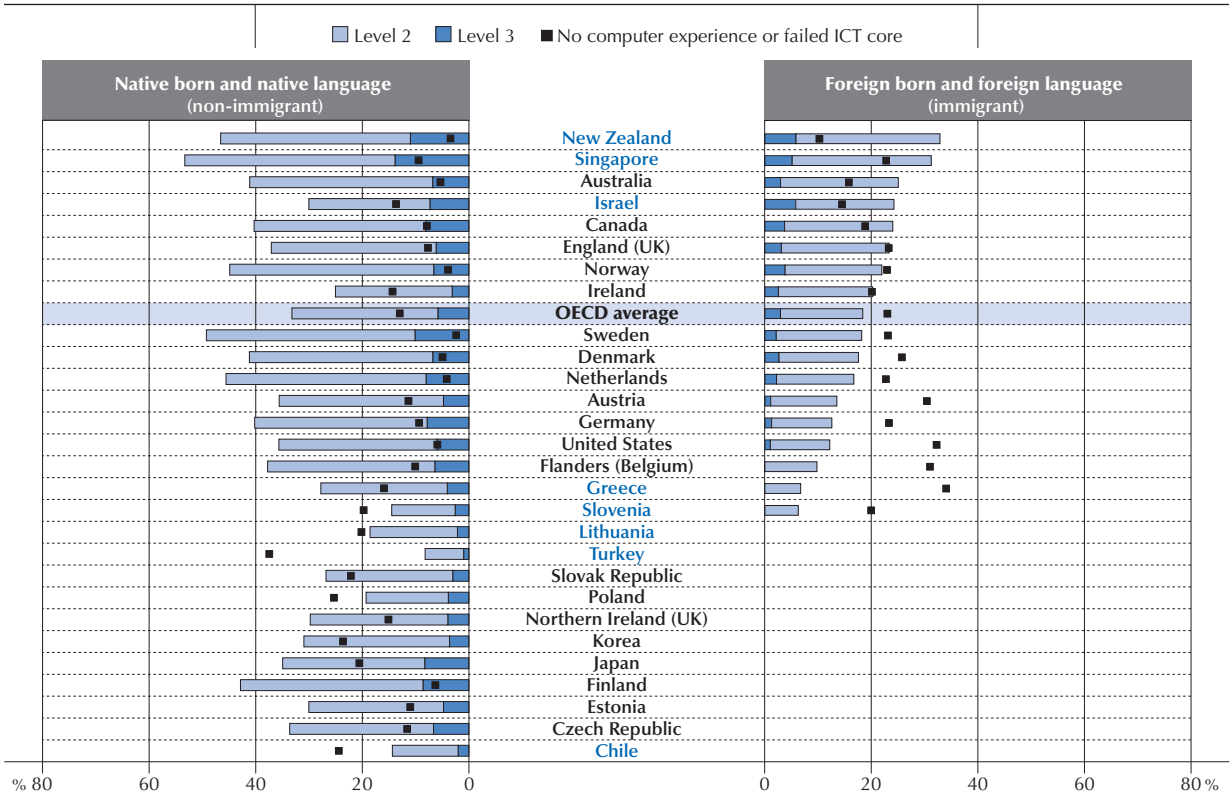
StatLink http://dx.doi.org/10.1787/888933366102

Proficiency in problem solving in technology-rich environments among native- and foreign-born adults

The share of foreign-born, foreign-language adults who scored at Level 2 or 3 on the problem solving in technology-rich environments assessment ranges from about 7% in Greece and Slovenia to about 30% in New Zealand and Singapore (Figure 3.15). When compared with native-born, native-language adults, the difference is most pronounced in Singapore (largely due to the high levels of proficiency among native-born adults) and Slovenia (mainly due to the low levels of proficiency among foreign-born adults). By contrast, the differences are small in Israel (where the proficiency of native-born adults is close to the average, but some 24% of foreign-born adults scored at Level 2 or 3) and in Greece (where the share of adults who scored at Level 2 or 3 is well below the average among both native- and foreign-born adults).

