OECD Skills Studies

Do Adults Have the Skills They Need to Thrive in a Changing World?

SURVEY OF ADULT SKILLS 2023

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Please cite this publication as:
OECD (2024), *Do Adults Have the Skills They Need to Thrive in a Changing World?: Survey of Adult Skills 2023*, OECD Skills Studies, OECD Publishing, Paris, https://doi.org/10.1787/b263dc5d-en.

ISBN 978-92-64-70680-4 (print)
ISBN 978-92-64-98704-3 (PDF)
ISBN 978-92-64-46260-1 (HTML)

OECD Skills Studies
ISSN 2307-8723 (print)
ISSN 2307-8731 (online)

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Corrigenda to OECD publications may be found at: https://www.oecd.org/en/publications/support/corrigenda.html.

Acknowledgements

The Survey of Adult Skills, a product of the OECD Programme for the International Assessment of Adult Competencies (PIAAC) is the outcome of a collaboration among participating countries and economies, the OECD Directorate for Education and Skills and the OECD Directorate for Employment, Labour and Social Affairs, and an international Consortium led by Educational Testing Service (ETS).

The development of this report was guided by Stefano Scarpetta and Andreas Schleicher. The report was prepared by Francesco Avvisati, Elif Bahar, Anja Meierkord, Marco Paccagnella, Helke Seitz, Mila Staneva and Roland Tusz, under the supervision of Glenda Quintini and Claudia Tamassia. François Keslair provided statistical and analytical support, assisted by Hajar Sabrina Yassine. Sally Hinchcliffe provided editorial assistance. Administrative support was provided by Sabrina Leonarduzzi. Rachel Linden co-ordinated production and Fung Kwan Tam designed the tables and figures.

The international Consortium was responsible for developing the assessment instruments and preparing the underlying data under the direction of Laura Halderman and Irwin Kirsch. Samuel Greiff, Jean-François Rouet, Dave Tout and Guido Schwerdt led the expert groups that oversaw the development of the cognitive assessment instruments and of the background questionnaire. Matthias von Davier chaired the project's Technical Advisory Group.

The PIAAC Board of Participating Countries (BPC) – co-chaired by Aviana Bulgarelli (Italy, until 2020), Ted Reininga (the Netherlands, until 2021), Katalin Zoltán (Hungary, since 2020) and James Davison (England, UK, since 2021) – steered the development of the project and of the report. Feedback and comments on this report by members of the BPC are gratefully acknowledged.

Editorial

In a world of rapid technological advancement, the transition to net-zero and demographic changes, the ability of adults to thrive increasingly depends on their foundational skills. Technological change, including automation and the latest strides of generative artificial intelligence, is transforming most industries and jobs. Alongside net-zero pledges, this transformation is creating new roles that require new skillsets. AI and digitalisation are also revolutionising how basic skills are used in everyday life, from managing personal finances to making data-driven decisions in the workplace. Ageing populations are leading to longer working lives and shifting demand for goods and services, including increased demand on healthcare systems.

More than ever, beyond specialised skills for specific professions, information-processing skills – literacy, numeracy and adaptive problem solving – are becoming essential for individuals to navigate these profound transformations. Literacy equips people to process information, communicate effectively and participate in civic life. Numeracy underpins decision-making, financial literacy and the ability to interpret complex data. Problem-solving skills enable individuals to adapt, innovate and leverage technology.

Together, these skills are not only indispensable for economic success but also fundamental for societies to address inequality, foster resilience and promote social cohesion.

With skill needs evolving at an unprecedented pace, the 2023 Survey of Adult Skills stresses the urgent need for education and training systems to scale up their efforts and adapt. The survey assessed the literacy, numeracy and adaptive problem solving skills of about 160 000 adults aged 16-65 from 31 countries and economies, representing 673 million people. The data confirms the essential role of these skills in achieving positive economic and social outcomes. Adults with higher numeracy skills, for example, are more likely to be employed, earn a higher wage, and report better health and life satisfaction than those with lower numeracy skills. In some countries, adults with high numeracy skills are considerably more likely to feel they can understand and influence political affairs.

Despite significant efforts by governments and social partners to strengthen education and adult training systems over the past decade, the survey reveals a starkly uneven skills landscape, with increasing numbers of people ill-prepared for the future.

Over the past decade, only Finland and Denmark have seen significant improvements in adult literacy skills, while other participating countries and economies have experienced stagnation or decline. The situation is less gloomy when it comes to numeracy proficiency: eight countries saw their average scores improve, with Finland and Singapore recording the largest gains.

Behind the declines in average skill levels, inequalities within countries are widening. Across all participating countries, one-fifth of adults are only able to understand simple texts or solve basic arithmetic. The incidence of this varies widely across countries. This is particularly worrying in the context of rapid technological and economic change, which increasingly rewards those with advanced literacy, numeracy and problem-solving skills, while leaving others behind.

This evolving situation raises urgent questions about how societies can ensure that everyone benefits from technological and economic progress. The findings call for targeted policies to address these gaps, through

improved access to education and training, stronger adult learning systems and efforts to equip all individuals with the skills they need to thrive.

The data also highlight specific areas for intervention. For example, the survey shows larger declines in literacy among men than women, but men continue to outperform women in numeracy. Meanwhile, foreign-born adults have lower skills than native-born adults in nearly all countries. In some places, an increase in the share of foreign-born adults coincided with declining average literacy proficiency scores. These changes are notable but relatively small, with immigrants' lack of familiarity with the local language a contributory factor.

Tackling all these issues is not just a matter of equity; it is essential for economic resilience and social cohesion. To address the challenges, we need to rethink our approach to lifelong learning and employability. It is not merely a matter of funding but of boosting upskilling and reskilling opportunities, particularly for low-skilled workers.

Adaptability is key; education and training need to become more accessible by reducing barriers to lifelong learning, including more modular, targeted courses and online options. This flexibility will make learning more attractive to both workers and employers, and potentially lead to a change in mindset: shifting from earning a degree to taking ownership over what we learn, how we learn, where we learn and when in our lives we learn. Improving the visibility and recognition of skills, and the effective use of AI, will likely play a crucial role in this transformation.

Overall, the survey results underscore the urgent need for a comprehensive re-evaluation of how countries support skills development. By investing in skills, governments will support a more resilient and inclusive workforce that helps sustains prosperity for all.

Andreas Schleicher
Director for Education and Skills and Special Advisor to the Secretary-General on Education

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Director for Employment, Labour and Social Affairs

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The Survey of Adult Skills and the COVID-19 pandemic

The second cycle of the Survey of Adult Skills (a product of the Programme for the International Assessment of Adult Competencies – PIAAC) took place in 2022/2023. It was originally planned to take place in 2021/22, ten years after the first round of the first cycle of the survey. Because of the COVID-19 pandemic, all activities were postponed by one year.

The pandemic had significant, although difficult to quantify, impacts on individual and societal attitudes and behaviours. Attitudes towards participating in surveys changed after the pandemic, even more than what was observed in previous years. This is reflected in declining response rates for the 2023 Survey of Adult Skills compared with the first cycle of the survey, as well as for many other household surveys. Considerable efforts were made by the countries participating in the survey to maximise response rates and to minimise the effects of non-response.

The overall quality of the data and the adherence to the technical standards for the administration of the survey were evaluated by independent experts, members of the Technical Advisory Group (TAG) in May 2024. This evaluation involved a holistic assessment of the quality of the data, including: the representativity of the data with respect to the target population, the comparability of results across countries, and the adherence to the technical standards. The TAG concluded that all countries adhered satisfactorily to the PIAAC standards and that data from all countries and economies are of sufficiently high quality for publication and reporting.

Additionally, extensive analyses were conducted to evaluate the extent to which estimates from the survey are susceptible to non-response bias. A summary of the non-response bias analysis as well as a few country-specific issues that readers are invited to keep in mind while interpreting the Survey's results, are presented in this Readers' Guide. More information can be found in the *Survey of Adult Skills 2023 Technical Report* (OECD, forthcoming[1]).

Response rates and non-response bias analysis

In the first round of the Survey of Adult Skills, undertaken in 2011/12, response rates varied between 45% and 75% (OECD, 2024[2]). In 2023, response rates were much lower, varying between 27% and 73%. Korea was the only country where the response rate exceeded 70%.

Low response rates are a potential source of non-response bias. Bias from non-response can occur if non-respondents are systematically different (in terms of skills proficiency, for example) from those who agree to participate in the survey. For this reason, the 2023 Survey of Adult Skills undertook extensive non-response bias analyses (NRBAs). These NRBAs considered, for each participating country and economy, a range of indicators and analyses to gauge the likelihood of bias related to non-response in the estimation of adults' proficiency from the survey. Details on the indicators included in the analysis and its final results can be found in the *Survey of Adult Skills 2023 Technical Report* (OECD, forthcoming[1]).

One of these analyses compared the weighted sample of participants in the Survey of Adult Skills to other sources to identify potential misalignments in the distribution of certain characteristics, such as age, gender, immigrant status, level of education, or employment status.

When the decision to participate in the survey is linked to specific characteristics of the sampled adults, the distribution of these characteristics among participants in the Survey of Adult Skills may not match the true distribution in the population or that observed in other surveys. However, as all surveys are affected by some non-response, it is not clear that other sources are necessarily more accurate than the Survey of Adult Skills. Misalignments between the distribution of certain characteristics of adults in the sample and in the population, as well as with other sources, have been observed in both cycles of the Survey of Adult Skills. As a result, the changes in the composition of the population observed over the two cycles of the Survey of Adult Skills may also not match exactly the changes observed in other sources.

Sampling weights can be applied to bring the composition of the sample closer to the known distribution of characteristics in the population. In the Survey of Adult Skills, countries and economies agreed with the Secretariat and the OECD contractors on which variables to use for weighting. For variables that were not used in weighting, some discrepancies may remain after weighting.

Table 1 provides an overview of some misalignments between the (weighted) PIAAC sample and alternative data sources. Discrepancies are listed if they are statistically significant and over 1.5 percentage points. Some of these misalignments can be explained by differences in the definition or in other methodological aspects between the Survey of Adult Skills and other sources. Moreover, not all countries could verify the alignment across all characteristics due to data availability.

Alternative weighting schemes were considered to understand the extent to which the observed discrepancies might bias the estimated proficiency of the adult population in the 2023 Survey of Adult Skills. Significant differences in estimated proficiency were found in a few countries with these alternative weights (Table 2). However, the impact of applying alternative weighting schemes never exceeded four score points. This means that the fact that the distribution of some characteristics in the sample is not consistent with other sources does not seem to have a major impact on estimated proficiency because these alternative weighting adjustments resulted in only minor changes to the overall results.

The final outcomes of the NRBA are reported in Table 3. These are based on the analyses described above but also on other indicators that are described in more detail in the *Survey of Adult Skills 2023 Technical Report* (OECD, forthcoming[1]). Countries were assigned to different categories, reflecting an assessment of the likelihood that their proficiency estimates could be affected by non-response bias and the extent to which results should be interpreted with caution. Such categories are:

- Pass, meaning that the analysis provided no strong evidence of non-response bias;
- Low caution, meaning that some caution should be taken in interpreting the results, as non-response bias may be present;
- Medium caution, meaning that proficiency estimates are more susceptible to non-response bias and more caution should be exerted;
- High caution, meaning that the likelihood of non-response bias is higher.

Table 1. Discrepancies in the distribution of certain variables between the PIAAC weighted sample and an alternative source

OECD countries and economies	Variables whose distribution does not match an alternative source	Differences in coverage, timing or definition can partly explain the discrepancies
OECD countries		
Austria	-	-
Canada	Education, Nativity, Language, Life satisfaction	Yes
Chile	Education by gender	No
Czechia	ISCO-08 broad skill levels (current occupation)	Yes
Denmark	Population density	No
Estonia	-	-
Finland	-	-
France	-	-
Germany	-	-
Hungary	Education	Yes
Israel	Marital status by ethnicity, Type of locality	No
Italy	-	-
Japan	Education by gender, Education by age, Employment status by age	Yes
Korea[1]	Not applicable	Not applicable
Latvia	Employment status	Yes
Lithuania	Education, Employment status, Gender	Yes
Netherlands	Income, Socio-economic status, Wealth	No
New Zealand	Employment status, Ethnicity	Yes
Norway	Employment status, Industry, Household composition	No
Poland	Education by age	Yes
Portugal	Region by age	Yes
Slovak Republic	Education by region	Yes
Spain	-	-
Sweden	Education, Employment status, Occupation, Economic activity, Nativity	Yes
Switzerland	-	-
United States	Education, Employment status, Household composition, Ethnicity, Health insurance coverage	Yes
Subnational entities		
England (UK)	Employment status by age	Yes
Flemish Region (Belgium)	Employment status by age	Yes
Partner countries		
Croatia	-	-
Singapore	Nativity	Yes

1. Results are not available for Korea because this analysis was not required for countries with response rates above 70%.
Note: When no information is reported, no discrepancies were identified in the distribution of the variables analysed between the Survey of Adult Skills and other sources. The variables analysed varied from country to country.

Table 2. Notable and significant differences in estimated proficiency from alternative weighting schemes

Countries and economies	Score differences			Variables used for reweighting
	Literacy	Numeracy	Adaptive problem solving	
Estonia	2.54	2.58	1.82	County (5) * Education (3)
Lithuania	-3.55	-3.73	-2.34	Education (5) * Labour force status (4)
Latvia	2.86	2.91	2.23	Gender (2) * Education (7)
Netherlands	1.10	1.41	0.98	Socio-economic status
Poland	-1.88	-2.16	-1.09	Education (4)
Singapore	2.18	2.17	1.43	Gender (2) * Education (5)
Spain	-2.45	-2.46	-1.95	Country of birth (2) * Region (18)

Note: The table reports the difference between the average proficiency estimated using the final PIAAC weights and the proficiency obtained using alternative weighting schemes. The table only reports countries and economies for which differences are statistically significant and notable (absolute value of the difference larger than the standard error of the differences). In a few other countries, statistically significant differences are found, but they are almost all smaller than 1 score point. These are not reported to save space but can be found in the *Survey of Adult Skills 2023 Technical Report* (OECD, forthcoming[1]). The number in parenthesis next to the variables used for reweighting indicates the number of categories for each variable.

Table 3 also presents response rates for each country and economy. Response rates are only one element (although an important one) considered in the NRBAs, as mentioned previously. It is, therefore, possible that countries with lower response rates receive a more favourable assessment than countries who achieved higher response rates.

In interpreting the outcomes of the NRBA and the resulting classification of countries, readers should note that:

- The classification reflects an assessment of the likely existence of non-response bias, and not of its magnitude. In other words, one cannot conclude that countries in the “high caution” category necessarily have a larger non-response bias than countries in the “low caution” category.
- The criteria and the thresholds used for the classification have been approved by the independent experts who are members of the TAG.
- In any such classification, threshold effects will always exist, meaning that countries might be classified in different categories even though the differences in the underlying indicators are very small.
- This classification reflects a judgement on the collected data, and not on the quality of the work done by national centres and data collection agencies, which all countries completed satisfactorily and in accordance with the requirements specified in the Technical Standards.

Countries not fully meeting the sampling standards

In Lithuania and the Slovak Republic, not all eligible persons in a household were given a chance to be selected to participate in the survey, which could lead to coverage error. Measures were taken to reduce coverage error (weight calibration). While some additional caution should be taken when analysing data from these countries, the results of additional analysis, including the NRBA, suggest that the effect of this deviation from the sampling standards is rather small.

Table 3. Outcomes of the non-response bias analysis (NRBA)

Countries and economies	Response Rate (%)	Outcome of the NRBA
Korea[1]	73	Not Applicable
Slovak Republic[2]	70	Pass
Singapore	62	Pass
Israel	61	Pass
Spain	61	Pass
Estonia	50	Pass
France	55	Pass
Hungary	59	Low Caution
Poland	57	Low Caution
Chile	56	Low Caution
New Zealand	48	Low Caution
Ireland	47	Low Caution
Germany	45	Low Caution
Lithuania	44	Low Caution
Norway	41	Low Caution
Czechia	40	Low Caution
Austria	39	Low Caution
Finland	34	Low Caution
Sweden	31	Low Caution
Denmark	27	Low Caution
Japan	41	Medium Caution
Netherlands	40	Medium Caution
Portugal	39	Medium Caution
England (UK)	38	Medium Caution
Croatia	36	Medium Caution
Flemish Region (Belgium)	35	Medium Caution
Switzerland	30	Medium Caution
United States	28	Medium Caution
Canada	28	Medium Caution
Italy	29	High Caution
Latvia	28	High Caution

1. The extended NRBA was not required for countries with response rates above 70%. For this reason, the results of the NRBA are not available for Korea.
2. The extended NRBA was conducted for the Slovak Republic, despite a response rate of 70%, because the country did not fully meet the standard related to sampling selection in the field.

Additional quality checks focusing on respondents' engagement

The OECD Secretariat conducted additional quality checks on the data, expanding on the quality control procedures set in the Technical Standards and Guidelines. These analyses found some unusual response patterns, suggesting that some respondents may not have exerted a reasonable level of effort in answering the literacy, numeracy and adaptive problem solving assessment. This may call into question whether their responses accurately reflect their proficiency. To identify such cases, the OECD relied on the following criteria: a very short time spent on the assessment, a high share of very rapid responses, a high share of missing answers, and locator failure (i.e. failure to answer a set of easy questions) from highly educated, native-born respondents. Anomalies were mostly found in the responses to the cognitive assessment; the pattern of responses to the background questionnaire did not raise particular concerns.

Disengaged respondents will always exist in surveys, and it is difficult to establish objective criteria to assess whether a reasonable level of effort was exerted. In some countries (Israel, Lithuania, New Zealand, Poland, the Slovak Republic, and Spain), it was found that many of these respondents were clustered around a few interviewers, suggesting that the problem may stem from such interviewers not following the PIAAC protocols. In particular, interviewers were identified for which a high share of their cases met at least two of the criteria mentioned above. This cast doubts on the quality of all data collected by such interviewers. The following notes describe in more detail the results of the analysis in these six countries, and the actions undertaken by the OECD to improve, to the extent possible, the quality of the published data.

Note regarding Lithuania, New Zealand, the Slovak Republic and Spain

In Lithuania, New Zealand, the Slovak Republic and Spain, all cases from the identified interviewers (406 in Lithuania, 301 in New Zealand, 356 in the Slovak Republic, and 385 in Spain) have been excluded from the data used to estimate the population model, which establishes the relationship between the variables from the background questionnaire and performance on the direct assessment to generate proficiency estimates (plausible values; see the *Survey of Adult Skills 2023 Technical Report* (OECD, forthcoming[1]) for more detail). This exclusion enhances the robustness of the model, by ensuring it is estimated based only on the cases considered to be of sufficient quality. In the absence of definitive evidence of data falsification or other forms of interviewer misconduct, the responses to the cognitive assessment items still contributed to the estimation of plausible values for these respondents.

Note regarding Israel

In Israel, six interviewers were identified as having a relatively large share of cases with unusual response patterns, using the same criteria that led to the identification of cases in the other countries. All data from these interviewers (748 cases in total) have been excluded from the data used to estimate the population model, which establishes the relationship between the variables from the background questionnaire and performance on the direct assessment to generate proficiency estimates (OECD, forthcoming[1]). This exclusion enhances the robustness of the model, by ensuring it is estimated based only on the cases considered to be of sufficient quality.

Moreover, stronger evidence was collected that three of these interviewers breached data collection protocols throughout the survey or were implausibly productive (conducting a very large number of interviews in a relatively short period). As this raised additional concerns about the quality of data, the responses to the cognitive assessment items for all cases of these interviewers were excluded from the database (572 in total). Plausible values for these cases were then estimated using only their responses to the background questionnaire (for which no unusual patterns were detected) and the parameters estimated by the population model.

Note regarding Poland

In Poland, nine interviewers were identified as having a relatively large share of cases with unusual response patterns of respondents, using the same criteria that led to the identification of cases in the other countries. All data from these interviewers (774 cases in total) have been excluded from the data used to estimate the population model, which establishes the relationship between the variables from the background questionnaire and performance on the direct assessment to generate proficiency estimates (OECD, forthcoming[1]). This exclusion enhances the robustness of the model, by ensuring it is estimated based only on the cases considered to be of sufficient quality.

Moreover, stronger evidence was collected that six of these interviewers in Poland breached data collection protocols throughout the survey. For instance, some of these interviewers were implausibly productive, conducting many interviews on a single day. Others did not record interviews or obtain

respondents' phone numbers, which made validation of interviews more difficult. Yet another interviewer was found to have falsified seven cases during data collection (cases which were immediately removed from the dataset as part of the quality control process and are not included in the 774 cases under consideration in this note). Twenty-seven other cases collected from this interviewer were, however, validated and remained in the dataset. Since these factors raise concerns about the quality of all cases completed by these six interviewers, the responses to the cognitive assessment items for all cases of these six interviewers were excluded from the database (559 in total). Plausible values for these cases were then estimated using only their responses to the background questionnaire (for which no unusual patterns were detected) and the parameters estimated by the population model.

In Poland, other cases with unusual response patterns that could suggest possible disengagement or lack of a reasonable level of effort during the assessment were identified. As these cases were not clustered within any particular interviewer, they were left in the dataset and treated as all other cases, given the difficulty of establishing objective criteria to determine whether reasonable effort was exerted, and whether the results of the assessment truly reflect the proficiency of respondents. While similar cases are present in all countries, the number of such cases in Poland can potentially have a significant impact on the estimated proficiency of the overall population. This should be kept in mind when interpreting Poland's results.

Comparability with past adult skills surveys

The literacy and numeracy scores from the 2023 Survey of Adult Skills are psychometrically linked and, therefore, comparable with results from previous adult skills surveys, in particular the first cycle of the Survey of Adult Skills (conducted over three rounds between 2011/12 and 2017), the Adult Literacy and Life Skills Survey (ALL, conducted between 2003 and 2007) and (in literacy only) the International Adult Literacy Survey (IALS, conducted between 1994 and 1998). The data make it possible to analyse changes in skills proficiency over time. Survey operations also remained largely unchanged over time. All surveys were conducted by trained interviewers in the respondents' households. The interviewer first administered a background questionnaire and then supervised participating adults during the direct assessment.

Some caution is always advised when comparing results across different surveys, especially as they were conducted many years apart and, therefore, under different conditions. Some methodological changes that occurred between the first and the second cycle of the survey need to be considered when analysing changes in proficiency over time. These are briefly summarised below. More information on the comparability of data across adult skills surveys can be found in the *Survey of Adult Skills 2023 Reader's Companion* and the *Survey of Adult Skills 2023 Technical Report* (OECD, 2024[2]; OECD, forthcoming[1]).

Doorstep interview

In all countries, a small percentage of adults were unable to participate in the survey because they lacked the necessary language proficiency to communicate with the interviewer who administered the background questionnaire. For the same reason, they were also unable to participate in the cognitive assessment. These adults are referred to as "literacy-related non-respondents" (LRNR). In the first cycle of the Survey of Adult Skills, no information was collected on such adults, effectively leading to a small undercoverage of the target population and an upward bias in the average proficiency of the population.

In the 2023 Survey of Adult Skills, such adults were administered a very short questionnaire available in many languages (called "doorstep interview"). Respondents completed the questionnaire on a tablet by themselves. The information collected through this doorstep interview (age range, gender, years of completed education, employment status and migration history) was used to generate plausible values for these respondents, thus allowing them to contribute to the estimation of the average proficiency of the population.

The introduction of the doorstep interview creates a small misalignment between the populations for which proficiency estimates are available in the two cycles of the survey. For this reason, this report systematically excludes doorstep interview cases from the analysis when comparing results from the 2023 Survey of Adult Skills with those from previous adult skills surveys (including the first cycle of the Survey of Adult Skills). Doorstep interview cases may also be excluded because the information necessary for the analysis is not collected in the questionnaire. The inclusion or exclusion of doorstep interview cases is specified under every table and figure of this report.

The Technical Standards and Guidelines allowed for the background questionnaire to be completed with the aid of a translator or interpreter. This could have been a family member or a staff of the survey organisation. Sweden was the only country that made systematic use of interpreters in both cycles of the survey. As a result, all respondents in Sweden, in both cycles, were able to complete the background questionnaire, and no respondents were classified as literacy-related non-respondents (in the first cycle), nor took the doorstep interview (in the second cycle). This improved the precision of the estimates of proficiency for such respondents in Sweden because richer information is available for them. However, it also introduced a small difference in survey operations between Sweden and other countries, as adults who were not able to participate in the survey because of language barriers were treated slightly differently in Sweden than in other countries. As such adults constitute a very small percentage of the population, the threat to comparability remains low. However, some caution is warranted when comparing results between Sweden and other countries for groups of adults that may include a larger share of adults with very low language proficiency (for example, recent immigrants).

The assessment of reading and numeracy components

In both cycles of the Survey of Adult Skills, adults who failed the locator assessments were judged to have too low proficiency to undertake the full assessment. To gather some information on what such low-skilled adults are able to do, they were administered an assessment that tested the basic skills that are a prerequisite to developing proficiency in literacy (reading components). In the 2023 Survey of Adult Skills, a numeracy component assessment was also added.

Thanks to enhancements in the assessment design, the 2023 Survey of Adult Skills could incorporate the component assessment when estimating the proficiency of respondents. This increased the precision of proficiency estimates for those at the lower end of the skills distribution. This methodological change has a negligible impact on the estimation of average proficiency for the entire adult population. However, it has a more significant impact on the proficiency estimates of adults who failed the locator and only took the component assessment. In the first cycle, the proficiency of these respondents would have been computed differently, which would have led to sometimes significantly different results.

Results of all analyses that look at how the proficiency of subgroups of the population has changed between the first and the second cycle of the survey are not reported if, within the group analysed, the (weighted) share of adults in the second cycle who failed the locator and only took the component assessment is above 20%.

Comparing levels of education across surveys

In the 2023 Survey of Adult Skills, the classification of levels of education is based on the latest International Standard Classification of Education (ISCED 2011), while the first cycle of the survey relied on the previous classification (ISCED 1997). These two classifications can be compared using official crosswalks.

However, over time, a few countries have changed the way they classify specific educational qualifications. These reclassifications have caused some qualifications to change ISCED levels. In this report, whenever results from the 2023 Survey of Adult Skills are compared with results from the first cycle, educational

qualifications have been reclassified and assigned to the same level they would have been assigned in the first cycle (OECD, forthcoming[1]).

Linking error

When examining changes in proficiency between the first and second cycle of the Survey of Adult Skills, additional uncertainty around scale values due to changes in the assessment frameworks and items must be taken into account ("is a score of 235 in the second cycle of the survey equivalent to 235 in the first cycle?"). The difference between a score in the second cycle scale and the corresponding score in the first cycle scale is modelled as a constant, equal for all countries and at all points of the proficiency scale. While the actual value of this constant remains unknown, its standard deviation $le_{1,2}$ can be estimated and is known as the *linking error.* This linking error should be added to the standard error of any trend statistics expressed as a proficiency score (e.g. difference in mean proficiency across cycles or the values of the percentiles of the proficiency distribution). More formally, the standard error of the change in proficiency for country (or subgroup) g between the first and second cycle is: $\sigma(\Delta_{g2-g1}) = \sqrt{\sigma_{g2}^2 + \sigma_{g1}^2 + le_{1,2}^2}$, where σ_{g1} is the standard error of the proficiency of group g in the first cycle, σ_{g2} is the standard error of the proficiency of group g in the second cycle, and $le_{1,2}$ is the linking error between the two cycles. The actual value of the linking error is 3.27 for literacy and 2.95 for numeracy.

It should be noted that the linking error does not apply to trends of any statistic which is homogenous to a score point difference, such as gender or age gaps in proficiency scores. Given that the additional uncertainty for comparing results across cycles is modelled as a constant at all points of the scale, when taking the difference between two scores, the uncertainties associated with each score cancel each other out, and there is no need to add the linking error term to the standard error of the trend.

A more complex case is when the analysis looks at trends in the shares of the population scoring at a given proficiency level. In this case, the additional error term for the standard error of these trends depends on $le_{1,2}$, but also on the density f_g of the proficiency score distribution around these cut-offs. For instance, the resulting linking error for the trend in the proportion of the population score at Level 1 in group g will be $le_{1,2}^2 * (f_g(226) - f_g(176))^2$.

The assessment of problem solving in the two cycles of the Survey of Adult Skills

The 2023 Survey of Adult Skills included a new assessment of *adaptive problem solving (APS)*. This new domain replaced the assessment of *problem solving in technology-rich environments (PSTRE)* administered in the first cycle of the survey. As these two assessments do not share a common conceptual framework or any assessment items, the results from these two assessments are not comparable.

Data underlying figures

The following symbols are used to denote missing data:

m Data are not available (not collected by the country)

f There are too few observations to provide reliable estimates (i.e. fewer than 30 respondents)

c The estimates are not reliable because they refer to cells in which the (weighted) share of adults who, in the second cycle, failed the locator and only took the component assessment is above 20%. This only applies to analyses comparing the first and the second cycle of the survey.

Detailed data tables corresponding to the figures presented in the main body of the report can be found in Annex A.

These figures and tables share a common reference number, are numbered according to the corresponding chapters, and include an abbreviation in brackets to denote the skill domain they refer to (when applicable) – literacy (L), numeracy (N) and adaptive problem solving (A). As an example, Figure 3.1 denotes Figure 1 in Chapter 3; Table A.3.1 (L) is a table contained in Annex A, cited or referenced in Chapter 3, and containing data for literacy only.

Annex B includes other detailed data tables that either correspond to figures included in boxes or to citations in the main body of the report, but no figure was provided for them.

Unless otherwise stated, the population underlying each of the figures and tables covers adults aged 16-65.

StatLinks

This report has StatLinks for tables and graphs at the end of the chapters. To download the matching Excel® spreadsheet, just type the link into your Internet browser, or click on the link from the e-book version.

Conventions regarding subnational entities

For consistency, national and subnational entities are referred to as “countries” and “economies”, respectively, in the whole publication. Territorial and subnational entities are referred to throughout the publication by their subnational name and country: England (United Kingdom) and the Flemish Region (Belgium).

Following guidelines established by the OECD Chief Statistician, in consultation with the Bureau of the Committee on Statistics and Statistical Policy, a visual separation between the data from subnational entities and the data from national entities is introduced, to the extent possible, in all figures and tables in this report. In Annex tables, results for subnational entities are reported separately, after the results for national entities. In figures, the names of subnational entities are reported in blue.

Coverage

This report features data from 31 countries and economies: Austria, Canada, Chile, Croatia, Czechia, Denmark, England (United Kingdom), Estonia, Finland, the Flemish Region (Belgium), France, Germany, Hungary, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, the Netherlands, New Zealand, Norway, Poland, Portugal, Singapore, the Slovak Republic, Spain, Sweden, Switzerland, the United States.

International averages

The OECD average corresponds to the arithmetic mean of the respective estimates for all OECD countries and economies for which data are available. It was calculated for most indicators presented in this report. The following countries and economies are included in the OECD average: Austria, Canada, Chile, Czechia, Denmark, England (United Kingdom), Estonia, Finland, the Flemish Region (Belgium), France, Germany, Hungary, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, the United States.

Focusing on statistically significant differences

This report discusses only statistically significant differences or changes. These are denoted in darker colours in figures and bold font in tables. Unless otherwise specified, the significance level is set to 5%.

Further documentation and resources

The details of the technical standards guiding the design and implementation of the 2023 Survey of Adult Skills can be found at https://www.oecd.org/en/about/programmes/piaac/piaac-data.html#manuals. Information regarding the design, methodology and implementation of the Survey of Adult Skills can be found in summary form in the *Survey of Adult Skills 2023 Reader's Companion* (OECD, 2024[2])and, in detail, in the *Survey of Adult Skills 2023 Technical Report* (OECD, forthcoming[1]).

References

OECD (2024), *Survey of Adult Skills 2023: Reader's Companion*, OECD Skills Studies, OECD Publishing, Paris, https://doi.org/10.1787/3639d1e2-en. [2]

OECD (forthcoming), *Survey of Adult Skills 2023 Technical Report*, OECD Publishing, Paris. [1]

Abbreviations and acronyms

AI	Artificial intelligence
APS	Adaptive Problem Solving
CI	Confidence interval
EFTA	European Free Trade Association
EU	European Union
ICT	Information and communication technologies
ILO	International Labour Organisation
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
PIAAC	Programme for the International Assessment of Adult Competencies
PISA	Programme for International Student Assessment
p.p.	Percentage points
p.p. dif.	Percentage-point difference
PPP	Purchasing power parity
Score dif.	Score-point difference
S.D.	Standard deviation
S.E.	Standard error
STEM	Science, technology, engineering or mathematics
USD	US Dollar

Executive summary

The 2023 Survey of Adult Skills provides unique information on adults' proficiency in literacy, numeracy and adaptive problem solving. These are key information-processing skills that both individuals and societies need to thrive. They are a necessary foundation for further learning and innovation, and ultimately shape economic opportunities. Skills help adults manage and embrace complexity in both private and civic spheres. Skilled adults can better navigate the modern information landscape, thereby contributing to more informed collective decision making and policy choices.

Thirty-one countries and economies (mostly OECD members) participated in the 2023 Survey of Adult Skills. As 27 of them also participated in previous rounds, the data provide insights into how proficiency in literacy and numeracy has evolved over the past decade.

Adult skills mostly declined or stagnated in the past decade

- **Over the past decade, average literacy proficiency has remained stable or declined in most participating countries and economies**, with only Finland (15 points) and Denmark (9 points) exhibiting significant improvements. The largest falls (over 20 points) were in Korea, Lithuania, New Zealand and Poland.
- **Changes in numeracy proficiency have been more favourable.** Eight countries have seen average numeracy scores improve, with the largest gains recorded in Finland and Singapore (both 17 points). Average scores remained stable in 12 countries and declined in 7, most significantly in Lithuania and Poland.
- **Finland, Japan, the Netherlands, Norway and Sweden are the best-performing countries in all three domains**. In 2023, adults in Finland display the highest level of proficiency in both literacy (296 points, against an average of 260 points across OECD countries) and numeracy (294 points, against an OECD average of 263). In adaptive problem solving, Finland and Japan have the highest average scores (276 points in both countries, against an OECD average of 251). Eleven countries (Chile, Croatia, France, Hungary, Israel, Italy, Korea, Lithuania, Poland, Portugal and Spain) consistently perform below the OECD average in all skills domains.
- **On average, across participating OECD countries, nearly one-fifth of adults are considered low performers**, scoring at or below Level 1 in all three domains. This share ranges from 7% in Japan to 44% in Chile. Some 14 countries recorded an increase in the share of low-performing adults in literacy, and no country saw a reduction. The share of low performers in numeracy increased in 9 countries and decreased only in Canada, Finland and Singapore.
- **Declines in average proficiency are largely due to falls among the lowest-performing adults.** In most countries and economies, the literacy proficiency of the lowest-performing 10% of the population has declined, with many experiencing similar declines in numeracy. The evolution of proficiency of the top-performing 10% of the population has evolved more favourably, leading to

widening skills inequalities within countries. In 2023, Singapore and the United States displayed the largest skills inequalities in literacy and numeracy.

Some groups are at risk of being left behind as skill gaps widen

- **In literacy, foreign-born adults scored 44 points below native-born adults, on average.** About half of this difference can be explained by factors such as immigrants having lower level of educational attainment and lacking proficiency in the language of the assessment. The largest gap between native- and foreign-borns was recorded in Finland (105 points), where foreign-born adults make up only 10 percent of the adult population. Gaps are also large in countries with a larger immigrant population, like Germany, Denmark and the Netherlands (around 70 points). Gaps are much smaller in Ireland (10 points), Chile (19 points) and New Zealand (20 points).
- **Over the past decade, literacy proficiency among foreign-born adults has improved only in Denmark, Finland and Sweden, and has declined in 11 countries.** As native-born adults have recorded more positive trends, the proficiency gap between foreign-born and native-born adults has widened in eight countries, with the largest increase recorded in Germany (28 points).
- **In a few countries, immigration explains a small part of the changes in proficiency of the overall population**. In Austria, Germany, New Zealand, Norway and Sweden, average proficiency would have been around 5 points higher if the number of immigrants and their relative proficiency with respect to natives, had not changed over the past decade. This effect is however too small to fully account for the decline in literacy observed in Austria and New Zealand.
- **Despite widespread educational expansion, average skill levels have not increased accordingly**. Over the past decade, average literacy skills of tertiary-educated adults have increased only in Finland and have decreased in many countries. Large declines (of more than 20 points) were recorded among tertiary-educated adults in Korea, Lithuania and the Slovak Republic. **Declines in proficiency have been even larger and more widespread among low-educated adults**, often leading to widening gaps by level of education.
- **The literacy proficiency of young adults aged 16-24 has increased only in Norway, Finland and England (United Kingdom)** over the past decade, and has declined in eight countries, with large falls (above 20 points) in New Zealand, Lithuania, Poland and the Slovak Republic.
- As literacy proficiency has declined more strongly among men than women, gender gaps have narrowed in many countries and **women now display higher literacy skills than men, on average.** On the other hand, men continue to outperform women in numeracy (by 10 points), as well as in adaptive problem solving (by only 2 points).
- **Family and socio-economic background strongly affect skills proficiency, hindering social and economic mobility**. The average difference in skills proficiency between adults with low- and highly educated parents amounted to 50 points in literacy, 49 points in numeracy and 42 points in adaptive problem solving. These differences are particularly pronounced in Germany. Since the previous assessment, the literacy skills gap between adults with low- and highly educated parents has widened in half of the countries.

Skills matter for economic and social outcomes

- **Skills are key drivers of employability and wages, over and above formal education**. A one standard deviation increase in numeracy (58 points on the numeracy scale) is associated with a 1 percentage point greater likelihood of employment and 9% higher wages. This compares to 16% higher wages for three additional years of education (also equivalent to one standard deviation). While numeracy has the strongest association with employment and wages, similar relationships

exist for literacy and adaptive problem solving. The link between employment and skills is weaker than it was in the first cycle of the Survey of Adult Skills; tighter labour markets during this round of data collection may partly explain this change. These findings highlight the need for continued policy action to maintain, develop, recognise, and value skills.

- **Skills are closely related to both individual well-being (e.g. self-reported health and life satisfaction) and civic engagement (e.g. political efficacy, trust and volunteering)**. The strength of this relationship varies across countries and economies. Many low-skilled adults feel disconnected from political processes and lack the skills to engage with complex digital information, which is a growing concern for modern democracies. As well as reaffirming the need to invest in skills, this underlines the importance of addressing the causes of differences in social outcomes between adults with different skill levels.
- **A good match between workers' skills and qualifications and those required by their jobs is essential for a well-functioning, productive economy.** There are significant economic and social costs associated with being overqualified for one's job: in particular, a 12% reduction in wages and a 4 percentage points reduction in the likelihood of reporting high life satisfaction. About one-third of workers across OECD countries are mismatched to their jobs, whether in terms of their qualifications, skills or fields of study. Over-skilling is more common than under-skilling in all countries except Estonia, Finland, Japan and Norway. Across countries, 10% of workers say that they do not have the skills required for their jobs. Although the extent of mismatch varies, most countries and economies could benefit from better alignment of workers' skills with jobs to increase productivity and the returns to human capital investment.

1 The relevance of information-processing skills in rapidly changing societies

This chapter places the 2023 Survey of Adult Skills in the context of major challenges faced by modern societies: population ageing, the climate crisis and the rise of generative artificial intelligence, which has the potential to greatly affect the demand for skills in the labour market. In light of these trends, the chapter argues that information-processing skills (literacy, numeracy and problem solving) will continue to shape economic opportunities and the well-being of individuals and societies for the foreseeable future. Not only will these foundational skills remain essential in the production of goods, services and ideas, but they are also crucial for restoring trust and cohesion in increasingly diverse and polarised societies. Skills empower people and allow them to manage and embrace complexity, contributing to better-informed collective decision making and policy choices. By determining how societies respond to the challenges ahead, such policy choices will substantially influence individual and collective well-being.

Introduction

To what extent do adults possess and use key skills required to contribute as workers and citizens to the economy and society? And what are these key skills?

In the early 2000s, these questions guided the design of the Survey of Adult Skills, a product of the Programme for the International Assessment of Adult Competencies (PIAAC), the first cycle of which was conducted in 2012.[1] At that time, evidence was rapidly accumulating that investments in education were linked to increased earnings for individuals, while country-level differences in education were linked to national growth rates (Deming, 2022[1]). A number of studies attributed the higher growth rates of some countries to a more skilled workforce: the most rapidly growing countries had, on average, greater levels of educational attainment and a better quality of (school) education, according to children's results in international tests of mathematics and science (Mankiw, Romer and Weil, 1992[2]; Barro, 2001[3]; Hanushek and Woessmann, 2008[4]).

At the same time, adults who struggled to understand written texts and extract relevant information from them to achieve their goals came to be seen as particularly exposed to a number of risks, including unemployment. A report by the OECD had already noted in 1992 that low literacy levels among adults were a serious threat to economic performance and social cohesion (Benton and Noyelle, 1992[5]). As the Survey of Adult Skills was rolled out, it was clear that machines had begun to take over repetitive tasks, gradually replacing workers in many sectors of the economy (OECD, 2013[6]). The employment prospects for adults with strong cognitive and interpersonal skills appeared much brighter: many of the tasks that they could perform were not at risk of automation.

The survey placed a strong emphasis on the direct assessment of literacy and numeracy, which were seen as essential foundations for acquiring further knowledge and skills, in a world where much learning took place through reading and processing written information. It also assessed problem solving in technology-rich environments, to specifically capture the ability to process information in digital environments.

Yet today's societies and economies differ in many respects from those of the early 2000s, and even more substantive changes lie ahead. Many new technologies and tools are being invented and adopted; population ageing is intensifying; the imperative to reduce net carbon emissions is becoming increasingly urgent; and a rapidly spreading pandemic, COVID-19, brought significant disruption to economies, education systems and the ways people interact with each other, across the world. In light of these recent changes, how relevant are information-processing skills for individuals and societies? How can policy makers use information on the level and distribution of skills in their country to prepare for the changes ahead?

This chapter describes the social and economic context in which the 2023 Survey of Adult Skills was conducted, highlighting similarities and differences with the period when the first cycle of the survey was conceived and implemented. It identifies questions about the future of work and the vulnerability of democratic processes to disinformation campaigns as major contemporary policy concerns and suggests ways in which the results of the survey can inform related discussions and help policy makers identify effective responses.

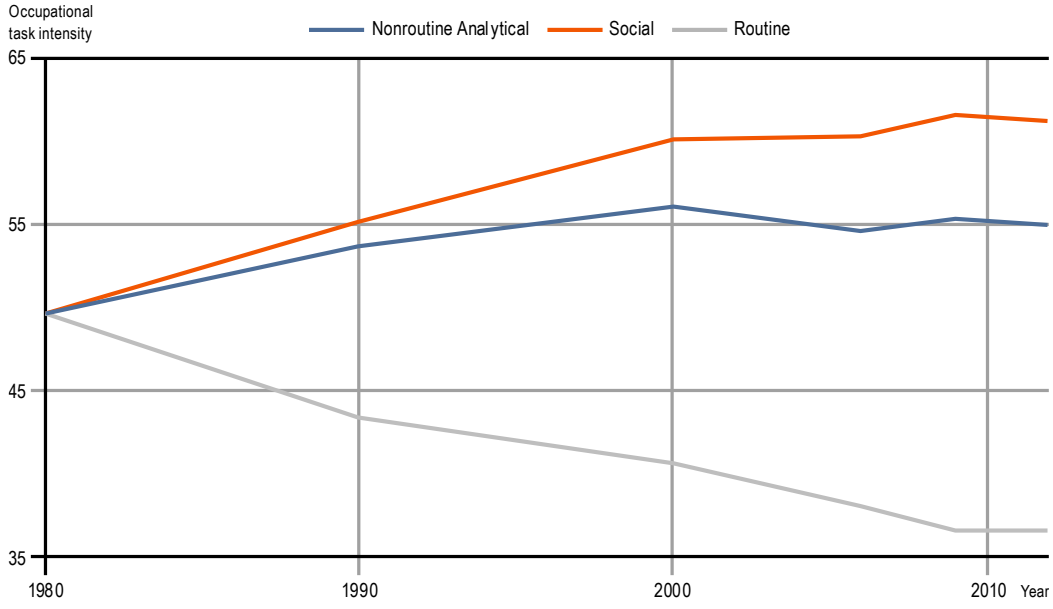
Against this background, the chapter then describes in some detail the information-processing skills assessed in the survey: literacy, numeracy and adaptive problem solving. It presents example items used in the assessment and provides readers with information about how to correctly interpret the results of the assessment. The chapter concludes with an overview of what the participating countries and economies can learn from the indicators presented in this and in future reports from the Survey of Adult Skills.

Workforce skills: Rising to the task in the era of artificial intelligence

Over the past decades, changes in the demand for goods and services, but also, and more importantly, changes in the capabilities of machines and in how they are used to produce goods and services, have profoundly changed the tasks that workers perform in their jobs (Autor, Levy and Murnane, 2003[7]; Spitz-Oener, 2006[8]; Autor and Price, 2013[9]; Ikenaga and Kambayashi, 2016[10]). The adoption of new technologies has not only affected the distribution of jobs across occupations, but, at a much finer level, also changed the tasks that define individual occupations. Machines have replaced workers in the performance of some tasks, even as workers have developed new skills to work alongside machines in entirely new tasks.

Recent studies suggest that the proportion of the workforce whose job involved routine tasks continued to decline in the early 21st century – probably reflecting the increasing use of machines, rather than workers, to perform such tasks. Meanwhile, non-routine tasks have increased in importance, particularly those related to interactions with clients, customers, service users or co-workers. In the United States, for example, the share of the employed workforce whose job involved social (or interpersonal) tasks continued to increase after 2000 (Deming, 2017[11]); in contrast, the share of those whose job involved analytical tasks (i.e. engaging with textual information, with numbers or with other abstract objects) stopped increasing in the most recent period (Figure 1.1). Among Swedish men, returns to interpersonal skills grew larger between 2002 and 2013, while those associated with cognitive skills remained stable– likely reflecting an increasing demand for interpersonal skill (Edin et al., 2022[12]).[2]

Figure 1.1. Evolution of tasks performed by workers in the United States, 1980-2012



Note: Adapted from Figure III "Worker Tasks in the U.S. Economy, 1980-2012" (Update of Figure I by Autor, Levy and Murnane (2003[7]), "The Skill Content of Recent Technological Change: An Empirical Exploration", https://doi.org/10.1162/003355303322552801), recreated from Deming (2017[13]), "Replication Data for: The Growing Importance of Social Skills in the Labor Market'", https://doi.org/10.7910/DVN/CYPKZH, Harvard Dataverse, V1. The occupational task intensity index is based on O*NET 1998. Index values range between 0 and 100 and represent the percentile rank of the occupation in the distribution of task intensities in 1980 (weighted by employment shares). Task intensities by occupation are measured at a single point in time (based on O*NET 1998); the reported trends therefore do not reflect changes in task intensity *within* occupations. Average values of the index, reported on the vertical axis, represent the employment-weighted average percentile of task intensity across industry/education/sex cells, in the 1980 distribution. Trends therefore reflect shifts in employment shares by occupation.
Source: Deming (2017[11]) "The Growing Importance of Social Skills in the Labor Market", https://doi.org/10.1093/qje/qjx022.