Figure 3.15 ■ **Problem-solving proficiency among foreign-language immigrants and non-immigrants**

Percentage of foreign-born and foreign-language (immigrants) and native-born and native-language (non-immigrants) adults scoring at Level 2 or 3 in problem solving in technology-rich environments or having no computer experience



Notes: Estimates based on low sample sizes are not shown. Percentages on the problem solving in technology-rich environments scale are computed so that the sum of percentages for the following mutually exhaustive categories equals 100%: opted out of computer-based assessment; no computer experience; failed ICT core test; below Level 1, Level 1, Level 2 and Level 3. For more detailed results for each category, see corresponding table mentioned in the source below. Native language refers to whether the first or second language learned as a child is the same as the language of assessment, and not whether the language has official status. Foreign language refers to whether the first or second language learned as a child is not the same as the language of assessment. Thus in some cases, foreign language might refer to minority languages in which the assessment was not administered. Estimates for the Russian Federation are missing due to the lack of language variables. Cyprus,[1] France, Italy, Jakarta (Indonesia) and Spain did not participate in the problem solving in technology-rich environments assessment.

1. See note 1 under Figure 3.1.

Countries and economies are ranked in descending order of the combined percentages of foreign-born and foreign-language (immigrant) adults scoring at Level 2 or 3.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A3.13 (P).

StatLink http://dx.doi.org/10.1787/888933366113

DIFFERENCES IN SKILLS PROFICIENCY RELATED TO SOCIO-ECONOMIC BACKGROUND

There are few factors that shape individuals' lives more significantly than the family in which they grow up. This influence works not only through the characteristics of individual families, but also through the different social and cultural environments in which people are raised. This crucial factor in determining an individual's life chances is completely beyond the control of the person concerned.

Ensuring that everyone, regardless of his or her particular socio-economic background, has equal chances to develop his or her skills and make the best of his or her talents is an explicit goal of education systems in most countries. In fact, there is probably no better way to tackle growing income inequality than by providing a quality education for all.