Established trends in the demand for skills may change, following a new wave of automation powered by artificial intelligence

Until recently, machines had a distinct advantage in the performance of rule-based operations: computers and robots could be programmed to perform tasks which were explicitly codified (most obviously, repetitive ones). The development of more rapid machines, integrating refined sensors to analyse the environment and select the most appropriate action, progressively expanded the contexts in which they could effectively be deployed. These now included more complex operations, in which a larger number of contingencies had to be considered. The tasks that could be automated became less repetitive, but still needed to be explicitly codified.

Then, in the last 10-15 years, a new technological paradigm emerged – commonly referred to as artificial intelligence (AI) (OECD, 2019[14]). Using a rapidly expanding suite of statistical learning models, and building on the increasing availability of ("big") data and on the falling cost of computing capacity, AI has made rapid advances in its ability to predict the correct answer to problems where formal rules are impossible to codify, and where humans have until recently had a comparative advantage in making decisions based on their training or past experience (OECD, 2023[15]). Machines that embed modern AI technologies can not only do routine tasks faster and more cheaply than ever; they can now imitate and often outperform humans in a much wider range of situations. In 2022 experts judged that AI could already answer around 80% of the literacy questions administered in the Survey of Adult Skills – significantly more than the majority of adults who took the assessment in that year. AI could, in particular, solve most of the easy questions, which typically involve locating information in short texts and identifying basic vocabulary. The remaining tasks are nearly within reach: large language models (LLMs) are expected to be able to "solve" all the tasks in the Survey of Adult Skills assessment within a few years (OECD, 2023[16]).

Given a sufficiently wide corpus of data from which to infer patterns of appropriate responses, machines no longer need human programmers to distil explicit rules; they can learn the rules that guide their behaviour from the data themselves. As a result, the need for workers to rely on "tacit knowledge" and expertise in performing a task is no longer an obstacle to that task's automation.

A new generation of devices and robots, powered by AI, will probably be able to replicate human performance in a significantly wider array of tasks than past automation technologies (Lassébie and Quintini, 2022[17]; Lane and Saint-Martin, 2021[18]). New types of tasks that can be automated include both cognitive tasks (such as classifying data, summarising texts, detecting deviations, planning and advising) and physical tasks (including some requiring fine psychomotor abilities and hand-eye co-ordination, driven by progress in computer vision technology).

Automation need not necessarily lead to a reduction in overall employment opportunities; the automation of routine tasks did not reduce labour demand overall (OECD, 2019[19]; Georgieff and Milanez, 2021[20]). The impact on workers is uncertain because of the productivity gains that motivate a firm's decision to automate some tasks: automation allows the same goods and services to be produced at lower costs. As these gains translate into lower prices, the demand for these goods and services can be expected to increase, and, if this increase is sufficiently large, may result in more workers than before being required to perform the remaining, complementary tasks involved in their production.

When projecting the effect of automation on the demand for skills, there are two mechanisms that must be considered: complementarity with non-automated tasks, and the emergence of entirely new jobs (Acemoglu and Restrepo, 2019[21]). Complementarity with a new technology often benefits different occupations and workers from those that were displaced in the first place. But complementarity may also be observed within a given occupation, particularly if jobs involve a complex bundle of tasks. In fact, the complementarity is more likely to operate at the level of tasks rather than at the level of jobs. Workers who perform tasks that are complementary with the new technology will be made more

productive by the new technology and may experience substantial changes in the tasks they perform and the skills they need to bring to the task. Considering the type of tasks that AI can do, the transformation of occupations, rather than their disappearance, may be the most frequent pattern observed as its adoption in the economy progresses (Lane and Saint-Martin, 2021[18]).

There is little doubt about the potential of AI to automate many tasks. But there is also considerable uncertainty about the strength of the complementarity effects that result from automation, and about the skills that workers will need to have, or acquire, in order to benefit. To anticipate the consequences of these new technologies for skill demand, it is useful to distinguish two ways in which the statistical learning models behind AI applications can be trained (Acemoglu, 2024[22]): by learning how actions are linked to outcomes, or by learning to imitate the decisions of humans in similar settings. For tasks that have a reliable, observable outcome metric, and where the possible interactions between actions and contextual factors in determining success are relatively simple, statistical learning algorithms can evaluate the success of their own actions and gain a better understanding of how possible actions are linked to success than any human could possibly do. This can lead to large productivity gains and can be expected to result in the targeted automation of particular subtasks.

In many workplace situations, however, either there is no reliable outcome metric to define success, or the link between actions and desired outcomes may depend on a vast number of contextual factors. In the corresponding tasks, AI systems can still learn to imitate humans, but cannot learn from their own actions what the optimal strategy might be. As a result, there will be a tendency for their performance to be similar to the average performance of human decision makers, rather than to the performance of experts (which can reliably be identified only in the former type of tasks). In these cases, AI systems will not outperform humans in some specific subtasks, but rather replicate humans across whole tasks. The gains that firms can expect from adopting AI technologies are more limited in this situation and the workers whose tasks complement those being automated may not see any indirect benefit.

Early signals of the impact of artificial intelligence on the demand for skills do not yet paint a clear picture

There are not yet any studies available for the period after 2012 describing overall trends in skill demand based on detailed descriptions of occupational tasks, similar to the ones that documented the decline in routine task performance over more than four decades (e.g. Figure 1.1). Even if they existed, such studies would be unlikely to capture the impact that AI technologies will have over the next 10 years. As new technologies are adopted in the economy, they may initially mostly leave workers performing the same occupation in new ways – a change that will not be fully and immediately reflected in standardised descriptions of occupational tasks. Moreover, even in recent years, there are many other factors influencing trends in occupation shares besides the adoption of AI technologies. These include a deepening of more traditional forms of automation (e.g. due to lower costs of computers and faster connectivity), but also changes in the demand for particular goods and services. For example, population ageing or the desire to limit greenhouse gas emissions also change the demand for skills, through their effect on the demand for particular products and services (OECD, 2024[23]).

Another approach to monitoring the evolution of the demand for skills is to use the information available in job postings, which are, nowadays, often published on line. Online vacancies may not be fully representative of all vacancies and certainly do not represent all jobs in an economy, but they reflect the changing content of jobs in real time. Tracking them over time therefore allows *emerging* trends in skill demand and variations in the skills required for a particular occupation to be captured. Analyses based on a large database of online job postings show, for example, that the share of new vacancies emphasising decision-making responsibilities grew substantially in the United States between 2010 and 2018 (Deming, 2021[24]). Extending this approach to online job vacancies in ten OECD countries, Green (2024[25]) shows that over the decade leading up to 2021-22, firms have increased the emphasis on

specific tasks (such as using digital office tools and collaboration software) in job descriptions for occupations that rely heavily on non-routine analytical tasks. This suggests that the corresponding skills have become more important in defining success in these occupations. Next to digital skills (and, in particular, the use of office tools and collaboration software), these include also social skills such as collaboration or teamwork and cognitive skills such as originality and creativity. It is unclear, however, whether these trends will continue as new AI-based technologies are adopted.

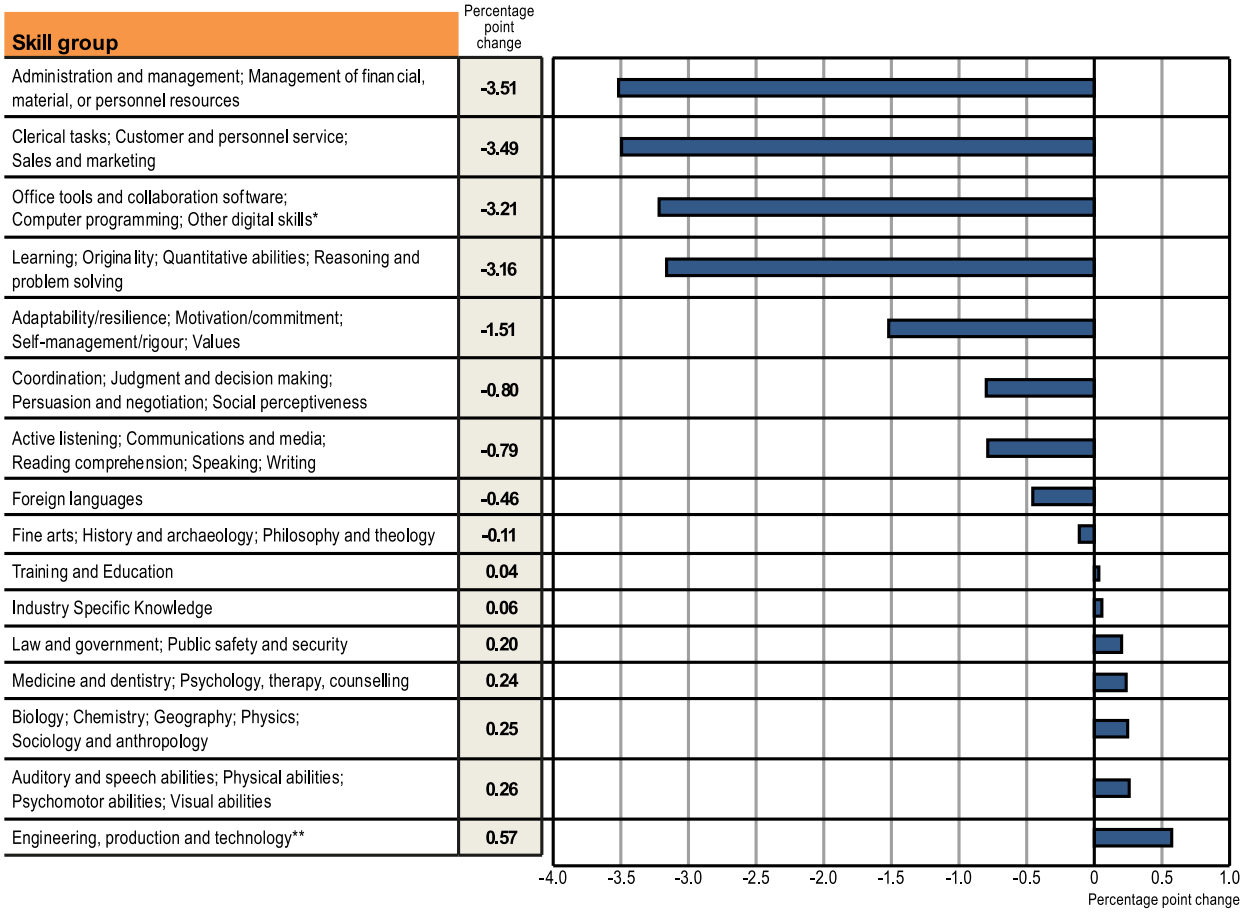
Green (2024[25]) also finds that the establishments that are most likely to have already adopted AI technologies over this time period did not reduce hiring overall. However, they did reduce, at the margin, their demand for some types of workers and their skills, relative to their competitors within the same industry (Figure 1.2). In particular, they reduced demand for general resource management skills (including budgeting and accounting); for clerical tasks such as administrative support and record keeping; and for workers with the ability to use basic digital office tools such as spreadsheets and word processors. They also posted relatively fewer vacancies that highlighted originality as an asset for the position. In contrast, for other groups of skills, hiring trends were similar regardless of an establishment's exposure to AI. These include physical skills, and skills related to science, medicine, law and public safety. Meanwhile, demand for skills involved in "production and technology" tasks (which include design and engineering, but also construction and food production) seemed to increase in establishments with the highest likelihood of adopting AI technologies (Green, 2024[25]).

For specific AI applications, a number of experiments in laboratory or real-world settings have observed the likely strength and direction of skill complementarity effects. These studies examined generative AI technologies that could assist web developers in writing software code (Peng et al., 2023[26]), guide the conversations of customer support agents (Brynjolfsson, Li and Raymond, 2023[27]) or help white-collar professionals with specific writing tasks (Noy and Zhang, 2023[28]).[3] In each case, the AI application could automate some subtasks. The largest gains accrued to the less experienced and less productive workers in these occupations, suggesting the possibility of complementarity with general cognitive skills, but not with job-specific skills associated with expertise.

How will AI and human labour complement each other in the future? And how fast will new AI technologies be adopted in the economy? The answers to these questions will determine skill demand over the next 10 years, and the possibilities are still wide open. The future depends not only on the current capabilities of AI but also on the direction in which they are developed: replicating the performance of "average" humans in the production of existing goods and services; enhancing the productivity of most and acting as an alternative to scarce talent in the performance of essential tasks; or creating entirely new products and services, where humans and machines complement each other in new ways. The future also depends on any barriers to the adoption of new technologies that firms face, including regulatory barriers, labour-market frictions and the costs of training the current workforce. Ultimately, the demand for skills in the long term largely depends on the choices of consumers, citizens and policy makers, who can influence the direction of AI research, create new demand for labour in jobs not substituted by AI, lower some barriers to adoption and, at the same time, raise new protections, in order to achieve their desired outcomes.

Figure 1.2. How skill demand evolved in establishments that most likely adopted AI, relative to other establishments

Average change across 10 countries, 2012/13 to 2021/22 (3 countries) or 2018/19 to 2021/22 (7 countries)



Note: Each bar represents the change in the percentage of vacancies demanding at least one skill from the corresponding grouping between the base and end years for a one-standard-deviation increase in establishment-level AI exposure. The analysis relies on data from the following countries: Austria, Belgium, Canada, Czechia, France, Germany, the Netherlands, Sweden, the United Kingdom and the United States. For full notes on the analysis and data sources, see Green (2024[25]).

* Other digital skills include: Digital content creation; Digital data processing; ICT safety, networks and servers; Web development and cloud technologies

** Engineering, production and technology skills include: Building and construction; Design; Engineering, Mechanics and technology; Equipment selection; Food production; Installation and maintenance; Production and processing; Quality control analysis; Telecommunications; Transportation.

Source: Reproduction of Figure 4.1 in Green (2024[25]), "Artificial intelligence and the changing demand for skills in the labour market", https://doi.org/10.1787/88684e36-en.

What task automation and the rise of artificial intelligence imply for information-processing skills

Technologies are changing rapidly, and with them, the organisation of tasks within almost any occupation. To adapt to this reorganisation and the emergence of new tasks, and to weather potential job losses and the need to find new jobs, workers need to learn new skills. In a changing world, some skills that individuals have acquired through education, training and practice may rapidly become obsolete.

However, this is not the case for high levels of literacy, numeracy and (adaptive) problem solving; indeed these general information-processing skills underpin individuals' ability to adapt and to weather change and uncertainty. For individuals who master them, these skills make access to new, specialised knowledge and know-how in any domain easier. For younger and older adults alike, they form the foundation for acquiring new skills through formal and informal learning processes. Hanushek et al. (2017[29]), for example, used data from the first cycle of the Survey of Adult Skills and found that labour market returns to literacy and numeracy are higher in countries that have grown rapidly, supporting the hypothesis that such skills facilitate adaptation to change.

Such "foundational" skills are the focus of the Survey of Adult Skills assessments. The tasks used by the survey to measure them, however, are now well within the reach of modern AI (OECD, 2023[16]). If machines can provide better answers to the Survey of Adult Skills items than most humans, in what sense is it relevant for adults to possess the skills that are measured by these tests?

This critique rests, in part, on fallacious logic. When calculators became better than the best humans at solving mathematics operations, the performance of addition, division and other such operations ceased to be part of the everyday job of shopkeepers, bank tellers, ship pilots and other workers. Yet the teaching of such operations continued and the importance of this training for humans, as a means to develop mathematical understanding and numeric reasoning, did not change. Similarly, the ability to complete a few dozen tasks in the Survey of Adult Skills allows us to draw much more wide-ranging conclusions about humans than about machines. The limited number of tasks included in the survey reflect typical progressions in proficiency observed in humans, but this underlying proficiency is an unobservable trait that helps humans in performing a much broader (potentially infinite) set of tasks. Correlations between this underlying proficiency and observable behaviour outside the test situation are expected to have solid roots in human psychology and neurobiology, allowing for reasonably robust predictions of what adults at a certain level of proficiency (as assessed by the Survey of Adult Skills) would be able to achieve in a wide range of situations and tasks.

In contrast, when a machine is able to solve a task in the Survey of Adult Skills, because it has learned to imitate the actions of the most effective humans in similar situations, it is much harder to make inferences about what that machine can do beyond the specific task. While machines may, in the future, continue to expand their capabilities, the capacity of current AI systems to "learn" from their actions remains highly context specific, and depends on the availability of a corpus of relevant and reliable training data.

In many contexts, the use of AI could make some tasks easier for workers, who may no longer be required to perform all of it. Rather than having to produce a translation, or write code, they can instead focus on slightly simpler subtasks: verifying the translation, debugging the code or explaining a new software feature to a client. Current experimental evidence suggests that AI can often replace tacit, job-specific knowledge that is usually only acquired with experience (if at all). This is most likely to happen in contexts where AI can be trained to capture and reproduce the behaviour of the most productive workers. In these contexts, AI technologies could empower a larger share of workers – those with at least minimal skills for the task – to compete with niche experts (Autor, 2024[30]; Brynjolfsson, Li and Raymond, 2023[27]). This could undeniably lead to a form of de-skilling, but workers will still need general information-processing skills to understand, interpret and take advantage of the support given by AI (Noy and Zhang, 2023[28]; Autor, 2024[30]).

While AI is therefore unlikely to make information-processing skills useless, it could potentially change the relevance of some aspects (or subdimensions) of literacy and numeracy, by changing the types of tasks adults are most likely to engage with in the future. When using literacy skills, for example, there may be less emphasis on extracting information, and more on constructing knowledge, including navigating ambiguity and distinguishing fact from opinion. The relevance of such aspects is already

quite evident in the ocean of online information that adults have to navigate to access news and information, and which replaced traditional media outlets.

Valid and reliable measures of literacy and numeracy skills are also indicative of other, harder-to-measure traits, of continued value. Adults reach high levels of literacy and numeracy only as a result of long, difficult learning processes. This means that those with a strong command of these skills are likely to also have the attitudes, or emotional skills, that will assist them in learning new skills in the future – including the interpersonal, physical and manual capacities that may be hardest to automate successfully.[4] The background questionnaire of the 2023 Survey of Adult Skills can be used to validate some of these claims, with measures of adults' "readiness to learn" and participation in formal and informal learning activities, and an assessment of social and emotional skills.

Finally, even if AI threatens to displace workers in cognitive-intensive occupations (such as financial analysts, translators and interpreters), these workers will not necessarily be the ones who suffer the most significant consequences from a new wave of automation. An initial substitution of workers with machines may have a ripple effect, with these workers then displacing other workers. In the worst-case scenario, in which machines perform a larger share of the tasks where individuals with high literacy and numeracy skills currently have a comparative advantage without creating new opportunities for them to use their advanced skills in the workplace, then these individuals will compete with less skilled workers for the remaining jobs.

Ultimately, for individuals and countries, investment in literacy and numeracy skills may pay off in one of two ways. In the most likely scenario, these individuals and economies will be the ones to benefit from new employment opportunities that result from innovative uses of AI. In the worst-case scenario in which few new opportunities emerge, it is the individuals (and countries) with low literacy and numeracy skills who are likely to suffer the most. Unless they can count on an entirely different set of skills (e.g. fine motor skills) to shield them from competition, they risk losing their comparative advantage over individuals with greater cognitive skills.

Making democracy work in increasingly diverse and interconnected societies

Public policies can shape the future of societies

Technological disruptions, the climate crisis, population ageing and migration have the potential to reshuffle the distribution of income, wealth and power in societies, and to influence economic growth and collective well-being. The degree and the direction of such changes, however, are not predetermined: public policies and collective action can harness the forces behind these trends to reach desirable outcomes. The way policies are designed to respond to the complex questions and challenges raised will significantly influence individual and collective well-being in the long run.

Public policies can influence how the gains resulting from the use of AI are shared, and how the resulting income contributes to funding public expenditure – for example, by regulating the access and use of personal data and intellectual works to train AI applications. Public policies, combined with consumer choices and social dialogue, can rein in undesirable uses of AI technologies, such as scam industries, arms races in IT security or the creation of media that exploit psychological addiction mechanisms. They can also drive the direction of future AI research and facilitate the adoption of new technologies which best complement human capacities or overcome scarcity issues.

Public policies can also accelerate the green transition, or slow it down, through regulations, subsidies, taxes and direct investment. Perhaps more importantly, policy levers can maximise the efficiency of investment in the green transition to obtain the greatest possible reduction in emissions at the lowest possible economic and social cost.

Public policies can also create training and insurance policies to help workers at risk of losing their jobs (e.g. due to the introduction of regulations aimed at reducing emissions) in the transition to new occupations and encourage firms to invest in the training of all workers and improved working conditions to keep older workers in the workforce for longer. Public policies can also respond to ageing societies by reforming pension systems and promoting measures that boost birth rates.

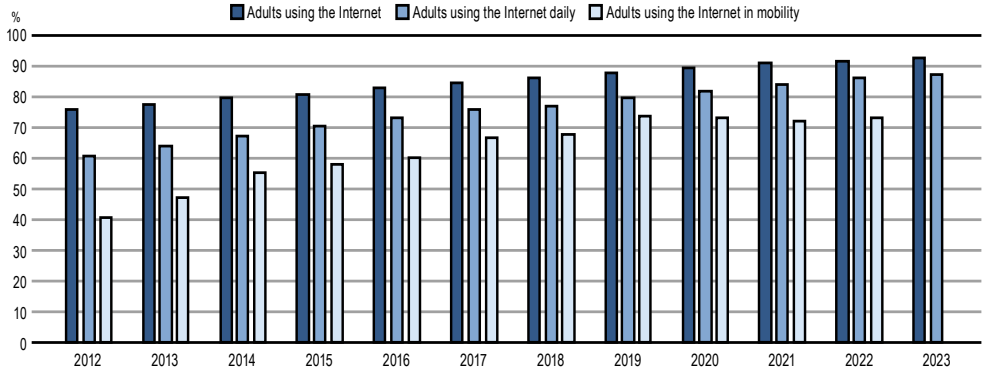
In democratic societies, the responses to these challenges will depend on citizens' preferences, in particular those expressed in elections and through collective action. The context in which policy preferences are formed, and collective decisions taken, has significantly changed over the past decade, due in particular to the rise of digital media and the increasing socio-economic and cultural diversity of modern societies.

The Internet has changed how people access news and information

In the decade that separated the two cycles of the Survey of Adult Skills, OECD countries have achieved near-universal access to the Internet. On average, the share of adults using the Internet increased from 76% in 2012 to 93% in 2023, with 87% of adults reporting using it daily (up from 61% in 2012; Figure 1.3). In 2022, 73% of adults reported accessing the Internet from a mobile device and 71% used it to read or download newspapers or news magazines (OECD, 2024[31]).

Figure 1.3. Evolution of Internet usage, 2012-23

Internet use in the past three months among 16-74 year-olds; OECD average; in per cent



Note: Data on adults using the Internet in mobility are not available for 2023.
Source: OECD (2024[31]), "ICT Access and Usage by Households and Individuals", https://doi.org/10.1787/b9823565-en (accessed on 29 May 2024).

As a result, the role of traditional media (the printed press, radio and television) has declined, and adults increasingly use social media to get information and discuss and debate political opinions. In the European Union, 64% of adults reported using the Internet for reading online news sites or newspapers in 2023, and 18% used it for civic or political participation (Eurostat, 2024[32]). A recent survey by the Pew Research Center found that about half of adults in the United States got news from social media "sometimes" or "often" in 2022 (Pew Research Center, 2023[33]).

The rapid diffusion and circulation of information is not without risks. There is a concern that the increase in the sheer amount of information available has been accompanied by a decrease in the quality (OECD, 2023[34]). Internet platforms and social media also make it easier to spread false and misleading information. Some actors may do so deliberately to distort public debates and fuel polarisation. At times this may form part of a hybrid warfare tactic, to erode the social fabric of open societies and weaken

their defences. Such disinformation campaigns have already been observed. They cast doubt on factual evidence and aggravate existing societal divisions, making it difficult to build the societal consensus essential to address complex policy challenges. A survey conducted by the Lloyd's Register Foundation in 2019 found that 56% of adults in OECD countries were concerned about receiving false information online (World Risk Poll, 2019[35]).

Disinformation is not a new phenomenon, but modern digital communication technologies have fundamentally changed its reach and impact. Today, anyone with an Internet connection can produce and distribute content, without any responsibility to adhere to the journalistic or academic and scientific ethics and standards, which have been developed over the years to support information integrity. Generative AI tools may further amplify and strengthen the production of false and misleading content (OECD, 2024[36]).

The ease with which false and misleading information spreads can have very practical negative consequences. For example, misinformation may already be hindering action to improve the environment and fight climate change (Benegal and Scruggs, 2018[37]) and fake news can increase political polarisation, making political action more difficult (Tucker et al., 2018[38]). People appear to be over-confident in their ability to distinguish false news from true information (Corbu et al., 2020[39]).

On the other hand, this same accessibility provides unprecedented access to knowledge and can foster citizen engagement and innovative news reporting. In a survey conducted by the Pew Research Center in 19 countries (Australia, Canada, Israel, Japan, Korea, Malaysia, Singapore, the United States and 11 large European countries, including France, Germany, Italy and the United Kingdom) the majority of respondents tend to see social media as a positive thing for democracy (Pew Research Center, 2022[40]).

Literacy and numeracy skills are key to navigating the new digital information landscape

For democracies to function effectively, individuals must be able to actively seek out relevant information and to assess its quality. Without these skills, adults will not be able to form well-grounded opinions on the complex issues and challenges that policies are attempting to address. Together with other important foundations, knowledge and skills thus contribute to the successful operation of a democratic society.

Literacy and numeracy skills, in particular, determine how individuals access and process information about available options and their associated prospects, thereby influencing the decisions people ultimately make. These skills influence which media or content adults choose to access, and the extent to which they are able to understand and act upon the information they receive. Navigating this new world of online information requires the ability to understand and evaluate information in a written text. These are core cognitive processes that support proficiency in literacy, defined as the ability to "access, understand, evaluate and reflect on written texts" (Rouet et al., 2021[41]).

The role of literacy and numeracy skills in helping individuals orient themselves and reach their goals in the information landscape is a clear example of how the social benefits of skills go well beyond the private benefits. Greater skills do not just benefit the individuals who hold them. When it comes to how the public opinion is formed, and how this can influence electoral outcomes and policy decisions, having large shares of the population lacking the basic skills to effectively participate in complex social and democratic processes can have very important negative implications for the entire society, including for individuals with high levels of skills.

Items for the literacy assessment in the 2023 Survey of Adult Skills have purposefully been updated to better reflect the kinds of reading tasks that adults are likely to encounter in modern digital information environments. Similarly, the numeracy framework emphasises the importance of "using and reasoning

critically with mathematical content" (Tout et al., 2021[42]), a crucial skill in a world where "data" and "scientific evidence" are often presented in partial ways in order to make deceptive arguments in support of a particular opinion or position. The specific mental processes that underpin literacy and numeracy need to be complemented by (more general) metacognitive skills. These are the ability to calibrate one's comprehension of the problem, evaluate potential solutions and monitor progress towards the goals (OECD, 2021[43]) They are a core element of the assessment of adaptive problem solving (Greiff et al., 2021[44]). Indeed, effectively operating in complex information landscapes requires having knowledge about how information is generated and the limitations inherent to different information-generation processes, and also being aware of one's own and other people's cognitive limitations (OECD, 2023[34]).

Higher-order skills and attitudes are becoming increasingly important in complex and diverse societies

Critical thinking helps citizens to identify and counter falsehoods, steer clear of disinformation campaigns, and defuse misleading narrations. Critical thinking involves assessing the strength and appropriateness of a statement, theory or idea through a questioning and perspective-taking process (Vincent-Lancrin, 2021[45]) – or, to put it differently, engaging in "reasonable reflective thinking focused on deciding what to believe or do" (Ennis, 2016[46]). Although critical thinking clearly has a strong cognitive base, it also relies on non-cognitive attitudes or dispositions (OECD, 2023[34]). The literature has stressed, for instance, the role of self-regulation; of an open, fair and reasonable mindset; of commitment to self-improvement, truth-seeking and curiosity; and the avoidance of cultural- or trait-induced bias and dichotomous thinking (Vardi, 2015[47]; Thomas and Lok, 2015[48]).

More generally, there are several indications that attitudes and dispositions, or social and emotional skills, have increased their relevance in recent years. Economic returns to social and emotional skills have grown faster than returns to cognitive skills in recent years (Deming, 2017[11]; Edin et al., 2022[12]) and this trend may well continue in the future, as generative AI increases its ability to perform non-routine cognitive tasks. But the importance of attitudes and social and emotional skills is likely to be even greater for society at large, as they are key for restoring (or building) the interpersonal and institutional trust and co-operation that are essential to the functioning of liberal democracies.

Modern societies are becoming increasingly diverse, bringing together people with very different experiences and backgrounds. The entry of new migrants intending to settle permanently in OECD countries reached a record high of 6.1 million in 2022, and the share of foreign-born residents across OECD countries increased from 8.9% in 2012 to 10.6% in 2022, with greater increases observed in countries already hosting a relatively large share of immigrants (OECD, 2023[49]). This suggests that diversity will increase further in the years to come.

The speed at which information travels across borders, potentially reaching every individual around the globe thanks to the Internet, also makes it more likely that citizens will be exposed to a wider variety of opinions and points of view. At the same time, and perhaps in reaction, many are finding refuge in homogeneous virtual communities, which in turn increase the polarisation of opinions and the refusal to consider other points of view (Suhay, Bello-Pardo and Maurer, 2017[50]; Bakshy, Messing and Adamic, 2015[51]; Hobolt, Lawall and Tilley, 2023[52]) Many of these virtual communities span borders, and may therefore introduce a disconnect between the community individuals identify themselves with and the community in which they live and whose collective decisions they can influence through voting and other forms of civic and political engagement.

Building effective trust and co-operation in this context requires developing attitudes and values to understand global and intercultural issues. These considerations are at the base of the numerous efforts made by the OECD to better understand the role of social and emotional skills, and how to measure and foster them. Specific examples in this sense include the Programme for International Student Assessment (PISA) assessment of global competence (OECD, 2019[53]) and the OECD Survey on

Social and Emotional Skills (Chernyshenko, Kankaraš and Drasgow, 2018[54]). The Survey of Adult Skills gathers information on attitudes and dispositions toward learning and teamwork, albeit only indirectly (i.e. by relying on information about tasks performed on the job). The second cycle of the survey has also introduced an assessment of social and emotional skills, grounded in the Big Five taxonomy (Soto and John, 2017[55]; Kankaraš, 2017[56]) and administered within the background questionnaire of the survey.

The Survey of Adult Skills was born as a programme to assess the adult competencies that are considered relevant to modern societies. So far, the focus has mostly been on foundational cognitive skills. To remain relevant as societies evolve, the assessment must continue to stay attuned to changes in the types of tasks adults are confronted with, and for which they need to rely on literacy and numeracy skills. Looking ahead, the programme must stay attuned to shifts in skills demand in societies and remain open to adapting or expanding the set of skills and competencies that it tracks and assesses.

What the Survey of Adult Skills measures

The 2023 Survey of Adult Skills assessments of literacy, numeracy and adaptive problem solving are based on conceptual frameworks that define what these skills are and describe how to design assessment items to measure them. The assessment tasks reflect how these skills are applied across a wide range of situations in adults' lives. A prominent role is played by tasks embedded in data-intensive, complex digital environments, which are increasingly common in the workplace and everyday life in modern societies.

To this end, the assessment was exclusively administered on digital devices (tablets). This constitutes an important difference from the previous cycle of the survey, where respondents had the option to sit the assessment using paper-based instruments. While a statistical equivalence was established at the time between paper-based and computer-based instruments, the paper-based assessments were necessarily limited in the range of tasks they could accommodate.

Assessment items differ along various dimensions: cognitive processes (i.e. the mental strategies that form part of the skill in question), content (i.e. the artefacts, knowledge, representations and situations to which these cognitive processes are applied) and contexts (i.e. the settings in which the skill is used). A large number of items are needed to cover all aspects of a skill domain, as well as the variety of contexts in which adults are required to use that particular skill to solve tasks.

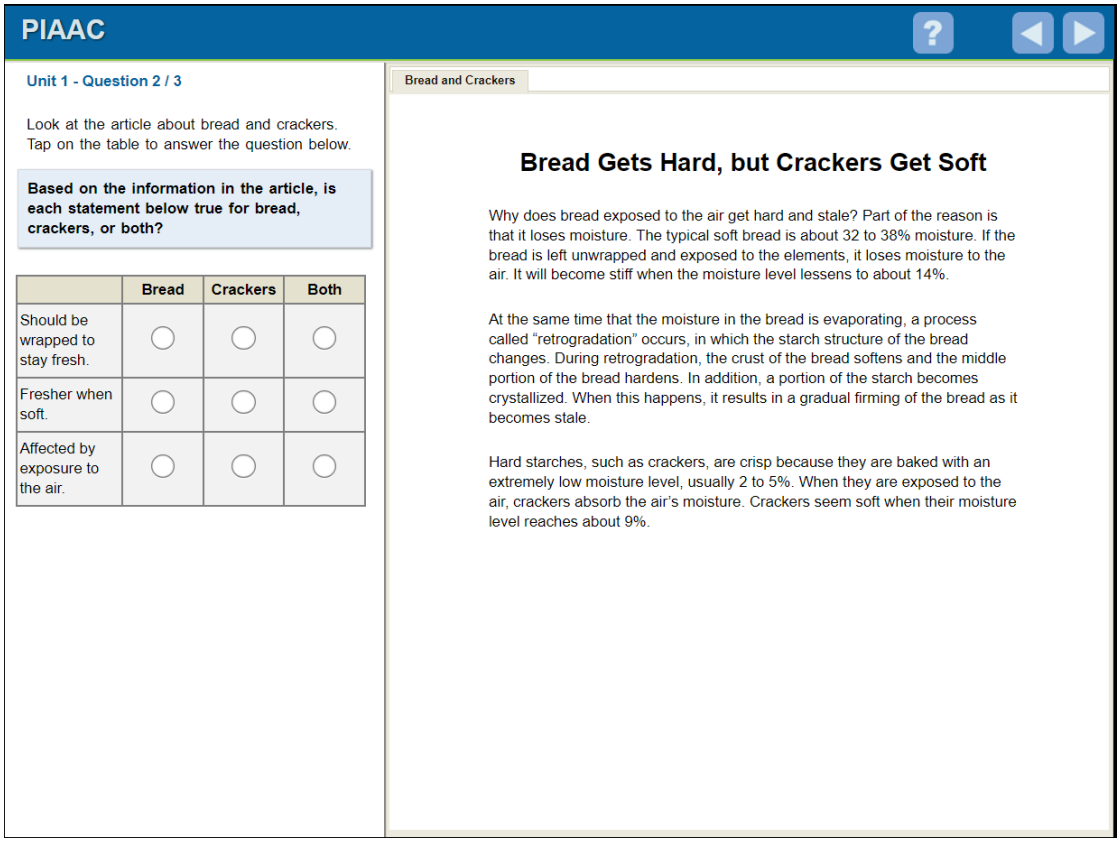
Literacy and numeracy were also assessed in the first cycle of the Survey of Adult Skills. The frameworks used in the second cycle build on past frameworks, but have been revised and extended to ensure relevance to contemporary reality and understanding of the phenomena measured (Rouet et al., 2021[41]; Tout et al., 2021[42]; Tout et al., 2017[57]). The links with the first cycle of the survey remain strong, both at the conceptual level and at the practical level, as the second cycle relies on many assessment items already used in the first cycle. Such common items allow strong psychometric links to be established across the two assessments.

In the 2023 Survey of Adult Skills, literacy is defined as "accessing, understanding, evaluating, and reflecting on written texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society" (Rouet et al., 2021[41]). Proficiency in literacy is crucial for adults across their personal, social and professional spheres, given the prevalence of written communication in various aspects of life. Throughout the day, adults engage in a diverse range of reading activities, spanning from delving into extensive pieces of continuous text to swiftly scanning pages for pertinent information. Examples include reading emails, leaflets, timetables and instruction manuals.

An example of a literacy item is presented in Figure 1.4. In this item, readers must make inferences based on the information presented in the text in order to determine if a set of statements is true for

bread, crackers or both. Respondents are asked to tap on a response for each of the presented statements. Only one response can be selected for each row.

Figure 1.4. Example literacy item: "Bread"

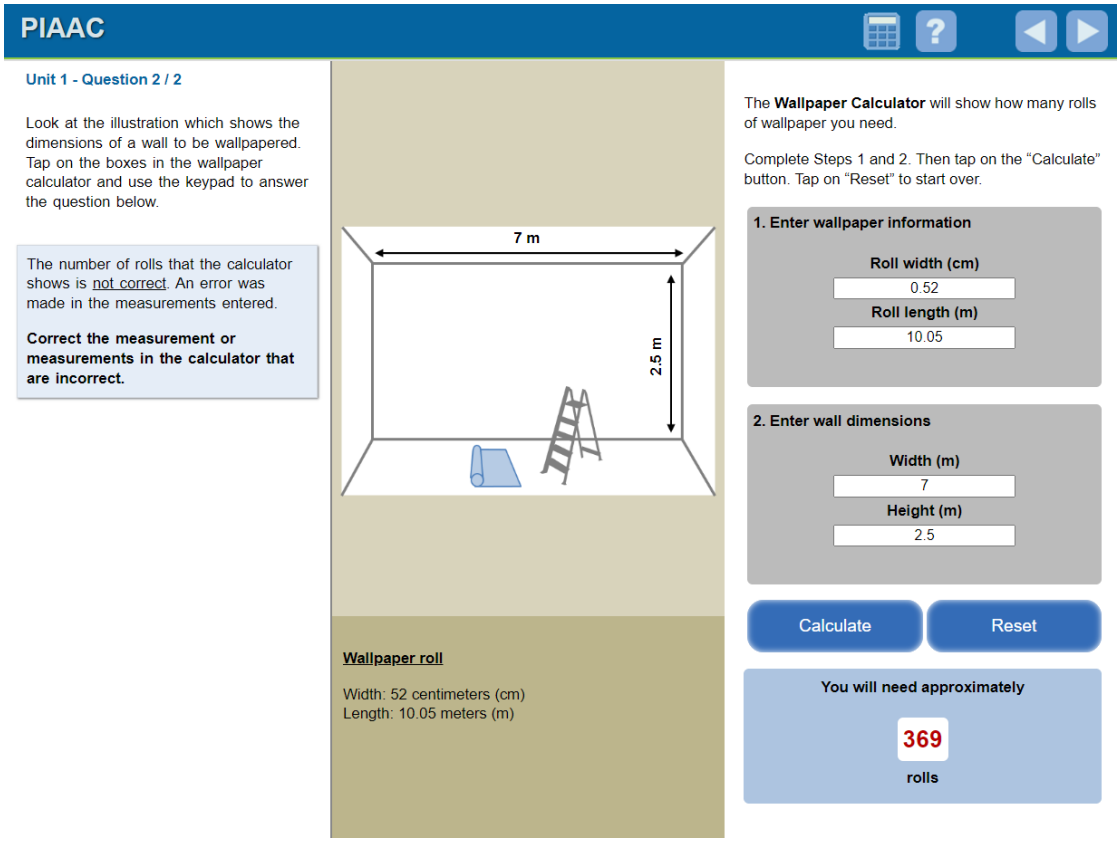


Source: https://www.oecd.org/en/about/programmes/piaac/piaac-released-items.html (accessed on 18 November 2024)

In the 2023 Survey of Adult Skills, numeracy encompasses "accessing, using, and reasoning critically with mathematical content, information and ideas represented in multiple ways in order to engage in and manage the mathematical demands of a range of situations in adult life" (Tout et al., 2021[42]). The skills and knowledge needed for work and civic participation, and in more personal spheres of life, have changed. Individuals are presented with ever-increasing amounts of information of a quantitative or mathematical nature through online or technology-based resources, which have to be located, selected or filtered, interpreted, and at times questioned and doubted, and analysed for their relevance to the responses needed.

Figure 1.5 presents an example numeracy item, which relies on an interactive tool. For this item, the wallpaper calculator has already been used to determine the number of rolls needed. However, an error was made when one or more values were entered into the tool. The task is to identify the error(s) and enter the correct value(s).

Figure 1.5. Example numeracy item: "Wallpaper"



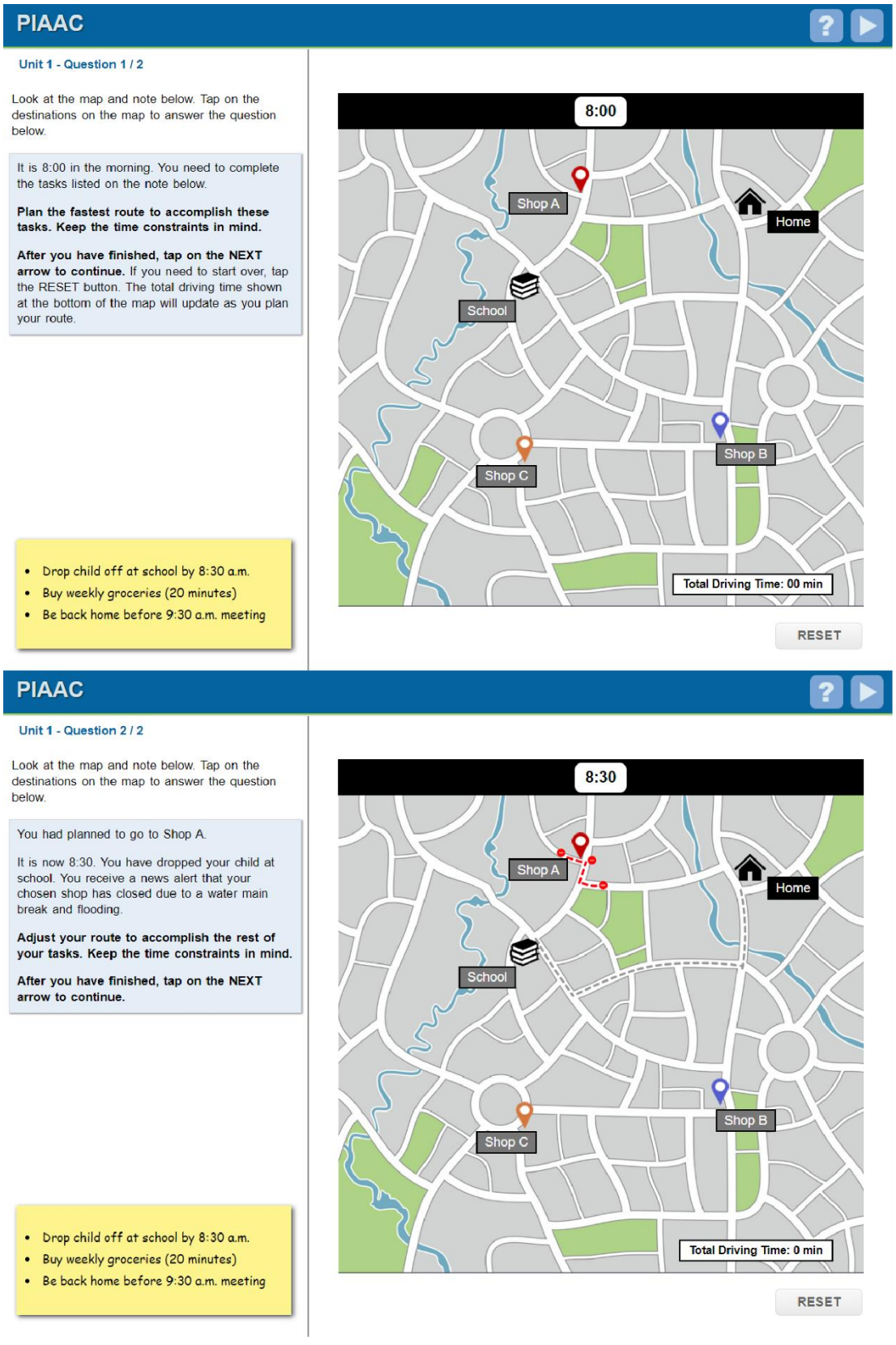
Source: https://www.oecd.org/en/about/programmes/piaac/piaac-released-items.html (accessed on 18 November 2024)

Adaptive problem solving (APS) involves "the capacity to achieve one's goals in a dynamic situation in which a method for solution is not immediately available. It requires engaging in cognitive and metacognitive processes to define the problem, search for information, and apply a solution in a variety of information environments and contexts" (Greiff et al., 2021[44]). The ability of adults to adapt to new circumstances and learn throughout life has likely become more important in complex modern societies, which are evolving at an accelerating pace (Greiff et al., 2017[58]). This motivated the inclusion of this new domain in the 2023 Survey of Adult Skills, replacing the assessment of problem solving in technology-rich environments administered in the first cycle of the survey.[5]

APS has three important features. First, it emphasises individuals' capacity to flexibly and dynamically adapt their problem-solving strategies to a dynamically changing environment. Second, it tests their ability to identify and select among a range of available physical, social and digital resources. Third, individuals need to monitor and reflect on their progress in solving problems, through metacognitive processes.

An example item is presented in Figure 1.6. In it, an initially static situation becomes dynamic due to obstacles that change the problem and the solutions available. In the first item, the problem solver needs to use an interactive map to find the fastest route to accomplish three goals, keeping a set of time constraints in mind. The problem solver needs to take a child to school by a designated time, purchase groceries and return home by a designated time. The total driving time (shown at the bottom right of the screen) updates as the route is selected by the respondent. This could be considered a standard problem-solving task, in which a solution needs to be found given some constraints that need to be satisfied. In the second item, the situation becomes dynamic as the problem solver has to deal with new circumstances that interfere with the initial solution. The solver has to overcome impasses and take additional constraints into consideration when adapting the initial problem solution.

Figure 1.6. Example adaptive problem solving item: “Best route”

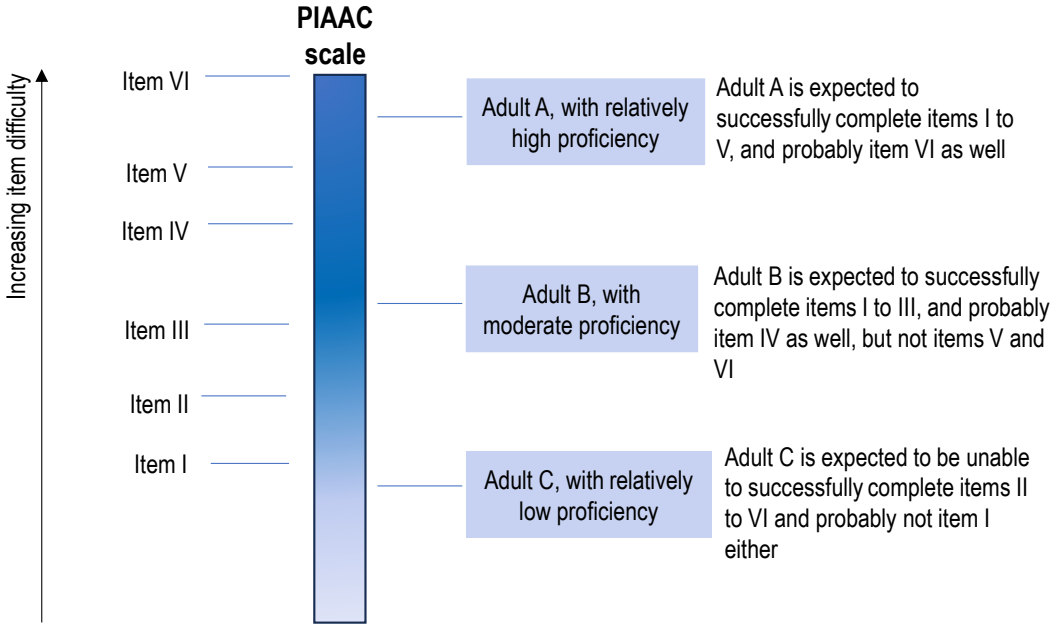


Source: https://www.oecd.org/en/about/programmes/piaac/piaac-released-items.html (accessed on 18 November 2024)

Reporting and interpreting the results of the Survey of Adult Skills

The 2023 Survey of Adult Skills assessments require adults to complete a set of tasks (also called assessment items),[6] that can only be solved if they have a sufficient level of literacy, numeracy and adaptive problem solving skills. Their performance in these assessments is used to estimate their proficiency in each of these skill domains. These estimates are reported on three distinct 500-point scales. The same scales are used to classify assessment items according to their difficulty. At each point on the scale, an individual with a given level of proficiency has a 67% chance of successfully completing tasks located at that same level. Adults with a given level of proficiency will have a lower probability of being able to successfully complete more difficult tasks (those with higher values on the scale). They will similarly have a higher probability of successfully completing easier tasks. The relationship between adults' proficiency and task difficulty is illustrated in Figure 1.7. For example, Adult C, with low proficiency, is unlikely to complete items II to IV and is also less likely to complete item I. Adult A, with high proficiency, is likely to successfully complete items I to V and probably also item VI.