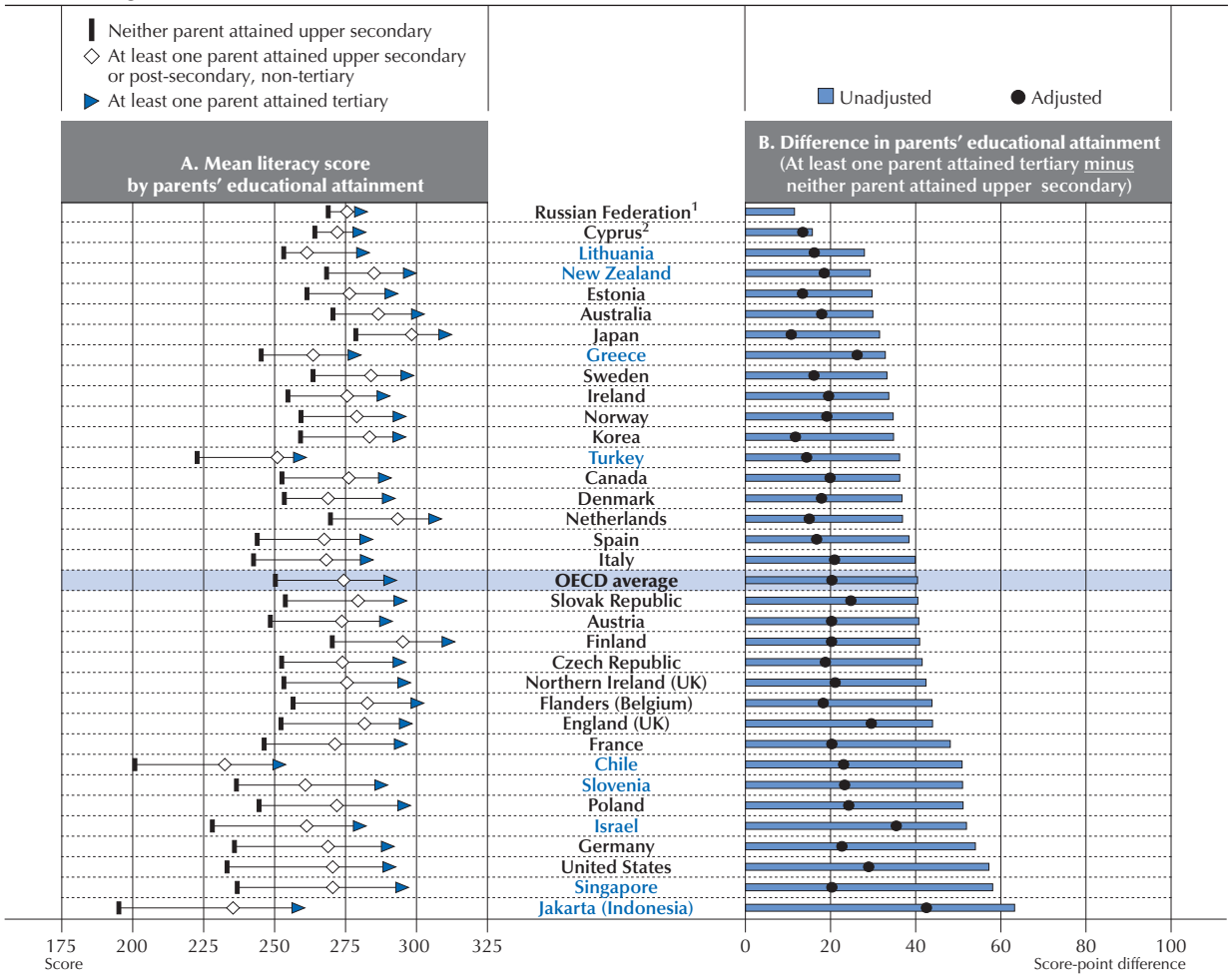
In the Survey of Adult Skills, the educational attainment of the respondent's parents is used as a proxy for socio-economic status.[6] The results of the analysis presented below are consistent with much of the existing literature on this topic, and indicate that parents' educational attainment has a large influence on the proficiency of their offspring and, consequently, on labour market outcomes and, more broadly, individual well-being. The strength of the association between parents' educational attainment and proficiency (also called the "parental education gradient") differs across countries. It is shown in the greater likelihood that children of highly educated parents will complete higher education themselves.

The parental education gradient can also be interpreted as a measure of inequality of opportunity: the steeper the gradient, the less likely that adults whose parents attained low levels of education will attain high levels of proficiency. Given the established positive link between proficiency and a wide range of economic and non-economic outcomes, a strong link between parents' educational attainment and their children's proficiency can be a serious obstacle to broader social and intergenerational mobility.

Proficiency in literacy among adults with high- and low-educated parents

On average, almost 30% of adults with neither parent having attained an upper secondary degree scored at or below Level 1 in the literacy assessment and only 5% scored at Level 4 or 5 (Table A3.15 [L]). By contrast, among adults raised by at least one tertiary-educated parent, 20% scored at Level 4 or 5 and 8% scored at or below Level 1. The average difference in proficiency between an advantaged and a disadvantaged adult is slightly less than 60 score points in Singapore and the United States, and between 50 and 55 score points in Chile, Germany, Israel, Poland and Slovenia. A larger difference (63 score points) is recorded in Jakarta (Indonesia). In Australia, Estonia, Lithuania and New Zealand, differences are less than 30 score points (Figure 3.16).