Figure 1.7. An illustration of the relationship between the difficulty of assessment items and proficiency of adults on the literacy, numeracy and adaptive problem solving scales



It is important to note that literacy, numeracy and adaptive problem solving are separate skills, measured on distinct scales. This means that direct comparisons of literacy and numeracy scores, for example, are not meaningful. In other words, the fact that individuals (or a group) have a higher score in literacy than in numeracy does not allow to conclude that their literacy skills are higher than their numeracy skills. Any comparison of performance across different domains must necessarily be of a *relative* nature. For example, it can be said that individuals (or a group) are *relatively* better at literacy than numeracy if their rank in the ordered literacy distribution is higher their rank in the numeracy distribution.

Finally, it is worth noting and stressing that proficiency is necessarily linked to a specific language, the one used in the assessment items. The language of the assessment is, in most cases, the official language of the country or economy. However, participating countries were allowed to choose the

assessment language, and some countries decided to administer the assessment in multiple languages.

The importance of this link between skills and language proficiency is particularly salient when looking at adults who lack sufficient mastery of the assessment language to take the assessment. These adults are present (although generally as a very small percentage of the population) in all countries and are defined as "literacy-related non-respondents". In the first cycle of the Survey of Adult Skills, the proficiency of these adults was not estimated, which meant a country's average results did not cover the entire adult population[7]. In order to collect more information on such adults, so as to allow their likely proficiency in the assessment language to be estimated, the 2023 Survey of Adult Skills introduced a new survey instrument, the doorstep interview (Box 1.1).

Box 1.1. The doorstep interview

The Survey of Adult Skills assesses adults' proficiency in literacy, numeracy and adaptive problem solving in a particular language, most often the official language(s) spoken in the participating countries and economies. The proficiency of adults in the assessment language, while conceptually different from their abstract literacy or numeracy proficiency, determines their performance in the assessment, or even their ability to participate in the survey at all. Language barriers can lead to literacy-related non-responses.

To minimise such non-responses, the 2023 Survey of Adult Skills introduced a doorstep interview as a short alternative to the comprehensive background questionnaire. The doorstep interview is a short, self-administered questionnaire offered in all the languages of the countries and economies taking part in the survey, as well as in the languages spoken by the most common linguistic minorities in the country. The doorstep interview collects key personal background information on gender, age, years of schooling, employment status, country of origin and duration of residence in the survey country. The doorstep interview was administered whenever the interviewer was not able to communicate well enough with the respondent because of language difficulties, and no translator or interpreter was available to help the respondent answer the full background questionnaire.

This information is used to estimate the proficiency of doorstep respondents via a statistical model that relies on the relationship between background characteristics and proficiency for the adults that took the actual assessment. Some ad-hoc assumptions on the likely proficiency of doorstep respondents have been made, to take into account the fact that such respondents have very limited proficiency in the assessment language, and therefore their proficiency in literacy, numeracy and adaptive problem solving cannot be very high (OECD, 2024[59]; OECD, forthcoming[60]). It is very possible that such respondents would be able to show higher levels of proficiency if they were assessed in a different language.

By minimising the share of literacy-related non-respondents, the introduction of the doorstep interview provides a more accurate picture of the distribution of skills in the overall adult population. However, the inclusion of these respondents means the sample is not comparable with previous adult skills surveys, in which the proficiency of those respondents was not estimated. For this reason, doorstep interview cases are excluded when analysing how skills proficiency has evolved since the previous cycle of the survey (this applies, for example, to all analyses presented in Chapter 3). Moreover, as the doorstep interview only collects a limited amount of information, individuals who only answered this short questionnaire are necessarily excluded from some analyses. This is the case, for instance, for most analyses that look at labour-market and social outcomes in Chapter 4. Throughout the report, care has been taken to indicate whether or not doorstep respondents are included in the analyses presented in each table and figure.

What the Survey of Adult Skills can tell us

What is the level and distribution of key information-processing skills among adults in 2023?

The Survey of Adult Skills directly assesses adults' literacy, numeracy and adaptive problem solving skills. A basic command of these skills is thought to be necessary for fully integrating and participating in the labour market, education and training, and social and civic life. Results from the first cycle of the survey show that adults with more advanced mastery of these skills also benefit from greater earnings, well-being, agency and prestige (OECD, 2013[6]). Literacy, numeracy and adaptive problem solving skills are domain-general and highly transferable, and relevant to many social contexts and work situations; they can also be learned and are therefore subject to the influence of policy. Understanding the level and distribution of these skills among adult populations in participating countries is thus important for policy makers in a range of social and economic policy areas. To this end, Chapter 2 provides a descriptive, comparative analysis of the distribution of skills within the adult population. Chapter 2 also addresses the question of who has low, medium or high proficiency in literacy, numeracy and adaptive problem solving in 2023.

Have countries been able to maintain and further develop these skills among their adult population or workforce during the last decade?

The vast majority of countries and economies that participated in the 2023 Survey of Adult Skills also took part in its first cycle, and some of them also participated in previous international assessments of adult skills. The evolution of the information-processing skills of their adult populations can therefore be tracked over time, although some caution is always advised in these analyses because of changes in the design, implementation and methods of the surveys. As each survey covers all adults born during a period of almost 50 years, more than three-quarters of participants in the most recent Survey of Adult Skills would have also been eligible to participate in the first cycle of the survey. In other words, the populations behind the statistical indicators presented in this report are largely the same populations whose skills were assessed in previous editions. This makes it possible not just to compare the results of different age groups with those of the same age in the previous survey but, for older cohorts, to also compare them with the same cohort at a younger age.

Skills are not fixed for life, at any age. Comparisons such as these, presented in Chapter 3, can offer insight into how well governments, firms and other actors, including individuals themselves, have been able to retain and expand the information-processing skills of the adult population, through investment in formal and informal education and training, and how recent migration flows have contributed to skill dynamics.

Additional comparisons, based on background questionnaires that measure adults' participation in training and readiness to learn, can also provide insights into the effectiveness of skill policies. Future reports will analyse adults' participation in non-formal and informal learning and how it has changed over time, looking at the nature of such training and barriers to accessing it.

At the same time, inward and outward migration means that the composition of the eligible population will have changed over time. Not all these compositional changes can be fully accounted for when analysing the evolution of results over time. For example, it is possible to restrict comparisons to individuals born in the country, in an attempt to neutralise the impact of inward migration. However, little can be done to control for outward migration.

Future reports will also analyse the skills of adults with an immigrant background in greater depth – e.g. to explore the extent to which gender gaps differ depending on where adults were born and went to

school, or how the skills of foreign-born adults evolved over time, and in comparison to those of native-born adults of the same age.

Do young adults have strong foundation skills – and how do they compare to the young adults surveyed in the first cycle?

For adults who completed their initial education more recently, the results can also indicate how well this has equipped them with a solid foundation to engage in further learning throughout their life. Comparing the results of younger cohorts with those of young adults surveyed in the first cycle can complement the information about trends among 15-year-olds who were assessed in related domains (reading and mathematics) in PISA. The analysis of changes in the scores of young adults across cycles, presented in Chapter 3, forms the basis for such comparisons.

For countries that participated in the first cycle of the survey, it is also possible to compare the growth in skills between those measured by PISA among 15-year-olds and those of 19-25 year-olds who participated in either cycle of the Survey of Adult Skills. Only participants in the most recent cycle will have been affected by the disruptions to education and early career experiences due to the COVID-19 pandemic. With careful comparison, it may therefore also be possible to understand whether countries were able to successfully mitigate lost learning opportunities during the pandemic, or whether the negative shock experienced by young adults in 2020-21 is likely to have long-lasting consequences for their careers.

To what extent are the skills of adult men and women used in the economy, and has this changed in response to the adoption of new technologies and other trends?

Not all adults participate in the workforce, and some of those who do may not be using their skills to their full extent. Based on the belief that skill requirements are rapidly evolving and cannot be adequately conveyed through job titles, the Survey of Adult Skills has continued to expand its indicators on the use of skills in the workplace. Chapter 4 examines how skills relate to labour-market participation and wages, and the extent of skills mismatches. Future reports will also analyse how the use of skills have evolved in response to the adoption of new technologies and other trends that have changed the demand for skills over the past decade. In particular, the Survey of Adult Skills allows changes in workers' tasks within and across occupations to be documented, providing a picture of job requirements that could reflect the emerging impact of automation or changes in workplace practices triggered by the COVID-19 pandemic.

How do social and emotional skills relate to information-processing skills, formal educational qualifications, labour-market participation and wages?

A number of studies have documented the growing importance of interpersonal skills, such as teamwork and leadership, for labour-market success in the 21st century. Data from the 2023 Survey of Adult Skills will enable analysis of how differences in social and emotional skills relate to information-processing skills, economic outcomes, lifelong learning dispositions and behaviour, and past educational qualifications. This will be the focus of future reports.

Are adults prepared for lifelong learning?

In an era of rapid changes in skill requirements, and of longer working lives, the need to invest in lifelong learning takes on an added urgency. Workers, employers and unions need to be aware of this imperative. Data from the Survey of Adult Skills can document inequality in access to and participation in adult learning. In particular, they show how the uptake of formal, non-formal and informal learning

opportunities varies across demographic groups and levels of educational attainment, but also how literacy, numeracy or social and emotional skills relate to adult behaviour and dispositions towards learning. This will be the focus of future reports.

Do skills relate to the well-being of adults?

Through its background questionnaire, the Survey of Adult Skills assesses more than economic well-being and labour-market outcomes. It also collects data on social and civic dimensions of well-being and self-assessed health status. These data can be used to explore the nexus between skills, skill development and well-being – both in cross-sectional comparisons (at a single point in time) and in cohort-level, longitudinal comparisons. These questions are partly covered in Chapter 4 of this report but will be analysed in greater depth in future reports.

Table 1.1. Chapter 1 figures

Figure 1.1	Evolution of tasks performed by workers in the United States, 1980-2012
Figure 1.2	How skill demand evolved in establishments that most likely adopted AI, relative to other establishments
Figure 1.3	Evolution of Internet usage, 2012-23

StatLink https://stat.link/7joki2

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Notes

[1] The first cycle of the Survey of Adult Skills was implemented over three rounds, with data collected in 2011/12, 2014/15 and 2017/18. Different countries participated in different rounds, except the United States, which collected data in all three. The survey instruments (background questionnaire and direct skills assessment) and the survey procedures were identical across the three rounds.

[2] The analysis in Edin et al. (2022[12]) combines administrative wage data, around the age of 40, with skill measures, around the age of 20, based on military conscription registers, and is therefore limited to men only.

[3] Generative AI (GenAI) is a category of AI that can create new content such as text, images, videos, and music, often in response to prompts. Examples include text-to-image generators, chatbots and machine translation tools based on large language models (LLMs; see https://www.oecd.org/en/topics/sub-issues/generative-ai.html).

[4] Heckman and Mosso (2014[61]) summarise a large literature on the economics of skills formation and argue that scores on achievement tests depend on both cognitive and non-cognitive capacities.

[5] Readers should note that results in adaptive problem solving are not comparable with results in problem solving in technology-rich environments, as these are two separate assessments that have not been linked.

[6] A task can have a more complex structure than an item as a task represents the construct or scale of interest, while an item is a question referring to a common stem or stimulus. Thus, one task can consist of one or more items. In the context of the description of the frameworks and scale developments, we refer to “tasks”; in the context of data analyses, we refer to “items”.

[7] To limit literacy-related non-response (and recourse to the Doorstep Interview, which collects much less information than the full background questionnaire) it was possible to make use of interpreters or translators to help adults struggling with the language. Interpreters could be either family members, or staff hired by the organisation implementing the survey. In both the first and the second cycle of the survey, Sweden was the only country that, by making use of interpreters, was able to have all respondents complete the entire background questionnaire.

2 Literacy, numeracy and adaptive problem solving among adults in 2023

This chapter provides an overview of proficiency in literacy, numeracy and adaptive problem solving among adults between 16 and 65 years old. It compares average proficiency across countries and economies, and examines how these skills are distributed. It also describes how adults with different socio-demographic characteristics (age, gender, educational attainment, immigrant background and parental education) differ in their skills proficiency.

In Brief

- Across the OECD countries and economies that participated in the 2023 Survey of Adult Skills, the average scores for adults aged 16-65 are 260 points in literacy, 263 points in numeracy and 251 points in adaptive problem solving, on scales ranging from 0 to 500 points. Adults in Finland achieved the highest scores in literacy (296 points) and numeracy (294 points), as well as in adaptive problem solving (276 points, the same score achieved by adults in Japan).
- Large shares of the adult population scored at the two lowest levels of the proficiency scales: 26% in literacy, 25% in numeracy and 29% in adaptive problem solving, on average across OECD countries and economies. In Chile, 44% of adults scored at the two lowest levels in all three skill domains, compared to only 7% in Japan.
- On average, 55-65 year-olds display lower proficiency than younger adults in all the assessed domains. The best results were achieved by 25-34 year-olds, followed by 16-24 year-olds.
- Higher levels of educational attainment are associated with greater proficiency in literacy, numeracy and adaptive problem solving. On average, adults with tertiary education scored 33 points higher in literacy than those with upper secondary education, who in turn scored 43 points higher than those without upper secondary education.
- Gender gaps in proficiency are generally small, especially in literacy and adaptive problem solving. Women displayed higher average proficiency than men in literacy (a difference of 3 points), while men scored higher in numeracy (10 points) and adaptive problem solving (2 points).
- Native-born adults of native-born parents displayed much higher proficiency in all domains than foreign-born adults of foreign-born parents (differences of 44 points in literacy, 38 points in numeracy and 32 points in adaptive problem solving). Much of these gaps are explained by the different socio-demographic characteristics of these two groups.
- Adults who grew up in advantaged socio-economic conditions displayed greater proficiency in all skill domains. Having at least one tertiary-educated parent is associated with an advantage of 50 points in literacy, 49 points in numeracy and 42 points in adaptive problem solving, when compared to adults with no parent who has attained upper secondary education.

Introduction

The 2023 Survey of Adult Skills provides a snapshot of adults' proficiency in literacy, numeracy and adaptive problem solving. These are foundation skills that enable individuals to engage and function effectively across a broad spectrum of everyday situations and to perform the tasks required by their various social roles, in everyday life as well as in their jobs. Command of these skills enables adults to:

- achieve personal goals, cultivate their knowledge and potential, and actively engage in society
- navigate and handle the mathematical challenges encountered in a range of situations in adult life
- use cognitive and metacognitive processes to define problems, seek relevant information and implement solutions across diverse information environments and contexts.

As literacy, numeracy and adaptive problem solving are linked to several important economic and social outcomes for both individuals and countries (see Chapter 4), raising skills proficiency of all adults is crucial

for individual and collective prosperity. The skills adults possess are determined by the learning opportunities available throughout their lives. These opportunities start during childhood and youth and continue into adulthood and old age. Therefore, policies must strive to give all citizens the same opportunities to develop and reach their full potential by eliminating the barriers to learning related to social circumstances outside of individuals' control (OECD, 2021[1]; 2019[2]; 2018[3]).

Despite increasing and continuing efforts to ensure equal educational opportunities for all, no country has achieved a level playing field for everyone, although some succeed better than others. Disparities in access to resources persist among different socio-demographic groups, which are reflected in observed differences in proficiency between adults with low and high levels of education, between men and women, between immigrants and non-immigrants, and between adults raised in families with different economic and cultural resources.

To achieve equal opportunities, well-targeted policies in various areas continue to play a key role. For these policies to be effective, policy makers should carefully assess the challenges and barriers some population groups face. Policies should also be adaptable and responsive to evolving trends and crises, which can both exacerbate inequalities and potentially offer new avenues to achieve fair and equal conditions.

This chapter examines adults' skills proficiency as assessed in the 2023 Survey of Adult Skills. Its first section reports on adults' average proficiency in literacy, numeracy and adaptive problem solving in each participating country and economy, compared to adults in other countries and economies as well as to the OECD average. This section also presents the distribution of adults across proficiency levels in all domains. Finally, it examines aggregate inequalities, by considering the inter-decile range. This refers to the gap that separates the highest-performing and lowest-performing 10% of adults within each country and economy. Its second section looks at inequalities with respect to adults' socio-demographic characteristics. It examines the average proficiency in literacy, numeracy and adaptive problem solving of adults in different socio-demographic groups, which are defined in terms of age, education, gender, immigrant background and parental education.

How did adults perform in the 2023 Survey of Adult Skills?

Average proficiency across countries

The average literacy proficiency of adults in OECD countries and economies participating in the 2023 Survey of Adult Skills is 260 points with a standard deviation of 55 points (Table 2.1). Adults in Finland scored, on average, significantly higher (296 points) than the averages for all other participating countries and economies. Adults in Japan (289 points), Sweden (284 points) and Norway (281 points) also achieved average scores above 280 points. In nine other countries and economies, adults performed significantly above the OECD average, ranging from an average of 279 points in the Netherlands to 263 points in Ireland. The results in Czechia and New Zealand (both 260 points) and the United States (258 points) were not statistically different from the OECD average. In contrast, adults in 15 countries scored significantly below the OECD average, with average scores ranging from 255 points in France and Singapore to 218 points in Chile.

The average numeracy proficiency among participating OECD countries and economies is 263 points with a standard deviation of 58 points (Table 2.2). Adults in Finland scored significantly higher (294 points on average) than those from all other participating countries and economies. In five other countries, average scores exceeded 280 points: Japan (291 points), Sweden and Norway (both 285 points), the Netherlands (284 points), and Estonia (281). Nine more countries and economies scored significantly above the OECD average, ranging from an average of 279 points in the Flemish Region (Belgium) and Denmark to 267 points in Czechia and Austria while the average scores in Latvia (263 points) and the Slovak Republic (261 points) were not statistically different from the OECD average. Fourteen countries scored significantly below the OECD average, ranging from 260 points in Ireland to 214 points in Chile.

Across OECD countries and economies, adults scored on average 251 points in adaptive problem solving with a standard deviation of 47 points (Table 2.3). Adults in Finland and Japan scored significantly higher (276 points on average in both countries) than those from all other participating countries and economies, followed by Sweden (273 points) and Norway (271 points). Another nine countries and economies scored above the OECD average, ranging from the Netherlands (average of 265 points) to Austria (253 points). Average scores in Singapore (252 points), Czechia (250 points), and New Zealand (249 points) were not statistically different from the OECD average. In contrast, 15 countries and economies scored below the OECD average, ranging from 249 points in Ireland and 248 points in France to 218 points in Chile.

Table 2.1. Comparison of countries and economies based on average proficiency in literacy

Statistically significantly above the OECD average
Not statistically significantly different from the OECD average
Statistically significantly below the OECD average

Mean score	Comparison country/economy	Countries and economies whose mean score is not statistically significantly different from the comparison country's/economy's score
296	Finland	
289	Japan	
284	Sweden	
281	Norway	Netherlands
279	Netherlands	Norway
276	Estonia	Flemish Region (BE)
275	Flemish Region (BE)	Denmark, Estonia
273	Denmark	Flemish Region (BE), Canada, England (UK)
272	England (UK)	Canada, Denmark
271	Canada	Denmark, England (UK)
266	Switzerland	Germany
266	Germany	Switzerland
263	Ireland	Czechia, New Zealand
260	Czechia	Ireland, New Zealand, United States
260	OECD average	Czechia, New Zealand, United States
260	New Zealand	Czechia, Ireland, United States
258	United States	Czechia, Croatia, New Zealand
255	France	Austria, Croatia, Singapore, Slovak Republic
255	Singapore	Austria, France, Croatia, Slovak Republic
254	Austria	France, Croatia, Singapore, Slovak Republic
254	Croatia	Austria, France, Singapore, Slovak Republic, United States
254	Slovak Republic	Austria, France, Croatia, Singapore
249	Korea	Spain, Hungary, Latvia
248	Hungary	Spain, Italy, Korea, Latvia
248	Latvia	Spain, Hungary, Italy, Korea
247	Spain	Hungary, Italy, Korea, Latvia
245	Italy	Spain, Hungary, Israel, Latvia
244	Israel	Italy
238	Lithuania	Poland*, Portugal
236	Poland*	Lithuania, Portugal
235	Portugal	Lithuania, Poland*
218	Chile	

Note: Adults aged 16-65; includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). No adjustment is made to significance levels for multiple hypotheses testing. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of their average proficiency in literacy.
Source: Table A.2.1 (L) in Annex A.

Countries performing well in one domain typically did well in other domains as well. The same five countries are at the top of the ranking in all domains: Finland, Japan, the Netherlands, Norway and Sweden. Seven other countries and economies scored above the OECD average in all domains: Canada, Denmark, England (United Kingdom), Estonia, the Flemish Region (Belgium), Germany and Switzerland. Eleven countries scored, on average, significantly below the OECD average across all domains: Chile, Croatia, France, Hungary, Israel, Italy, Korea, Lithuania, Poland, Portugal and Spain. Average proficiency in Chile was significantly lower than in all other participating countries and economies in all three domains.

Table 2.2. Comparison of countries and economies based on average proficiency in numeracy

Statistically significantly above the OECD average
Not statistically significantly different from the OECD average
Statistically significantly below the OECD average

Mean score	Comparison country/economy	Countries and economies whose mean score is not statistically significantly different from the comparison country's/economy's score
294	Finland	
291	Japan	
285	Sweden	Netherlands, Norway
285	Norway	Netherlands, Sweden
284	Netherlands	Norway, Sweden
281	Estonia	Flemish Region (BE), Denmark
279	Flemish Region (BE)	Denmark, Estonia
279	Denmark	Flemish Region (BE), Estonia
276	Switzerland	Singapore
274	Singapore	Switzerland, Germany
273	Germany	Canada, Singapore
271	Canada	Germany, England (UK)
268	England (UK)	Austria, Canada, Czechia
267	Czechia	Austria, England (UK)
267	Austria	Czechia, England (UK)
263	OECD average	Latvia, Slovak Republic
263	Latvia	Slovak Republic
261	Slovak Republic	Ireland, Latvia
260	Ireland	New Zealand, Slovak Republic
257	France	Croatia, Hungary, New Zealand
256	New Zealand	France, Croatia, Hungary, Ireland, Korea
254	Hungary	France, Croatia, Korea, New Zealand
254	Croatia	France, Hungary, Korea, New Zealand
253	Korea	Croatia, Hungary, New Zealand
250	Spain	United States
249	United States	Spain, Israel, Italy, Lithuania
246	Israel	Italy, Lithuania, United States
246	Lithuania	Israel, Italy, United States
244	Italy	Israel, Lithuania, United States
239	Poland*	Portugal
238	Portugal	Poland*
214	Chile	

Note: Adults aged 16-65; includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). No adjustment is made to significance levels for multiple hypotheses testing. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of their average proficiency in numeracy.
Source: Table A.2.1 (N) in Annex A.

Table 2.3. Comparison of countries and economies based on average proficiency in adaptive problem solving

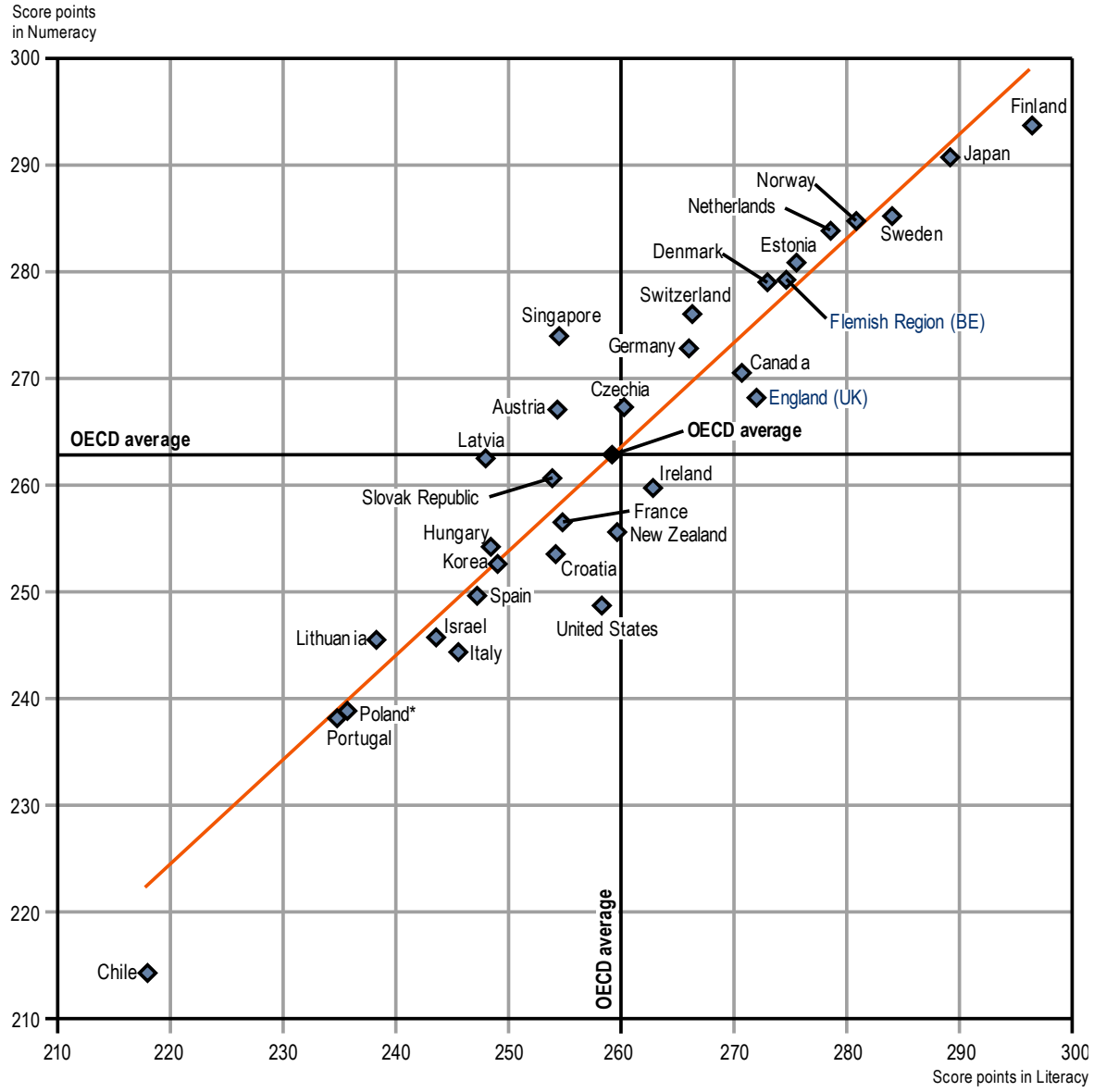
Statistically significantly above the OECD average
Not statistically significantly different from the OECD average
Statistically significantly below the OECD average

Mean score	Comparison country/economy	Countries and economies whose mean score is not statistically significantly different from the comparison country's/economy's score
276	Finland	Japan
276	Japan	Finland
273	Sweden	Norway
271	Norway	Sweden
265	Netherlands	Denmark, Estonia
264	Denmark	Estonia, Netherlands
263	Estonia	Flemish Region (BE), Denmark, Netherlands
262	Flemish Region (BE)	Germany, Estonia
261	Germany	Flemish Region (BE), Canada, England (UK)
259	Canada	Germany, England (UK)
259	England (UK)	Canada, Switzerland, Germany
257	Switzerland	England (UK)
253	Austria	New Zealand, Singapore
252	Singapore	Austria, Czechia, New Zealand
251	OECD average	Czechia, New Zealand, Singapore
250	Czechia	Ireland, New Zealand, Singapore, United States
249	New Zealand	Austria, Czechia, France, Ireland, Singapore, Slovak Republic, United States
249	Ireland	Czechia, France, New Zealand, Slovak Republic, United States
248	France	Ireland, New Zealand, Slovak Republic, United States
247	United States	Czechia, France, Ireland, New Zealand, Slovak Republic
247	Slovak Republic	France, Ireland, Latvia, New Zealand, United States
244	Latvia	Slovak Republic
241	Spain	Hungary
241	Hungary	Spain
238	Korea	Croatia, Israel
236	Israel	Croatia, Korea, Portugal
235	Croatia	Israel, Korea, Portugal
233	Portugal	Croatia, Israel, Italy, Lithuania
231	Italy	Lithuania, Portugal
230	Lithuania	Italy, Portugal
226	Poland*	
218	Chile	

Note: Adults aged 16-65; includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). No adjustment is made to significance levels for multiple hypotheses testing. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of their average proficiency in adaptive problem solving.
Source: Table A.2.1 (A) in Annex A.

A similar picture emerges when looking at the association between average proficiency in different skill domains across countries. Figure 2.1 shows the relationship between average proficiency in literacy and numeracy. Average performance in the two domains is highly correlated, with a correlation coefficient of 0.88[1]. The dashed line in Figure 2.1 represents the best estimate of numeracy proficiency for a given value of literacy proficiency, based on the underlying data from all participating countries and economies. For countries above the dashed line, average performance in numeracy is higher than what could be predicted based on average performance in literacy. One way of interpreting such results is saying that adults in these countries perform relatively better in numeracy than in literacy. The opposite can be said for countries that fall below the dashed line. A similar positive correlation between literacy and numeracy was also found in the first cycle of the Survey of Adult Skills (OECD, 2016[4]).[2]

Figure 2.1. Comparison of countries' and economies' average proficiency in literacy and numeracy



Note: The correlation in this figure is based on countries' and economies' average proficiency in literacy and numeracy. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Source: Table A.2.1. (L, N) in Annex A.

How adults are distributed across proficiency levels

To facilitate the interpretation of results, the 2023 Survey of Adult Skills divides the scales for the three domains, which range from 0 to 500, into proficiency levels. The scales for literacy and numeracy are divided into six levels: Below Level 1 and Levels 1 to 5, while adaptive problem solving does not include Level 5. For more information, readers are advised to consult the Reader's Companion (OECD, 2024[5]).

The difficulty of the different assessment tasks is expressed on the same scale used for measuring the proficiency of respondents (see Chapter 1). This makes it possible to describe what adults at each proficiency level are able to do, based on the characteristics of the assessment tasks whose difficulty level matches that of respondents. These descriptions are provided in Table 2.4 for literacy, Table 2.5 for numeracy and Table 2.6 for adaptive problem solving.

As skills are valuable for individuals but also for societies, one priority for policy makers is the identification of adults who perform at low proficiency levels. This report defines low-performing adults as those who score at the two lowest levels (at or below Level 1) in all skill domains. Box 2.1 provides information on how the Survey of Adult Skills measures what adults with very low proficiency can do.

Table 2.4. Description of what adults can do at each proficiency level in literacy

Level	Score range	Percentage of adults scoring at each level (OECD average)	What adults can do at this level
Level 5	Equal to or higher than 376 points	1.1%	At Level 5, the assessment provides no direct information on what adults can do. This is mostly because feasibility concerns (especially with respect to testing time) precluded the inclusion of highly difficult tasks involving complex interrelated goal structures, very long or complex document sets, or tools containing highly complex texts (e.g. extensive catalogues, complex menu structures, or lists of unstructured results from search engines), which require advanced skills to access and process the information they contain. These tasks, however, form part of the construct of literacy in today's world, and future assessments aiming at a better coverage of the upper-end of the proficiency scale may seek to include testing units tapping on literacy skills at Level 5. From the characteristics of the most difficult tasks at Level 4, some suggestions regarding what constitutes proficiency at Level 5 may be offered. Adults at Level 5 may be able to reason about the task itself, setting up reading goals based on complex and implicit requests. They can presumably search for and integrate information across multiple, dense texts containing distracting information in prominent positions. They are able to construct syntheses of similar and contrasting ideas or points of view; or evaluate evidence-based arguments and the reliability of unfamiliar information sources. Tasks at Level 5 may also require the application and evaluation of abstract ideas and relationships. Evaluating reliability of evidentiary sources and selecting not just topically relevant but also trustworthy information may be key to achievement.
Level 4	326 to less than 376 points	10.6%	At Level 4, adults can read long and dense texts presented on multiple pages in order to complete tasks that involve access, understanding, evaluation and reflection about the text(s) contents and sources across multiple processing cycles. Adults at this level can infer what the task is asking based on complex or implicit statements. Successful task completion often requires the production of knowledge-based inferences. Texts and tasks at Level 4 may deal with abstract and unfamiliar situations. They often feature both lengthy contents and a large amount of distracting information, which is sometimes as prominent as the information required to complete the task. At this level, adults are able to reason based on intrinsically complex questions that share only indirect matches with the text contents, and/or require taking into consideration several pieces of information dispersed throughout the materials. Tasks may require evaluating subtle evidence-claims or persuasive discourse relationships. Conditional information is frequently present in tasks at this level and must be taken into consideration by the respondent. Response modes may involve assessing or sorting complex assertions.
Level 3	276 to less than 326 points	30.9%	Adults at Level 3 are able to construct meaning across larger chunks of text or perform multi-step operations in order to identify and formulate responses. They can identify, interpret or evaluate one or more pieces of information, often employing varying levels of inferencing. They can combine various processes (accessing, understanding and evaluating) if required by the task. Adults at this level can

Level	Score range	Percentage of adults scoring at each level (OECD average)	What adults can do at this level
			compare and evaluate multiple pieces of information from the text(s) based on their relevance or credibility. Texts at this level are often dense or lengthy, including continuous, noncontinuous, mixed. Information may be distributed across multiple pages, sometimes arising from multiple sources that provide discrepant information. Understanding rhetorical structures and text signals becomes more central to successfully completing tasks, especially when dealing with complex digital texts that require navigation. The texts may include specific, possibly unfamiliar vocabulary and argumentative structures. Competing information is often present and sometimes salient, though no more than the target information. Tasks require the respondent to identify, interpret, or evaluate one or more pieces of information, and often require varying levels of inferencing. Tasks at Level 3 also often demand that the respondent disregard irrelevant or inappropriate text content to answer accurately. The most complex tasks at this level include lengthy or complex questions requiring the identification of multiple criteria, without clear guidance regarding what has to be done.
Level 2	226 to less than 276 points	31.4%	At Level 2, adults are able to access and understand information in longer texts with some distracting information. They can navigate within simple multi-page digital texts to access and identify target information from various parts of the text. They can understand by paraphrasing or making inferences, based on single or adjacent pieces of information. Adults at Level 2 can consider more than one criterion or constraint in selecting or generating a response. The texts at this level can include multiple paragraphs distributed over one long or a few short pages, including simple websites. Noncontinuous texts may feature a two-dimension table or a simple flow diagram. Access to target information may require the use of signaling or navigation devices typical of longer print or digital texts. The texts may include some distracting information. Tasks and texts at this level sometimes deal with specific, possibly unfamiliar situations. Tasks require respondents to perform indirect matches between the text and content information, sometimes based on lengthy instructions. Some tasks statements provide little guidance regarding how to perform the task. Task achievement often requires the test taker to either reason about one piece of information or to gather information across multiple processing cycles.
Level 1	176 to less than 226 points	17.1%	Adults at Level 1 are able to locate information on a text page, find a relevant link from a website, and identify relevant text among multiple options when the relevant information is explicitly cued. They can understand the meaning of short texts, as well as the organization of lists or multiple sections within a single page. The texts at level 1 may be continuous, noncontinuous, or mixed and pertain to printed or digital environments. They typically include a single page with up to a few hundred words and little or no distracting information. Noncontinuous texts may have a list structure (such as a web search engine results page) or include a small number of independent sections, possibly with pictorial illustrations or simple diagrams. Tasks at Level 1 involve simple questions providing some guidance as to what needs to be done and a single processing step. There is a direct, fairly obvious match between the question and target information in the text, although some tasks may require the examination of more than one piece of information.
Below Level 1	Below 176 points	8.9%	Adults at Below Level 1 are able to process meaning at the sentence level. Given a series of sentences that increase in complexity, they can tell if a sentence does or does not make sense either in terms of plausibility in the real world (i.e. sentences describing events that can vs. cannot happen), or in terms of the internal logic of the sentence (i.e. sentences that are meaningful vs. not). Most adults at this level are also able to read short, simple paragraphs and, at certain points in text, tell which word among two makes the sentence meaningful and consistent with the rest of the passage. Finally, they can access single words or numbers in very short texts in order to answer simple and explicit questions. The texts at Below Level 1 are very short and include no or just a few familiar structuring devices such as titles or paragraph headers. They do not include any distracting information nor navigation devices specific to digital texts (e.g. menus, links or tabs). Tasks Below Level 1 are simple and very explicit regarding what to do and how to do it. These tasks only require understanding at the sentence level or across two simple adjacent sentences. When the text involves more than one sentence, the task merely requires dealing with target information in the form of a single word or phrase.

Table 2.5. Description of what adults can do at each proficiency level in numeracy

Level	Score range	Percentage of adults scoring at each level (OECD average)	What adults can do at this level
Level 5	Equal to or higher than 376 points	1.7%	Adults at Level 5 can use and apply problem-solving strategies to analyse, evaluate, reason and critically reflect on complex and formal mathematical information, including dynamic representations. They demonstrate an understanding of statistical concepts and can critically reflect on whether a data set can be used to support or refute a claim. Adults at this level can determine the most appropriate graphical representation for relational data sets.
Level 4	326 to less than 376 points	12.2%	Adults at Level 4 can use and apply a range of problem-solving strategies to access, analyse, reason, and critically reflect on and evaluate a broad range of mathematical information that is often presented in unfamiliar contexts. Such information may not be presented in an explicit manner. Adults at this level can devise and implement strategies to solve multi-step problems. This may involve reasoning about how to integrate concepts from different mathematical content areas or applying more complex and formal mathematical procedures. Adults at this level can: • calculate and interpret rates and ratios, • devise a strategy to compare large data sets, • read and interpret multi-variate data presented in a single graph, • analyse complex, authentic algebraic formulae to understand relationships between variables, • reflect and reason mathematically to review and evaluate the validity of statistical or mathematical conclusions, claims or arguments while accommodating relevant conditions, and • formulate a problem so that the result will be at the required level of specificity to the context of the situation.
Level 3	276 to less than 326 points	30.6%	Adults at Level 3 can access, act on, use, reflect on and evaluate authentic mathematical contexts. This requires making judgements about how to use the given information when developing a solution to a problem. The mathematical information may be less explicit, embedded in contexts that are not always commonplace, and use representations and terminology that are more formal and involve greater complexity. Adults at this level can complete tasks where mathematical processes require the application of two or more steps and where multiple conditions need to be satisfied. Tasks may also require the use, integration or manipulation of multiple data sources in order to undertake the mathematical analyses necessary for the specific task. Adults at this level can: • estimate or perform calculations with a wide range of whole numbers, decimals, percentages, fractions, and measurements, including the application of proportional reasoning, • determine a missing value from a data set given the mean, • recognise and use patterns (visual and numerical) to estimate values, • reflect on and use mathematical reasoning when reviewing and evaluating the validity of conclusions drawn from data, including a limited set of related conditions or statements, • evaluate claims and stated relationships using a variety of data sources, • recognise a formulation using non-standard notation, and • use spatial-visualisation ability to analyse figures, including moving from three- to two-dimensional representations.
Level 2	226 to less than 276 points	30.6%	Adults at Level 2 can access, act on and use mathematical information, and evaluate simple claims, in tasks set in a variety of authentic contexts. They are able to interpret and use information presented in slightly more complex forms (e.g. doughnut charts, stacked bar graphs or linear scales) that includes more formal terminology and more distracting information. Adults at this level can carry out multi-step mathematical processes. Adults at this level can: • use dynamic applications to perform simple measurements, and access and sort data given in tables or interactive charts, • apply simple proportional reasoning or solve problems satisfying up to two conditions, • formulate processes and expressions to represent situations mathematically, including combining and linking information, • use mathematical reasoning when reviewing and evaluating the validity of statements, • estimate or perform calculations involving fractions, decimals, time, measurements, and less common percentages or perform routine algorithms such as that used to generate the mean, • substitute into and evaluate contexts involving authentic algebraic formulae, and • identify patterns within two-dimensional geometric representations.

Level	Score range	Percentage of adults scoring at each level (OECD average)	What adults can do at this level
Level 1	176 to less than 226 points	16.3%	Adults at Level 1 demonstrate number sense involving whole numbers, decimals, and common fractions and percentages. They can access, act on and use mathematical information located in slightly more complex representations set in authentic contexts where the mathematical content is explicit and uses informal mathematical terminology with little text and minimal distracting information. They can devise simple strategies using one or two steps to determine the solution. Adults at this level can: • interpret simple spatial representations or a scale on a map, • identify and extract information from a table or graphical representation or complete a simple whole-number bar chart, • identify the largest value in an unordered list, including comparing the decimal part of the number, and • interpret and perform basic arithmetic operations, including multiplication and division, with whole numbers, money, and common whole-number percentages, such as 25% and 50%.
Below Level 1	Below 176 points	8.6%	Adults performing Below Level 1 demonstrate elementary whole-number sense and can access and use mathematical knowledge to solve single-step problems, where the information is presented using images or simple structured information set in authentic, commonplace contexts with little or no text or distracting information. The mathematical content is non-formal and explicit. Adults at this level can: • count up to 20 objects that are displayed with varying degrees of organisation (i.e. randomly arranged, separated into groups, or in an array), • sort events by chronological order, • compare unordered lists of numbers to identify the largest number based on the whole-number component, • locate data directly from a graph, and • perform addition and subtraction with small whole numbers.

Table 2.6. Description of what adults can do at each proficiency level in adaptive problem solving

Level	Score range	Percentage of adults scoring at each level (OECD average)	What adults can do at this level
Level 4	Equal to or higher than 326 points	5.0%	Adults at this level are able to define the nature of problems in ill-structured and information-rich contexts. They integrate multiple sources of information and their interactions, identify and disregard irrelevant information, and formulate relevant cues. Adults identify and apply multi-step solutions towards one or more complex goals. They adapt the problem-solving process to changes even if these changes are not obvious, occur unexpectedly, or require a major reevaluation of the problem. Adults are able to distinguish between relevant and irrelevant changes, predict future developments of the problem situation, and consider multiple criteria simultaneously to judge whether the solution process is likely to lead to success. Adults at Level 4 engage in the following cognitive processes: • develop complex mental models of problems by integrating information from multiple sources, • establish connections between tasks and stimuli even if these connections are difficult to detect or contain complex interactions, • develop strategies to reach several goals in parallel and implement multi-step solutions, and continuously update their mental model, search strategies, and solutions during problem solving. Adults at this level engage in the following metacognitive processes: • continuously reflect and monitor the problem-solving process even if the environment is complex and changes unexpectedly, • constantly revisit and reevaluate their mental model, the available information, and goal attainment, • show adequate and immediate reactions to change, and • cope with frequent and unpredictable change and adapt their solution strategy accordingly.

Level	Score range	Percentage of adults scoring at each level (OECD average)	What adults can do at this level
Level 3	276 to less than 326 points	27.3%	Adults at this level understand problems that are either more complex static problems or problems that have an average to high level of dynamics. They can solve problems with multiple constraints or problems that require the attainment of several goals in parallel. In problems that change and require adaptivity, adults deal with frequent and, to some extent, continuous changes. They discriminate between changes that are relevant and those that are less relevant or unrelated to the problem. Adults at this level can identify and apply multi-step solutions that integrate several important variables simultaneously and consider the impact of several problem elements on each other. In dynamically changing problems, they predict future developments in the problem situation based on information collected from past developments. They adapt their behaviour according to the predicted change. Adults at Level 3 engage in the following cognitive processes: ● generate mental models for moderately to highly complex problems, ● actively search for solutions by continuously evaluating the information provided in the problem environment, and ● distinguish between relevant and irrelevant information. Adults at this level engage in the following metacognitive processes: ● monitor comprehension of the problem and the changes in the problem, ● monitor and evaluate progress towards the goal of the problem, ● search for solutions by setting sub-goals and evaluating alternative solutions to the problem, and ● reflect on their approach to solving the problem and, if necessary, revise their strategy.
Level 2	226 to less than 276 points	38.5%	Adults at this level can identify and apply solutions that consist of several steps in problems that require considering one target variable to judge whether the problem has been solved. In dynamic problems that exhibit change, adults at this level can identify relevant information if they are prompted to specific aspects of the change or if changes are transparent, occur only one at a time, relate to a single problem feature, and are easily accessible. Problems at this level are presented in well-structured environments and contain only a few information elements with direct relevance to the problem. Minor impasses may be introduced but these can be resolved easily by adjusting the initial problem-solving procedure. Adults at Level 2 engage in the following cognitive processes: ● develop mental models for simple to moderately difficult problems and adapt these as needed, ● adequately react to changes that are presented in visible increments, and ● adapt resolution strategies to changes in the problem statement and the environment if these changes are of low or moderate cognitive complexity. Adults at this level engage in the following metacognitive processes: ● monitor progress towards a solution that consists of one specific goal, ● search for optimal solutions by evaluating alternative solution paths within a given problem environment of low to moderate complexity, and ● reflect on the chosen solution strategy if an impasse occurs and when explicitly prompted to adapt.
Level 1	176 to less than 226 points	21.5%	Adults at this level are able to understand simple problems and develop and implement solutions to solve them. Problems contain a limited number of elements and little to no irrelevant information. Solutions at this level are simple and consist of a limited number of steps. Problems are embedded in a context that includes one or two sources of information and presents a single, explicitly defined goal. Adults at Level 1 engage in the following cognitive processes: ● develop mental models of simple and clearly structured problems, ● understand connections between tasks and stimuli that are explicit and embedded in a well-structured environment, and ● solve problems that do not change and thereby do not require adaptivity.
Below Level 1	Below 176 points	7.7%	Adults at this level understand very simple static problems situated within a clearly structured environment. Problems contain no invisible elements, no irrelevant information that might distract from the core of the problem, and typically only require a single-step solution. Adults at this proficiency level are able to engage in basic cognitive processes required to solve problems if explicit support is given and if they are prompted to do so.

Box 2.1. Using components to assess what adults at low literacy and numeracy proficiency levels are able to do

The Survey of Adult Skills is designed to accurately measure the literacy and numeracy proficiency of all adults, including those who are low performing. In all assessment domains, tasks of varying levels of difficulty were designed to cover as much of the entire ability distribution as possible. To improve the precision of skills measurement at the lower end of the proficiency distribution, the 2023 assessments of literacy and numeracy included component tasks targeted at adults with very low levels of proficiency. Reading components represent the basic set of decoding skills that are essential for extracting meaning from written texts. They comprise sentence comprehension (respondents are required to identify whether sentences make sense or not) and passage comprehension (respondents are required to read a short passage and identify words that give meaning to the sentence). Numeracy components assess number sense with two types of tasks (identifying quantities and recognising the bigger number in a set).

Performance in component tasks is integrated into the literacy and numeracy proficiency scales, which allows the lower end of the proficiency scale to be estimated with greater precision. At the same time, the results from these components can be analysed separately, to help understand and describe the skills and knowledge of adults with low levels of numeracy and literacy.

Source: OECD (2024[5]), *Survey of Adult Skills: 2023 Reader's Companion,* https://doi.org/10.1787/3639d1e2-en; OECD (2021[6]), *The Assessment Frameworks for Cycle 2 of the Programme for the International Assessments of Adult Competencies*, https://doi.org/10.1787/4bc2342d-en.

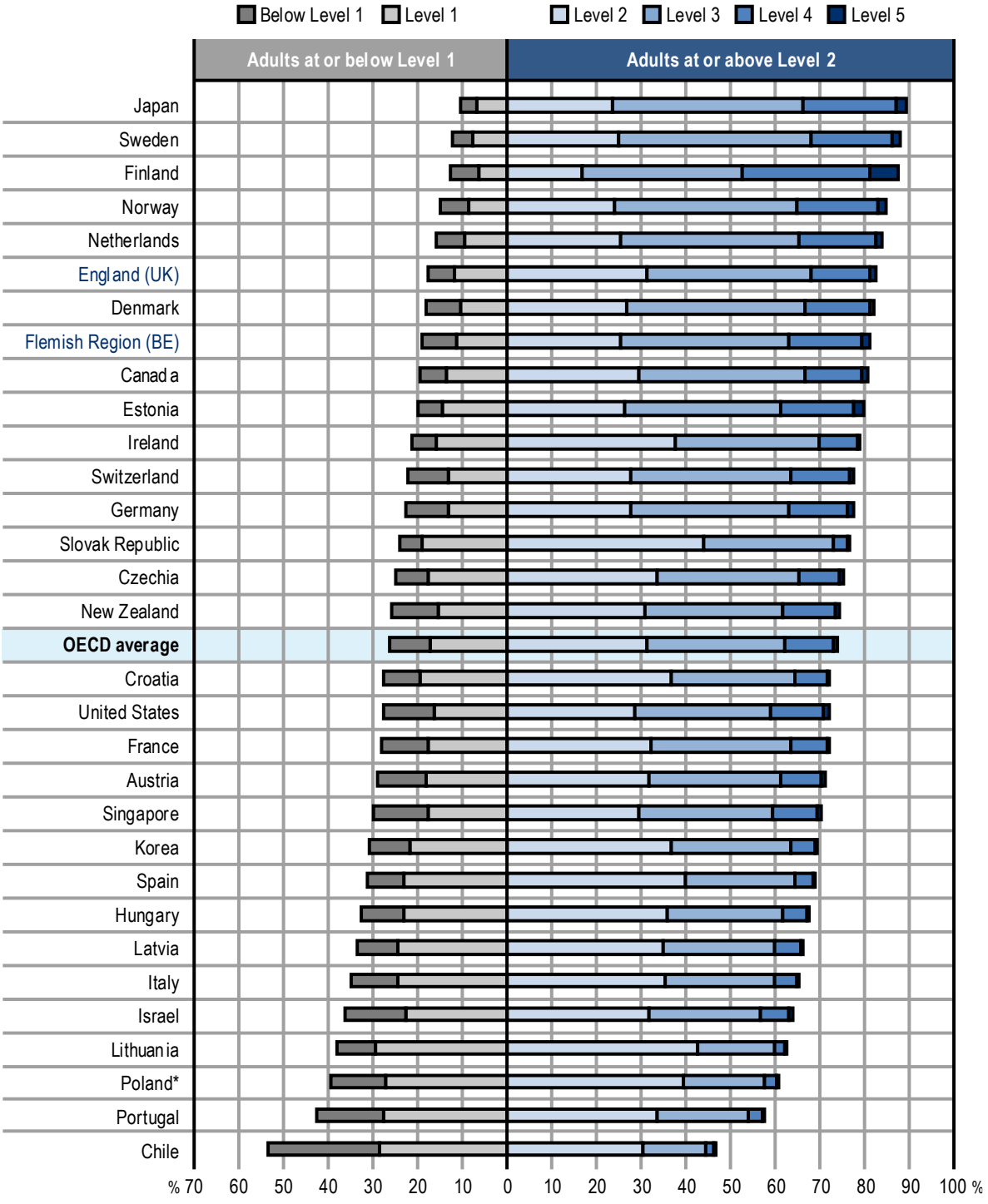
On average, across participating OECD countries and economies, 26% of adults are low performing in literacy, meaning they scored at or below Level 1: 9% scored below Level 1 and 17% scored at Level 1 (Figure 2.2). Chile has the largest share of such low-performing adults (53%), while Japan has the smallest (10%). Further up the scale, 31% of adults scored at Level 2 and 31% at Level 3, on average across OECD countries and economies. At the highest proficiency levels, 11% of adults scored at Level 4 and 1% at Level 5. Finland has the largest share of adults at Levels 4 and 5 (35%), while Chile and Lithuania have the smallest (2%).

In numeracy, 25% of adults in participating OECD countries and economies are low performing on average. In particular, 9% of adults scored below Level 1 and 16% scored at Level 1 (Figure 2.3). The share of low-performing adults is largest in Chile (56%) and smallest in Japan (10%). On average, 31% of adults scored at Level 2, 31% at Level 3, 12% at Level 4 and 2% at Level 5. Finland is the country with the largest share of adults performing at Levels 4 and 5 (31%), while Chile has the smallest (2%).

In adaptive problem solving, on average, 29% of adults in participating OECD countries and economies are low performing (scoring at Level 1 or below). In particular, 8% of adults scored below Level 1 and 22% at Level 1 (Figure 2.4). Chile has the largest share of low-performing adults, at 56%, while Japan has the smallest, at 11%. In this domain, 38% of adults scored at Level 2 on average, 27% at Level 3 and 5% scored at Level 4. Finland has the largest share of adults scoring at Level 4 (13%) and Chile, Italy, Korea, Lithuania, Poland and the Slovak Republic have the smallest, below 1%.

Figure 2.2. Literacy proficiency among adults

Share of 16-65 year-olds scoring at each proficiency level in literacy



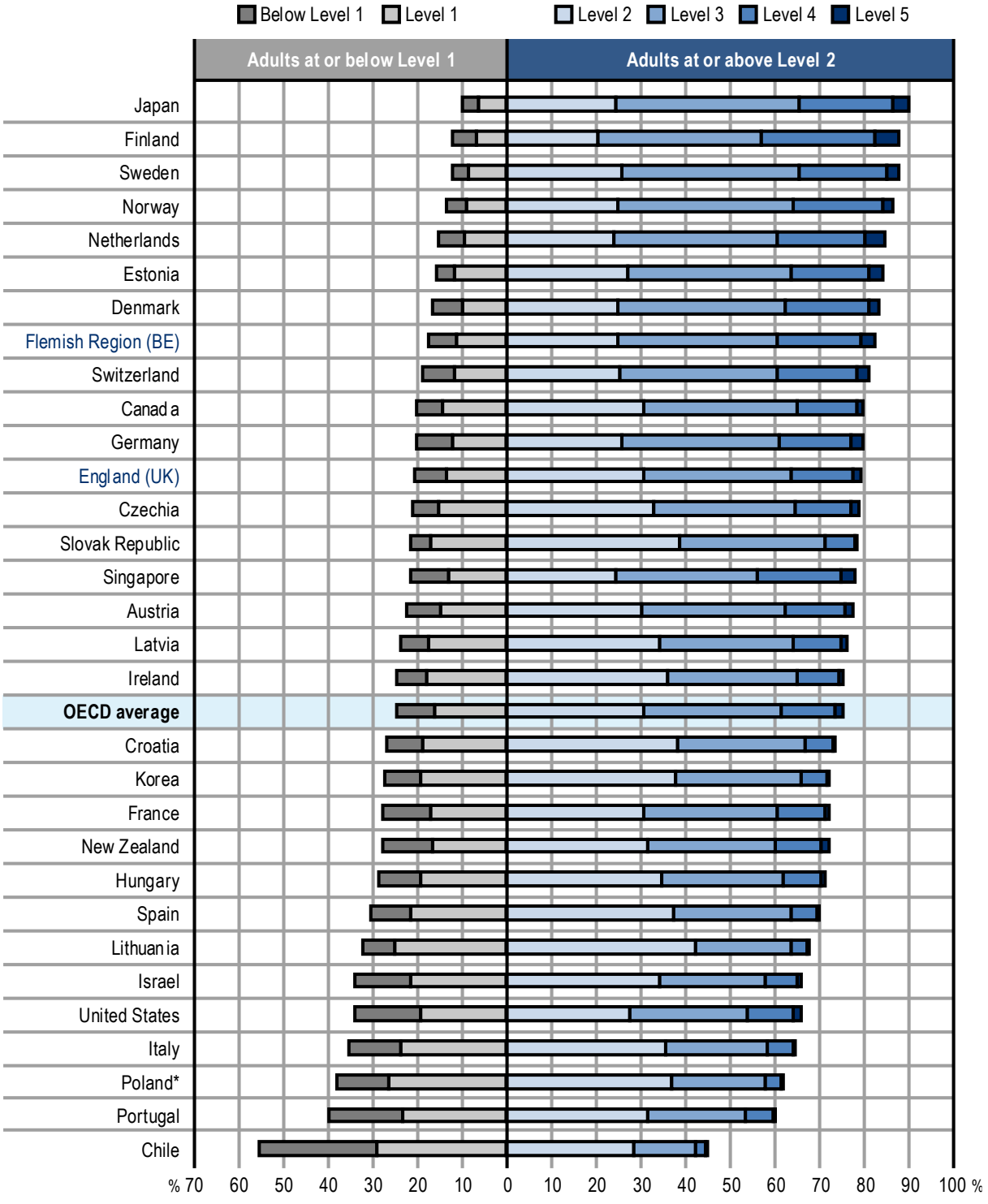
Note: Includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in ascending order of the share of adults scoring at or below Level 1.

Source: Table A.2.2 (L) in Annex A.

Figure 2.3. Numeracy proficiency among adults

Share of 16-65 year-olds scoring at each proficiency level in numeracy



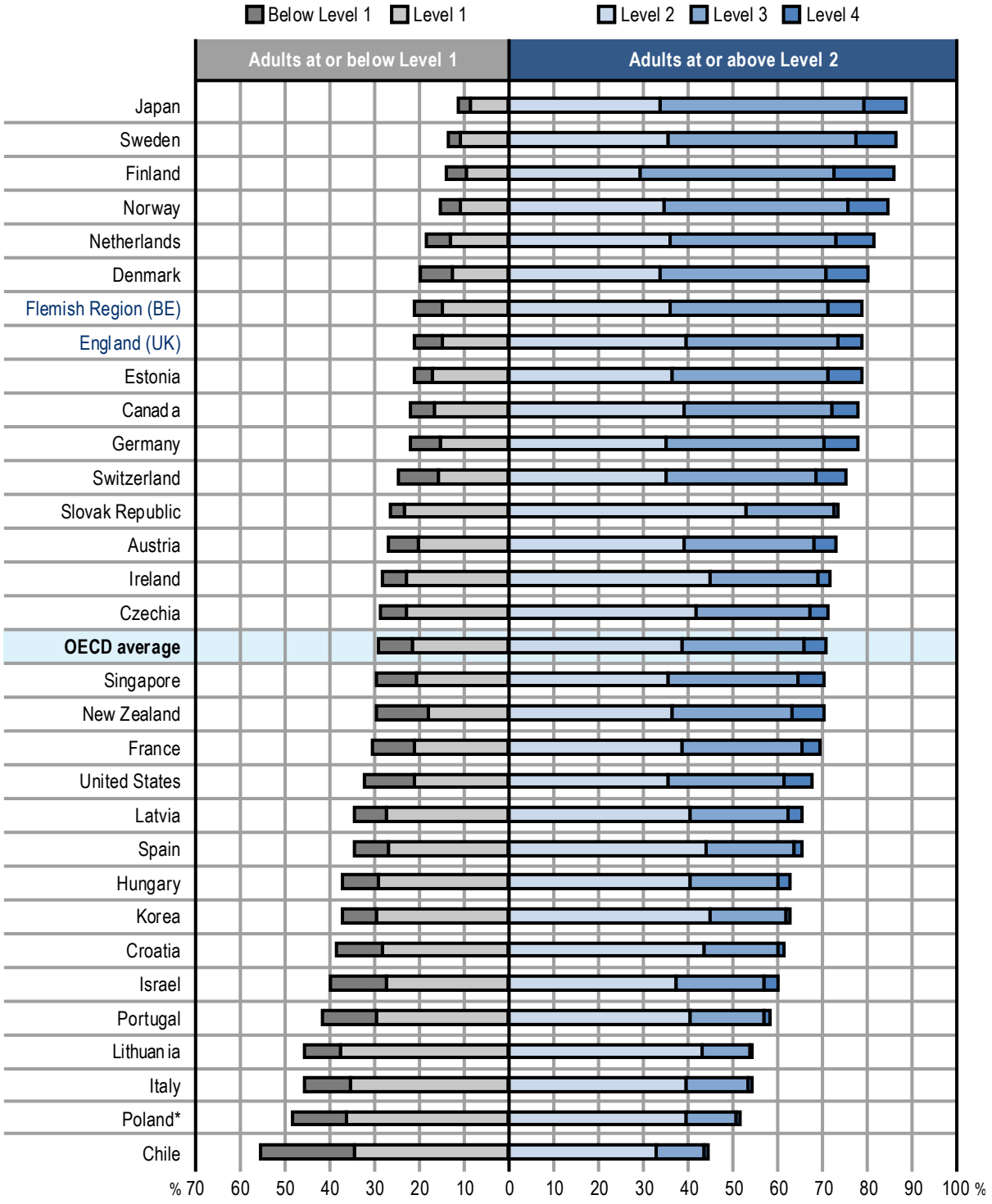
Note: Includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in ascending order of the share of adults scoring at or below Level 1.

Source: Table A.2.2 (N) in Annex A.

Figure 2.4. Proficiency in adaptive problem solving among adults

Share of 16-65 year-olds scoring at each proficiency level in adaptive problem solving



Note: Includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

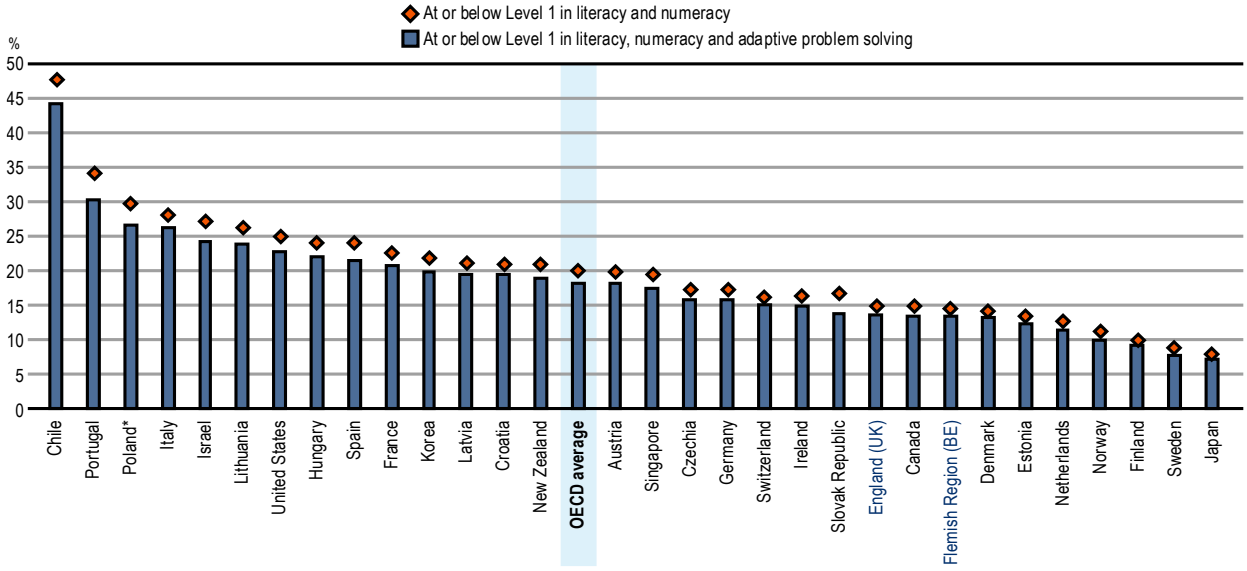
Countries and economies are ranked in ascending order of the share of adults scoring at or below Level 1.

Source: Table A.2.2 (A) in Annex A.

As proficiency in literacy and numeracy is correlated (OECD, 2016[4]), adults with low proficiency in one domain are also likely to have low proficiency in other domains. Figure 2.5 shows the share of adults with low proficiency in all three domains. This share is highest in Chile (44%) and lowest in Japan (7%). Figure 2.5 also presents the percentage of low-performing adults in literacy and numeracy only. This share ranges between 48% in Chile and 8% in Japan.

Figure 2.5. Share of adults who are low performing in more than one domain

16-65 year-olds scoring at or below Level 1 in more than one domain



Note: Includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the share of adults performing at or below Level 1 in all three domains.

Source: Table A.2.3 in Annex A.

Aggregate inequality in the distribution of skills

Aggregate skills inequalities can be measured by the dispersion of the distribution of skills within each country or economy. One measure of such dispersion is the inter-decile range, i.e. the distance between the 90th percentile of the national skills distribution (the score below which 90% of adults perform) and the 10th percentile of the national skills distribution (the score below which 10% of adults perform).

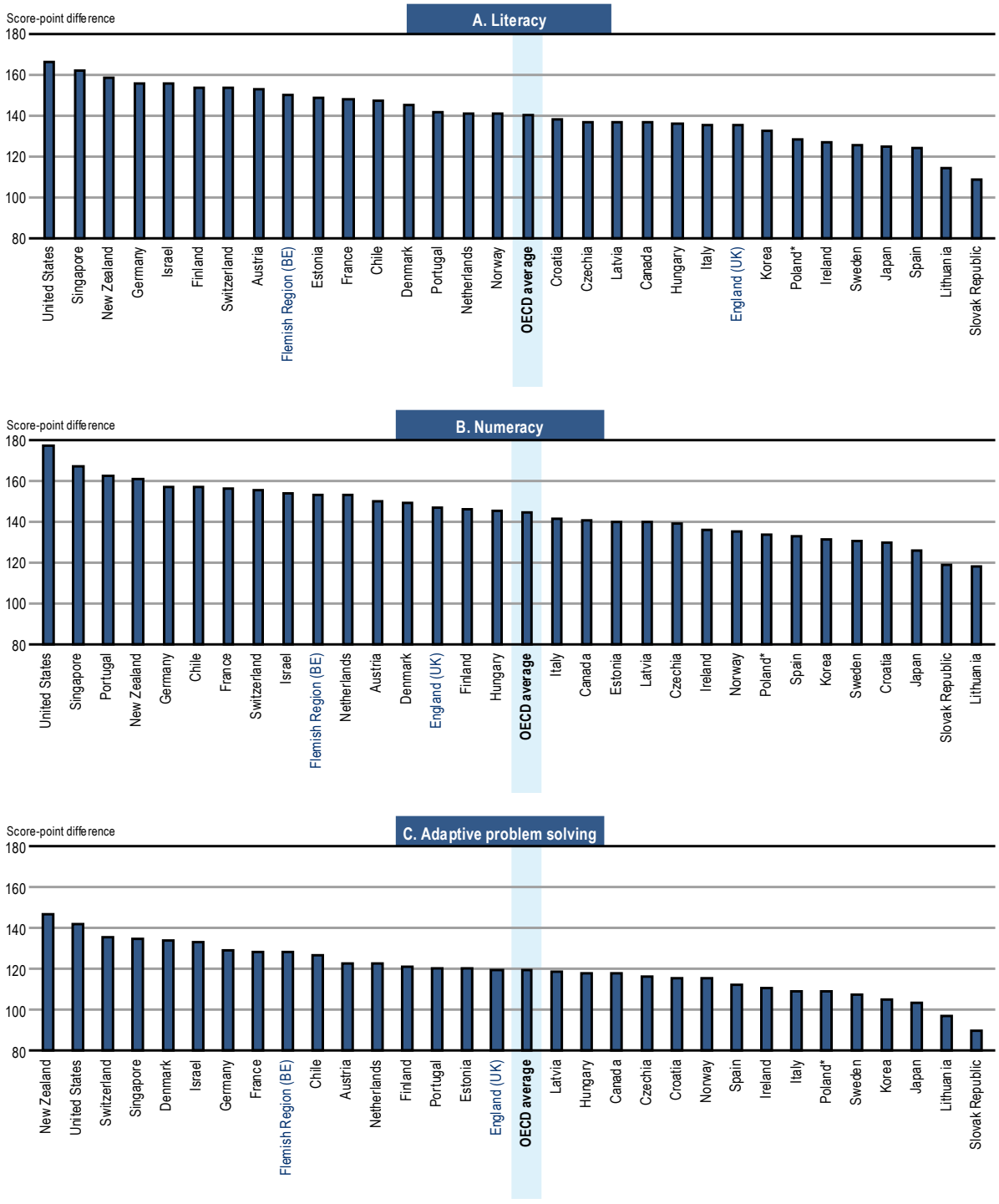
On average, the inter-decile range in literacy in participating OECD countries and economies is 140 points (Figure 2.6, Panel A). Inequality is particularly pronounced in Singapore and the United States, where the inter-decile range exceeds 160 points. The distribution is more compressed in Lithuania and the Slovak Republic, where the inter-decile range is below 115 points.

In numeracy, the inter-decile range in participating OECD countries and economies averages 144 points (Figure 2.6, Panel B). The difference is widest in New Zealand, Portugal, Singapore and the United States, where the inter-decile range exceeds 160 points, while it is more compressed in Japan, Lithuania and the Slovak Republic, where the inter-decile range is below 130 points.

In adaptive problem solving, the inter-decile range averages 119 points (Figure 2.6, Panel C). Variation is widest in New Zealand and the United States, with the inter-decile range exceeding 140 points. The skills distribution is more compressed in Lithuania and the Slovak Republic, where the inter-decile range is lower than 100 points.

Figure 2.6. Inequality in the distribution of key information-processing skills

Difference between the 90th and 10th percentile of the national skills distribution for literacy, numeracy and adaptive problem solving (90th percentile *minus* 10th percentile)



Note: Adults aged 16-65; includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1).
*Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the difference between the 90th and the 10th percentile.
Source: Table A.2.1 (L, N, A) in Annex A.

The countries with the greatest inequality (widest inter-decile range) across all domains are New Zealand, Singapore and the United States; those with the lowest levels of inequality are Japan, Lithuania, the Slovak Republic and Sweden. Inequality in skills does not appear to be clearly correlated with average levels of proficiency, suggesting that education and training policies can succeed in equipping a large majority of the population with relatively high levels of skills. Countries where skills inequality is high also tend to be countries where parents' level of education is more strongly related to skills proficiency of their offspring. This is consistent with findings from the previous cycle of the Survey of Adult Skills (Paccagnella, 2015[7]), and highlights the importance of helping people from disadvantaged backgrounds to achieve a more inclusive and fairer distribution of skills.

Socio-demographic differences in key information-processing skills

Monitoring the skill endowment of different population subgroups can help countries and economies identify at-risk populations with low levels of foundation skills. Policy makers can use this information to identify, design and implement targeted policies to address the needs of low-skilled populations, as well as assessing the effectiveness of such measures. This section considers skill differences across groups defined in terms of age, educational attainment, gender, immigrant background and parental education.

Differences in skills proficiency related to age

Skills are not static. Over the course of a lifetime they can be acquired and developed, lose value, and even decline (Kautz et al., 2014[8]). Skills are influenced by the nurturing effects of the home, family, school and work environment (Kautz et al., 2014[8]); culture (Baltes, 1993[9]); genetic factors (Toga and Thompson, 2005[10]); effects related to ageing (Desjardins and Warnke, 2012[11]; Kautz et al., 2014[8]); and many other factors such as beliefs, attitudes and values. With increased life expectancy leading to longer working lives, it is more important than ever to understand how skills develop throughout people's lives, including into old age.

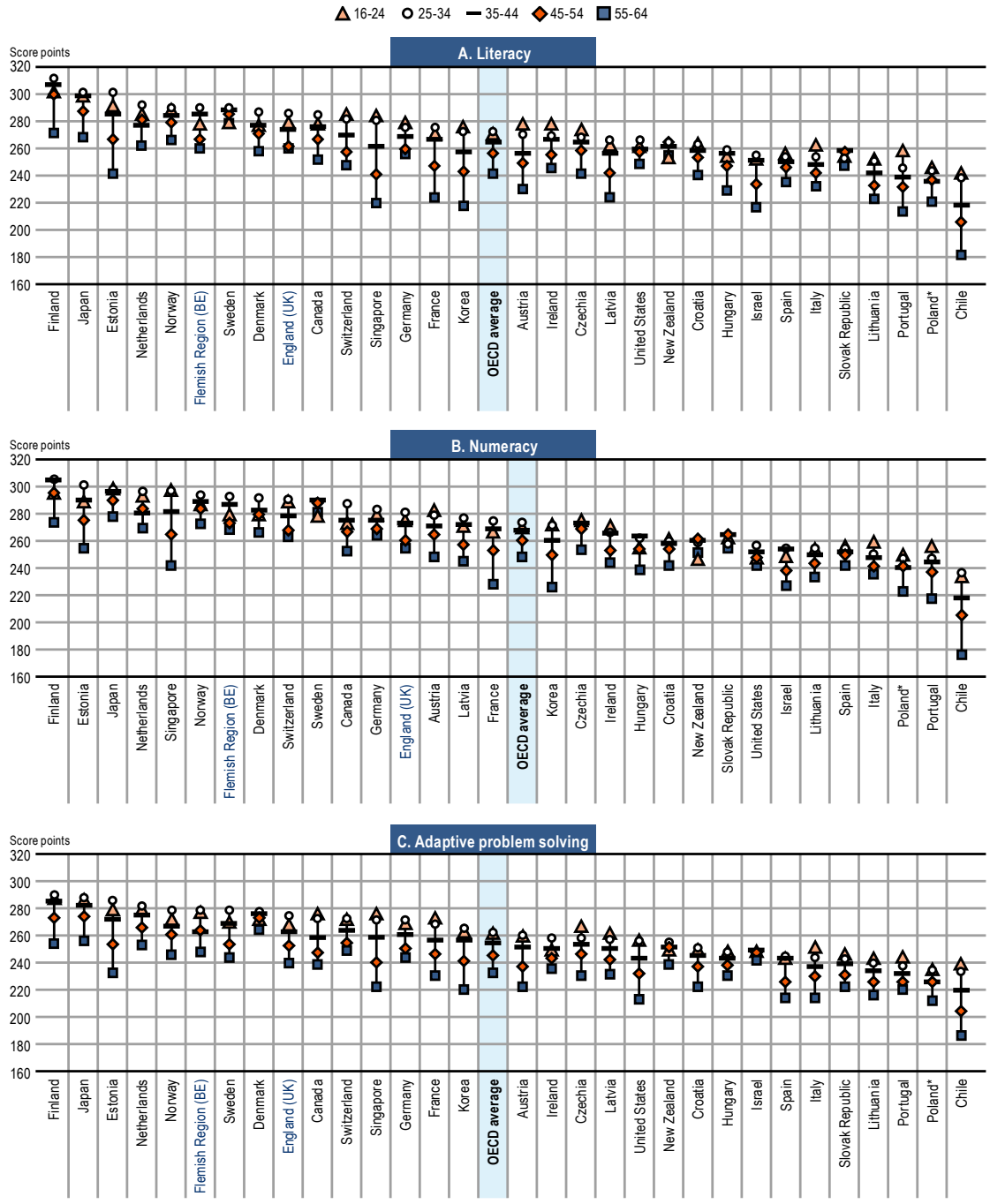
The 2023 Survey of Adult Skills covers adults aged 16 to 65 (born between 1957 and 2007), spanning the end of compulsory schooling, through working age and up to the onset of retirement. Not all differences in skills among adults of different ages can be attributed to ageing itself (i.e. the consequences of growing older, including factors such as neurological development or behavioural maturation). Some of those differences can be due to cohort effects (which reflect the different experiences that adults born at different times go through, for example different educational policies) as well as to period effects (which capture influences that vary through time, like macro-economic conditions, or events like the COVID-19 pandemic). Cross-sectional data such as those collected in the Survey of Adult Skills, which only provide a snapshot of the skills of the population at a particular point in time, do not allow age, cohort and period effects to be disentangled. Chapter 3 uses information from the two cycles of the survey to separately investigate age and cohort effects.

Figure 2.7 shows the average proficiency of adults in different age groups in literacy, numeracy and adaptive problem solving. In the vast majority of countries and economies, adults aged 55-65 display the lowest average proficiency in all domains. The exceptions are New Zealand and Sweden, where 16-24 year-olds achieved the lowest average proficiency in numeracy in both countries. In literacy, New Zealand is the only country where 16-24 year-olds achieved the lowest average proficiency.

In most countries and economies, the highest average proficiency is observed among either 25-34 year-olds or 16-24 year-olds. Adults aged 25-34 achieved the highest average proficiency for literacy in 15 out of 31 countries and economies, in 14 for numeracy, and in 16 for adaptive problem solving while those aged 16-24 achieved the highest average proficiency in 14 countries and economies for literacy, 12 for numeracy, and 14 for adaptive problem solving. The exceptions in literacy are New Zealand, where 45-54 year-olds scored the highest on average, and the Slovak Republic, where the best-performing adults were 35-44 year-olds. In numeracy, 35-44 year-olds scored highest in Finland, Hungary and Sweden, while 45-54 year-olds scored highest in New Zealand and the Slovak Republic. In adaptive problem solving, 35-44 year-olds scored highest in the Slovak Republic.

Figure 2.7. Average proficiency in key information-processing skills, by age

Literacy, numeracy and adaptive problem solving



Note: Adults aged 16-65; includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1).
*Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the average proficiency among 25-34 year-olds.
Source: Table A.2.4 (L, N, A) in Annex A.

Differences in skills proficiency related to educational attainment

Skills are developed, enhanced and accumulated over a lifetime through education and training opportunities. The various skills that adults possess at any given time are determined by their past access to learning opportunities. This process begins during early childhood education and care, continues through formal school education, and extends into adulthood through formal, non-formal and informal learning at work, in leisure time activities and at home. Assessing the relationship between education, learning opportunities and the skills proficiency of adults is therefore complex, as skill development is a dynamic process in which the skills acquired at earlier stages in life determine the learning at later stages in life (Cunha et al., 2006[12]).

Educational reforms and the expansion of access to formal education over the past decades have affected adults' skills. Educational attainment levels have risen, a trend that is reflected in the expansion of tertiary attainment rates. Between 2000 and 2021, the share of 25-34 year-olds with tertiary attainment increased from 27% to 48% (OECD, 2022[13]). Opportunities for adults to advance their education, especially through online learning, have expanded. Although the COVID-19 pandemic had adverse effects, including school closures (Grewenig et al., 2021[14]; Werner and Woessmann, 2021[15]) and reduced informal learning opportunities (OECD, 2021[1]), it has also led to a substantial increase in online learning opportunities for adults (OECD, 2020[16]).

While skills can be developed through various education and training settings, formal education plays a pivotal role in the development of foundation skills (Desjardins, 2003[17]; OECD, 2013[18]). Historically, educational attainment or years of schooling have been used as the main proxy for the stock of human capital (Barro and Lee, 2013[19]; Hanushek and Woessmann, 2011[20]). However, this proxy is imperfect as it overlooks factors unrelated to educational attainment that affect skill development (Hanushek and Woessmann, 2011[20]; 2008[21]). Some of these factors are related to education systems – such as school quality, tracking, the share of privately funded schools and government systems (Green and Pensiero, 2016[22]; 2015[23]) – while others are related to the family, as elucidated further below.

Formal education has a crucial role in providing children, adolescents and adults with adequate proficiency in foundation skills like literacy, numeracy and problem solving. It is important to examine whether it is fulfilling this mission. This section analyses the relationship between the highest educational qualification obtained by adults and their foundation skills. However, it is important to acknowledge that the skills of the working-age population are not solely a product of their formal education and the design of school systems and selection processes (Silva et al., 2020[24]). They are also influenced by their occupation, their educational choices (in terms of the field of study, for instance), and the availability of non-formal and informal learning opportunities. It is also important to keep in mind that literacy, numeracy and adaptive problem solving are only some of the skills that are developed in formal education. In fact, formal education develops a wide range of skills, including subject-specific skills, social and emotional skills (OECD, 2024[25]), and creative thinking (OECD, 2024[26]).

Average proficiency, by educational attainment

The 2023 Survey of Adult Skills finds that higher levels of educational attainment are associated with higher average proficiency in literacy, numeracy and adaptive problem solving (Figure 2.8). Tertiary-educated adults scored 33 points higher in literacy, on average, than those with upper secondary attainment, who in turn scored, on average, 43 points higher than adults who did not complete upper secondary education (Figure 2.8, Panel A). These findings confirm the relationship already observed in the first cycle of the Survey of Adult Skills (OECD, 2016[4]). The analysis here is limited to those aged 25-65, as they are the most likely to have completed their formal education. Younger adults are a much more heterogeneous population, as only some of them have left education, while others will still be following a variety of educational paths.

Cross-country comparisons of the proficiency of adults at either the same level of educational attainment or at different levels, can be informative about how well different educational systems succeed in building their citizens' skills. Adults with the same level of qualifications (e.g. tertiary) may perform better on average in one country or economy than their equally qualified peers in another. When adults with different levels of attainment (e.g. tertiary and upper secondary) are compared, those with upper secondary attainment in one country might be found to perform better than tertiary-educated adults in the other, on average.

Such comparisons show that the expected pattern of higher proficiency among individuals with higher levels of qualification does not always hold across borders: adults with relatively lower levels of educational attainment may have relatively high skills proficiency. For example, adults with upper secondary attainment in Finland scored 288 points in literacy on average, outperforming tertiary-educated adults in 19 out of 31 participating countries and economies (Figure 2.8, Panel A).

Conversely, highly educated adults in some countries might have lower proficiency than adults with lower attainment in other countries. For example, tertiary-educated adults in Chile scored an average of 249 points in literacy, below the average for those with upper secondary attainment in 17 other participating countries and economies.

These results underline the value of the Survey of Adult Skills in providing information about differences in skills between and within countries that statistics on educational attainment are unable to fully capture. The considerable differences can be attributed to cross-country differences in the quality of their education systems, but also to differences in the provision and organisation of education and lifelong learning opportunities. These include factors such as when learning takes place (e.g. childhood, youth or adulthood), where it takes place (formal, informal and non-formal), how learning is facilitated (e.g. whether there are barriers to participation), and what is learned (e.g. skills, attitudes and values) (OECD, 2021[1]).

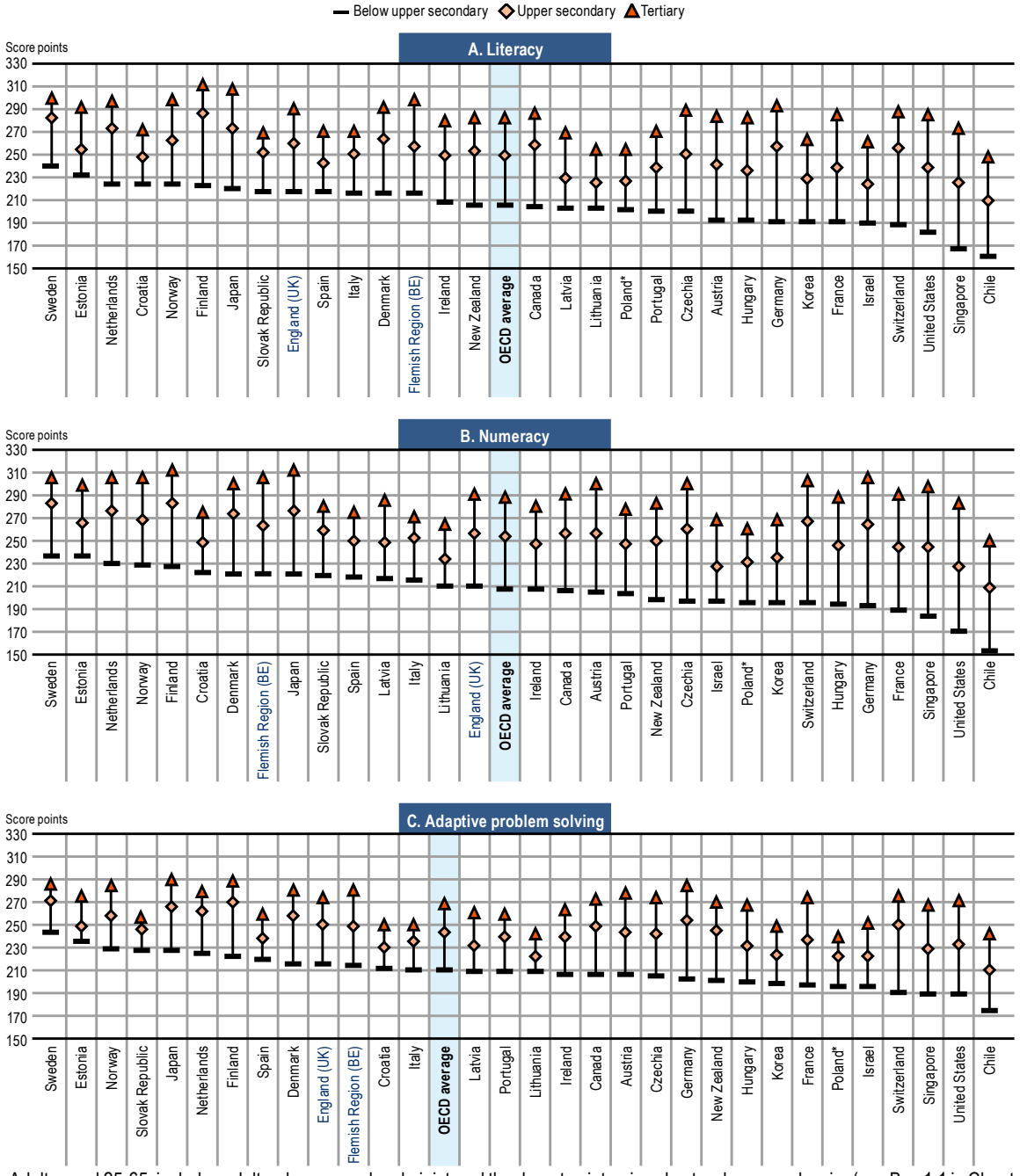
Differences in proficiency between highly and low-educated adults

The size of the skills gap between highly educated adults (those with tertiary education) and low-educated ones (with below upper secondary education) varies across participating countries and economies (Figure 2.9). However, France, Germany, Singapore, Switzerland and the United States consistently have the widest gaps across all domains: exceeding 94 points in literacy, 102 points in numeracy and 76 points in adaptive problem solving. Conversely, the smallest gaps are in Croatia, Italy, Lithuania, Poland, the Slovak Republic and Spain for literacy, at 54 points and less, and in Croatia, Italy, Lithuania, the Slovak Republic and Spain for numeracy, at less than 61 points. In adaptive problem solving the five countries with the smallest average gaps (below 40 points) are Croatia, Estonia, Lithuania, the Slovak Republic and Spain.

Figure 2.9 also presents so-called "adjusted" differences. These take into account the fact that adults at different levels of education also differ in other dimensions that are independently related to skills proficiency. Box 2.2 describes the interpretation of adjusted versus unadjusted differences and the information they provide to countries, economies and policy makers. Estimates of adjusted differences control for age, gender, immigrant background, the language spoken at home and parents' educational attainment. These socio-demographic characteristics, however, can only account for a small part of the observed gaps, confirming the important role played by education in explaining skills differences.

Figure 2.8. Average proficiency in key information-processing skills, by educational attainment

Literacy, numeracy and adaptive problem solving



Note: Adults aged 25-65; includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). Respondents who were administered the doorstep interview reported the number of years they spent in the educational system and are included in the calculation of all estimates assuming a correspondence between years of education and educational levels as follows: No education or less than 10 years of education is considered equivalent to less than upper secondary education, between 11 and 13 years of education is considered equivalent to upper secondary education, and more than 13 years of education is considered equivalent to tertiary education. Educational attainment is based on the International Standard Classification of Education (ISCED) 2011, grouped into below upper secondary (ISCED 1, 2 and 3 short), upper secondary (ISCED 3 and 4) and tertiary (ISCED 5, 6, 7 and 8). Where possible, foreign qualifications are included as the closest corresponding level in the respective national education systems. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the proficiency of adults with below upper secondary attainment.

Source: Table A.2.5 (L, N, A) in Annex A.

Figure 2.9. Differences in key information-processing skills, by educational attainment

Adjusted and unadjusted differences in mean literacy, numeracy and adaptive problem solving scores between tertiary and below upper secondary educated adults (tertiary *minus* below upper secondary educated)

Note: Adults aged 25-65; includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). Respondents who were administered the doorstep interview reported the number of years they spent in the educational system and are included in the calculation of all estimates assuming a correspondence between years of education and educational levels as follows: No education or less than 10 years of education is considered equivalent to less than upper secondary education, between 11 and 13 years of education is considered equivalent to upper secondary education, and more than 13 years of education is considered equivalent to tertiary education. Educational attainment is based on the International Standard Classification of Education (ISCED) 2011, grouped into below upper secondary (ISCED 1, 2 and 3 short), upper secondary (ISCED 3 and 4) and tertiary (ISCED 5, 6, 7 and 8). Where possible, foreign qualifications are included as the closest corresponding level in the respective national education systems. Unadjusted differences are the differences between the two averages for each contrast category. Adjusted differences are based on a regression model that takes into account differences associated with gender, age, immigrant background, language spoken at home and parents' educational attainment. Doorstep interview cases for which parental education information is not collected are included in the regression by assigning them to a separate category. All differences are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the unadjusted difference in proficiency.

Source: Table A.2.5 (L, N, A) in Annex A.

Adults can achieve their highest formal qualification through several pathways. These pathways are, among other things, determined by the policies and practices used to select and sort students during formal schooling as well as by adults' educational choices (OECD, 2020[27]). These choices include the orientation of an educational programme (general, vocational or combined) and the field of study. Box 2.3 discusses how differences in the field of study chosen by tertiary-educated adults are related to their proficiency in numeracy, focusing in particular on the skills of adults who studied science, technology, engineering or mathematics (STEM programmes).

Box 2.2. Adjusted versus non-adjusted differences: Understanding variations in skills proficiency across different socio-demographic groups

This chapter presents differences in proficiency between subgroups both before (unadjusted) and after (adjusted), accounting for differences in socio-demographic characteristics that are associated with skills proficiency. Unadjusted differences inform policy makers about the size of the real gaps in performance between groups. Adjusted differences are informative about the factors that are driving and potentially explaining these observed gaps. Adjusted differences are estimated through linear regressions. The estimated coefficient of the variable of interest captures adjusted differences. Large differences between adjusted and unadjusted coefficients suggest that the groups analysed differ according to other factors that are correlated with skills proficiency.

For example, proficiency differences between low- and highly educated adults might partly be due to the fact that both groups differ according to other dimensions which are independently correlated with proficiency, for instance, average age. Data from the 2023 Survey of Adult Skills show that in some countries, adults aged 55-65 are over-represented among the low-educated. For example, in France, 33% of low-educated adults are over 55, while only 16% of highly educated adults fall in that age range (see Table B.3.17 in Annex B). To the extent that older adults, irrespective of their level of education, perform worse on the assessment, the average score of low-educated adults would be impacted by something that has little to do with education levels. Adjusted differences control for this by comparing the proficiency of low-educated and highly educated adults with similar characteristics. This gives a more accurate picture of the extent to which observed differences can be attributed to differences in levels of education.

In this chapter, adjusted estimates control for differences in age, educational attainment, gender, immigrant background, language spoken at home and parents' educational attainment, as these factors are plausibly independently correlated with proficiency. Comparing adjusted and unadjusted differences highlights the extent to which the adults that are compared differ along the characteristics that are controlled for. For example, in Estonia, unadjusted and adjusted differences in literacy (61 and 59 points, Figure 2.9) are very similar, suggesting that low-educated and highly educated do not differ much in terms of socio-demographic characteristics, or that the effect of any differences in characteristics cancel each other out. In contrast, in Finland, the large difference between the unadjusted and adjusted differences in literacy (89 and 51 points, Figure 2.9) hints at the fact that low- and highly educated adults differ along other dimensions, beyond their education.

Box 2.3. Field of study choices and proficiency in numeracy among tertiary-educated adults

Individuals can choose between various fields in their tertiary education.[1] Over the past decades, technological progress has increased the demand for adults with the right mix of skills to work in technology-rich environments. This has raised the economic returns of obtaining degrees in science, technology, engineering and mathematics (STEM) (OECD, 2022[13]).[2] Several countries, including Denmark and the United States, have launched initiatives to increase the number of students enrolled in STEM programmes; encourage learners' interest in such fields; and foster diversity, equity and inclusion in STEM fields (OECD, n.d.[28]; Office of Science and Technology Policy, 2021[29]).

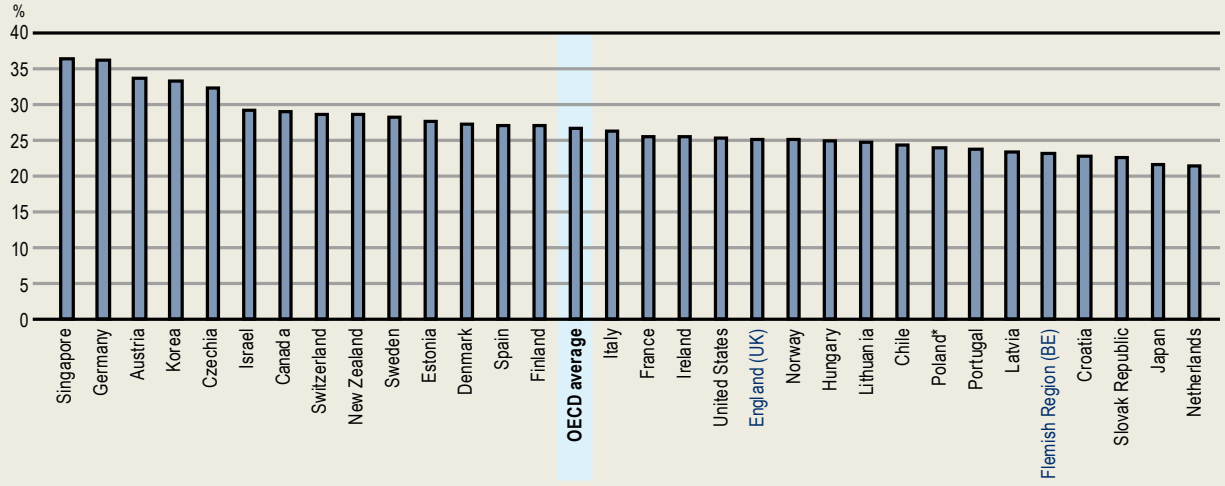
On average across OECD countries and economies, 27% of tertiary-educated adults have a STEM degree. This share varies from more than 36% in Germany and Singapore to around 21% in the Netherlands (Figure 2.10).