Figure 3.16 ■ **Differences in literacy proficiency, by parents' educational attainment**



Notes: All differences in Panel B are statistically significant. Unadjusted differences are the differences between the two means for each contrast category. Adjusted differences are based on a regression model and take account of differences associated with other factors: age, gender, education, immigrant and language background. Only the score-point differences between two contrast categories are shown in Panel B, which is useful for showing the relative significance of parents' educational attainment vis-a-vis observed score-point differences. Upper secondary includes ISCED 3A, 3B, 3C long and 4. Tertiary includes ISCED 5A, 5B and 6. Adjusted difference for the Russian Federation is missing due to the lack of language variables.

1. See note at the end of this chapter.

2. See note 1 under Figure 3.1.

Countries and economies are ranked in ascending order of the unadjusted difference in literacy scores (at least one parent attained tertiary minus neither parent attained upper secondary).

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A3.14 (L).

StatLink http://dx.doi.org/10.1787/888933366126

Accounting for other background characteristics strongly reduces the estimated impact of parents' educational attainment, from 40 to 20 score points, on average. This suggests that a significant portion of the overall impact of parental education is explained by the intergenerational transmission of educational attainment, i.e. by the fact that children of highly educated parents are themselves more likely to attain higher levels of education. Still, even after accounting for this, proficiency differences remain substantial – similar to the gaps that are observed between native-born and foreign-born adults. In Greece and Israel (and, to a lesser extent, in Lithuania and New Zealand), accounting for other characteristics does not result in a large reduction in the impact of parents' educational attainment on proficiency.

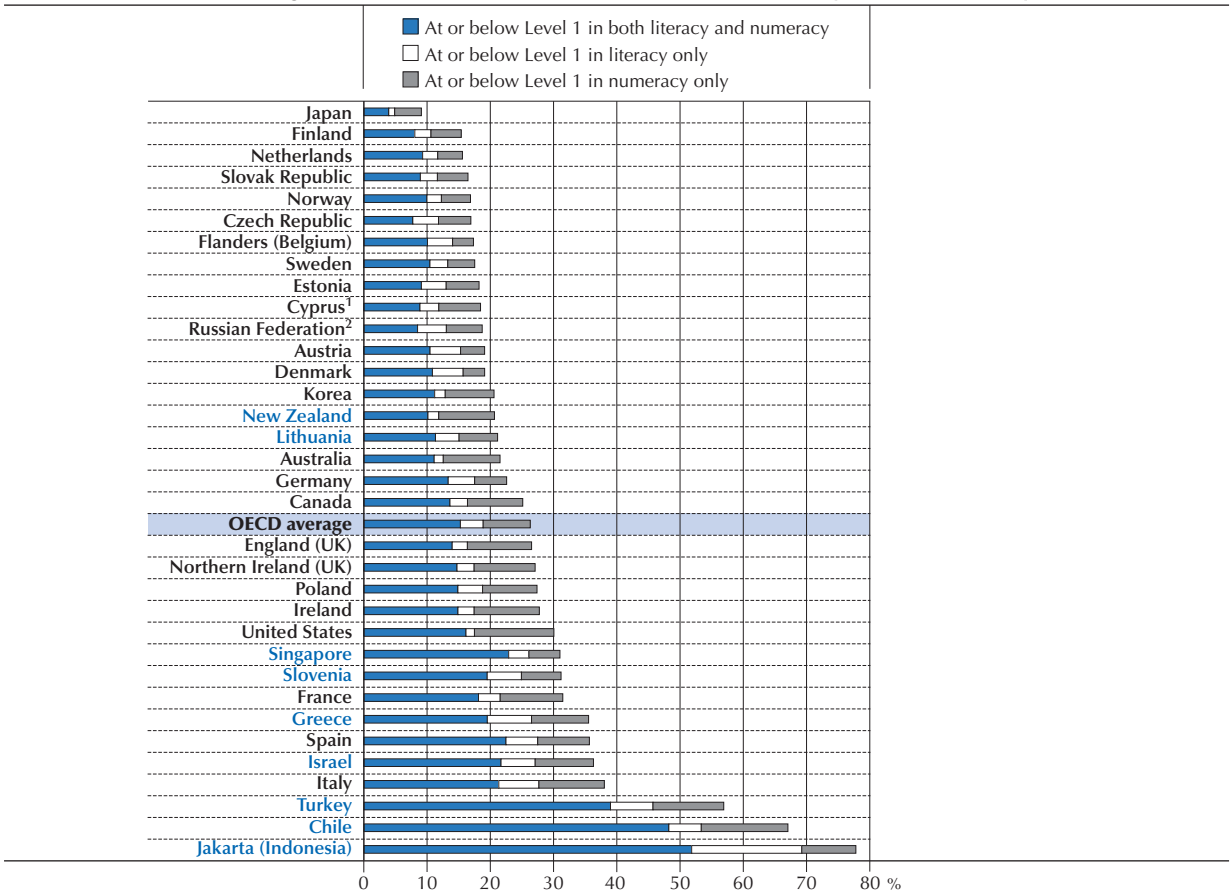
ADULTS WITH LOW PROFICIENCY

Adults with low proficiency, defined as those who score at or below Level 1 in either literacy or numeracy, can successfully complete reading tasks that involve only short and simple texts, and mathematics tasks involving only basic operations. They are most at risk of being marginalised in modern societies and economies, where knowledge and the ability to access and process information is ever more crucial, not only in order to succeed in the labour market, but also to participate in the broader society (Grotlüschen et al., 2016).

Figure 3.17 shows how low proficiency is pervasive in most countries/economies that participated in the Survey of Adult Skills. Even in Japan, the country with highest average literacy and numeracy scores, 9% of adults are low performers in either literacy or numeracy. This share is about 20% in Lithuania and New Zealand, 31% in Singapore and Slovenia, 36% in Greece and Israel, 57% in Turkey, and 67% in Chile. In Jakarta (Indonesia), 78% of adults can be classified as low performers.

Figure 3.17 ■ **The proportion of adults who are low performers**

Percentage of adults who score at or below Level 1 in literacy and/or numeracy



Note: Low-performing adults are defined as those who score at or below Level 1 in either literacy or numeracy.