Adults' field of study is correlated with differences in numeracy proficiency. This can be attributed both to the fact that access and success to STEM programmes require a high level of numeracy skills, and to the fact that STEM programmes (and employment in STEM sectors) help develop such skills. Among tertiary-educated 25-65 year-olds, the average numeracy proficiency of those who studied in a STEM field is 304 points compared to 285 points for those who studied in non-STEM fields (Figure 2.11).

Significant differences in average numeracy proficiency between adults with a STEM and a non-STEM tertiary education range from 28 points in Japan to 5 points in Croatia (see Table A.2.6 (N) in Annex A). For other domains, adults who studied a STEM field have an average advantage of 6 points in literacy and 10 points in adaptive problem solving (see Table A.2.6 (L) and Table A.2.6 (A) in Annex A).

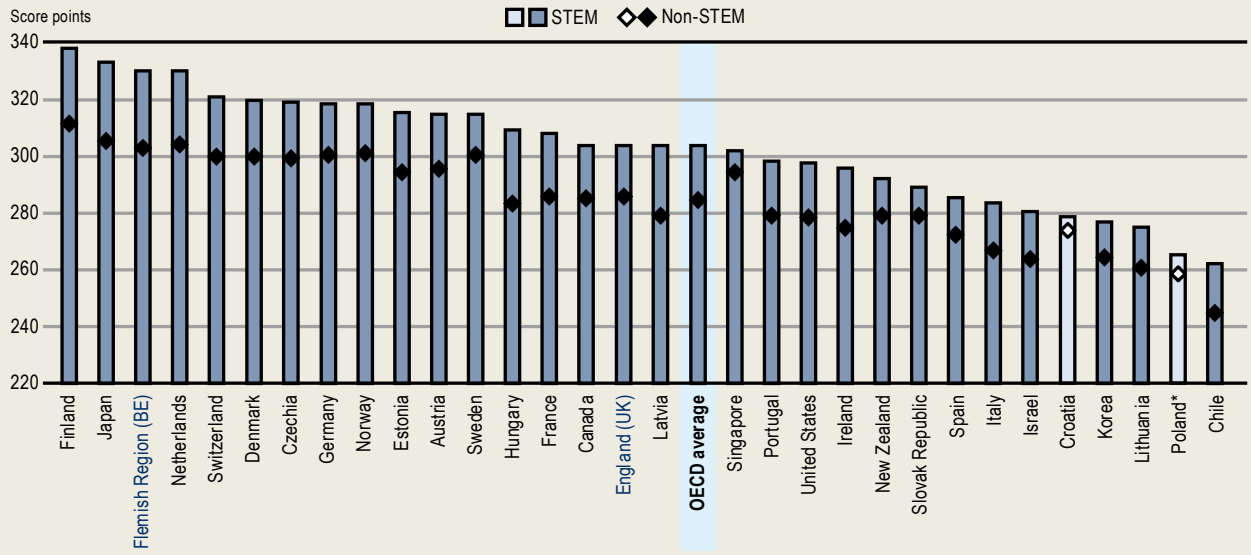
Figure 2.10. Share of tertiary-educated adults who studied STEM fields

Share of tertiary-educated 25-65 year-olds who obtained their highest qualification in a science, technology, engineering or mathematics (STEM) field



Note: Does not include adults who were only administered the doorstep interview due to a language barrier, as information on field of study was not collected for those respondents (see Box 1.1 in Chapter 1). STEM stands for science, technology, engineering and mathematics. Educational attainment is based on the International Standard Classification of Education (ISCED) 2011, grouped into below upper secondary (ISCED 1, 2 and 3 short), upper secondary (ISCED 3 and 4) and tertiary (ISCED 5, 6, 7 and 8). Where possible, foreign qualifications are included as the closest corresponding level in the respective national education systems. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order based on the percentage of tertiary-educated adults who studied STEM fields.
Source: Table B.3.2 in Annex B.

Figure 2.11. Average numeracy proficiency among tertiary-educated adults, by field of study



Note: Adults aged 25-65; does not include adults who were only administered the doorstep interview due to a language barrier, as information on field of study was not collected for those respondents (see Box 1.1 in Chapter 1). STEM stands for science, technology, engineering and mathematics. Educational attainment is based on the International Standard Classification of Education (ISCED) 2011, grouped into below upper secondary (ISCED 1, 2 and 3 short), upper secondary (ISCED 3 and 4) and tertiary (ISCED 5, 6, 7 and 8). Where possible, foreign qualifications are included as the closest corresponding level in the respective national education systems. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the proficiency of tertiary-educated adults who studied STEM fields.

Source: Table A.2.6 (N) in Annex A.

1. Within the International Standard Classification of Education (ISCED), programmes and related qualifications can be classified by the field of education and training as well as the level. The 2023 Survey of Adult Skills distinguishes between the following fields of study: economics, business and administration; law; health; welfare; social and behavioural sciences; journalism and information; information and communication technologies (ICT); natural sciences, mathematics and statistics; engineering and manufacturing; construction; agriculture, forestry, fisheries and environmental studies; personal and community services; security and transport; education and teacher training; humanities, languages and arts; and no main area of study or emphasis (if it was a general education programme).

2. In the 2023 Survey of Adult Skills, adults educated in a STEM field are defined as having obtained their highest educational qualification in one of the following fields: ICT; natural sciences, mathematics and statistics; engineering and manufacturing; or construction.

Differences in skills proficiency related to gender

Promoting gender equality is not just a matter of social justice: it also has the potential to enhance growth, productivity, competitiveness and the sustainability of economies (Klasen, 2002[30]). While efforts have been made to reduce gender gaps in various aspects of life, disparities persist, including in academic performance (OECD, 2023[31]; 2016[4]), financial literacy (Monticone, 2023[32]), physical skills (Borgonovi, Seitz and Vogel, 2022[33]), labour-market outcomes (OECD, 2023[34]) and leadership positions (OECD, 2019[35]).

In recent years, historical gender gaps in education that originally favoured men have narrowed and, in some cases, even reversed. For example, the share of women aged 25-34 with tertiary education has consistently risen over the past decades, overtaking the share of men; as of 2023, the gap in OECD countries is 13 percentage points in favour of women, on average, and widening (Lee and Lee, 2016[36]; OECD, 2024[37]; 2021[38]). Despite this, women continue to face considerable disadvantages. For example, women and girls, on average, score lower in mathematics and numeracy performance (OECD, 2023[31]; 2019[39]). Women are also under-represented in STEM programmes, as men and women tend to make different choices about what to study (OECD, 2023[40]; 2022[13]). Box 2.4 shows differences in the field-of-study choices between men and women, along with associated gaps in numeracy proficiency. There are also worrying gender gaps to the disadvantage of men and boys. For example, among 15-year-olds, boys make up a larger share of low performers in reading (31% of boys and 22% of girls) (OECD, 2023[31]) and on average 57% of students who repeat a grade are boys (OECD, 2024[37]).

In the 2023 Survey of Adult Skills women scored higher in literacy, while men scored higher in numeracy and adaptive problem solving, on average. Men are also more likely to be low performers in literacy while women are more likely to be low performers in numeracy.

Box 2.4. Educational choices and gender differences

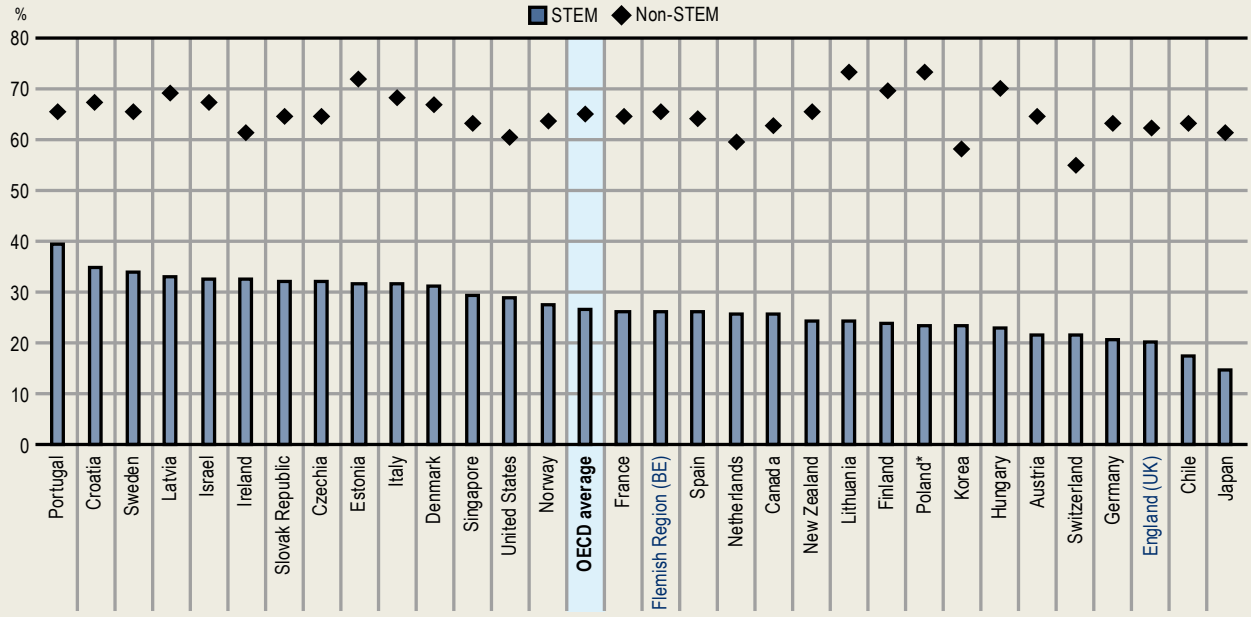
Men and women make different educational choices. At the age of 15, girls are less likely than boys to plan to pursue a career that involves a lot of mathematics. Later in life, women are less likely to enrol in STEM programmes (OECD, 2023[40]; 2022[13]), and they are also more likely to drop out of them before graduating (OECD, 2022[13]).

This leads to the under-representation of women in the technology sector, which matters not only for individual outcomes, but also for societies more broadly (OECD, 2024[41]). For example, in the European Union, 18% of information and communications technology (ICT) specialists are women (OECD, 2024[41]). Under-representation of women leads to less diverse work environments which can have important consequences. For example, biases in artificial intelligence (AI) systems are attributed to biased data used to train algorithms, and de-biasing AI systems requires the awareness that these biases exist, which is more likely with diverse teams (Vallee, 2021[42]).

On average, across participating OECD countries, less than one-third of tertiary-educated adults who graduated from a STEM field are women (Figure 2.12). In contrast, women are over-represented in non-STEM fields (65%). The share of women with a STEM degree is highest in Portugal at 39% and lowest in Japan at 15%. Women outnumber men among the graduates of non-STEM fields in all countries, with shares ranging from 73% in Lithuania and Poland to 55% in Switzerland.

Figure 2.12. Share of women among STEM and non-STEM graduates

Share of tertiary-educated 25-65 year-olds who graduated from each field of study who are women



Note: Does not include adults who were only administered the doorstep interview due to a language barrier, as information on field of study was not collected for those respondents (see Box 1.1 in Chapter 1). STEM stands for science, technology, engineering and mathematics. Educational attainment is based on the International Standard Classification of Education (ISCED) 2011, grouped into below upper secondary (ISCED 1, 2 and 3 short), upper secondary (ISCED 3 and 4) and tertiary (ISCED 5, 6, 7 and 8). Where possible, foreign qualifications are included as the closest corresponding level in the respective national education systems. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the percentage of STEM graduates who are women.

Source: Table B.3.4 in Annex B.

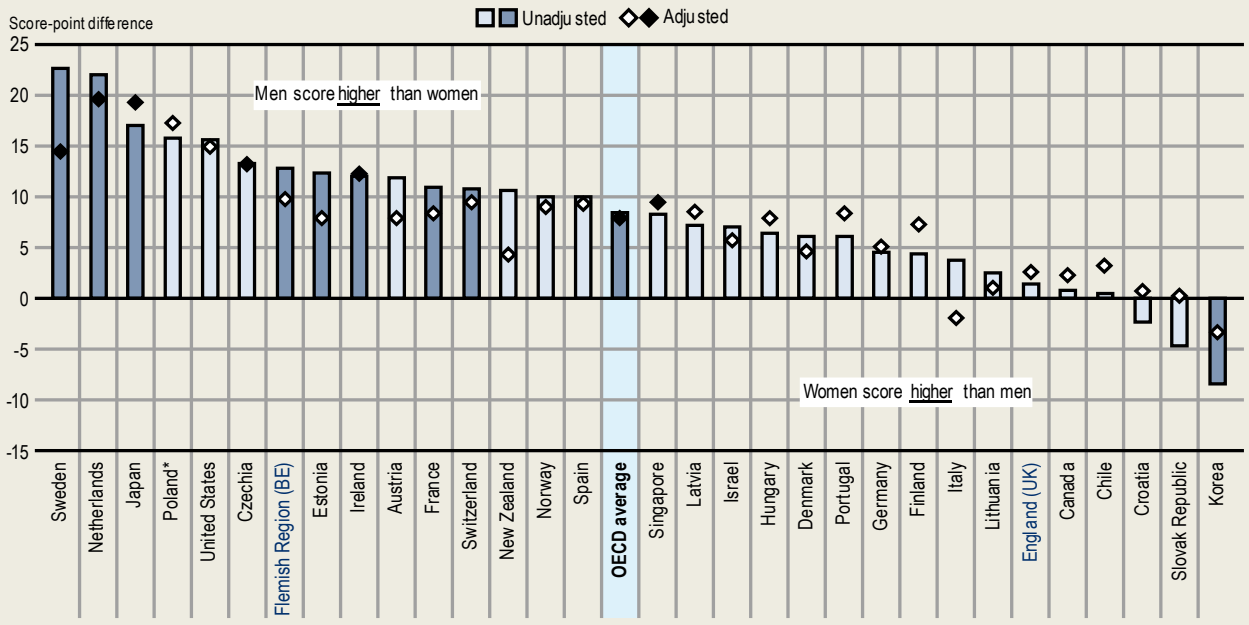
When comparing tertiary-educated men and women who have studied STEM fields, data from the 2023 Survey of Adult Skills show that, on average, women score 8 points lower in numeracy (Figure 2.13). This gap is narrower than the gap among all tertiary-educated adults (16 points; see Table A.2.9 (N) in Annex A). Accounting for other relevant characteristics only marginally helps to explain this gap.

Among tertiary-educated adults who have chosen STEM fields, women have a small and statistically insignificant advantage in literacy over men (1 point); this gap increases to 2 points and becomes statistically significant after accounting for differences in other background characteristics. In contrast, men in this group have a small but statistically significant advantage over women in adaptive problem solving (3 points), which reduces to 2 points after accounting for relevant socio-demographic characteristics (see Table A.2.9 (L, A) in Annex A).

These results show that the gender gap in numeracy persists even when comparing men and women who made similar educational choices. Factors other than the observable socio-demographic characteristics examined in this report would need to be investigated in order to understand the reasons behind such differences and to design initiatives that aim at reducing this gender gap. The first cycle of the Survey of Adult Skills also found an advantage for men in numeracy (10 points) among adults working in STEM occupations (OECD, 2015[43]).

Figure 2.13. Gender differences in numeracy among STEM graduates

Adjusted and unadjusted differences in average numeracy scores between tertiary-educated men and women who studied STEM fields (men *minus* women)



Note: Adults aged 25-65. Does not include adults who were only administered the doorstep interview due to a language barrier, as information on field of study was not collected for those respondents (see Box 1.1 in Chapter 1). STEM stands for science, technology, engineering and mathematics. Educational attainment is based on the International Standard Classification of Education (ISCED) 2011, grouped into below upper secondary (ISCED 1, 2 and 3 short), upper secondary (ISCED 3 and 4) and tertiary (ISCED 5, 6, 7 and 8). Where possible, foreign qualifications are included as the closest corresponding level in the respective national education systems. Unadjusted differences are the differences between the two averages for each contrast category. Adjusted differences are based on a regression model that takes into account differences associated with age, immigrant background, language spoken at home and parents' educational attainment. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the unadjusted difference between men and women who studied STEM fields.
Source: Table A.2.9 (N) in Annex A.

Differences in proficiency between men and women

On average across participating OECD countries and economies, women scored 3 points higher than men in literacy, while men outscored women by 10 points in numeracy and 2 points in adaptive problem solving (Figure 2.14). After accounting for relevant background characteristics, the adjusted gender gap shrinks to 1 point in favour of women in literacy (which is not statistically significant), but widens to 12 points in numeracy and 4 points in adaptive problem solving in favour of men. One potential explanation for this increase in the size of the adjusted coefficients in numeracy and adaptive problem solving is gender differences in educational attainment. For example, on average, 48% of women are tertiary educated, but only 40% of men are (see Table B.3.3 in Annex B). As higher levels of education are normally associated with higher proficiency, adjusted differences control for the fact that women appear to underperform in the assessment, compared to what one would expect based on their level of education.

In literacy, women in 13 countries (Croatia, Estonia, Finland, France, Germany, Hungary, Israel, Latvia, Lithuania, the Netherlands, New Zealand, Norway and Poland) scored significantly higher than men on

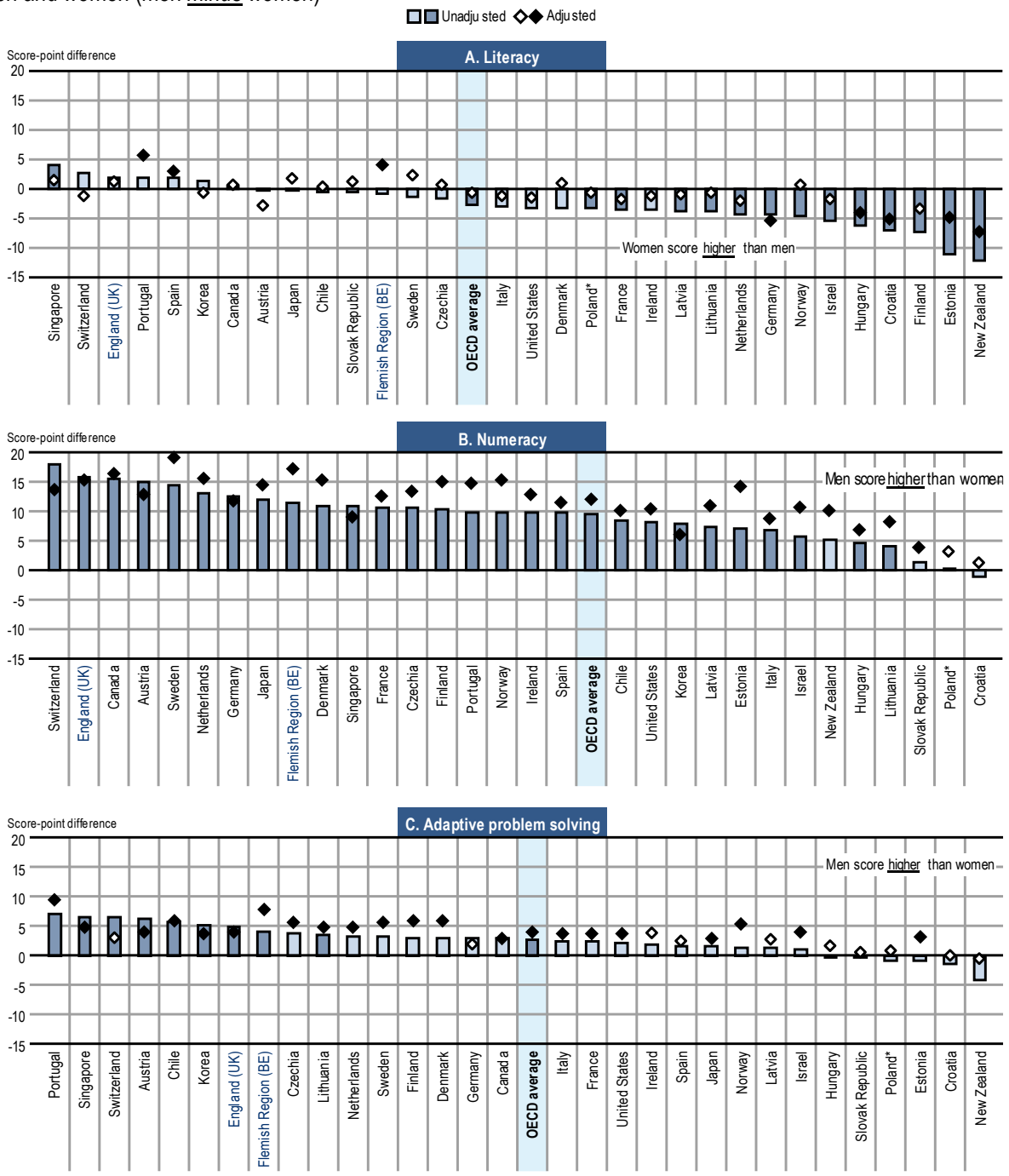
average before accounting for relevant background characteristics, while in Singapore, men achieved significantly higher average literacy proficiency than women. In numeracy, men scored, on average, significantly higher than women in 27 countries and economies. In adaptive problem solving, in nine countries and economies (Austria, Chile, England [United Kingdom], the Flemish Region [Belgium], Korea, Lithuania, Portugal, Singapore and Switzerland) men scored significantly higher than women, on average. The direction of the gender gap in numeracy is the same as in the first cycle of the survey (OECD, 2019[39]); for literacy, however, the gender gap has reversed.

On average across participating OECD countries and economies, the direction of the gender gaps observed in the 2023 Survey of Adult Skills in literacy and numeracy mirrors those found in the OECD Programme for International Student Assessment (PISA).[3] In 2022, 15-year-old boys scored on average 9 points above girls in the PISA mathematics assessment, while girls had a 24-point advantage in reading (OECD, 2023[31]). Although the average gender gaps in proficiency in PISA and the 2023 Survey of Adult Skills point in the same direction, the magnitude of the gaps cannot be directly compared, as PISA and the Survey of Adult Skills use two different reporting scales. However, it is possible to express gender gaps in the two surveys relative to their respective average standard deviations (55 points in literacy and 58 points in numeracy in the 2023 Survey of Adult Skills; and 90 points in mathematics and 101 points in reading in PISA). When dividing the gender gap by the standard deviation, the resulting effect size in reading is 24% of a standard deviation among 15-year-olds in PISA, compared to 5% of a standard deviation in literacy among adults in the 2023 Survey of Adult Skills. This suggests that the gender gap in literacy among adults is smaller than the gender gap in reading for 15-year old students. In contrast, the effect size is 10% of a standard deviation for mathematics in PISA, compared to 16% of a standard deviation for numeracy in the 2023 Survey of Adult Skills, suggesting a widening of the gap among adults. These findings are in line with previous studies that compared the proficiency of 15-year-olds in PISA with that of 27-year-olds in the first cycle of the Survey of Adult Skills (Borgonovi, Choi and Paccagnella, 2021[44]).

Observed gender disparities in academic performance tend to develop early in life due to prevailing stereotypical expectations and cultural norms within the social and cultural environment (González de San Román and De la Rica, 2020[45]). The empirical evidence suggests that gender stereotypes about mathematics ability emerge before any actual differences in achievement are observed (Cvencek, Meltzoff and Greenwald, 2011[46]). Boys also tend to be more confident than girls in tackling maths tasks (OECD, 2013[47]), while girls exhibit higher levels of mathematics anxiety (OECD, 2015[48]). Men are more likely than women to select fields of studies – and consequently occupations – that require more intense use of numeracy skills, which fosters their development. These could explain the widening gap in numeracy. The smaller literacy gap among adults may be explained by literacy being considered a more transversal skill that is developed irrespective of the field of study (Borgonovi, Choi and Paccagnella, 2021[44]).

Figure 2.14. Gender differences in key information-processing skills

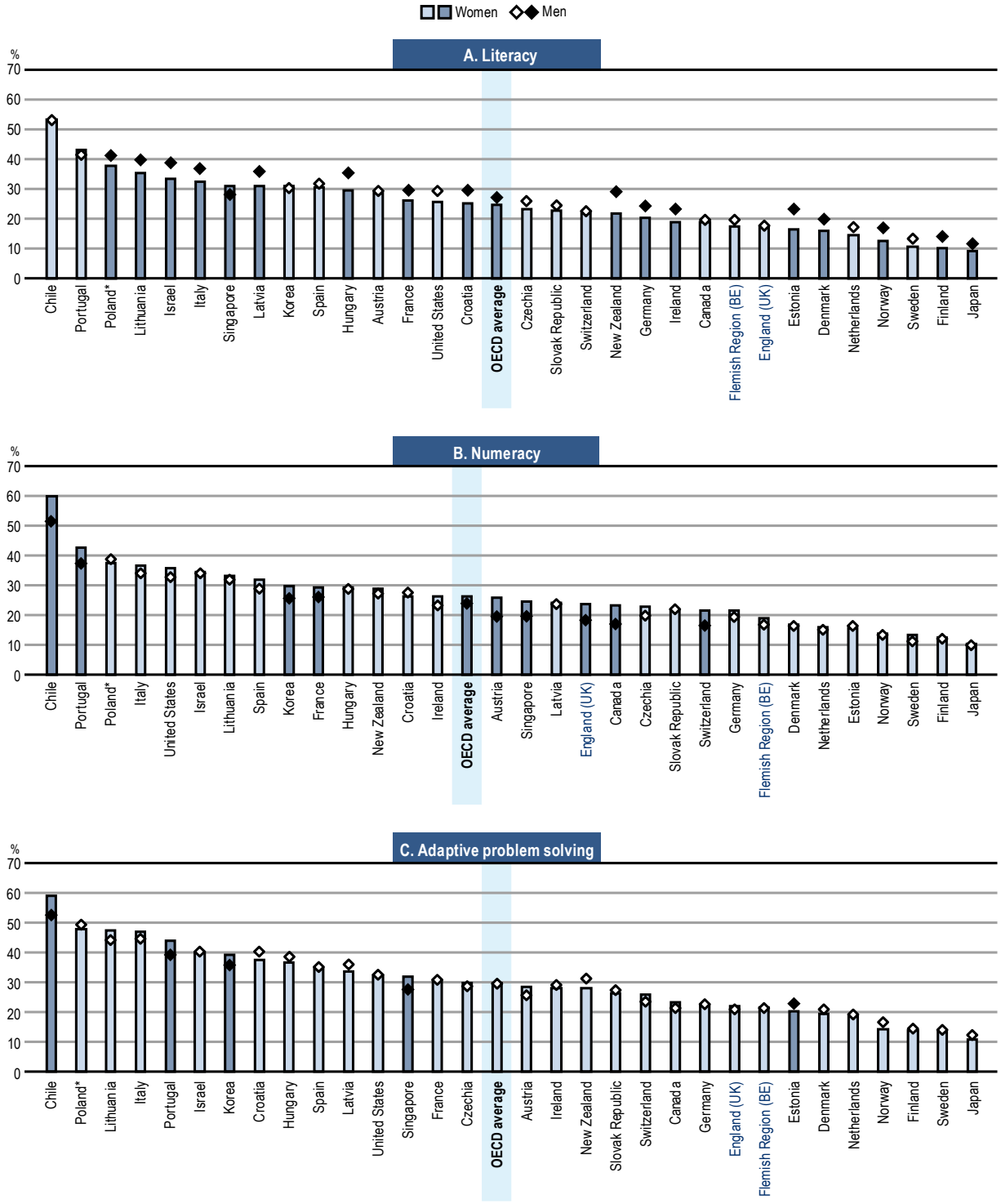
Adjusted and unadjusted differences in average literacy, numeracy and adaptive problem solving scores between men and women (men *minus* women)



Note: Adults aged 16-65. Includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). Unadjusted differences are the differences between the two averages for each contrast category. Adjusted differences are based on a regression model that takes into account differences associated with education, age, immigrant background, language spoken at home and parents' educational attainment. Doorstep interview cases for which parental education information is not collected are included in the regression by assigning them to a separate category. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide. *Countries and economies are ranked in descending order of the unadjusted proficiency difference between men and women.*
Source: Table A.2.7 (L, N, A) in Annex A.

Figure 2.15. Share of low performers in key information-processing skills, by gender

Share of adults who scored at or below Level 1 in literacy, numeracy and adaptive problem solving



Note: Adults aged 16-65. Includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the share of women scoring at or below Level 1.

Source: Table A.2.7 (L, N, A) in Annex A.

Gender differences among low performers

As higher proficiency in literacy, numeracy and adaptive problem solving are associated with a number of important economic and social outcomes for both individuals and countries (see Chapter 4), it is important to identify those scoring at low proficiency levels. This section examines differences in the percentage of low-performing men and women, i.e. those scoring at or below Level 1.

Figure 2.15 shows the percentage of low performers among men and women for all three skill domains. In literacy, 27% of men and 25% of women are low performing. In numeracy the shares are 24% of men and 26% of women. In adaptive problem solving, the share of low performers is not statistically different across genders (29% each).

Low literacy performance is more prevalent among men than among women in 16 countries. In Estonia, Hungary, Israel, Latvia and New Zealand, gender differences are particularly pronounced, with men 5 percentage points more likely than women to be low performers. The opposite is true in Singapore, where only 28% of men are low performing, compared to 31% of women.

In numeracy, the share of low-performing women is significantly higher than that of men in nine countries and economies (Austria, Canada, Chile, England [United Kingdom], France, Korea, Portugal, Singapore and Switzerland). In adaptive problem solving, Estonia has significantly more low-performing men, while Chile, Korea, Portugal and Singapore have significantly more low-performing women.

The over-representation of low performers among men in literacy and among women in numeracy mirrors findings from PISA. Among 15-year-olds, 31% of boys and 22% of girls are low performing in reading. In contrast, in mathematics, slightly more girls than boys are low performing (32% versus 31%).

Differences in skills proficiency related to immigrant background

Migration flows in OECD countries and economies have reached an unprecedented level, with over 6 million new permanent immigrants in 2022 (OECD, 2023[49]).[4] By mid-2023, OECD countries had recorded an influx of around 5 million refugees fleeing the war of aggression of Russia against Ukraine.[5] In light of these circumstances, public and policy discussions regarding the support and facilitation of migrants' integration into education systems, labour markets and society remain prominent on the political agenda.

This section distinguishes between adults who are foreign-born of foreign-born parents, native-born of foreign-born parents and native-born of native-born parents. On average, native-born adults of native-born parents make up 75% of the adult population across countries and economies participating in the Survey of Adult Skills (see Table B.3.10 in Annex B).[6] These shares range from 46% in Switzerland to 97% each in Japan and Korea and 99% in Poland. Foreign-born adults of foreign-born parents comprise the second largest group with 15%, with shares ranging between 1% in the Slovak Republic to 33% in Switzerland and New Zealand. Finally, native-born adults of foreign-born parents comprise 5% of respondents on average, with shares ranging from 1% in Czechia, Italy, Lithuania and Spain to 18% in Israel. When interpreting the average proficiency of immigrant groups or proficiency differences between native-born adults of native-born parents and immigrant groups, the size of the immigrant population should be considered (see Table B.3.10 in Annex B).

Average proficiency, by immigrant background

The 2023 Survey of Adult Skills found substantial differences in proficiency between adults with different immigrant backgrounds in each domain. In literacy, on average, native-born adults of native-born parents scored 267 points, native-born adults of foreign-born parents scored 260 points and foreign-born adults of foreign-born parents scored 222 points (Figure 2.16, Panel A). Average scores of native-born adults of native-born parents range from 219 points in Chile to 307 points in Finland. Among native-born adults of foreign-born parents, scores range from 233 points in Czechia to 289 points in Ireland. Among foreign-born adults of foreign-born parents, scores range from 188 points in Korea to 254 in Ireland.

In numeracy, on average, native-born adults of native-born parents scored 269 points, native-born adults of foreign-born parents scored 258 points and foreign-born adults of foreign-born parents scored 230 points (Figure 2.16, Panel B). Among native-born adults of native-born parents, scores range from 215 in Chile to 302 points in Finland. Among native-born adults of foreign-born parents, scores range from 224 points in Portugal to 280 points in Switzerland and 281 points in Canada. Among foreign-born adults of foreign-born parents, scores range between 190 points in Czechia and more than 260 points in Estonia (262), Canada (263) and Singapore (264).

In adaptive problem solving, on average, native-born adults of native-born parents scored 256 points, native-born adults of foreign-born parents scored 249 points and foreign-born adults of foreign-born parents scored 223 points (Figure 2.16, Panel C). Among native-born adults of native-born parents, scores range from 218 points in Chile to 280 points or higher in Norway (280 points), Sweden (282 points) and Finland (283 points). Among native-born adults of foreign-born parents, scores range from 224 points in Czechia to 271 points in both Ireland and Norway. Among foreign-born adults of foreign-born parents, scores range between 201 points in Czechia and 245 points or higher in Canada and Ireland (245 points each) and Sweden (246 points).

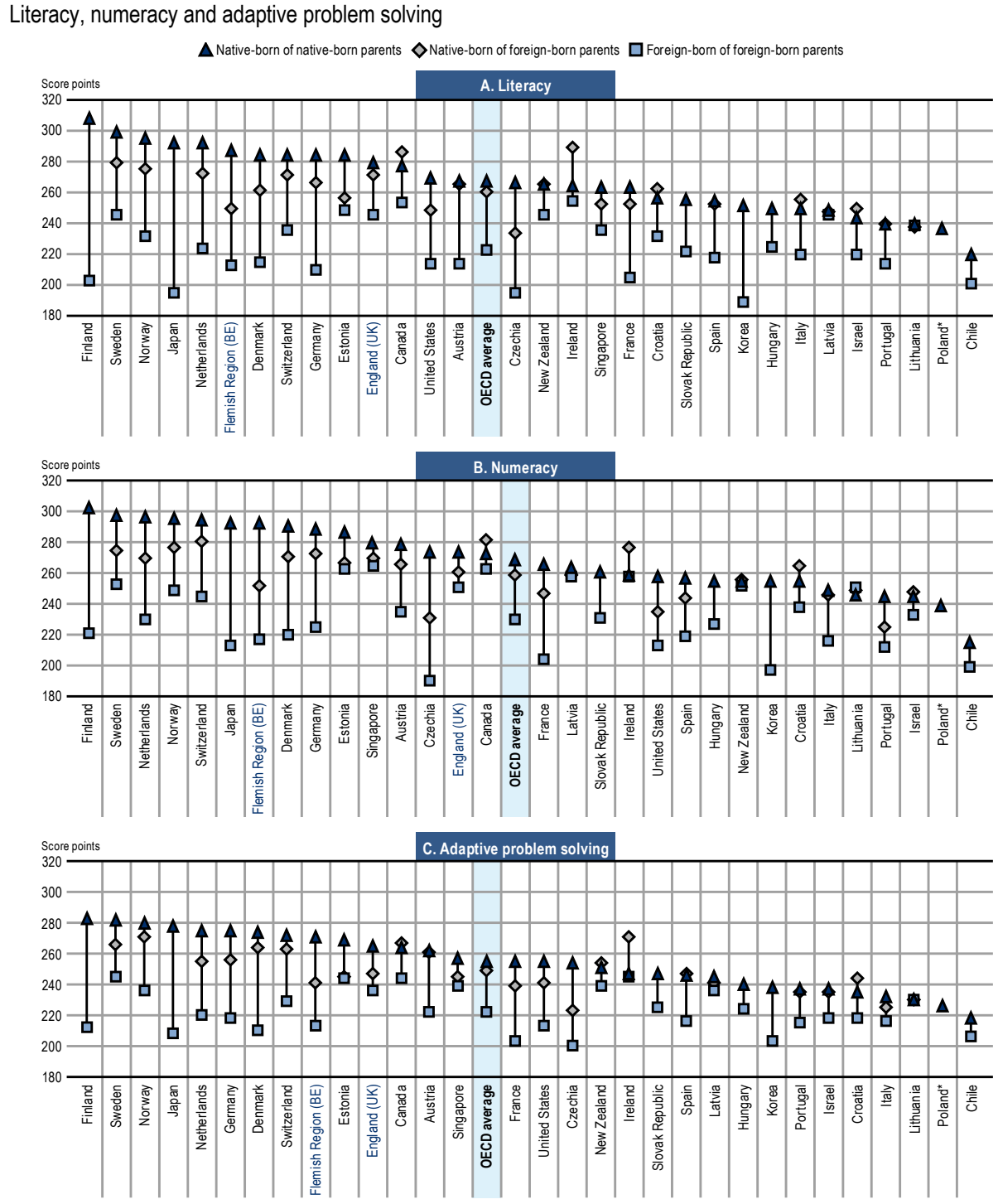
Figure 2.17 compares the literacy proficiency of native-born adults of native-born parents to that of foreign-born adults of foreign-born parents and native-born adults of foreign-born parents. On average, foreign-born adults of foreign-born parents scored 44 points lower than native-born adults of native-born parents (Panel A). The largest difference is observed in Finland (105 points), the lowest in Latvia (3 points) and Lithuania (1 point). Native-born adults of foreign-born parents scored 8 points lower than native-born adults of native-born parents in literacy, on average (Panel B). The largest difference was in the Flemish Region (Belgium), at 38 points. In contrast, in Ireland, native-born adults of foreign-born parents scored on average 25 points higher than native-born adults of native-born parents. Native-born adults of foreign-born parents also scored significantly higher than native-born adults of native-born parents in Canada (9 points) and Israel (6 points).

These differences (which are often substantial) partly stem from the fact that adults with a migration background are subject to multiple sources of disadvantage. It is therefore particularly important to take into account differences in other socio-demographic characteristics when interpreting skills differences among adults with different immigrant backgrounds. Accounting for these socio-demographic factors reduces the gap in literacy skills between foreign-born adults of foreign-born parents and native-born adults of native-born parents from 44 to 28 points (Figure 2.17, Panel A). In Finland, where the unadjusted proficiency gap between these groups is widest, it narrows from 105 to 61 points after accounting for socio-demographic characteristics. Among native-born adults of foreign-born parents, adjusted estimates reduce the gap from 8 to 4 points (Figure 2.17, Panel B).

Differences in numeracy and adaptive problem solving between native-born adults of native-born parents and adults with different immigrant backgrounds are provided in Table A.2.10 (N, A) in Annex A. In numeracy and adaptive problem solving the gap between native-born adults of native-born parents and foreign-born adults of foreign-born parents is 38 points and 32 points, while the gap between native-born adults of native-born parents to native-born adults of foreign-born parents is 10 points and 6 points.

The Survey of Adult Skills assesses adults' proficiency in literacy, numeracy and adaptive problem solving in a particular language(s) spoken in the participating countries and economies. Proficiency in the language of the assessment is therefore a crucial factor that must be taken into account when interpreting the results. Individuals who lack the language proficiency to participate in the survey are nonetheless included in this analysis, as some minimal information has been collected on them through the doorstep interview (see Box 1.1. in Chapter 1). Unsurprisingly, the large majority of adults that were only able to answer the doorstep interview were foreign-born (see Table B.3.18 in Annex B and Chapters 5 and 6 in OECD (2024[5])). Immigrants who speak the language in which the test is administered can naturally be expected to display higher proficiency than those who do not.

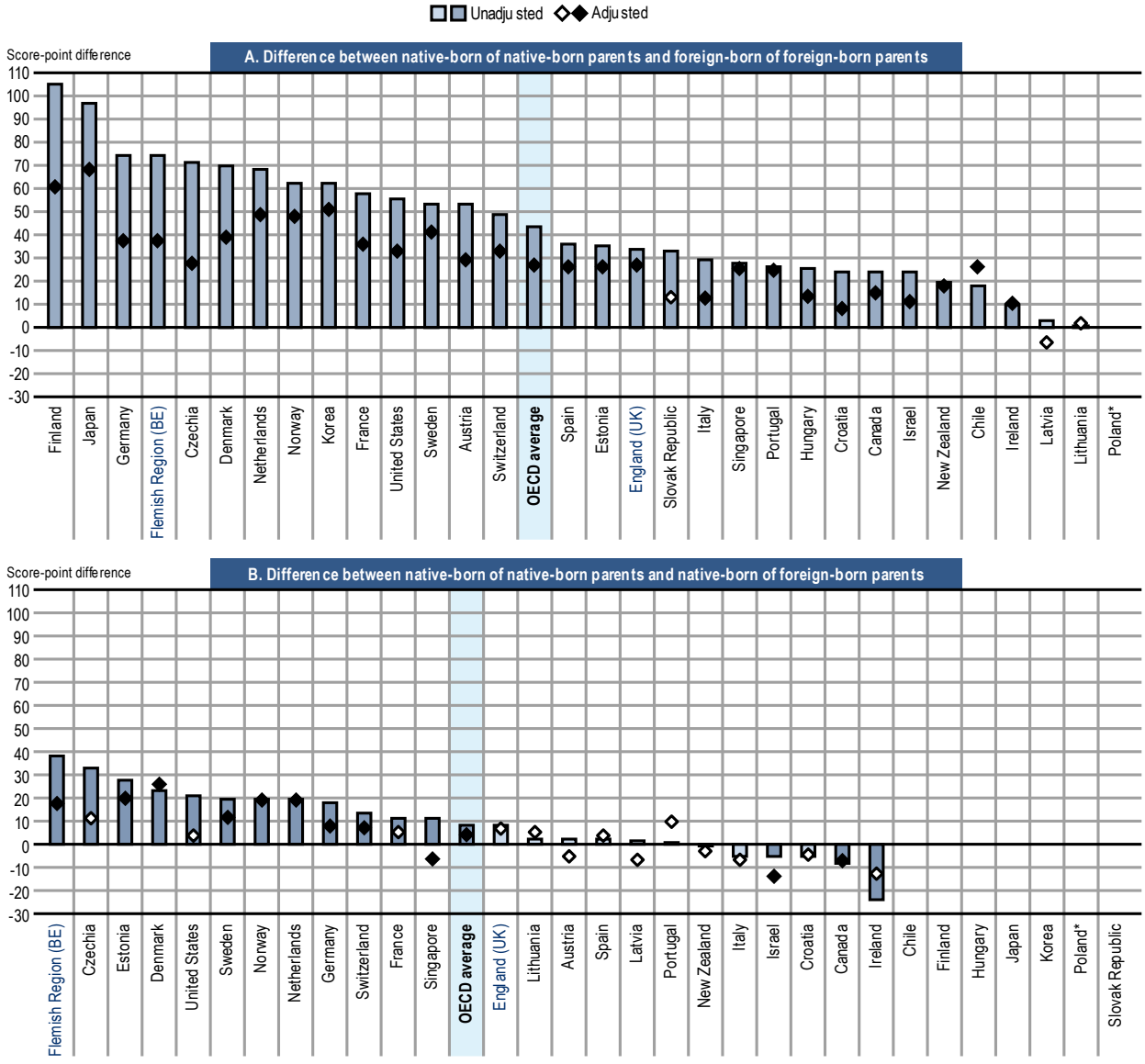
Figure 2.16. Average proficiency in key information-processing skills, by immigrant background



Note: Adults aged 16-65. Includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). Foreign-born of foreign-born parents include adults who reported being foreign-born in the doorstep interview, while native-born doorstep respondents are not part of any of the groups presented in this figure. Results for some groups in Chile, Finland, Hungary, Japan, Korea, Poland and the Slovak Republic are not reported because there are too few observations to provide reliable estimates. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide. *Countries and economies are ranked in descending order of the average proficiency of native-born adults of native-born parents*.
Source: Table A.2.10 (L, N, A) in Annex A.

Figure 2.17. Differences in literacy proficiency, by immigrant background

Adjusted and unadjusted differences in average literacy between immigrant groups (native-born adults of native-born parents *minus* foreign-born adults of foreign-born parents, native-born adults of native-born parents *minus* native-born adults of foreign-born parents)



Note: Adults aged 16-65. Includes adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). Foreign-born of foreign-born parents include adults who reported being foreign-born in the doorstep interview, while native-born doorstep respondents are not part of any of the groups presented in this figure. Unadjusted differences are the differences between the two averages for each contrast category. Adjusted differences are based on a regression model that takes into account differences associated with gender, education, age, language spoken at home and parents' educational attainment. Doorstep interview cases for which parental education information is not collected are included in the regression by assigning them to a separate category. Darker colours denote differences that are statistically significant at the 5% level. Results for some groups in Chile, Finland, Hungary, Japan, Korea, Poland and the Slovak Republic are not reported because there are too few observations to provide reliable estimates. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the unadjusted difference between immigrant groups.

Source: Table A.2.10 (L) in Annex A.

Therefore, the reduction in these gaps before and after accounting for relevant background characteristics may be explained by migrants being less likely to speak the language of the assessment (or having lower proficiency in the language of the assessment) and lower levels of education on average. For example, among foreign-born adults of foreign-born parents, only 45% speak the language of the assessment at home (see Table B.3.11 in Annex B), and the share of those without upper secondary education is 9 percentage points higher than among adults who are native-born of native-born parents (see Table B.3.12 in Annex B). As discussed below, the survey assesses some of these characteristics and their association with migrants' proficiency. However, there are multiple other factors that may further contribute to explaining proficiency gaps. Among these are the quality of school education in their country of birth; differences in school resources between schools with a high and low proportion of migrants in the host country; and differences in financial, human, and social and cultural capital between parents of migrants and non-migrants.

Individual migration characteristics and differences in proficiency

Migrant populations are highly heterogeneous across and within countries. Even within the same host country, migrants have different migration histories. The 2023 Survey of Adult Skills collects detailed information on the migration history of adults. Migrants can be characterised by the following factors: whether they speak the language of the host country, where they obtained their education, their age at arrival and the duration of their stay in the host country. These migration-related factors are relevant in explaining differences in performance in literacy, numeracy and adaptive problem solving.

As stated above, foreign-born adults of foreign-born parents constitute the largest group of those with an immigrant background. On average, 45% of foreign-born adults speak the language of the host country at home; 26% had arrived within the last five years, meaning 74% have been in the host country for more than five years; 62% obtained their education abroad; and 12% arrived in the host country at age 6 or younger, 9% between the ages 7 and 12, and 82% after age 12 (Table B.3.11 in Annex B).