1. See note 1 under Figure 3.1.

2. See note at the end of this chapter.

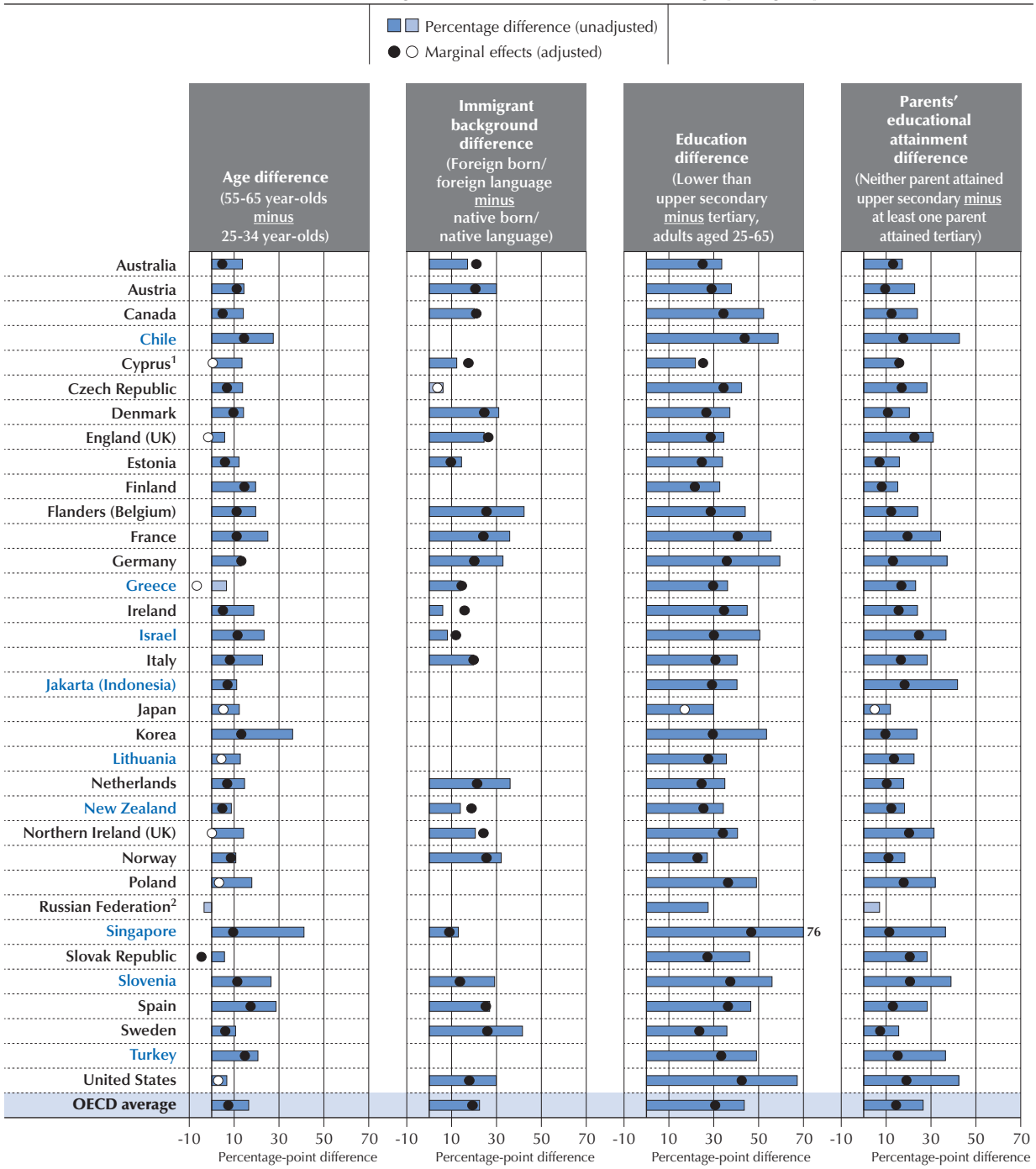
Countries and economies are ranked in ascending order of the combined percentages of adults scoring at or below Level 1 in literacy and/or numeracy.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A3.16.

StatLink http://dx.doi.org/10.1787/888933366131

Figure 3.18 ■ **Low performers: Synthesis of socio-demographic differences**

Adjusted and unadjusted difference in the percentage of adults scoring at or below Level 1 in literacy or numeracy between contrast categories within various socio-demographic groups



Notes: Statistically significant differences are marked in a darker tone. Estimates based on a sample size with too few observations are not shown (i.e. immigrant background differences in Chile, Finland, Jakarta [Indonesia], Japan, Korea, Lithuania, Poland, the Slovak Republic and Turkey). Unadjusted differences are those between the two means for each contrast category. Adjusted differences are based on a regression model and take account of differences associated with the following variables: age, gender, education, immigrant and language background and parents' educational attainment. Only the score-point differences between two contrast categories are shown, which is useful for showing the relative significance of each socio-demographic variable vis-a-vis observed score-point differences. Adjusted differences for the Russian Federation are missing due to the lack of language variables.

1. See note 1 under Figure 3.1.

2. See note at the end of this chapter.

Countries and economies are listed in alphabetical order.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Tables A3.17 and A3.18.

StatLink http://dx.doi.org/10.1787/888933366144

Figure 3.18 shows how certain socio-demographic characteristics are associated with a greater likelihood of being low performers. The overall picture emerging from Figure 3.18 is similar to that in Figure 3.1. The socio-demographic factors associated with low proficiency are also associated with a higher probability of being a low performer in either literacy or numeracy.