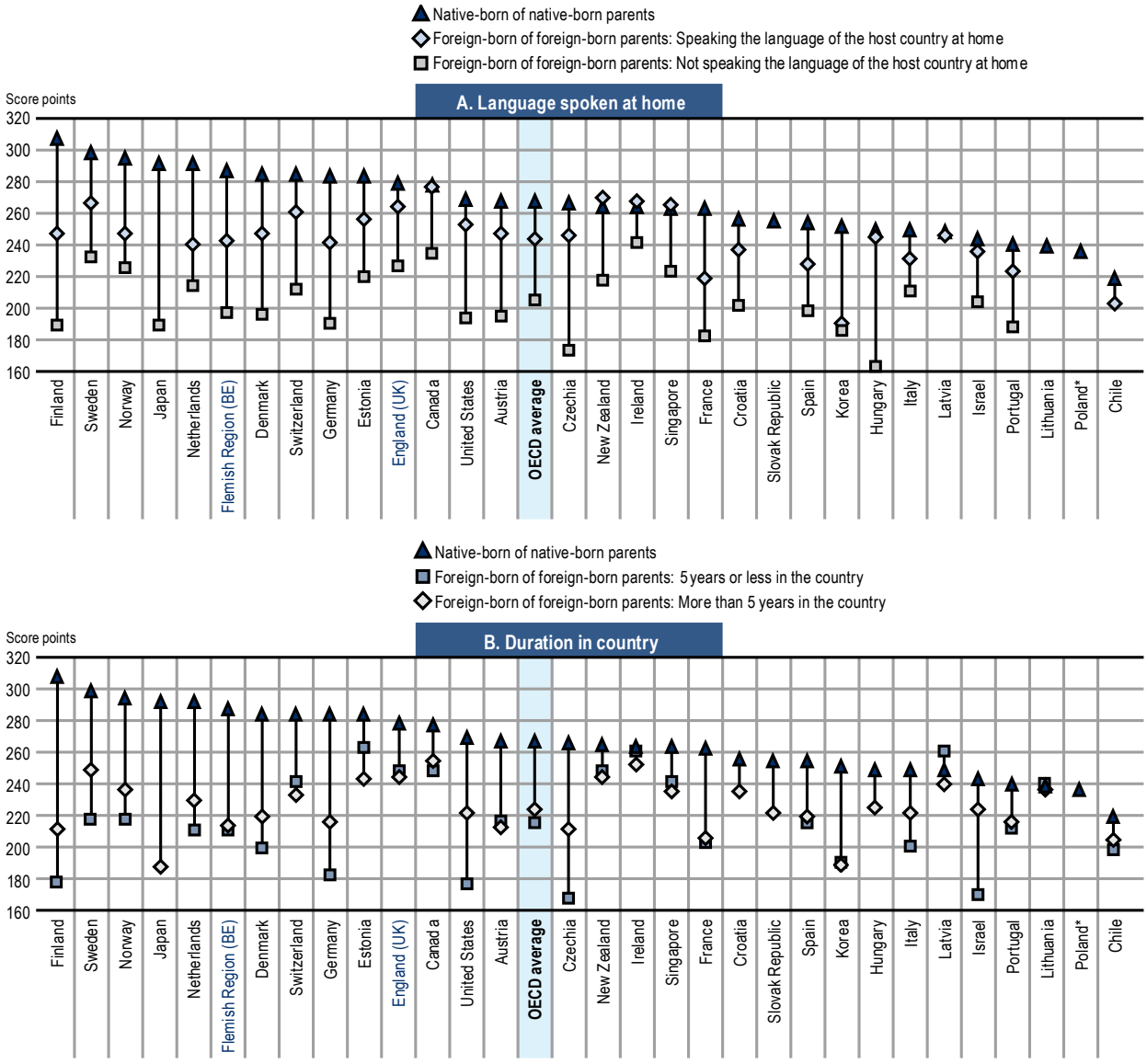
Figure 2.18 compares the performance in literacy of native-born adults of native-born parents to that of foreign-born adults of foreign-born parents with a range of migration-related characteristics. Overall, foreign-born adults of foreign-born parents have higher literacy proficiency if they speak the language of the host country at home (Panel A); if they have been living in the host country for more than five years (Panel B), if their highest educational qualification was obtained in the host country (Panel C); if they arrived in the host country at a young age (Panel D). Doorstep respondents are included in Panel A and Panel B. The share of doorstep respondents among foreign-born of foreign-born parents by language and duration are provided in Table B.3.19 in Annex B.

On average, native-born adults of native-born parents scored 267 points in literacy. Foreign-born adults of foreign-born parents averaged 243 points if they speak the host country's language at home, but only 204 points if they do not (Panel A). Those who obtained their education in the host country scored 247 points compared to 227 points for those who were educated abroad (Panel B). Looking at the age of arrival, foreign-born adults of foreign-born parents scored 257 points on average if they were aged 6 or younger when they arrived, 247 points if they were between the ages 7 and 12, and 231 points if they were 13 or older (Panel C). Those who have been in the host country for more than five years scored on average 224 points, compared to 214 points among more recent arrivals (Panel D). Results for numeracy and adaptive problem solving are provided in Table A.2.11 in Annex A.

These findings are in line with results from the first cycle of the Survey of Adult Skills and PISA. The first cycle of the Survey of Adult Skills also found notable differences in numeracy and literacy performance, with foreign-born adults experiencing a disadvantage compared to native-born adults.[7] It also found that a portion of these gaps can be attributed to factors related to their individual migration histories (OECD, 2019[39]; OECD, 2018[50]). Similarly, the latest PISA report found that the significant gaps in reading and mathematics performance between immigrant and non-immigrant 15-year-old students diminish when accounting for socio-economic background and language spoken at home (OECD, 2023[31]).[8]

Figure 2.18. Average literacy proficiency, by immigrant background and migration history [1/2]

Average literacy scores



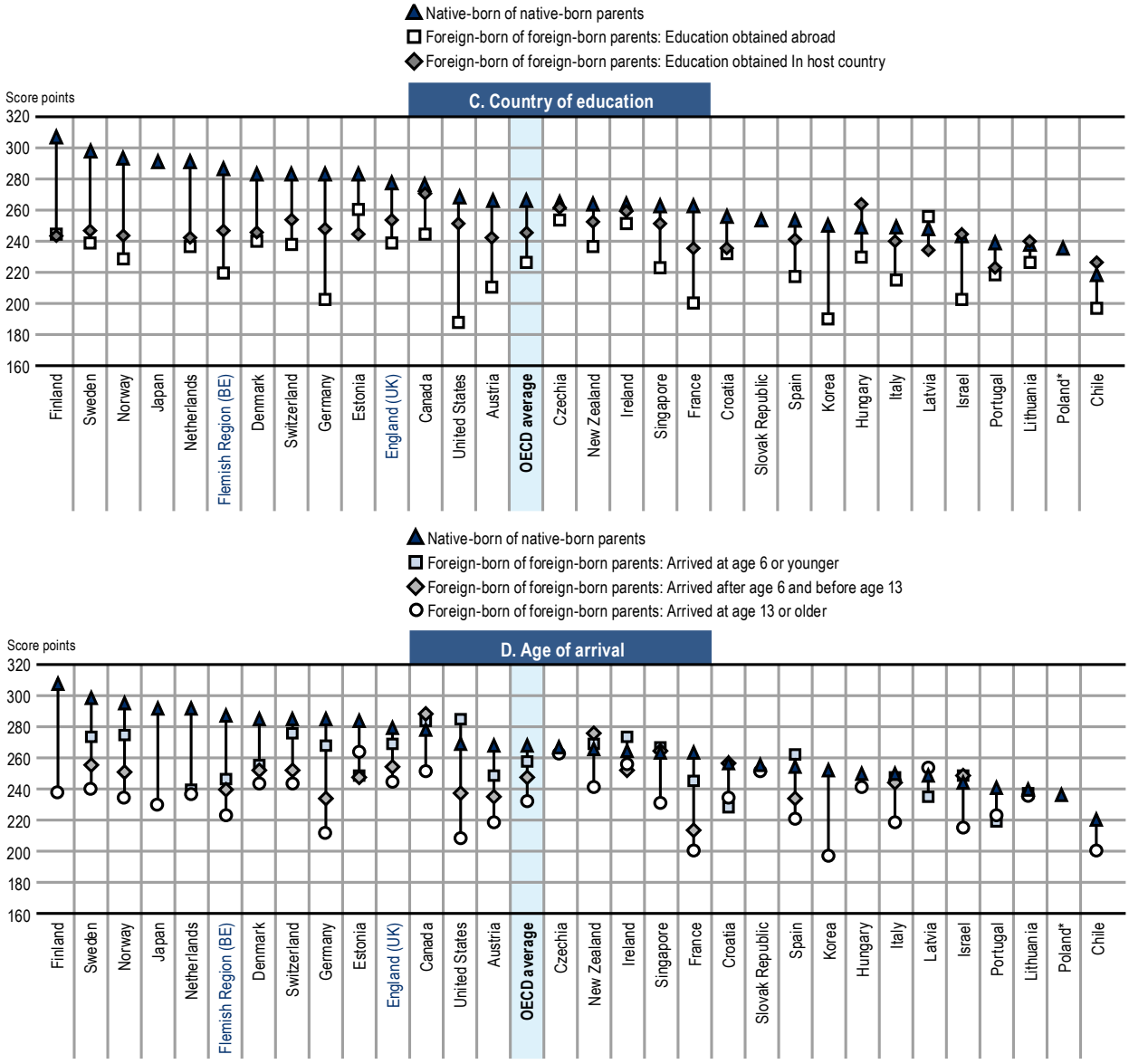
Note: Adults aged 16-65. Panels A and B include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). Panels C and D do not include adults who were only administered the doorstep interview due to a language barrier, as information on country of education and age of arrival was not collected for those respondents (see Box 1.1 in Chapter 1). Foreign-born of foreign-born parents include adults who reported being foreign-born in the doorstep interview, while native-born doorstep respondents are not part of any of the groups presented in this figure. Results for some groups in Chile, Croatia, Czechia, Finland, Hungary, Japan, Korea, Latvia, Lithuania, the Netherlands, Poland, Portugal, and the Slovak Republic are not reported because there are too few observations to provide reliable estimates. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the average score of native-born adults of native-born parents.

Source: Table A.2.10 (L) and Table A.2.11 (L) in Annex A.

Figure 2.18. Average literacy proficiency, by immigrant background and migration history [2/2]

Average literacy scores



Note: Adults aged 16-65. Panels A and B include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1). Panels C and D do not include adults who were only administered the doorstep interview due to a language barrier, as information on country of education and age of arrival was not collected for those respondents (see Box 1.1 in Chapter 1). Foreign-born of foreign-born parents include adults who reported being foreign-born in the doorstep interview, while native-born doorstep respondents are not part of any of the groups presented in this figure. Results for some groups in Chile, Croatia, Czechia, Finland, Hungary, Japan, Korea, Latvia, Lithuania, the Netherlands, Poland, Portugal, and the Slovak Republic are not reported because there are too few observations to provide reliable estimates. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the average score of native-born adults of native-born parents.

Source: Table A.2.10 (L) and Table A.2.11 (L) in Annex A.

Differences in skills proficiency related to parental education

Differences in academic achievement are associated with differences in socio-economic background. Socio-economically advantaged families have more financial, human and social capital resources. As a consequence, individuals raised in such families are more likely to benefit from access to learning materials, receive parental support for learning, attend better schools and be guided towards activities that will promote their eventual career success (Conger and Donnellan, 2007[51]).

Socio-economic status is a construct that captures various dimensions, such as parents' income, education and occupational status. This report uses the highest educational qualification obtained by the respondents' parents as a proxy for their socio-economic background in childhood. This section groups adults into those with highly educated parents (having at least one parent who had attained tertiary education), those with medium-educated parents (having at least one parent who had attained upper secondary education, but none who attained tertiary) and those with low-educated parents (neither parent had attained upper secondary education). As the level of education of parents is not recorded in the doorstep interview, adults who only answered the doorstep interview are excluded from the analysis presented in this section.

Adults with highly educated parents scored higher on average than those with medium-educated parents in the 2023 Survey of Adult Skills, while in turn adults with medium-educated parents outscored those with low-educated parents. This pattern holds across all domains, but the size of the gaps varies across countries. For example, proficiency gaps to the advantage of adults with highly educated parents are relatively high in Germany while relatively low in Spain.

Figure 2.19 shows the average proficiency scores grouped by parents' attainment level across participating OECD countries and economies for all three domains. Overall, adults with highly educated parents scored 284 points in literacy on average, those with medium-educated parents scored 264 points and those with low-educated parents scored 234 points (Panel A). Results for numeracy and adaptive problem solving are provided in Panels B and C.

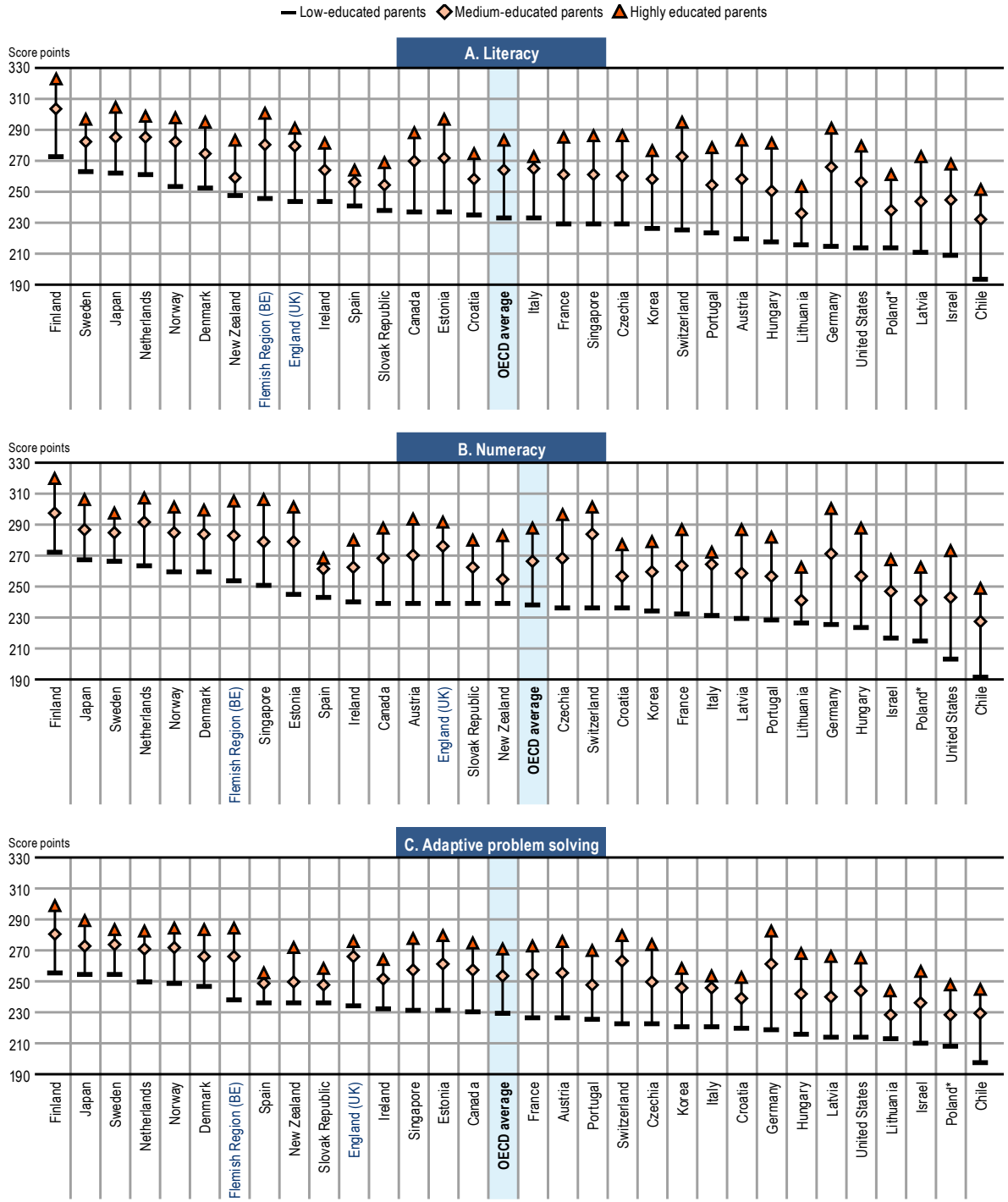
Figure 2.20 shows the proficiency gap between adults with highly educated parents and those with low-educated parents. On average, across participating OECD countries and economies, the unadjusted differences are 50 points in literacy (Panel A), 49 points in numeracy (Panel B) and 42 points in adaptive problem solving (Panel C), to the advantage of adults with highly educated parents.

The largest unadjusted gaps are observed in literacy in Germany and Switzerland (70 points and more), in numeracy in Germany and the United States (70 points and more), and in adaptive problem solving in Germany and Switzerland (more than 57 points), all to the advantage of adults with highly educated parents. Conversely, the smallest (yet still significant) gaps, to the advantage of adults with highly educated parents, on average, are observed in literacy in the Slovak Republic, Spain and Sweden (less than 33 points); in numeracy in Lithuania, Spain and Sweden (less than 36 points); and in adaptive problem solving in the Slovak Republic, Spain and Sweden (less than 29 points). Accounting for relevant background factors explains almost half of these gaps.

Generally, the findings are in line with the differences in proficiency observed among adults in the first cycle of the Survey of Adult Skills, which also found that adults whose parents had higher-level qualifications achieved higher average proficiency scores and that background characteristics explained a large part of the estimated gap (OECD, 2016[4]). PISA survey results also found that 15-year-olds with socio-economically advantaged backgrounds have greater proficiency in mathematics (OECD, 2023[31]) and science (OECD, 2016[52]). A study comparing 15-year-olds (PISA) and 27-year-olds (first cycle of the Survey of Adult Skills) has also shown that literacy disparities between students of low- and highly educated parents tend to widen over time, with the gap becoming more pronounced at the bottom end of the proficiency distribution (Borgonovi and Pokropek, 2021[53]).

Figure 2.19. Average proficiency in key information-processing skills, by parental education

Literacy, numeracy and adaptive problem solving



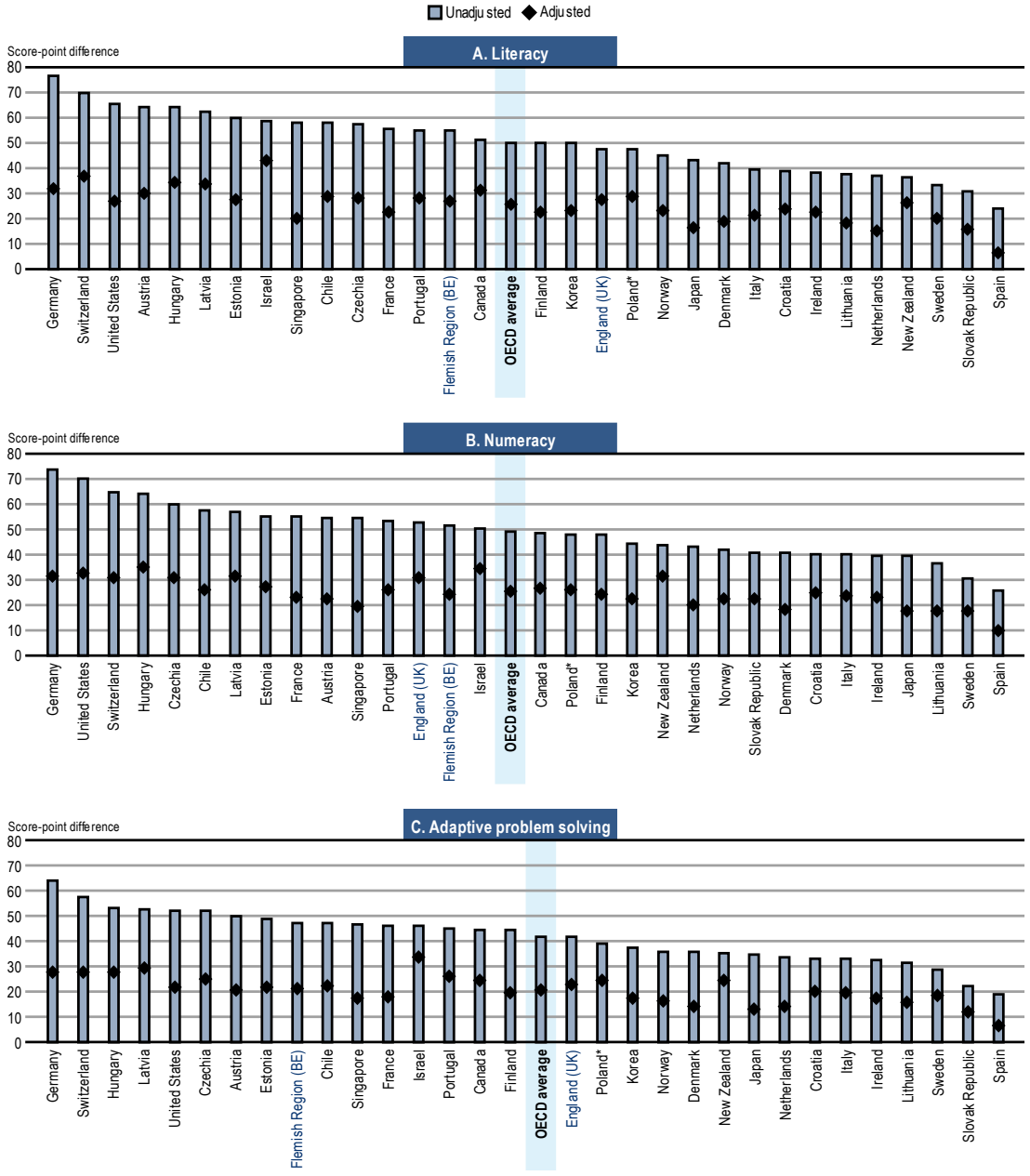
Note: Adults aged 16-65; does not include adults who were only administered the doorstep interview due to a language barrier, as information on parental education was not collected for those respondents (see Box 1.1 in Chapter 1). Respondents are categorised as having highly educated parents if at least one parent attained tertiary education; as having medium-educated parents if at least one parent attained upper secondary education and none of the parents attained tertiary education; and as having low-educated parents if neither parent attained upper secondary education. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the average proficiency of adults with low-educated parents.

Source: Table A.2.12 (L, N, A) in Annex A.

Figure 2.20. Differences in key information-processing skills, by parental education

Adjusted and unadjusted differences in average literacy, numeracy and adaptive problem solving scores between adults (highly educated parents minus low-educated parents)



Note: Adults aged 16-65; does not include adults who were only administered the doorstep interview due to a language barrier, as information on parental education was not collected for those respondents (see Box 1.1 in Chapter 1). Respondents are categorised as having highly educated parents if at least one parent attained tertiary education; as having medium-educated parents if at least one parent attained upper secondary education and none of the parents attained tertiary education; and as having low-educated parents if neither parent attained upper secondary education. Unadjusted differences are the differences between the two averages for each contrast category. Adjusted differences are based on a regression model that takes into account differences associated with gender, age, education, immigrant background and language spoken at home. All differences are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the unadjusted difference between adults with highly educated and low-educated parents.

Source: Table A.2.12 (L, N, A) in Annex A.

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Notes

[1] The correlation between the average performance in literacy and adaptive problem solving is 0.86, and between numeracy and adaptive problem solving 0.85.

[2] A predecessor international skills survey, the Adult Literacy and Life Skills Survey (ALL), found a similar correlation between prose literacy and problem solving, as did the Programme for International Student Assessment (PISA) between reading and mathematics among 15-year-olds (OECD, 2017[54]).

[3] The Survey of the Adult Skills and PISA measure different constructs, and data in the two studies are collected in different settings. As proficiency from the two studies cannot be directly compared, the analysis presented here is mainly suggestive. For more information on the relationship between the Survey of Adult Skills and PISA, readers are advised to consult Chapter 6 in OECD (2024[5]).

[4] Permanent-type international migration comprises the following categories: work-related, free movement (e.g. within the EU/EFTA countries, between Australia and New Zealand under the Trans-Tasman Travel Arrangement), accompanying family of workers, family migration and humanitarian migration (OECD, 2023[49]).

[5] Ukrainians do not fall under the category of permanent-type international migration. In the European Union (EU), the Temporary Protection Directive was activated, leading to a significant number of Ukrainian refugees registering for temporary protection across EU member states. Outside the EU, various countries have developed their own programmes to facilitate the arrival of Ukrainians. For instance, Canada introduced the Canada-Ukraine Authorization for Emergency Travel, the United States established the Uniting for Ukraine programme, and the United Kingdom implemented three parallel schemes: the Ukraine Family Scheme, the Ukraine Extension Scheme, and the Homes for Ukraine Sponsorship Scheme. Alternative legal grounds for staying are also used alongside these pathways (OECD, 2023[49]).

[6] Only permanent residents are part of the target population of the Survey of Adult Skills. It is possible that in some countries recent migrants who are considered to be temporary residents are excluded from these statistics. See Chapter 5 of OECD (2024[5]) for more information on the sampling frames used in the Survey of Adult Skills.

[7] Note that past international reports on the results of the Survey of Adult Skills used a different definition of immigrant background. In the first cycle of the Survey of Adult Skills, a strict distinction was made based on the country of birth and only distinguishing between foreign-born and native-born adults (hence disregarding any information about parents' country of birth).

[8] PISA 2022 distinguishes between first and second-generation immigrants and defines non-immigrant students as those who have at least one parent born in the country of the assessment.

3 How adults' proficiency in key information-processing skills has changed over the past decade

This chapter analyses how the literacy and numeracy proficiency of the adult population have changed in the years that separate the first and the second cycle of the Survey of Adult Skills. It shows the evolution of average proficiency for the entire adult population, as well as for various socio-demographic groups defined by age, immigrant background, educational attainment, gender and socio-economic background. In addition, the chapter provides insights into the development of skills-related inequalities by studying whether the proficiency gaps between specific socio-economic groups have narrowed or widened.

In Brief

- In most participating countries and economies, adults' skills proficiency has either declined or remained unchanged between the two cycles of the Survey of Adult Skills. Literacy proficiency improved significantly in only 2 countries, remained stable in 14, and declined significantly in 11 countries and economies. Proficiency in numeracy has improved significantly in 8 countries and economies, remained unchanged in 12, and declined in 7.
- Half of the countries and economies saw an increase in the share of adults scoring at the lowest levels of literacy proficiency (at or below Level 1), and one-third recorded an increase in those scoring at the lowest levels in numeracy.
- In most countries and economies, the literacy proficiency of the lowest-performing 10% of the population has declined, with many experiencing similar declines in numeracy. This widened the gap between the lowest- and the highest-scoring 10% of adults in society in 17 countries and economies in literacy, and in 13 in numeracy.
- Nearly all countries and economies experienced declines in literacy proficiency among adults with below upper secondary education. Among tertiary-educated adults, literacy proficiency fell in 13 countries, and only increased in Finland. As proficiency declines among the low-educated were generally larger than among highly educated adults, disparities in literacy proficiency by educational attainment widened in most of the participating countries and economies.
- In 11 countries and economies, literacy proficiency among foreign-born adults with foreign-born parents has declined. In eight countries and economies, the proficiency gap between this group and native-born adults has widened. This was especially pronounced in Germany, where the decline in proficiency among foreign-born adults coincided with an increase in proficiency among native-born adults.
- Although all the participating countries and economies are affected by population ageing, only a few saw improvements in literacy among older adults. In most countries and economies, the average proficiency of older adults declined or remained unchanged. Meanwhile, only England (United Kingdom), Finland and Norway saw an increase in literacy proficiency among 16-24 year-olds.
- Comparing the same birth cohorts at different ages shows that nearly half of the countries and economies have seen substantial age-related skill losses among older adults (of more than 20 points in literacy). Although young adults in many countries and economies seem to have gained skills as they reach their thirties, Hungary, Korea, Lithuania, Poland, Singapore and the Slovak Republic have recorded declines in skills even among the cohort of adults aged 27-34 in 2023.
- Literacy proficiency has declined more strongly among men than women. In some countries, women now have higher literacy proficiency than men. In contrast, changes in numeracy proficiency have tended to be similar for both women and men. Only Chile, Israel and the United States recorded greater improvements (or less pronounced declines) in numeracy proficiency among women, narrowing the numeracy gender gap.
- In most countries and economies, socio-economic differences in literacy proficiency have increased as a result of declining proficiency among adults with low-educated parents. Some saw stronger increases in socio-economic skills disparities among younger adults, while in others the widening socio-economic gap was mainly confined to older adults.

Introduction

Technological change and the need for a green transition are increasing the demand for advanced information-processing skills and other high-level cognitive skills. In parallel, social and demographic developments, including population ageing, educational expansion and migration, continue to alter the supply of skills. Over the past decade, many OECD countries have seen an increase in the share of older adults in their populations – a group that typically has lower skills. This trend is projected to continue. Immigration has increased in most countries, but significant shares of migrants lack sound foundation skills. At the same time, increasing shares of the population are attaining high levels of education.

How well countries manage to upgrade and adapt the skills of their adult population to meet changing demands depends, among other factors, on whether more education translates into better skills, how well the skills of older adults are maintained and developed, and how well people with immigrant backgrounds are supported in overcoming potential cultural and language barriers to develop strong skills. Furthermore, providing everyone with equal opportunities to develop their skills is increasingly important for addressing skills shortages and demands – and even more crucial to ensuring social mobility and fairness in society.

The Survey of Adult Skills tracks the development of key information-processing skills among adults over time by administering comparable assessments in repeated cycles. This chapter describes changes in adults' literacy and numeracy proficiency in the countries and economies that participated in both the first (between 2012 and 2017) and the second cycle (2023) of the survey. It examines shifts in the skills distribution for the entire adult population as well as for specific socio-demographic groups defined by age, education, immigrant background, gender and parental education. The results provide evidence to help answer important policy questions related to the development of the skill supply and the inclusiveness of skills provision: How has adults' skills proficiency changed over time and across countries? Has the relationship between education and skills changed with expanding educational attainment? How has proficiency among older age groups evolved? Have the skill levels of immigrants approached those of non-immigrants? Do socio-economic disparities in skills persist?

The results show that the skills proficiency of the adult population has declined in many countries and economies between the two cycles of the Survey of Adult Skills. Such declines have been most pronounced among the most vulnerable groups in society – the lowest-performing adults in a country's population, adults with below upper secondary education, adults with low-educated parents, and often immigrants or older adults. This is exacerbating inequalities along various dimensions, including socio-economic background, immigrant background and age. Gender gaps in literacy have essentially disappeared, but this was due mainly to the fact that men saw larger declines in their proficiency than women. In almost all countries, women continue to be significantly less proficient than men in numeracy. Increases in educational attainment did not compensate for the skill losses among the adult population.

Changes in the skills proficiency of the adult population

The Survey of Adult Skills provides comparable measures of proficiency over time in the domains of literacy and numeracy. The instruments and methodology used to assess these skills in the 2023 Survey of Adults Skills are largely similar to those used in the first cycle but have been updated to better reflect the way individuals encounter and use information in contemporary society and to enhance the quality of the assessment. Box 3.2 discusses the implications of these methodological changes for comparing results across cycles. In the domain of problem solving, the results from the second cycle for adaptive problem solving cannot be compared to those from the first cycle for problem solving in technology-rich environments due to differences in the underlying constructs.

Box 3.1. The Survey of Adult Skills in the United States

The United States is the only country that participated in all three rounds of data collection in the first cycle of the Survey of Adult Skills: in 2011/12, in 2014, as part of a National PIAAC Supplement (Rampey et al., 2016[1]), and in 2017. The data collected in 2011/12 and 2014 were merged and reweighted to control totals related to the 2010 census (whereas the 2011/12 data were weighted to totals related to the census in 2000) and should be considered as a single set of data. Details of the data collection in the United States can be found in the technical reports for the survey and the National PIAAC Supplement (Hogan et al., 2016[2]; OECD, 2019[3]).

In this chapter, results for the United States from the first cycle of the Survey of Adult Skills are reported using the combined data from 2011/12 and 2014. The 2017 data collection is used only when analysing long-term developments in average skills proficiency across the International Adult Literacy Survey (IALS) and the Survey of Adult Skills (Figure 3.5).

Twenty-seven countries and economies participated in both cycles of the survey. While only one round of the second cycle has been conducted so far (in 2022/23), the first cycle was carried out in three rounds: Round 1 in 2011/12, Round 2 in 2014/15 and Round 3 in 2017. As different countries participated in the three rounds, the amount of time that has elapsed between the two data collections is not the same for all countries and economies. The majority of them (21 out of 27) participated in Round 1 of the first cycle, 11 years before the second cycle. For this reason, this chapter often refers to changes that occurred "over the past decade", for ease of exposition. Five countries participated in Round 2 of Cycle 1, eight years before the second cycle. Hungary participated in Round 3 of Cycle 1, only six years before the second cycle (the United States also participated in Round 3, see Box 3.1). Because of these differences, the size of the change in proficiency between the cycles is not comparable across the participants in the different rounds of the first cycle. All the figures in this chapter, therefore, group countries and economies according to when they participated in the first cycle, and no results are given for the average across OECD countries.

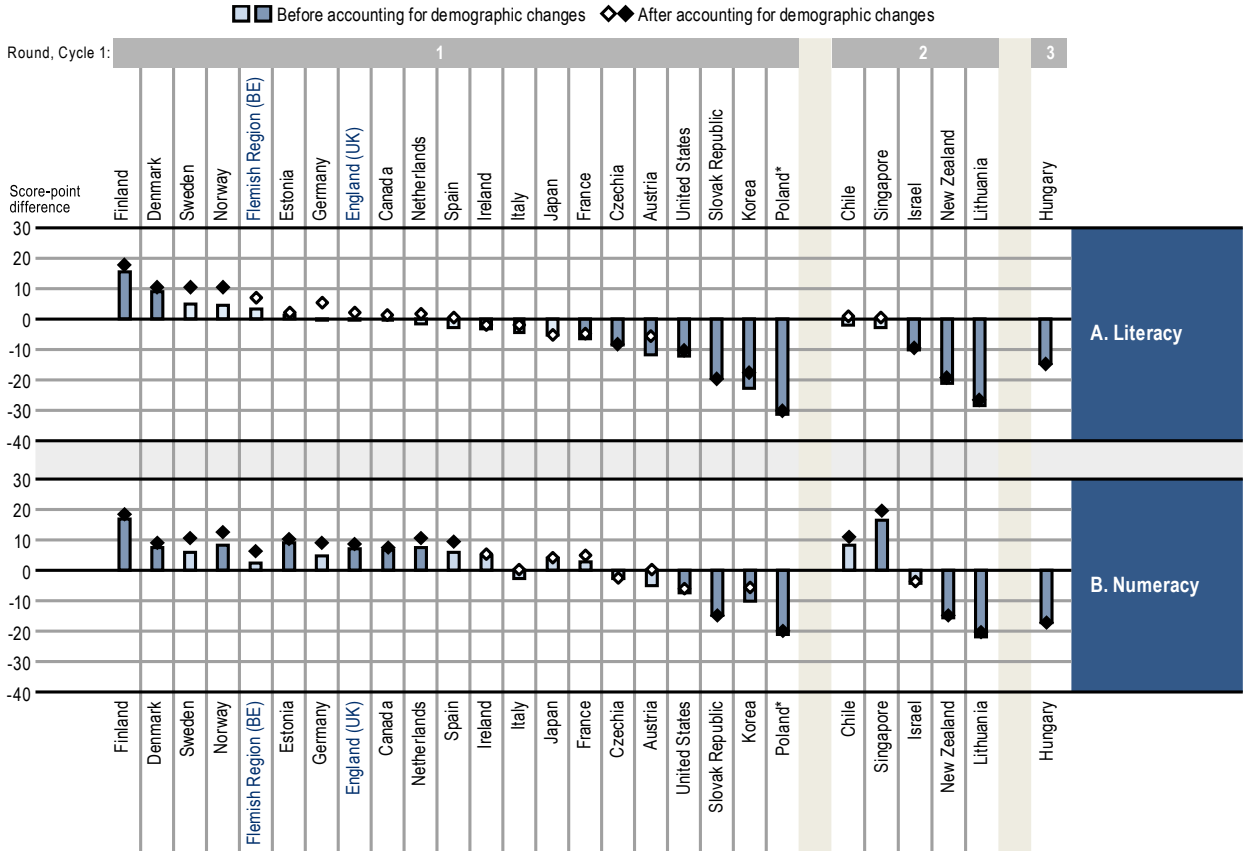
Changes in mean proficiency

Figure 3.1 shows the change in average literacy and numeracy proficiency between the first and second cycle of the Survey of Adult Skills. Literacy proficiency increased significantly in Finland (by 15 points) and Denmark (by 9 points) over 11 years, and remained stable in 14 countries and economies. Eleven countries experienced a significant decline in literacy proficiency. In four of these, the decrease was particularly large: 31 points in Poland, 28 points in Lithuania, 23 points in Korea and 21 points in New Zealand.

The trends in numeracy proficiency were more favourable. Eight countries and economies recorded significant increases in numeracy proficiency, with the largest gains observed in Finland (17 points), Singapore (17 points) and Estonia (9 points). Proficiency remained stable in 12 countries and economies and significantly decreased in 7. Sizeable falls in numeracy proficiency were observed in Lithuania (22 points) and Poland (21 points).

Figure 3.1. Change in average literacy and numeracy proficiency between cycles, before and after accounting for demographic changes

Difference in mean proficiency scores between cycles, after reweighting Cycle 2 to match Cycle 1's distribution of age, immigrant background and gender (Cycle 2 *minus* Cycle 1)



Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Unadjusted differences are the differences between the averages in each cycle. Adjusted differences are based on a method analogous to post-stratification that reweights the samples in Cycle 2 so that the demographic characteristics of these samples match those of the samples in Cycle 1 (see Note 1). Demographic characteristics considered are: age (in ten-year age brackets), gender and immigrant background. Adjusted differences represent a hypothetical scenario of how the proficiency of a population matching the demographic profile of the population in Cycle 1 would have changed over time. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the unadjusted change in mean literacy proficiency scores.

Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Tables A.3.1 (L) and A.3.1 (N) in Annex A.

Box 3.2. Methodological differences between the two cycles of the Survey of Adult Skills

In repeated large-scale assessments a tension always arises between keeping all aspects of the survey unchanged – to maximise the comparability of results over time – and improving or updating the content or the procedures of the survey – to have better and more relevant measures.

In designing the second cycle of the Survey of Adult Skills, great care has been taken to ensure the results are comparable with those of the first cycle. Survey operations and sampling strategies remained largely unchanged,[1] with a background questionnaire administered in Computer-Assisted Personal Interview (CAPI) mode by trained interviewers who then supervised participating adults during the direct skills assessment. The content of the background questionnaire is largely similar to that administered in the first cycle. The literacy and numeracy assessments contain many items that were administered in the first cycle, thus ensuring a strong psychometric link between the two assessments.

At the same time, some innovations have been introduced to improve the content, design and delivery of the assessment (OECD, forthcoming[7]). The following sections present the main methodological differences between the two cycles and how they impact the comparability of results.

Updates to the assessment frameworks

The assessment frameworks for literacy and numeracy have both been updated to reflect the increased reliance on digital devices in professional and personal life, and the new demands this poses for accessing, processing and evaluating information. The literacy assessment in the second cycle encompasses a broader spectrum of digital texts, including texts with multiple sources, and places greater emphasis on the evaluation of the accuracy and relevance of information. The numeracy assessment has also been adapted to reflect current realities. It now places a stronger focus on interpreting mathematical information presented in dynamic forms (e.g. interactive websites) and structured forms (e.g. infographics) and on making judgments based on critical evaluation of mathematical information.

As a result, the assessments in both cycles are comparable but not identical. The second cycle has a larger pool of items, thus improving measurement through better coverage of the literacy and numeracy constructs. A substantial number of items, known as trend items, were administered in both cycles. These provide the psychometric basis for putting the results of the two assessments on the same scale. Importantly, it is possible to estimate the uncertainty associated with the fact that the assessment has changed over time. The analysis in this chapter takes such uncertainty into account by adding a “linking error” to the standard error of the estimated changes in proficiency across cycles (see Reader’s Guide).

Assessment of reading and numeracy components

The first cycle of the Survey of Adult Skills included an assessment of reading components, designed to provide information about adults with very low levels of proficiency in reading. Only adults who failed an easy locator test were administered the assessment, which tested basic skills essential for understanding written texts (word recognition, sentence comprehension and reading fluency). Performance in the components tasks was not taken into account when estimating the literacy proficiency of these respondents; they received a literacy score based on their performance in the locator test and their answers to the background questionnaire (OECD, 2013[8]).

Similarly, in the second cycle, adults who failed the locator test were only administered the components tasks. In addition, they took an assessment of numeracy components. To improve the precision of the estimates of proficiency at the bottom of the skills distribution, the second cycle considered performance in these assessments in estimating the literacy and numeracy proficiency of respondents.

Incorporating the results of the components assessments into the estimates of overall literacy and numeracy proficiency has a negligible impact on the average proficiency score for the entire population. However, this methodological change has a greater impact on the estimated proficiency of adults who, having failed the locator, only took the components assessments (OECD, forthcoming[7]). These adults constitute a small minority within the overall population but are over-represented among specific groups. Caution must therefore be taken when comparing the proficiency of subgroups of the population containing a large portion of such respondents, as differences in observed proficiency over time may be driven by changes in the underlying methodology. For this reason, the analysis of this chapter excludes comparisons between cycles among subgroups where a non-negligible proportion of the respondents in Cycle 2 (more than 20%) only took the components assessment (see Reader's Guide).

Tablet-based assessment

In the first cycle, the default delivery mode was a computer-based assessment (CBA), with a paper version available for respondents who lacked the necessary skills to complete the assessment on a laptop computer or were reluctant to do so. The CBA approach has a number of advantages. It enables the use of items that more closely resemble real-world digital information processing (e.g. reading digital texts or interacting with mathematical information on digital devices). It also allows for automatic scoring of responses and the use of more complex and efficient test designs (e.g. adaptive testing). However, some 25% of respondents completed the paper-based version of the assessment in the first cycle.

In the second cycle, tablet devices were introduced to fully reap the benefits of a CBA. A user-friendly interface and a tutorial demonstrating the main functions of use (e.g. tapping, using drag and drop, and highlighting) ensured that all respondents could complete the assessment on a tablet. Results from the field trial supported the comparability of this new assessment mode with the laptop- and paper-based assessments of the first cycle (see OECD (2024[9]; 2013[8]; forthcoming[7])).

Doorstep interview

Some respondents are unable to complete the background questionnaire and the cognitive assessment due to insufficient knowledge of the language in which the questionnaire and the assessment are administered. This form of non-response could introduce bias since it is systematically concentrated among those with low literacy proficiency in the survey language (presumably migrants or people with very poor reading skills). In the first cycle, the share of such non-respondents amounted to less than 2% in most countries but exceeded 4% in four countries and economies (OECD, 2019[10]).

To reduce the bias induced by such literacy-related non-response (LRNR), the 2023 Survey of Adult Skills introduced a new instrument, called the doorstep interview. This is a short questionnaire offered in more than 40 languages, collecting basic background information – gender, age, years of schooling, employment status and country of origin. This questionnaire can be easily completed by individuals who do not speak the language(s) of the assessment and are therefore unable to answer the regular background questionnaire and the direct skills assessment. The information collected through the doorstep interview was used to estimate the literacy and numeracy proficiency for these non-respondents. This innovation allowed the results of the survey to cover the entire target population.[2]

While clearly an improvement with respect to the first cycle of the survey, the doorstep interview poses a challenge for comparing estimates over time, as the populations sampled are no longer fully comparable: adults who completed the doorstep interview in the second cycle would have been handled as literacy-related non-respondents in the first cycle. All analyses presented in this chapter therefore exclude adults who completed the doorstep interview in the second cycle.

1. An exception is Canada, where both provinces and territories were sampled in the first cycle, while territories were not sampled in the second cycle.

2. In Sweden, all respondents were able to complete the background questionnaire in both cycles of the survey, with the help of interpreters and translators. As a result, no respondents were classified as literacy-related non-respondents (in the first cycle), nor took the doorstep interview (in the second cycle). See the Reader's Guide for more details.

Overall, literacy and numeracy proficiency have tended to evolve in similar directions to each other across the participating countries and economies. The most notable exception to this pattern is Singapore, where a considerable increase in numeracy proficiency was accompanied by stable proficiency in literacy. Similar trends are seen in Canada, England (United Kingdom), Estonia, the Netherlands and Norway, albeit with relatively smaller changes in numeracy. In contrast, in Austria, Czechia, France and Israel, numeracy remained stable, while literacy declined.

In most countries and economies participating in the Survey of Adult Skills, the demographic composition of the adult population has changed in the years between the cycles. Larger migration flows and ageing populations may have contributed to declining proficiency within countries, as immigrants and older adults often display lower levels of skills. In order to isolate the impact of these demographic changes, data from the 2023 Survey of Adult Skills were reweighted to match the demographic distribution of the population (in terms of age, gender and immigrant background) observed in the first cycle.[1] This exercise provides an estimation of the proficiency that would have been observed in 2023, had the composition of the population remained the same as in the previous cycle.

Figure 3.1 shows that accounting for demographic changes does have an impact on the estimated evolution of skills. However, this impact is generally modest, and is not seen in all countries and economies. The analysis suggests that, in Norway and Sweden, average scores in literacy would have increased rather than remained stable, had the demographic profile of the adult population in the second cycle remained the same as in the first cycle. Were it not for demographic changes, literacy scores would have declined by 5.6 points in Austria and by 5 points in France (compared to the observed declines of 11.9 and 6.7 points, respectively), but these changes would not have been statistically significant. In other words, changes in the demographic composition of the population are one factor that accounts for the lack of improvement or the decline in literacy proficiency in these four countries. Similarly, average numeracy proficiency would have improved in Chile, the Flemish Region (Belgium), Germany, Spain and Sweden, were it not for population changes, while it would not have decreased significantly in Korea and the United States.