Low educational attainment is strongly correlated with the likelihood of being a low performer. On average, the chances of being a low performer increase by more than 40 percentage points when comparing adults, 25 years or older, who have not attained upper secondary education with those who have completed tertiary education. Education is a particularly strong predictor of low performance in Singapore (where the probability that low-educated adults are also low performers is 76 percentage points higher than that for high-educated adults), Chile, Germany, Slovenia and the United States.

Accounting for other socio-demographic characteristics substantially reduces the strength of the association between educational attainment and the likelihood of being a low performer. The estimated difference in the probability of being low performer decreases, on average, from 44 to 31 percentage points. These adjusted differences remain large (above 40 percentage points) in Chile, Singapore and the United States.

Adults raised by low-educated parents are more likely to be low performers in either literacy or numeracy. The strength of the relationship is remarkably similar across countries. On average, the likelihood of being a low performer is about 25 percentage points lower for adults with at least one tertiary-educated parent, compared to adults with neither parent having attained upper secondary education. This relationship is particularly strong in Chile, Israel, Singapore, Turkey and the United States, but well below average in Finland, Japan, New Zealand and Sweden.

Accounting for other socio-demographic characteristics strongly reduces the estimated association, especially in Chile (from 43 to 18 percentage points), Germany (from 37 to 13 percentage points), Singapore (from 36 to 11 percentage points) and the United States (from 42 to 19 percentage points).

Foreign-born adults whose native language is different from that of the assessment are more likely than native-born adults to be low performers, by 22 percentage points, on average. The influence of language and immigrant background is particularly strong in Flanders (Belgium) and Sweden, where the difference is greater than 40 percentage points. However, in both countries (and in Denmark, France, Northern Ireland [United Kingdom], Norway, and Spain) a large part of the gap is explained by other socio-demographic characteristics, and adjusted differences shrink to 26 percentage points. By contrast, in the Czech Republic, Estonia, Greece, Israel and Singapore, the risk of being a low performer among foreign-born, foreign-language adults is between 4 and 15 percentage points higher than among native-born, native-language adults.

The prevalence of low performance is generally greater among older adults, but the variation across countries is substantial, reflecting different age and cohort effects, as discussed above. Older adults in Korea and Singapore are more likely than 25-34 year-olds to be low performers by more than 35 percentage points, although much of this likelihood is explained by other socio-demographic characteristics. After accounting for those characteristics, the likelihood, while still above average, shrinks to 10 percentage points in Singapore and to 13 percentage points in Korea, similar to that observed in Austria, Chile, Finland, Flanders (Belgium), France, Germany, Israel, Slovenia and Turkey. After accounting for other background characteristics, older adults in Spain are most at risk of being low performers. In England (United Kingdom) and Greece, after accounting for other socio-demographic characteristics, the differences in the probability of being low performers become negative, although statistically not different from zero.

SUMMARY

This chapter investigates differences in skills proficiency by socio-economic and demographic characteristics, in order to identify which groups of individuals are more likely to suffer from low proficiency, and in which countries more disadvantaged adults are able to perform at high levels of proficiency.

Perhaps unsurprisingly, educational attainment is found to be an accurate predictor of proficiency in information-processing skills. The relationship between education and proficiency remains strong even after taking into account differences in other socio-demographic characteristics, such as age, gender, socio-economic status or immigrant background.

Proficiency is also strongly related to age. Much of this association is explained by lower educational attainment among older adults, especially in countries that recently expanded access to education. However, there is clear evidence that biological ageing also plays a role; and the large degree of between-country/economy variation in age-proficiency profiles suggests that policies can shape the evolution of proficiency over a lifetime.

Gender differences in literacy proficiency are negligible, and are statistically indistinguishable from zero in half of the countries or economies that participated in the first or second round of the survey. In numeracy, though, men maintain a more significant advantage over women. Gender gaps are generally more pronounced among older adults, which is probably due to a combination of lower levels of education among older women and faster depreciation of proficiency among them. This latter phenomenon can be linked to the fact that women participate less in the labour market and, when they do, are more likely to pursue careers in which they have limited possibility to practice their numeracy skills.

Foreign-born adults tend to have lower levels of proficiency than native-born adults. By shaping the composition of the immigrant population, immigration policies result in large differences among countries/economies in the magnitude of the proficiency gaps between native- and foreign-born adults. Not surprisingly, being skilled in the language of the assessment is found to be a strong determinant of literacy proficiency, and immigrants whose native language is the same as that of the host country often score similarly to native-born adults in literacy.

Socio-economic background exerts a significant influence on adults' proficiency in literacy. Having at least one tertiary-educated parent is associated with a large advantage over adults with neither parent having attained an upper secondary degree – as large as the difference in proficiency between tertiary-educated adults and adults who have not attained tertiary qualifications. About half of this gap is explained by the fact that children of high-educated parents are themselves much more likely to attain high levels of education.

Notes

1. More precisely, adjusted differences are estimated through an Ordinary Least Squares regression. The dependent variable is the score in the literacy (or numeracy) assessment, which is simultaneously regressed on a set of dummy variables identifying each individuals' gender, age category, educational attainment, socio-economic status (measured by parents' highest level of educational attainment), and immigrant and language background.

2. See note regarding the Russian Federation below.

3. The international average, or average across countries, is always computed as the average across OECD countries/economies participating in the survey, whether in Round 1 or 2.

4. Similar figures for Round-1 countries can be found in Figure 5.2b (L) in OECD (2013).

5. However, controlling for observable characteristics, such as educational attainment, is not enough to separately identify age and cohort effects, because of, among other things, changes in unobservable quality of education (Green and Riddel, 2013; Paccagnella, 2016).

6. The Survey of Adult Skills does not contain enough information to compute an index of socio-economic status, as is done, for instance, in PISA. Information on the occupation of parents was collected only in some countries. No information on wealth was recorded, and, in terms of cultural possessions, the only information that was collected was the number of books in the household. While there is much socio-economic background information that is not captured in the Survey of Adult Skills (e.g. income, wealth, and occupation of parents), parents' educational attainment is one of the most important proxies of socio-economic background, given that education is an important predictor of income, wealth and occupation.

A note regarding the Russian Federation

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 the Russian Federation but rather the population of the Russian Federation *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, Second Edition* (OECD, forthcoming).

References and further reading

Desjardins, R. and **A. Warnke** (2012), "Ageing and skills: A review and analysis of skill gain and skill loss over the lifespan and over time", *OECD Education Working Papers*, No. 72, OECD Publishing, Paris, http://dx.doi.org/10.1787/5k9csvw87ckh-en.

Green, D. and **W.C. Riddell** (2013), "Ageing and literacy skills: Evidence from Canada, Norway and the United States", *Labour Economics*, Vol. 22(C), pp. 16-29.

Grotlüschen, A. et al. (2016), "Adults with low proficiency in literacy or numeracy", *OECD Education Working Papers*, No. 131, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jm0v44bnmnx-en.

OECD (2016), *Survey of Adult Skills (PIAAC)* (Database 2012, 2015), www.oecd.org/site/piaac/publicdataandanalysis.htm.

OECD (2015a), *Education at a Glance 2015: OECD Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eag-2015-en.

OECD (2015b), *The ABC of Gender Equality in Education: Aptitude, Behaviour, Confidence*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229945-en.

OECD (2013), *OECD Skills Outlook 2013: First Results from the Survey of Adult Skills*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264204256-en.

Paccagnella, M. (2016), "Age, ageing and skills. Results from the Survey of Adult Skills", *OECD Education Working Papers*, No. 132, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jm0q1n38lvc-en.