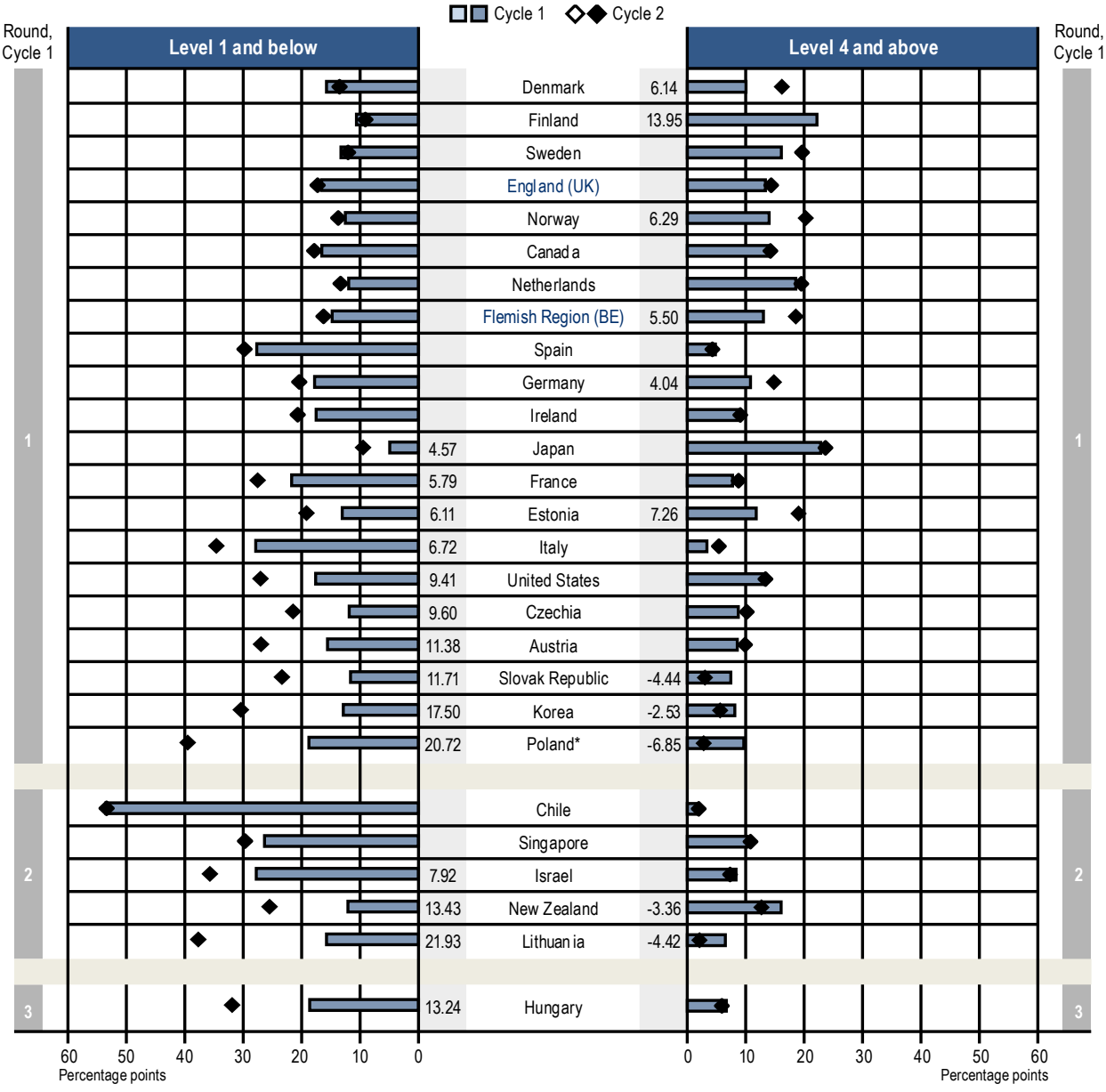
Changes in the shares of low and high performers

Literacy and numeracy proficiency in the Survey of Adult Skills is described in terms of six proficiency levels, ranging from Below Level 1 to Level 5 (see Chapter 2). This report denotes as low performers adults that scored at the two lowest levels (at or below Level 1), and as high performers those who scored at Levels 4 or 5. In nine countries, the share of low-performing adults in literacy has increased, while the share of high-performing adults has remained stable or (in the case of Estonia) increased (Figure 3.2). In Denmark, Finland, Germany, the Flemish Region (Belgium) and Norway, the share of adults scoring at or below Level 1 in literacy remained stable, while the share of adults performing at Levels 4 or 5 increased. In all these countries, it can be said that skills polarisation has increased, as more adults now perform at either the lowest or the highest levels.

Conversely, in Korea, Lithuania, New Zealand, Poland and the Slovak Republic, there was a shift towards lower levels of literacy proficiency. In these countries, the increase in the share of low-performing adults coincided with a fall in the share of those scoring at Levels 4 or 5.

Figure 3.2. Share of adults scoring at low and high proficiency levels in literacy in Cycle 1 and Cycle 2

Percentage of adults scoring at or below Level 1 and at or above Level 4 in literacy in Cycle 1 and 2 and percentage point changes in these shares between cycles



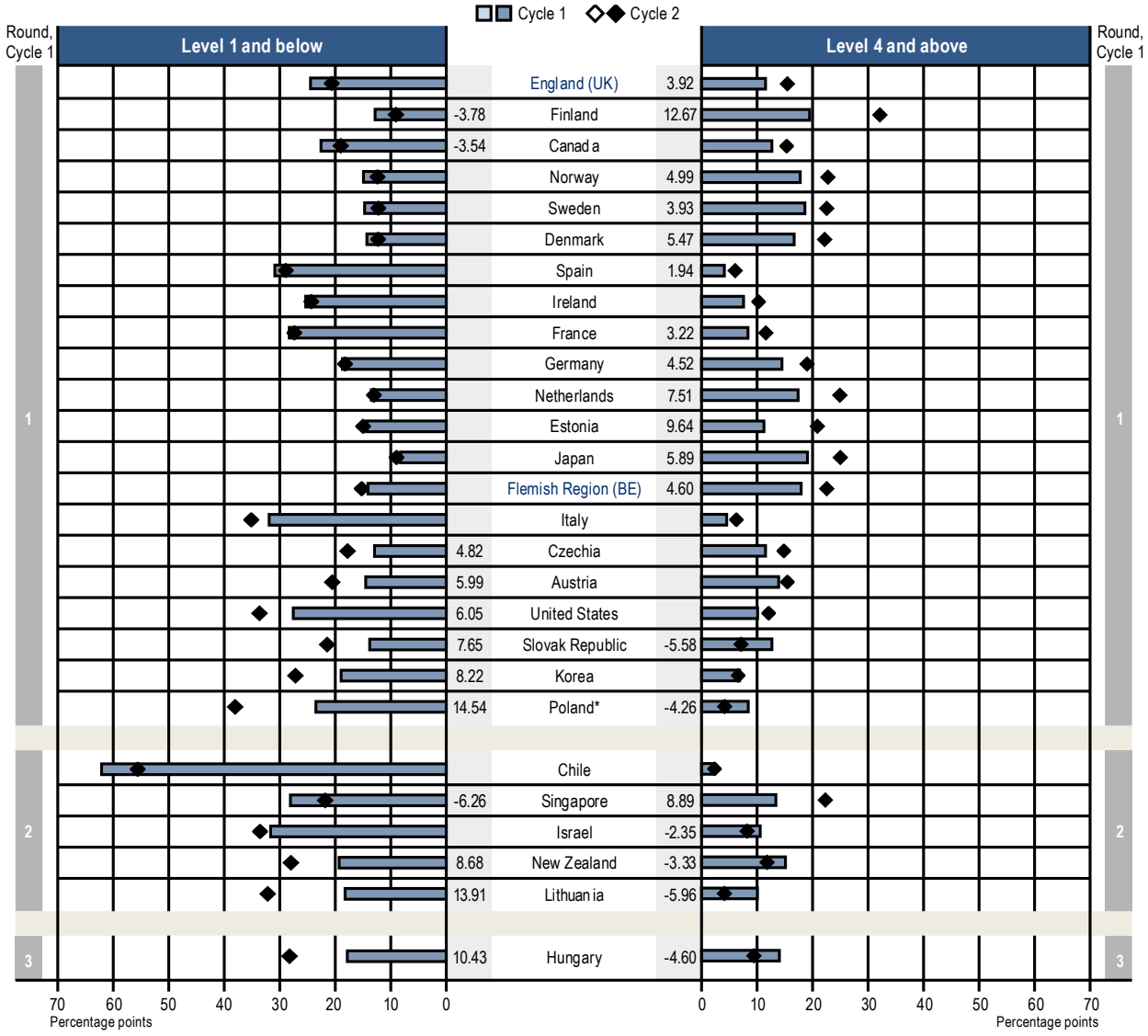
Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Differences are unadjusted. The numbers denote the percentage point change in the share of adults scoring at or below Level 1 (left) and of adults scoring at or above Level 4 (right) between cycles. Only changes that are statistically significant at the 5% level are presented. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in ascending order of the percentage point difference in the share of adults at or below Level 1.

Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table A.3.2 (L) in Annex A.

Figure 3.3. Share of adults scoring at low and high proficiency levels in numeracy in Cycle 1 and Cycle 2

Percentage of adults scoring at or below Level 1 and at or above Level 4 in numeracy in Cycle 1 and 2 and percentage point changes in these shares between cycles



Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Differences are unadjusted. The numbers denote the percentage point change in the share of adults scoring at or below Level 1 (left) and of adults scoring at or above Level 4 (right) between cycles. Only changes that are statistically significant at the 5% level are presented. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in ascending order of the percentage point difference in the share of adults at or below Level 1.

Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table A.3.2 (N) in Annex A.

A similar pattern of polarisation in proficiency also emerges for numeracy, albeit with greater increases in the share of high-performing adults (Figure 3.3). In 11 of the participating countries and economies, the proportion of adults scoring at Levels 4 and 5 in numeracy has increased, while the proportion of those scoring at or below Level 1 has remained unchanged. In four other countries – Austria, Czechia, Korea

and the United States – the share of low-performing adults in numeracy has increased, while the share of high performers has remained stable. In all these countries, relatively fewer adults than before score at intermediate proficiency levels.

In contrast, Finland and Singapore recorded improvements at the lowest and the highest proficiency levels in numeracy, with relatively fewer low-performing adults and relatively more high performers. Hungary, Lithuania, New Zealand, Poland and the Slovak Republic have seen a shift towards lower levels of numeracy proficiency, with relatively more low performers in numeracy than in the previous assessment, and relatively fewer adults scoring at the highest proficiency levels.

Changes in the distribution of proficiency

Changes in average skills proficiency do not necessarily correspond to changes at different points of the proficiency distribution within the country. Figure 3.4 illustrates changes in proficiency scores between the two cycles at different points of the literacy and numeracy proficiency distributions – the 10th, 25th, 75th and 90th percentiles. When adults are ranked according to their proficiency score, the 10th percentile marks the point below which the lowest-performing 10% of adults score, and the 25th percentile is the point below which the lowest-performing 25% of adults score. Changes in the scores at these percentiles, therefore, indicate how proficiency has changed among the lowest-performing adults in the country between cycles. Likewise, the 75th and the 90th percentile are the points above which the highest-performing 25% and 10% of adults score (or, conversely, below which 75% and 90% of adults fall). Changes in the scores at these percentiles reflect changes in proficiency among adults with the highest skills in a country or economy.

In 16 countries and economies, literacy proficiency declined significantly at the bottom end of the distribution, that is at the 10th and often the 25th percentile (Panel A, Figure 3.4). In 13 of these countries and economies, the proficiency distribution widened – either because proficiency at the upper ends increased (Estonia, the Flemish Region [Belgium] and Germany), or because it declined by less than at the bottom of the distribution (Hungary, Korea and New Zealand), or because it remained unchanged (Austria, Czechia, France, Italy, Israel, Japan and the United States). In Lithuania, Poland and the Slovak Republic, the decline in literacy proficiency was similar at both the bottom and the top of the distribution.

In contrast, in Chile, Canada, England (United Kingdom), Ireland, the Netherlands, Spain and Sweden, the distribution did not change significantly over time. In Finland and Denmark, proficiency increased at the 25th, 75th and 90th percentiles, while remaining unchanged at the 10th percentile. In Norway, proficiency increased significantly at the 75th and 90th percentile, with no change at the lower points of the distribution. Singapore saw a decline in proficiency at the 25th percentile.

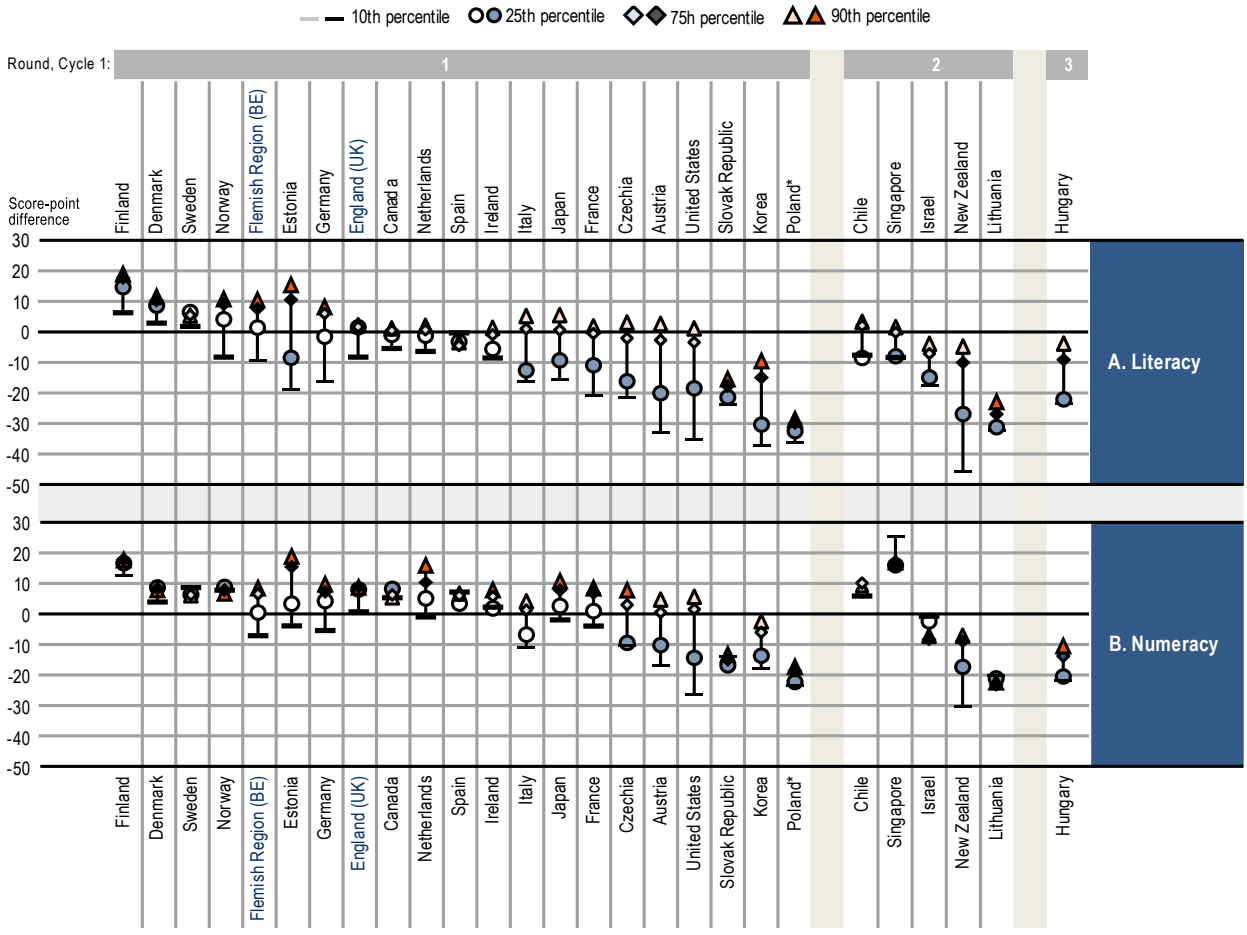
The shifts in the numeracy distribution over time follow a similar pattern, in that proficiency at the bottom of the distribution often changed less favourably than proficiency at the top (Panel B, Figure 3.4). In Austria, Czechia, Hungary, Italy, Korea, New Zealand and the United States, numeracy proficiency at the 10th and/or the 25th percentiles significantly decreased, while proficiency at the 75th and 90th percentiles changed less or remained stable. Declines in average numeracy proficiency in these countries are thus largely due to declining proficiency among the lowest-performing adults. In comparison, numeracy proficiency did not change at the bottom of the distribution but increased at the top in Estonia, the Flemish Region (Belgium), France, Germany, Ireland, Japan and the Netherlands. For Estonia and the Netherlands, this means that improvements among the highest-performing adults in the country were the main drivers of the overall increase in numeracy proficiency.

However, five countries and economies (Denmark, England [United Kingdom], Finland, Norway and Singapore) recorded improvements in numeracy at both the lower and the higher ends of the distribution, while Canada saw an increase at the 25th percentile. In contrast, Lithuania, Poland and

the Slovak Republic saw sizeable declines in proficiency at all four points. Israel recorded a decrease at the 75th percentile. In Chile, Spain and Sweden numeracy, like literacy, remained unchanged across the distribution.

Figure 3.4. Change in the distribution of proficiency of literacy and numeracy between cycles

Differences in proficiency scores between cycles at the 10th, 25th, 75th and 90th percentiles (Cycle 2 *minus* Cycle 1)



Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the unadjusted change in average literacy proficiency scores.
Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Tables A.3.3 (L) and A.3.3 (N) in Annex A.

These findings reveal important insights that are not evident when looking solely at average proficiency scores. First, the declines in average literacy proficiency noted above are largely the result of declines in proficiency among adults at the bottom of the national proficiency distribution. Second, the different trajectories at the bottom and top of the proficiency distribution have widened the gap between the lowest- and the highest-scoring adults in society in both assessment domains, even in countries where average scores have remained constant. In 17 participating countries and economies, the proficiency gap in literacy proficiency between the top- and the bottom-performing 10% of adults, known as the inter-decile range,

has widened significantly (see Table A.3.3 (L) in Annex A). In numeracy, the inter-decile range widened in 13 countries and economies (see Table A.3.3 (N) in Annex A). The majority of participating countries and economies thus saw increases in skills-related inequalities between the two cycles of the Survey of Adult Skills.

Box 3.3 Comparison of the results from the Survey of Adult Skills with those of previous international skills surveys

The Survey of Adult Skills was designed to be linked with the International Adult Literacy Survey (IALS) and the Adult Literacy and Life Skills Survey (ALL) in the domain of literacy, and with ALL in the domains of literacy and numeracy. A set of common items provides the psychometric linkage between the different surveys. The analysis in this chapter compares literacy results of IALS and PIAAC, while numeracy results from ALL are reported in Table A.3.23 (N) in Annex A. Differences in the constructs, survey methodology and operational procedures between the three assessments should be taken into account when interpreting these results.

Literacy, as measured in the Survey of Adult Skills, is conceptually similar to the literacy construct assessed in IALS and ALL in terms of the cognitive processes involved in solving reading tasks, the definition of contexts in which reading takes place and the factors affecting task difficulty. However, in addition to the prose and document literacy assessed in IALS and ALL (i.e. reading continuous texts and matrix-structured texts, such as tables), the Survey of Adult Skills also covers the reading of digital texts. The concept of numeracy remained largely unchanged between ALL and the first cycle of the Survey of Adult Skills.

While differences in the skills measured are small, there is a major difference in how the assessments are delivered. The Survey of Adult Skills is a computer-based assessment, whereas IALS and ALL were entirely paper-based. The field trial of the first cycle of the Survey of Adult Skills examined the potential effects of the delivery mode on response patterns by randomly assigning respondents to either the paper-based or the computer-based versions (OECD, 2013[8]). The results did not suggest that the mode of delivery made any difference.

Other differences relate to survey operations and quality assurance. The Survey of Adult Skills applies more rigorous measures than both IALS and ALL to ensure that implementation standards are met and that the survey is carried out with a high degree of uniformity and quality in all participating countries and economies. However, the exact extent to which the assessments differ in compliance with quality standards cannot be assessed. It is also not clear how such differences could affect the comparability of results. For these reasons, changes in proficiency between the previous large-scale assessments and the Survey of Adult Skills should be interpreted with caution. A more detailed discussion of the comparability between IALS, ALL and the first cycle of the Survey of Adult Skills can be found in Paccagnella (2016[11]) and in Chapter 6 of the Reader's Companion to this report (OECD, 2024[9]).

Long-term trends in skills proficiency

The Survey of Adult Skills was designed to provide reliable comparisons with the results of the International Adult Literacy Survey (IALS), administered in 21 countries between 1994 and 1998, and the Adult Literacy and Life Skills Survey (ALL), conducted in 13 countries between 2003 and 2007. There are 17 countries and economies which participated in both the Survey of Adult Skills and IALS, with results between 13 and

18 years apart, depending on the country. Comparisons between ALL and the Survey of Adult Skills are available for seven countries and are presented in Table A.3.23 (N) in Annex A. A brief overview of the relationship between the three surveys is provided in Box 3.3.

Figure 3.5 presents how average literacy proficiency has evolved between IALS and the first and second cycles of the Survey of Adult Skills. It groups countries and economies according to the pattern of their long-term trends. Of all the participants, only Finland exhibits a pattern of overall improvement, with mean proficiency in 2023 significantly exceeding that found by IALS by 15 points. In Denmark, Germany, Norway and Sweden, proficiency improved or remained stable over the two cycles of the Survey of Adult Skills, following a drop between IALS and the first cycle of the survey. Conversely, in Czechia and the United States, average proficiency remained stable between IALS and the first cycle of the Survey of Adult Skills but has since decreased. In Hungary, Poland and New Zealand, sizeable increases in literacy proficiency were followed by substantial declines. In Italy and England (United Kingdom), a moderate increase between IALS and the first cycle of the Survey of Adult Skills was followed by no significant change in the next cycle. Finally, in Canada, Chile, the Flemish Region (Belgium), Ireland and the Netherlands, proficiency remained unchanged throughout the entire period.

The data presented in Figure 3.5 span up to three decades and cover adults born between the 1930s and 2000s who started their schooling between the 1940s and early 2010s. They thus reflect influences that go as far back as the Second World War. Against the background of the significant social, political and economic changes of this period, the development of adults' literacy proficiency appears relatively stable. The differences in average scores between IALS and the Survey of Adult Skills were below 20 points in all the participating countries and economies except Poland and Sweden.

How trends in skills proficiency relate to changes in the socio-demographic composition of the population

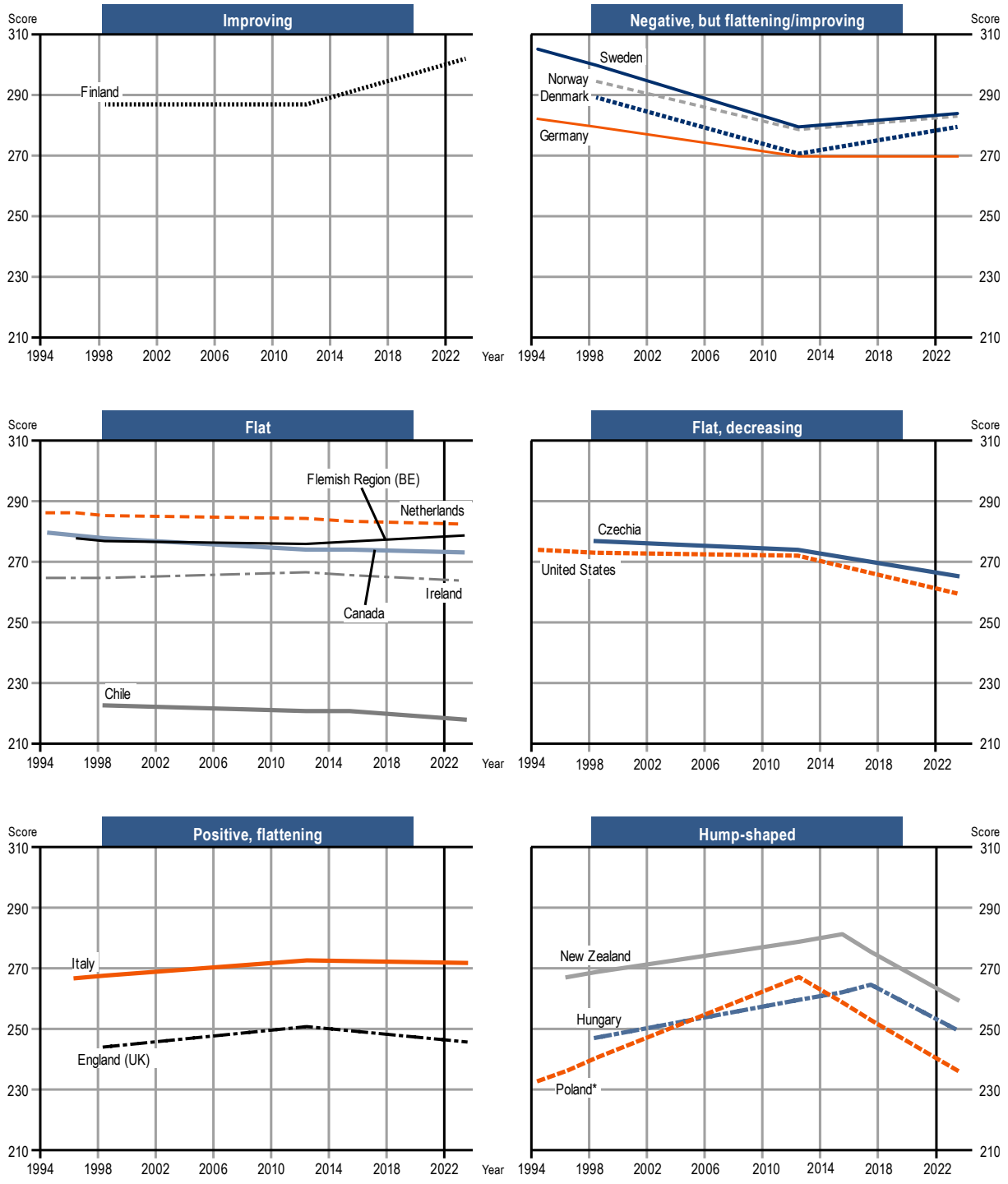
As discussed in the previous section, relative increases in the size of groups with generally lower skill levels, such as immigrants or older adults, can contribute to declines in skills proficiency. On the other hand, an increase in the share of highly educated adults can contribute to improvements in the average skills levels of the population. Along with these compositional changes in the adult population, country-level changes in proficiency depend on how skills proficiency *within* socio-demographic groups evolves. For example, the impact of a growing share of older adults in the population on overall skills levels depends on how well the skills of older adults are maintained and developed. Similarly, the extent to which educational expansion improves the proficiency of the population depends on whether the highly educated maintain the same high level of skills.

This section focuses on how the relative size and the skills proficiency of socio-demographic groups defined by immigrant background, age and educational attainment have changed across the cycles of the Survey of Adult Skills, and how much these changes have contributed to the proficiency changes in the overall population. The focus is on the literacy domain, while results in numeracy generally follow a similar pattern. The latter results are only briefly outlined and presented in detail in Annex A.

When interpreting the results of this analysis, it is important to keep in mind that the changes in the socio-demographic composition of the adult population are estimated using data collected in the two cycles of the Survey of Adult Skills. The surveys were designed to be representative of the adult population, but differences in the propensity of adults to participate in the surveys can result in adults with certain characteristics being over- or under-represented in the data. While the data are weighted to bring the composition of the sample more in line with the known distribution of characteristics in the population, some discrepancies with other data sources may remain. These discrepancies can sometimes be explained by differences in coverage, timing or definitions between the Survey of Adult Skills and other

Figure 3.5. Long-term trends in literacy proficiency

Average literacy proficiency scores in IALS and Cycles 1 and 2 of the Survey of Adult Skills



Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Source: Statistics Canada (2024[12]), *International Adult Literacy Survey (IALS)*, https://www150.statcan.gc.ca/n1/ (accessed on 23 September 2024); OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table A.3.23 (L) in Annex A.

sources (see Reader's Guide). Another reason for differences with other surveys relates to the exclusion of doorstep respondents in the second cycle of the survey and literacy-related non-respondents from the first cycle, which mechanically excludes adults with insufficient language proficiency. A more detailed discussion of these issues is presented in OECD (2024[9]) and OECD (forthcoming[7]).

Changes in skills proficiency related to educational attainment

Over the past few decades, the education systems of OECD countries have been expanding. Completion of upper secondary education has become commonplace, and an increasing number of individuals are attaining tertiary education (OECD, 2023[13]). The extent to which this development improves the key information-processing skills of the population depends on how effectively education translates into strong skills.

The relationship between education and skills is complex. The formation of skills through formal education takes place in a variety of institutions – from early childhood education and care programmes, through schools and universities, to providers of non-formal education and training for adults. How effectively these institutions contribute to the development of relevant skills depends on the quality of teaching and learning, which is a function of multiple factors – including teachers' training, the curriculum and the learning environment, to name a few (OECD, 2018[14]). As educational systems expand, maintaining high-quality teaching and learning for a growing number of students spending more years in education becomes a major challenge for countries (OECD, 2020[15]).

However, care should be taken not to attribute all changes in skills proficiency related to educational attainment to changes in the quality of education. Individuals select and are selected for advanced education levels based on their abilities and skills. This means that those who already have strong skills are more likely to attain higher levels of education. As access to higher education levels expands, students at these levels become more diverse in terms of academic ability and skills proficiency. Simultaneously, the average ability of adults with lower levels of educational attainment is likely to decline as the relative size of this group shrinks, other things being equal. Consequently, a change in skills proficiency among adults with the same level of education over time may reflect changes in the composition of students rather than changes in education quality.

In addition, skills formation also happens outside the education system, for example in the family and the workplace or through more or less structured adult training and learning opportunities. Adults with different educational attainment may have systematically different levels of access to such opportunities. This is another reason why not all changes in skills should be attributed to changes in formal education.

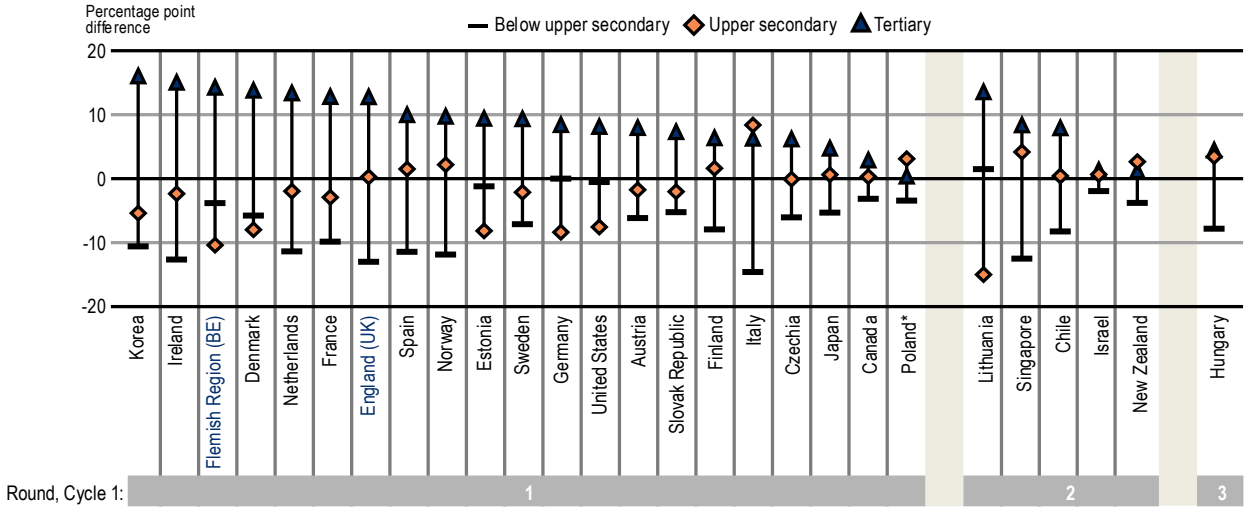
This section presents changes in literacy proficiency between cycles among adults with below upper secondary, upper secondary and tertiary education as their highest educational qualification. The analysis is restricted to adults over the age of 25, as they are most likely to have completed their formal education.

Changes in the educational attainment of the adult population

During the period between the two cycles of the Survey of Adult Skills, the education level of the population aged 25-65 has changed in all participating countries and economies (Figure 3.6).[2] In all countries except Israel, New Zealand and Poland, the proportion of adults with tertiary education has increased. This is due to two factors: older cohorts with less education are no longer part of the target population and enrolment rates among younger cohorts have increased. The increase in the share of tertiary-educated adults between 2012 and 2023 was most pronounced in the Flemish Region (Belgium), Ireland and Korea, where it rose by more than 14 percentage points. Meanwhile, the share of adults with below upper secondary education has declined in almost all countries and economies.

Figure 3.6. Change in educational attainment of the adult population between cycles

Difference in the shares of adults with below upper secondary, upper secondary and tertiary education (Cycle 2 *minus* Cycle 1); 25-65 year-olds



Note: Does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). See Note 2 for an explanation of the classification of educational attainment. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in ascending order of the change in the share of tertiary-educated adults.

Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table B.3.1 (Trend) in Annex B.

Changes in skills proficiency by educational attainment

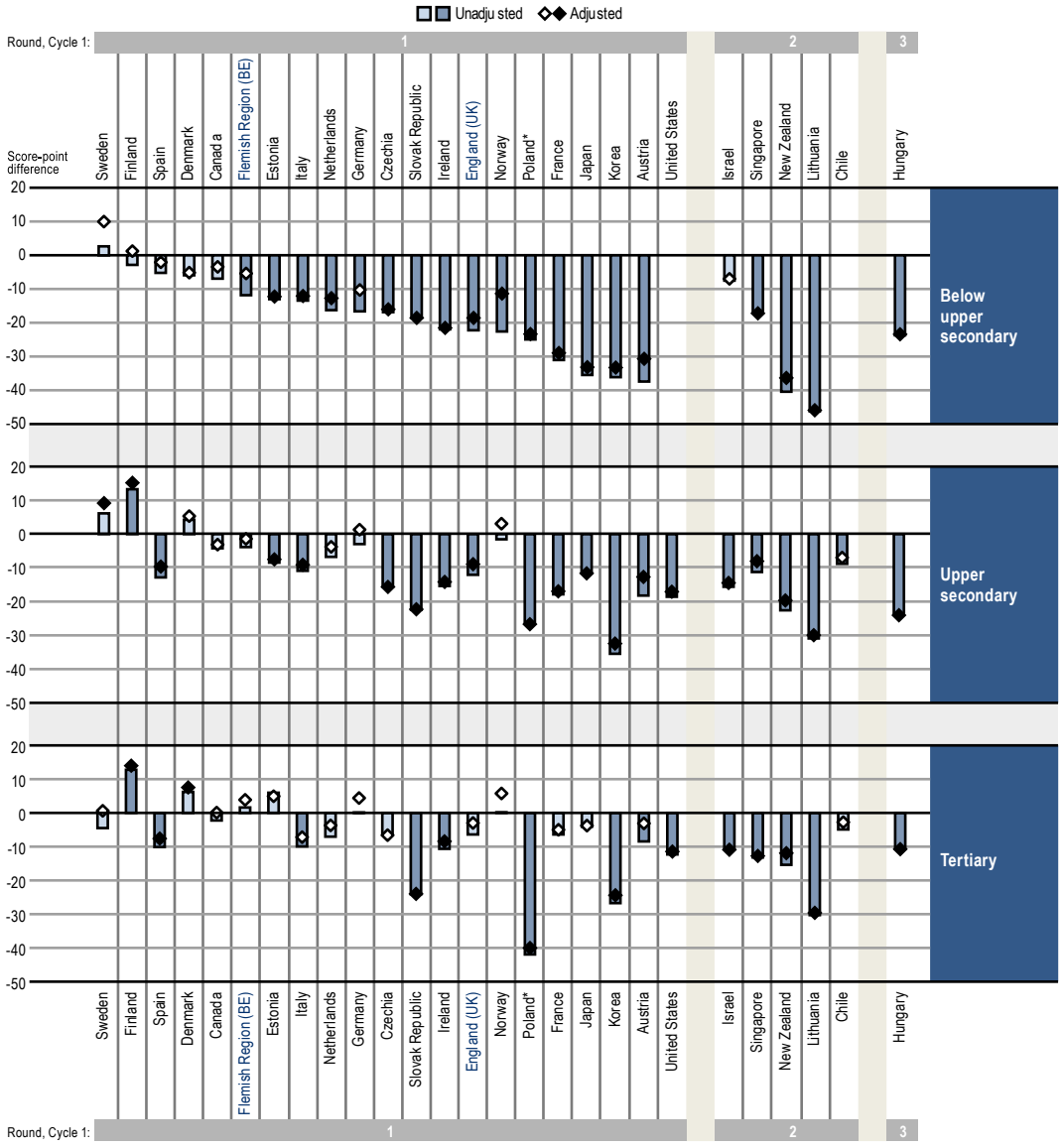
Across the countries and economies participating in both cycles of the Survey of Adult Skills, declines in literacy proficiency were most widespread among low-educated adults (Figure 3.7). The average proficiency of adults with below upper secondary education significantly decreased between the two cycles in all countries and economies except in Canada, Denmark, Finland, Israel, Spain and Sweden. These decreases ranged from 12 points in the Flemish Region (Belgium) to 46 points in Lithuania. The proficiency of adults with upper secondary education fell in 19 countries and economies, remained unchanged in 7, and increased in Finland. Among tertiary-educated adults, average proficiency fell in 13 countries and economies, and only increased in Finland.

Changes in numeracy followed a similar pattern, with declines in numeracy proficiency being more common among low-educated adults (see Table A.3.11 (N) in Annex A). Thirteen countries and economies showed a significant decrease in the average numeracy score of this group, while only Singapore recorded an increase. The average numeracy proficiency of tertiary-educated adults increased only in Canada, Estonia and Finland, and declined in Hungary, Israel, Italy, Korea, Lithuania, New Zealand, Poland and the Slovak Republic. Particularly large declines in the numeracy proficiency (over 20 points) of tertiary-educated adults were found in Lithuania, Poland and the Slovak Republic.

The widespread decline in proficiency among low-educated adults has widened disparities in proficiency by educational background in most of the participating countries and economies. Austria, France, Japan, New Zealand and Norway saw large increases in the proficiency gap between adults with below upper secondary and tertiary education (Figure 3.8) In contrast, in Singapore, which has the largest inequality in literacy by educational attainment, the gap changed less because proficiency declined among both low-educated and highly educated adults. The gap narrowed in Poland due to declining literacy proficiency among tertiary-educated adults (Figure 3.7).

Figure 3.7. Change in literacy proficiency between cycles, by educational attainment

Adjusted and unadjusted difference in mean literacy scores between cycles (Cycle 2 *minus* Cycle 1); 25-65 year-olds



Note: Does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). See Note 2 for an explanation of the classification of educational attainment. Unadjusted differences are the differences between the averages in each cycle. Adjusted differences are based on a method analogous to post-stratification that reweights the samples in Cycle 2 so that education groups have the same demographic characteristics as in Cycle 1 (see Note 1). Demographic characteristics considered are: age (in ten-year age brackets), gender and immigrant background. Darker colours denote differences that are statistically significant at the 5% level.

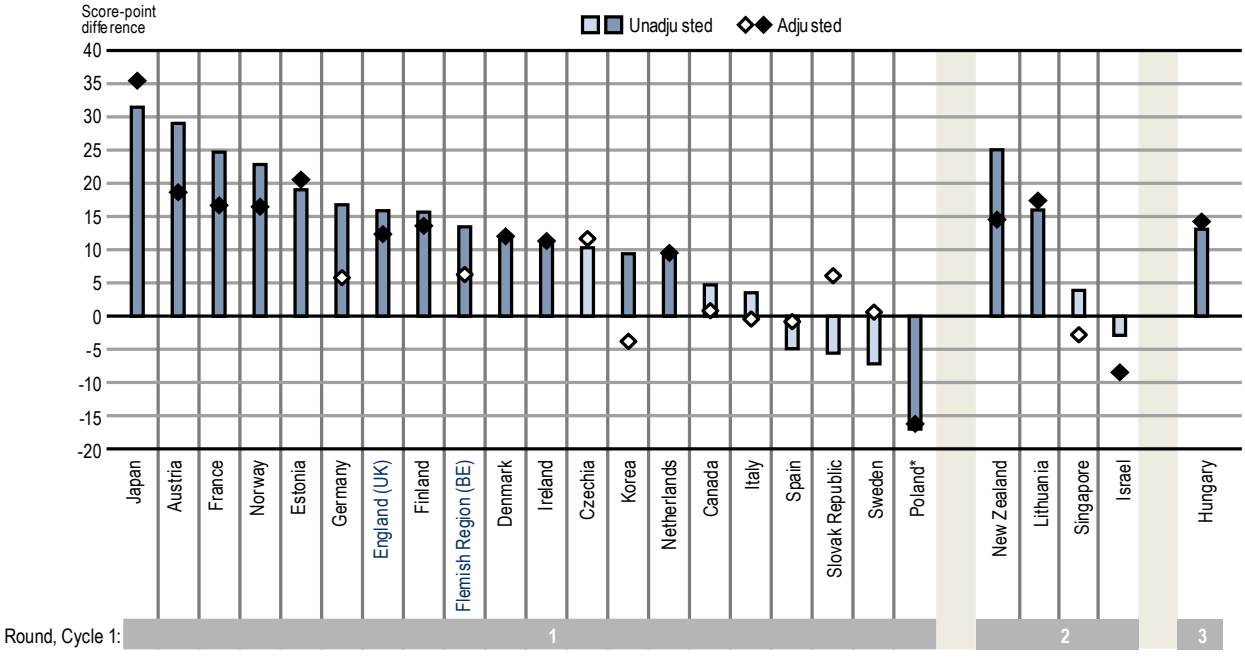
In Chile and the United States, more than 20% of the subsample of adults with below upper secondary education only completed the assessment of reading and numeracy components in the second cycle. As the methodology for estimating the proficiency of adults who only took the components assessment has changed between the cycles, the change in proficiency for this group is not reported. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the unadjusted change in literacy proficiency among adults with below upper secondary education.

Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table A.3.11 (L) in Annex A.

Figure 3.8. Change in the gap in literacy proficiency between highly and low-educated adults

Adjusted and unadjusted change between cycles in the average score difference between adults with tertiary education and adults with below upper secondary education (Cycle 2 *minus* Cycle 1); 25-65 year-olds



Note: Does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). See Note 2 for an explanation of the classification of educational attainment. Unadjusted changes in the proficiency gap are the changes in the difference between the two contrast categories across the cycles. Adjusted changes are obtained by subtracting the coefficients of regression models estimated separately for each cycle. These coefficients show the difference between the categories in each cycle, after accounting for: gender, immigrant background, age, parental education and language spoken at home. Darker colours denote differences that are statistically significant at the 5% level.
In Chile and the United States, more than 20% of the subsample of adults with below upper secondary education only completed the assessment of reading and numeracy components in the second cycle. As the methodology for estimating the proficiency of adults who only took the components assessment has changed between the cycles, the change in the proficiency gap is not reported for these countries. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the unadjusted change in the gap.
Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Tables A.3.12 (L) and A.3.13 (L) in Annex A.

The numeracy proficiency gap between low- and highly educated adults widened significantly in 11 countries and economies, with large increases (over 20 points) in Austria, Japan and New Zealand. In Singapore, the gap in numeracy narrowed due to improvements among the low-educated, while in Israel and the Slovak Republic it narrowed because of proficiency declines among tertiary-educated adults (see Tables A.3.11 (N) and A.3.12 (N) in Annex A).

Changes in skills proficiency by educational attainment among younger and older adults

When interpreting proficiency trends for different education groups, it is important to consider that the proficiency of younger and older adults with the same educational attainment may have evolved differently due to their different educational experiences. Older adults may have received a very different education from that received by younger people today. The relationship between older adults' formal education and their proficiency is also presumably weaker due to the length of time they have been out of education. In contrast, trends in the proficiency of younger adults with different attainment levels are more influenced by

the state of education and training in recent years. These trends are also of greater interest to governments, as they devote considerable public resources to education and are relying on the skills of the younger population to meet future skills demands in the labour market.

Figure 3.9 shows that changes in literacy among 25-44 year-olds are similar to those among 45-65 year-olds across the different levels of educational attainment. Exceptions to this pattern are observed among those with lower educational attainment. In particular, in Austria, England (United Kingdom), Estonia, Finland, the Flemish Region (Belgium), France, Germany, Japan, Korea and Norway, declining proficiency among adults with below upper secondary education are primarily seen among 45-65 year-olds, while proficiency among low-educated 25-44 year-olds either improved or changed less since the previous cycle. This suggests that, in these countries and economies, factors other than recent changes in education policy are driving declines in proficiency among low-educated adults.

Numeracy proficiency developed largely similarly among adults in different age groups but with the same level of educational attainment (see Table A.3.11 (N) in Annex A). As with literacy, age differences are mainly observed among low-educated adults. In particular, Austria, England (United Kingdom), Estonia, Finland and France recorded declines in numeracy proficiency among low-educated adults aged 45-65, but not among younger adults with the same educational attainment, after accounting for changes in the population composition by age, gender and immigrant background. In contrast, in Italy, Lithuania, New Zealand and Poland, declines in numeracy proficiency among the low-educated were more pronounced among younger adults, after accounting for demographic changes. In Israel, Singapore and Spain, numeracy proficiency did not change significantly among low-educated young adults and improved among low-educated older adults.

Changes in skills proficiency related to age

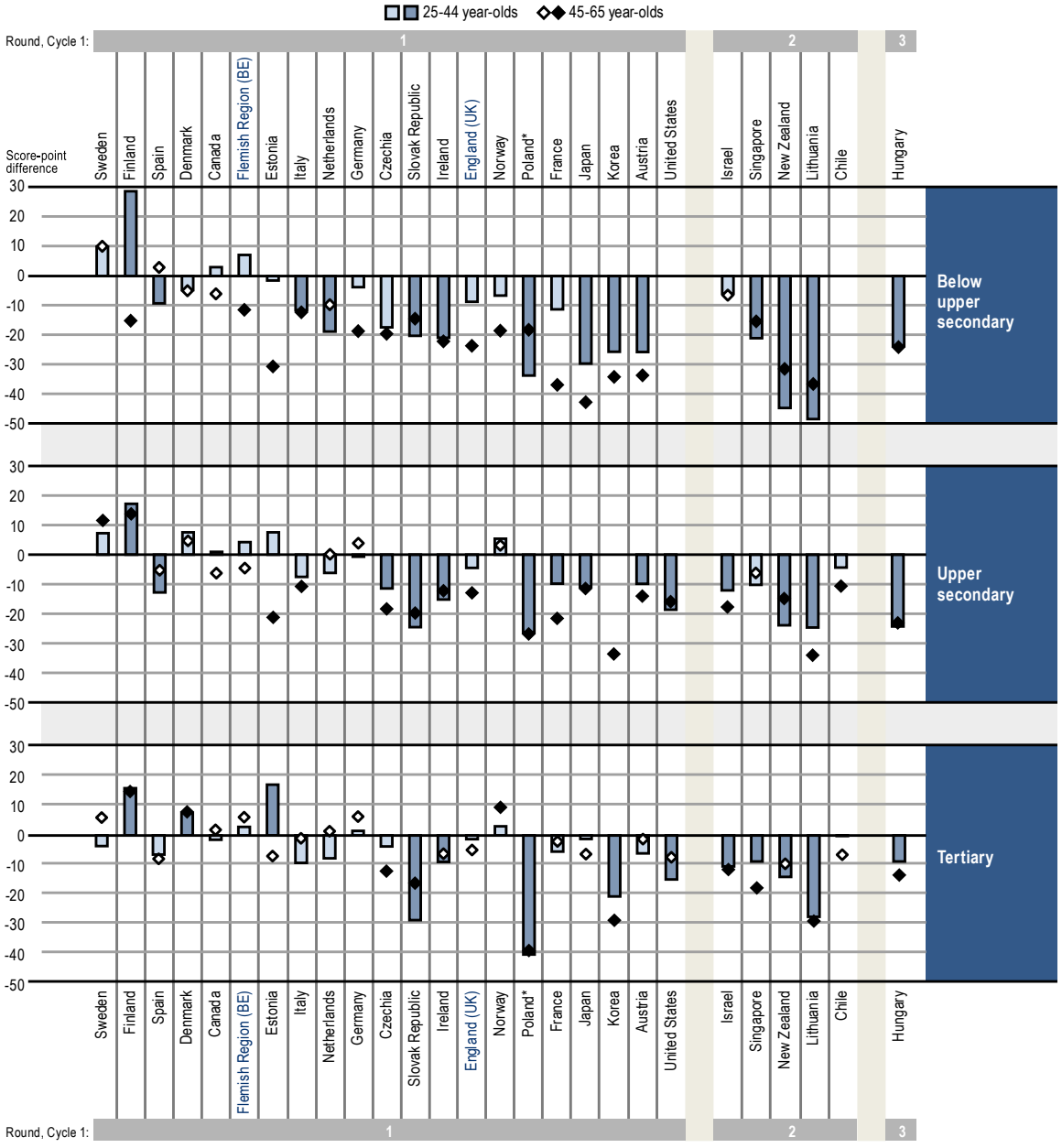
The populations and workforce of OECD countries are ageing, as a result of declining fertility rates, increasing longevity and labour-market policies that delay retirement and encourage longer careers (André, Gal and Schief, 2024[16]). To understand the capacity of an ageing society and workforce to adapt to the demands of the modern, skills-driven economy, means understanding how age relates to skills. The Survey of Adult Skills provides important insights into this relationship.

The 2023 Survey of Adult Skills makes it easier to disentangle some of the mechanisms that link age to skills proficiency. The addition of a second cycle allows the proficiency of the same birth cohort to be compared at two points in time, in other words at different ages. This sheds light on the so-called ageing effect on skills: how skills change as a consequence of growing older. This may be due to the gradual maturation and subsequent decline of cognitive abilities that result from biological ageing. It also depends on the opportunities available to individuals to develop and maintain their key information-processing skills. Since the Survey of Adult Skills does not track the same individuals over time, the focus is on how birth cohorts, rather than individual adults, have gained, maintained or lost skills, on average, over time.

The second cycle also enables different birth cohorts of the same age to be compared. This provides insights into the so-called cohort effect: differences in skills proficiency that are due to the specific experiences of different generations. Cohort effects provide information about how skills change as a consequence of important shifts in society, such as educational expansion, changes in education quality, migration flows, or changes in employment, occupations and work. Cohort effects are likely to vary widely across countries and economies due to differences in these factors, especially due to the different paces at which education expands.

Figure 3.9. Change in literacy proficiency between cycles, by educational attainment and age

Adjusted differences in mean literacy scores between cycles (Cycle 2 *minus* Cycle 1); 25-65 year-olds



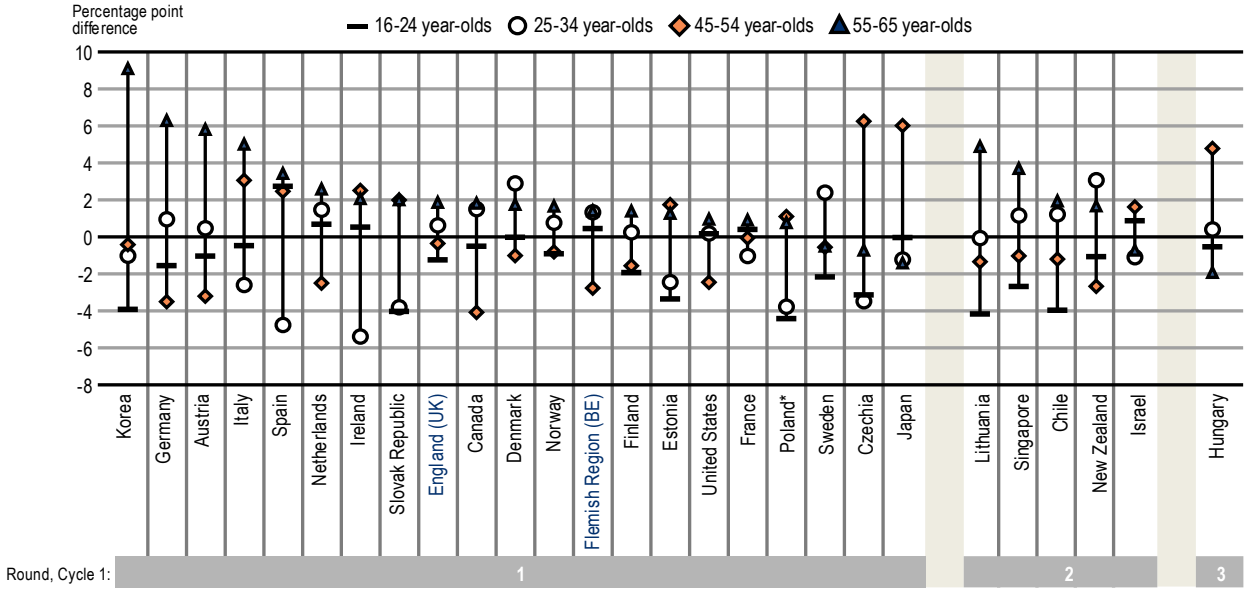
Note: Does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). See Note 2 for an explanation of the classification of educational attainment. Adjusted differences are based on a method analogous to post-stratification that reweights the samples in Cycle 2 so that education groups by age have the same demographic characteristics as in Cycle 1 (see Note 1). Demographic characteristics considered are: age (in ten-year age brackets), gender and immigrant background. Darker colours denote differences that are statistically significant at the 5% level.
In Chile and the United States, more than 20% of the subsample of adults with below upper secondary education only completed the assessment of reading and numeracy components in the second cycle. As the methodology for estimating the proficiency of adults who only took the components assessment has changed between the cycles, the change in proficiency for this group is not reported. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the change in literacy proficiency among adults with below upper secondary education.
Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table A.3.11 (L) in Annex A.

Changes in the age structure of the population

Over recent decades, all OECD countries have seen a steady increase in the share of older adults in the population. This trend is projected to continue, with the proportion of people aged 65 and over expected to increase from 18% in 2023 to 25% by 2050, and that of people aged 50 and over from 37% to 44% (OECD, 2024[17]). In the years between the two cycles of the Survey of Adult Skills, most participating countries and economies have experienced a change in the age structure of their population (Figure 3.10). This shift was most pronounced in Austria, Germany, Italy and Korea, where the share of 55-65 year-olds increased by 5 percentage points or more between 2012 and 2023. Among countries taking part in Round 2 of the first cycle, this share has grown by 5 percentage points in Lithuania and 4 percentage points in Singapore between 2015 and 2023.

Figure 3.10. Change in the age composition of the adult population between cycles

Difference in the relative size of 10-year age groups between cycles (Cycle 2 *minus* Cycle 1)



Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the change in the share of 55-65 year-olds.
Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table B.3.6 (Trend) in Annex B.

Changes in skills proficiency by age

Figure 3.11 presents differences in literacy proficiency between adults of the same age at the time of the first and second cycle (i.e. cohort effects). It shows how proficiency has changed between assessments within five different age groups across the participating countries and economies. The evolution of proficiency in the youngest age group will reflect, to a larger extent, current and recent changes in education, such as expanding participation or improving education quality due to recent reforms. In contrast, changes in proficiency among the older age groups may be the result of influences that occurred long before the period covered by the assessment – reaching as far back as the 1950s and 1960s, when the cohort aged 55-65 in the first Survey of Adult Skills began compulsory schooling. In addition, differences among older adults will also reflect more recent changes in the world of work that would have provided or limited their opportunities to maintain and develop skills.

The average literacy proficiency of young adults aged 16-24 improved significantly in England (United Kingdom), Finland and Norway between the two cycles. In contrast, in eight countries, 16-24 year-olds demonstrated lower proficiency in the second cycle than their peers in the first cycle, with particularly pronounced declines in Lithuania, New Zealand, Poland and the Slovak Republic. Among 25-34 year-olds, three countries saw improvements in proficiency and eight countries significant decreases. The trend for older adults was more widely negative: in 12 countries and economies, 55-65 year-olds had lower literacy proficiency in the second cycle than the same age group in the previous cycle. Only Denmark, Finland, Spain and Sweden have seen improved proficiency among older adults.

In numeracy, improvements among young adults aged 16-24 were recorded in Chile, Denmark, England (United Kingdom), Estonia, Finland, Ireland, Japan, the Netherlands, Norway and Singapore (see Table A.3.7 (N) in Annex A). In most of these countries, with the exception of Ireland and Japan, as well as in Canada, numeracy skills also improved among 25-34 year-olds. Numeracy proficiency among adults aged 55-65 increased in Finland, the Flemish Region (Belgium), Germany, the Netherlands, Norway, Singapore, Spain and Sweden. In contrast, Hungary, Lithuania, New Zealand, Poland and the Slovak Republic saw declines in numeracy proficiency among all age groups (except among 55-65 year-olds in New Zealand). In Israel, Italy, Korea and the United States, proficiency declined among 25-34 year-olds. The United States recorded declines among 55-65 year-olds, and Korea among 35-44 year-olds.

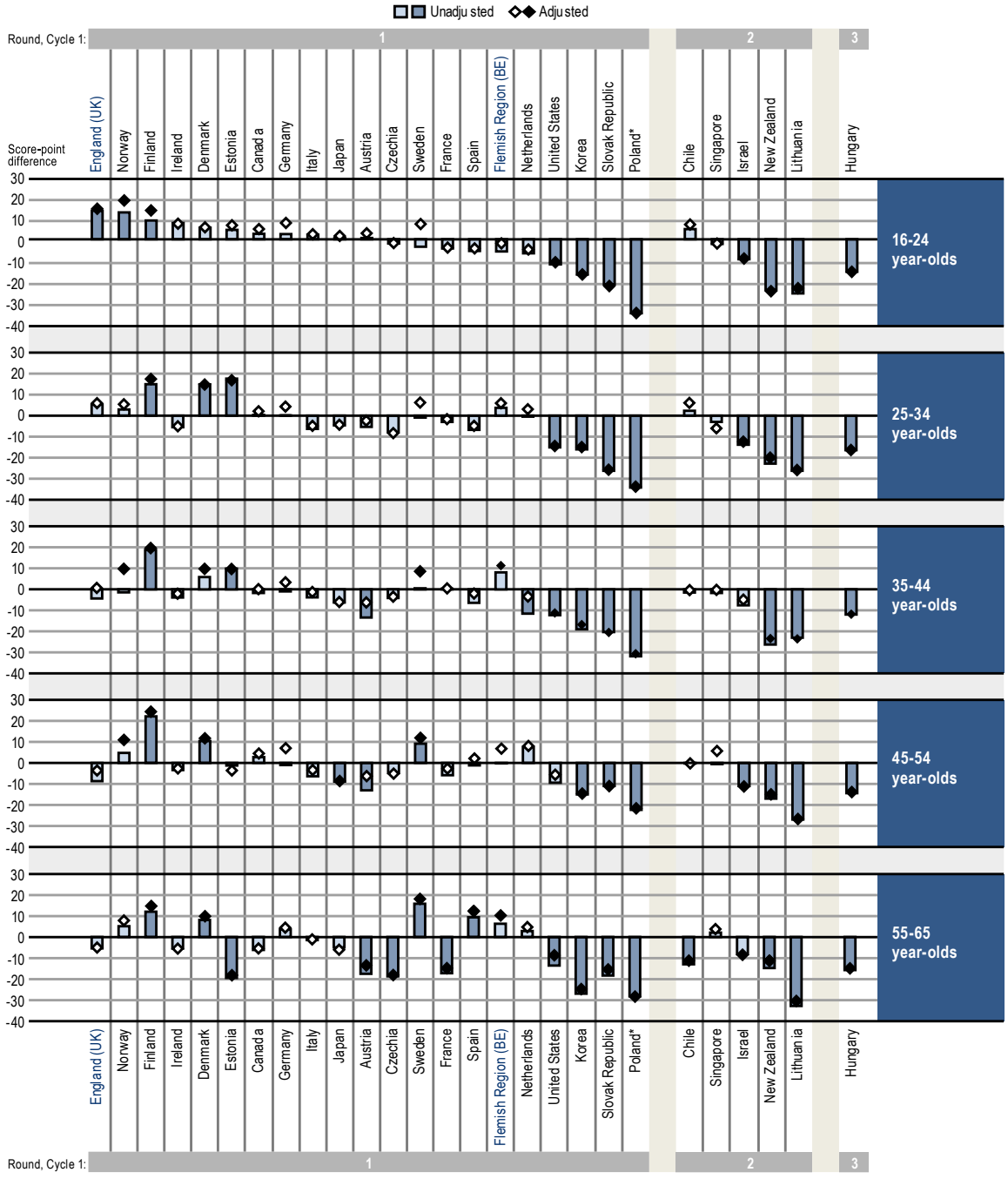
Ageing effects offer additional insights into how skills proficiency relates to age. Figure 3.12 compares the average literacy proficiency of cohorts in the second cycle to their proficiency in the previous cycle, when they were between 5 and 11 years younger, depending on the assessment round. For example, adults aged 55-65 in the second cycle are compared to (different) adults who were aged 44-54 in Round 1 of the first cycle, to show how the literacy proficiency of adults born in 1958-68 has evolved on average between these ages. The analysis excludes migrants who have lived in the country/economy for less than ten years in order to isolate the impact of migration on the composition of cohorts.

The figure shows that age-related skills declines are widespread. In almost all countries, the literacy proficiency of the older cohorts has decreased since the last assessment. The exceptions are Denmark, Germany and Sweden, where the average literacy proficiency of adults who were aged 55-65 in the second cycle did not change significantly with age. In the remaining countries and economies, the magnitude of the age effect varies widely. For example, in the Flemish Region (Belgium), the mean literacy proficiency of the oldest cohort in the second cycle only declined by 11 points between the ages 44-54 and 55-65, compared to declines of around 40 points in Korea and Poland. These cross-country differences suggest that investments in skills have a role to play in delaying the decline in skills in older age.

Countries and economies also differ in the onset of age-related skills loss. In six countries and economies, age-related skills loss seems to begin at a relatively young age: Hungary, Korea, Lithuania, Poland, Singapore and the Slovak Republic all recorded age-related declines in literacy among those aged 27-34 in the second cycle. In 12 other countries/economies, age-related declines were first observable among those aged 35-44 in the second cycle. The remaining countries – Canada, Denmark, England (United Kingdom), Estonia, Finland, the Flemish Region (Belgium), Germany, Norway and Sweden – saw clear skill gains across cycles for the cohort aged 16-23 in 2012 and 27-34 in 2023 while declines in literacy were only apparent among those in the older two cohorts.

Figure 3.11. Change in literacy proficiency between cycles, by age

Adjusted and unadjusted difference in mean literacy scores between cycles (Cycle 2 *minus* Cycle 1)



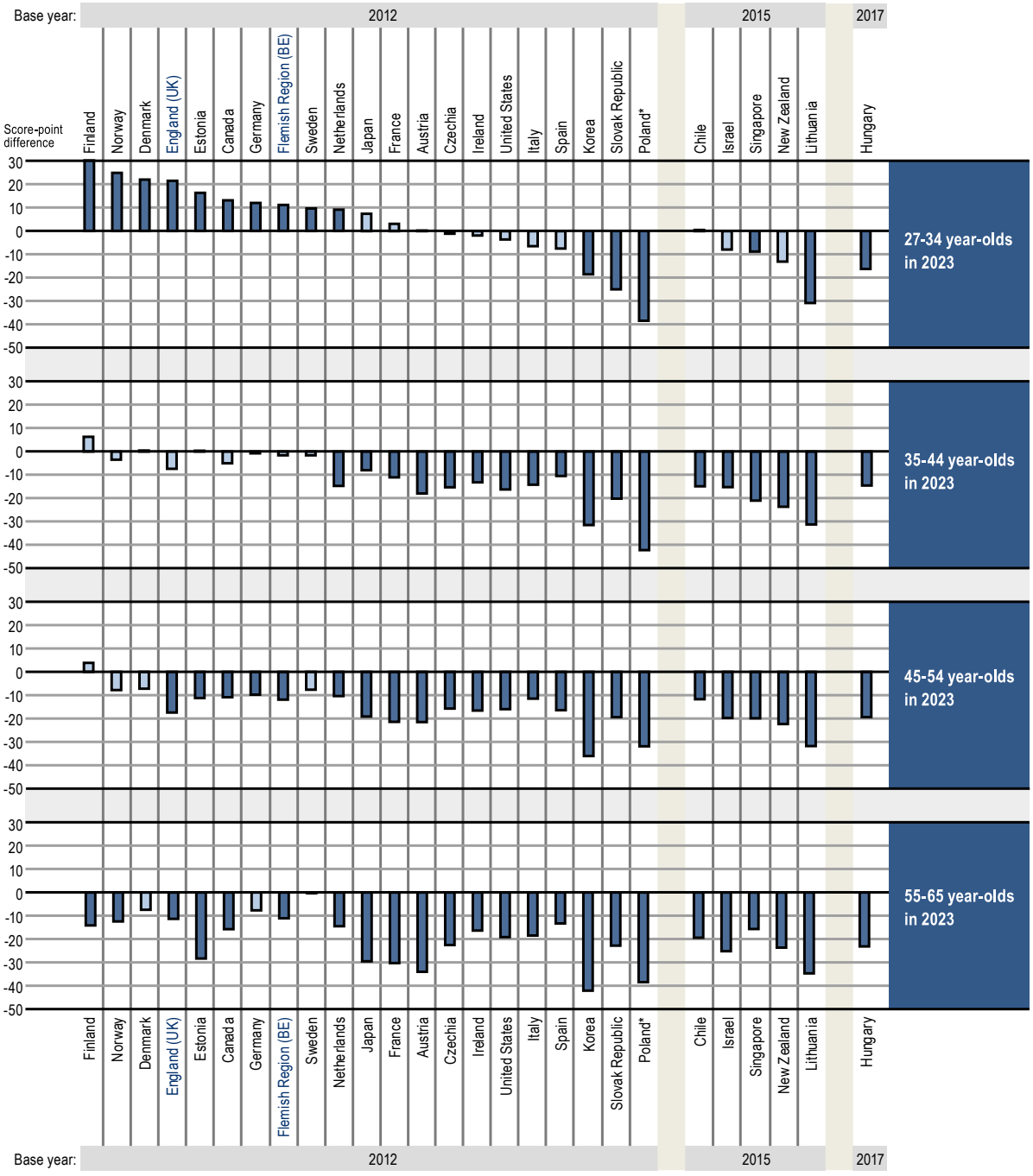
Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Unadjusted differences are the differences between the averages in each cycle. Adjusted differences are based on a method analogous to post-stratification that reweights the samples in Cycle 2 so that age groups have the same demographic characteristics as in Cycle 1 (see Note 1). Demographic characteristics considered are: gender and immigrant background. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the unadjusted change in literacy proficiency among 16-24 year-olds.

Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table A.3.7 (L) in Annex A.

Figure 3.12. Effect of ageing on literacy proficiency

Trend in literacy proficiency within cohorts (ageing effect), foreign-born adults who had lived in the country less than 10 years excluded



Note: Does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1. in Chapter 1 and Box 3.2), or foreign-born adults who had lived in the country less than ten years. The analyses start with those aged 27-34 in Cycle 2 because this is the youngest birth cohort covered in Round 1 of Cycle 1 (aged 16-23 at the time). Differences are unadjusted. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the change in literacy proficiency for the cohort aged 27-34 in Cycle 2.
Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table A.3.10 (L) in Annex A.

In comparison, age-related declines of numeracy skills were less pronounced (see Table A.3.10 (N) in Annex A). Two-thirds of the participating countries and economies recorded declines in numeracy proficiency among the cohort aged 55-65 in the second cycle. These declines varied from 9 points in Canada to 32 points in Poland. Only Hungary, Lithuania, Poland and the Slovak Republic recorded age-related declines in numeracy among the cohort aged 27-34 in 2023. These countries, together with Austria, Czechia, Israel, Italy, Korea and New Zealand, saw declines in numeracy proficiency between the cycles among adults aged 35-44 in 2023.

Changes in the proficiency gap between younger and older adults

Figure 3.13 shows how the proficiency gap between younger and older adults has changed between the cycles across participating countries and economies. Three scenarios can be distinguished according to whether changes in the gap result from an overall improvement in proficiency among both age groups, with one group improving more than the other; an overall decline, with one group declining more; or a divergence between the groups, with the proficiency of one group increasing and that of the other decreasing.

The first scenario, of net improvement in proficiency, is found in Spain and Sweden, where the literacy proficiency of 55-65 year-olds improved and that of 25-34 year-olds did not change significantly between cycles (Figure 3.11). As a consequence, the difference in proficiency between the age groups has narrowed. This change suggests adults have more opportunities to develop and maintain skills, even though these opportunities do not seem to benefit younger and older adults in the same way.

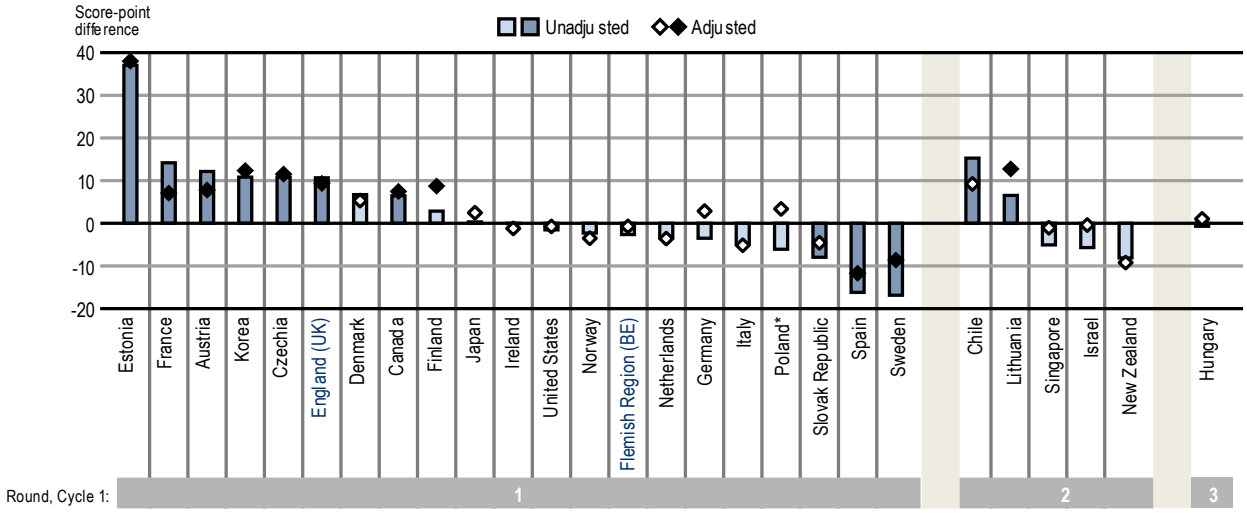
The second scenario, of overall proficiency decline, is found in several other countries. In Austria, Chile, Czechia and France, the age-related gap in literacy widened as proficiency declined among older adults but remained stable among younger adults (Figure 3.11). In Korea and Lithuania, the proficiency gap widened as a result of larger proficiency declines among older adults than among younger adults. In contrast, the Slovak Republic saw narrowing age-related proficiency gaps because of relatively larger declines among the younger age group. All these changes suggest less favourable conditions for developing skills, either for younger or older people in society or for both.

The third pattern, of divergence, is also observed in fewer countries. Notably, Estonia experienced improvements in proficiency among younger adults alongside declines among older adults that led to a sizable increase in the age-related skills gap (Figure 3.11). A similar pattern, albeit with non-significant changes in proficiency among the age groups, is found in England (United Kingdom).

In the numeracy domain, proficiency improved unevenly among younger and older adults in eight countries/economies (see Tables A.3.7 (N) and A.3.8 (N) in Annex A). In particular, Canada, Chile, Denmark, Estonia and England (United Kingdom) saw improvements among 25-34 year-olds and no change among 55-65 year-olds which widened age-related differences in numeracy proficiency. Singapore, Spain and Sweden saw relatively stronger increases in numeracy proficiency among the older age group, narrowing the gap. Israel, Italy and the Slovak Republic also saw a narrowing of the numeracy gap, as numeracy declined among older adults and remained stable or declined less among younger adults. In Austria, the gap widened due to a decline in the older age group. France exhibited a pattern of divergence, with (non-significant) increases in numeracy proficiency among younger adults and (non-significant) decreases among older adults leading to a widening of the age-related gap in numeracy.

Figure 3.13. Change in the gap in literacy proficiency between younger and older adults

Adjusted and unadjusted changes between cycles in the mean score difference between 25-34 year-olds and 55-65 year-olds (Cycle 2 *minus* Cycle 1)



Note: Does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Unadjusted changes in the proficiency gap are the changes in the difference between the two contrast categories across the cycles. Adjusted changes are obtained by subtracting the coefficients of regression models estimated separately for each cycle. These coefficients show the difference between the categories in each cycle, after accounting for: gender, immigrant background, educational attainment, parental education and language spoken at home. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the unadjusted change in the gap.

Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Tables A.3.8 (L) and A.3.9 (L) in Annex A.

Changes in skills proficiency related to immigrant background

Since the first Survey of Adult Skills, most OECD countries have seen unprecedented numbers of migrants arriving in their territories, many of whom are asylum seekers (OECD, 2024[18]).[3] This has posed challenges to many countries, while also presenting opportunities. Migrants increase and diversify the supply of labour, which can contribute to economic growth and help mitigate the negative impacts of population ageing (OECD, 2016[19]). A precondition for this is that they have the skills required to succeed in daily life and work in the host country (OECD, 2019[20]). While some migrants will already possess these skills, others need to overcome substantial language and cultural barriers to acquire them.

How immigrants' skills develop depends on two main factors: the profile of migrants coming in and the institutions and policies that support their integration. Countries often admit migrants with specific qualifications to address labour shortages or support innovative sectors. In contrast, during the refugee crises of the 2010s, many countries, particularly in Europe, admitted large numbers of low-skilled migrants who were unfamiliar with the host country's language. This can alter the average skills proficiency of the immigrant population and – depending on the size of the group – the adult population as a whole. Once migrants have settled in the host country, there are usually mechanisms in place to support their social and labour-market integration, such as language training and assistance in searching for and applying for work. These policies also impact migrants' skills levels. Their effectiveness may vary across countries and economies due to differences in quality but also differences in the linguistic proximity between migrants' countries of origin and destination.

The Survey of Adult Skills provides important insights into changes in immigrants' skills. It shows how the share and profile of migrants change over time and how skills proficiency evolves within different migrant groups and between migrants and native-born adults. However, these analyses are necessarily limited to respondents with sufficient knowledge of the language of the assessment. Only such respondents were surveyed in the first cycle of the survey. Although the doorstep interview provides better coverage of immigrants with poor knowledge of the national language(s) in the second cycle (see Box 3.2), these cases were excluded from the analysis of proficiency changes to maximise the comparability of samples across cycles. This means the results presented here are not representative of the entire immigrant population and should be interpreted accordingly.

Change in the share and profile of foreign-born adults

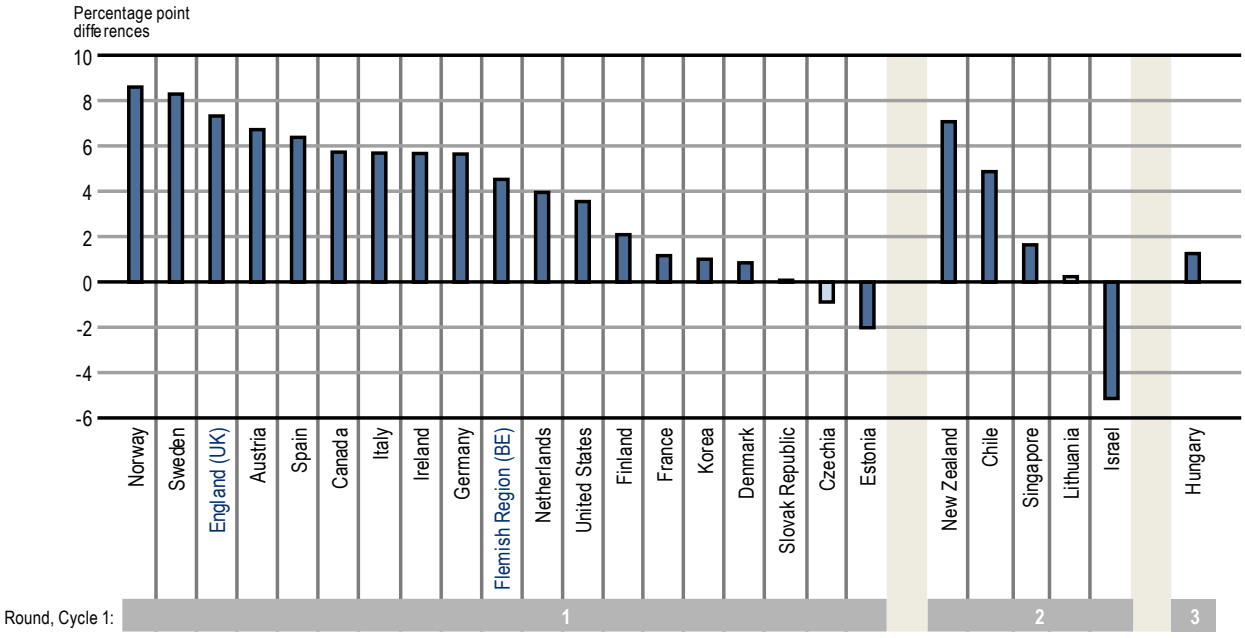
The changes in the relative size of the immigrant population observed in the Survey of Adult Skills largely mirror those observed from other sources (OECD, 2024[18]). Most countries and economies that participated in both cycles of the survey saw an increase in the share of their foreign-born populations over the last decade (Figure 3.14). According to the data collected in the Survey of Adult Skill, between 2012 and 2023 the proportion of foreign-born adults grew by more than 5 percentage points in Austria, Canada, England (United Kingdom), Germany, Ireland, Italy, Norway, New Zealand, Spain and Sweden. In contrast, this share fell in Estonia and Israel.[4] In interpreting these results, it is important to keep in mind that adults with insufficient proficiency of the language in which the survey was administered (literacy-related non-respondents in the first cycle and doorstep interview respondents in the second cycle) are excluded from the analysis, and these are often foreign-born adults.[5]

The composition of the migrant population represented by the Survey of Adult Skills has also changed over time. Most countries saw improvements in the educational level of foreign-born adults, which probably reflects common trends of educational expansion in both host countries and countries of origin (see Table B.3.12 (Trend) in Annex B). The strongest educational gains are observed in Estonia and the Netherlands. In contrast, the share of low-educated immigrants increased in the Flemish Region (Belgium) and remained stable in Germany, Israel, Italy and New Zealand. Some countries and economies have also seen the linguistic diversity of the foreign-born population covered by the survey increase since the first cycle. For example, Austria, Estonia, the Flemish Region (Belgium), Israel and the Netherlands saw an increase in the share of foreign-born adults who do not speak the language of assessment at home (see Table B.3.11 (Trend) in Annex B). This may have implications for migrants' literacy and numeracy proficiency, as the assessments are conducted in the countries' official national or regional language(s).

Changes in skills proficiency by immigrant background

Figure 3.15 shows the evolution of literacy proficiency for two groups: foreign-born adults of foreign-born parents and native-born adults of native-born parents. Larger fluctuations in literacy proficiency are observed among the foreign-born population, with statistically significant declines in proficiency recorded in 11 countries. These trends are likely to reflect changes in the socio-demographic and linguistic composition of the foreign-born population, driven by recent migration waves.

Figure 3.14. Change in the share of foreign-born adults in the adult population between cycles



Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2).
Japan and Poland are excluded due to small numbers of foreign-born adults.
Countries and economies are ranked in descending order of the change in the share of foreign-born adults.
Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table B.3.10 (Trend) in Annex B.

Overall, the patterns of change for the native-born population largely mirror those of the entire adult population, but there are exceptions in some countries. In the Flemish Region (Belgium), Germany and Norway, the literacy proficiency of adults without an immigrant background has improved since the first cycle, and it has remained stable in France. Meanwhile, the proficiency of adults with an immigrant background developed less favourably in these countries and economies.

Other countries have also experienced less favourable trends for immigrants than for native-born adults. In Chile and Singapore, literacy proficiency declined among immigrants, but not among native-born adults. In Austria and New Zealand, the decline in literacy proficiency for foreign-born adults was more pronounced than for native-born adults.

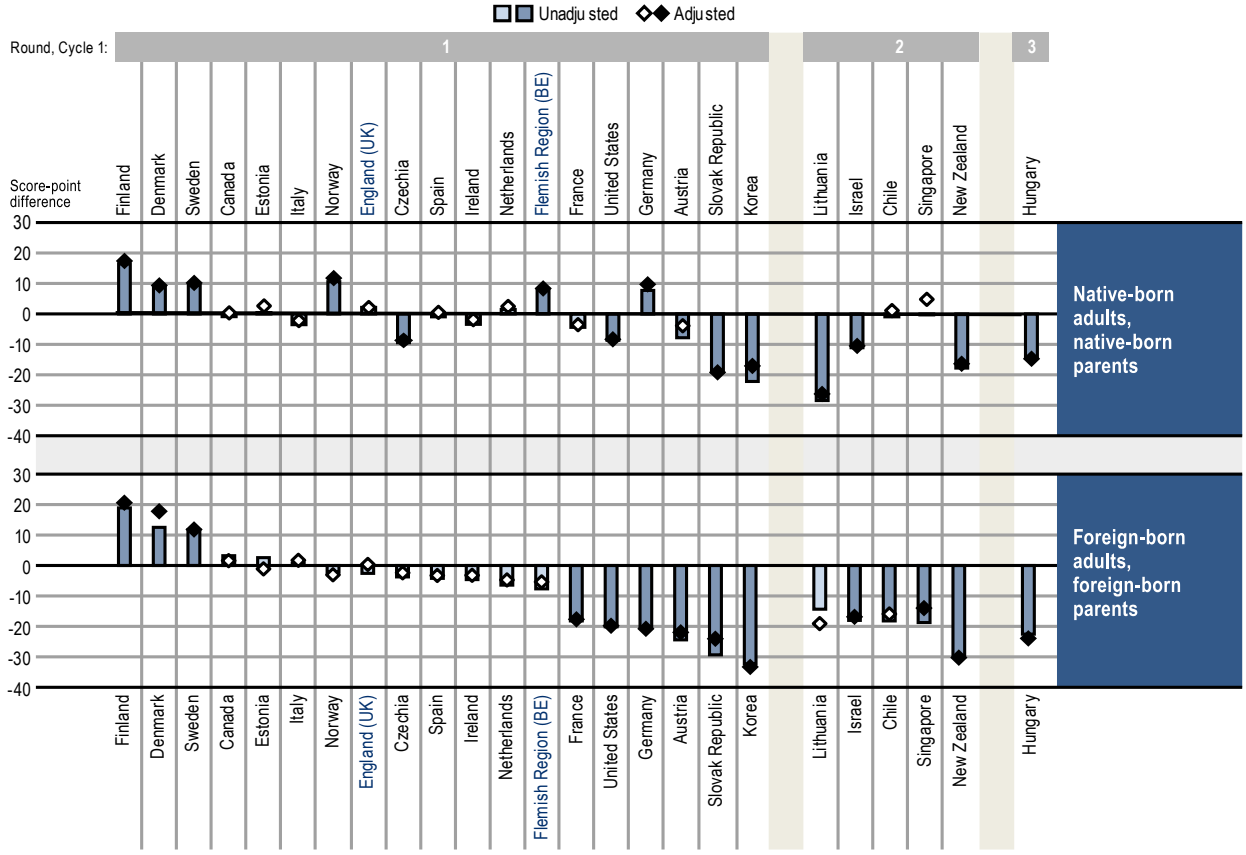
Migrants' numeracy skills have developed more positively in many countries over the past decade. Canada, Denmark, England (United Kingdom), Estonia, Finland, Norway and Sweden saw improvements in the proficiency of foreign-born adults (see Table A.3.14 (N) in Annex A). In Finland, Norway and Sweden, these gains were particularly large, exceeding 20 points. In contrast, numeracy proficiency among immigrants only declined significantly between cycles in Hungary and New Zealand.

When interpreting changes in the literacy proficiency of immigrants it is important to consider how long they have been living in the host country. Learning a new language and integrating into a new society takes time, while policies supporting immigrants' integration also take time to contribute effectively to skills formation. Recent migrants will have had less of both time and such resources. Their skills proficiency is typically lower and more strongly influenced by the opportunities available in their country of origin as well as their linguistic distance to the host country. Changes in proficiency among recently arrived migrants must therefore be interpreted in the context of the changing profile of incoming migrants, which is shaped by each country's immigration patterns and policies. The skills profile of long-term migrants may also vary

across time due to changing patterns of immigration, including return migration in the country of origin. In any event, the skills of long-term migrants are more strongly influenced by conditions in the host country. Changes in their skills over time can therefore offer insights into the effectiveness of the host country's policies in fostering integration.

Figure 3.15. Change in literacy proficiency between cycles, by immigrant background

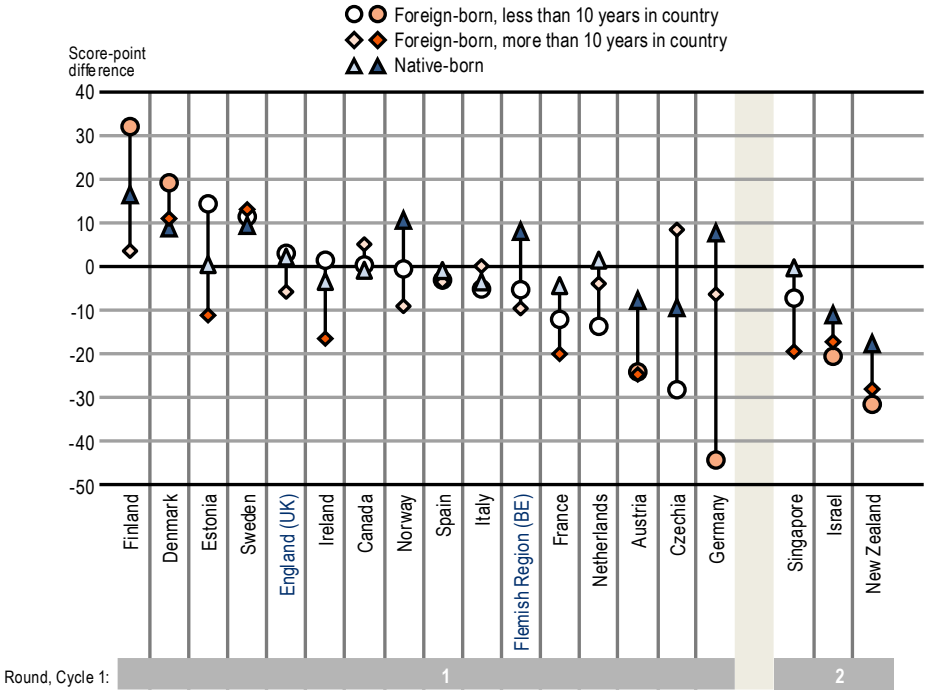
Adjusted and unadjusted difference in mean literacy scores between cycles (Cycle 2 *minus* Cycle 1)



Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Unadjusted differences are the differences between the averages in each cycle. Adjusted differences are based on a method analogous to post-stratification that reweights the samples in Cycle 2 so that the groups by immigrant background have the same demographic characteristics as in Cycle 1 (see Note 1). Demographic characteristics considered are: age and gender. Darker colours denote differences that are statistically significant at the 5% level.
Japan and Poland are excluded due to small numbers of foreign-born adults.
Countries and economies are ranked in descending order of the unadjusted change in literacy proficiency among foreign-born adults of foreign-born parents.
Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table A.3.14 (L) in Annex A.

Figure 3.16. Change in literacy proficiency between cycles, by immigrant background and years spent in the country

Difference in mean literacy scores between cycles (Cycle 2 *minus* Cycle 1)



Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Differences are unadjusted. Darker colours denote differences that are statistically significant at the 5% level.
Chile, Hungary, Japan, Korea, Lithuania, Poland and the Slovak Republic are excluded due to small numbers of cases in particular subgroups. In the United States, more than 20% of the subsample of foreign-born adults of foreign-born parents who had been living in the country/economy for less than 10 years only completed the assessment of reading and numeracy components in the second cycle. As the methodology for estimating the proficiency of adults who only took the components assessment has changed between the cycles, the change in proficiency for this group is not reported.
Countries and economies are ranked in descending order of the change in literacy proficiency among foreign-born adults who had been living in the country/economy for less than 10 years.
Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table A.3.14 (L) in Annex A.

Some countries have seen literacy proficiency for foreign-born adults evolve differently among those who have lived in the host country for less than ten years and those who have lived there longer (Figure 3.16). In Germany, the skills of recent migrants in 2023 are significantly lower than those of recent migrants in the previous cycle and no changes are observed among long-term migrants. While the average score in 2023 of recent migrants to Germany (203 points) was among the lowest across participating countries and economies, in the first cycle the average score for this subgroup (248 points) was close to the OECD average (240 points; see Table A.3.14 (L) in Annex A). In contrast, in Austria and New Zealand, literacy proficiency declined among both recent and long-term migrants. Estonia, France, Ireland and Singapore saw significant declines among long-term migrants.

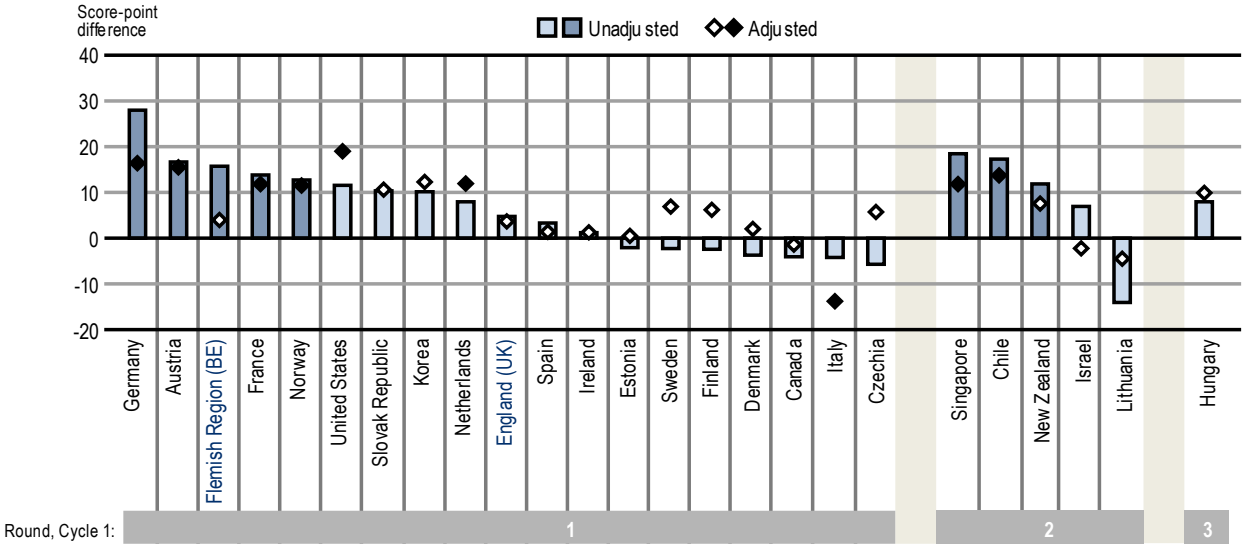
Changes in the proficiency gap between foreign-born and native-born adults

Declining literacy proficiency among immigrants leaves them at a significant disadvantage. It means that more immigrants will find it difficult to participate effectively in their host countries' labour markets or integrate into their communities. Declines in skills among migrants also pose a challenge for society as a

whole, as a widening skills gap between migrants and the native-born population risks undermining equity and social cohesion. In eight of the countries and economies with available data, the gap in literacy proficiency between migrants and non-migrants has widened (Figure 3.17). This was typically due to proficiency among foreign-born adults changing less favourably than that of native-born adults (Figure 3.15). Only Norway and the Flemish Region (Belgium) have seen the gap widening because the skills of native-born adults improved while those of foreign-born adults remained stable.

Figure 3.17. Change in the gap in literacy proficiency between non-immigrants and immigrants

Adjusted and unadjusted change between cycles in the mean score difference between native-born adults with native-born parents and foreign-born adults with foreign-born parents (Cycle 2 *minus* Cycle 1)



Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Unadjusted changes in the proficiency gap are the changes in the difference between the two contrast categories across the cycles. Adjusted changes are obtained by subtracting the coefficients of regression models estimated separately for each cycle. These coefficients show the difference between the categories in each cycle, after accounting for: gender, age, educational attainment, parental education and language spoken at home. Darker colours denote differences that are statistically significant at the 5% level.
Japan and Poland are excluded due to small numbers of foreign-born adults.
Countries and economies are ranked in ascending order of the unadjusted change in the gap.
Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Tables A.3.15 (L) and A.3.16 (L) in Annex A.

The widening of the proficiency gap between foreign- and native-born adults was particularly pronounced in Chile, Germany and Singapore (Figure 3.17). As described above, Germany experienced an increase in the relative size of its immigrant population, coupled with low skills among newly arrived migrants (Figure 3.14; see also Table A.3.14 (L) in Annex A). In Singapore, literacy proficiency among long-term migrants has significantly declined (Figure 3.16). Accounting for differences between foreign- and native-born adults in educational attainment, use of the language of the assessment and demographic characteristics accounts for only a fraction of the change in the proficiency gap in these countries. This suggests that additional factors are at play in widening the difference in literacy between these groups.

Numeracy proficiency increased more strongly among migrants than among native-born adults in Canada, England (United Kingdom), Estonia, Finland, Norway and Sweden, narrowing the gap in numeracy between the two groups (see Table A.3.15 (N) in Annex A). In contrast, the gap widened in the

Flemish Region (Belgium), Germany and Singapore as native-born adults improved their proficiency more than migrants did.

Contribution of immigration, population ageing and educational expansion to changes in mean skills proficiency

How have changes in the relative size and average level of proficiency of different socio-demographic groups contributed to overall changes in proficiency of the entire adult population? This section decomposes the changes in countries' mean literacy scores between the two cycles of the Survey of Adult Skills into two parts. The first relates to the changing composition of the population by age, education and immigrant background, while the second relates to changes in proficiency within these groups. Concretely, the first part quantifies the contribution of increasing educational attainment, ageing and immigration to the average proficiency trend in literacy of the population, assuming the relationship between literacy proficiency and socio-demographic characteristics remained constant. The second part shows how changes in the literacy proficiency of each socio-demographic group contribute to aggregate changes, net of the impacts linked to changes in the size of these groups (see Box 3.4). Table A.3.28 (N) of Annex A presents decomposition results for numeracy.

Overall, changes in educational attainment appear to have a stronger influence on countries' average literacy proficiency than ageing or immigration (Figure 3.18). This is due to literacy proficiency being on average more strongly related to educational attainment than to age or immigrant status. In most countries and economies, changes in the composition of the population by educational attainment are predicted to contribute to higher average proficiency, as overall levels of education have increased in most countries. These predicted contributions are greatest in Singapore, England (United Kingdom) and the Netherlands. As shown in Figure 3.6, the share of tertiary-educated adults in the adult population aged 25-65 increased by 13 percentage points in England (United Kingdom) and the Netherlands between 2012 and 2023, while the share of adults with below upper secondary education fell by 13 percentage points in Singapore between 2015 and 2023. Panel A in Figure 3.18 shows that changes in educational attainment are associated with an increase of more than 6 points in the average literacy scores in these countries and economies.

At the same time, the relatively stronger declines in proficiency among low-educated adults observed in most countries and economies are associated with substantial decreases in proficiency overall (Figure 3.18, Panel A). This is especially the case in Austria, Estonia, France, Hungary and New Zealand, where the gap in literacy proficiency between adults with below upper secondary or upper secondary education and those with a tertiary education widened considerably. In Estonia, for example, the widening skills gap between adults with tertiary education and those with below upper secondary education contributed to a reduction in overall proficiency by 4 points, while the widening gap between tertiary-educated adults and those with upper secondary attainment contributed to a reduction of 7 points.

Changes in the age composition of populations are not associated with changes in average proficiency because changes to the age distribution have been limited over the years that separate the two cycles of the Survey of Adult Skills (Figure 3.18, Panel B). However, in some countries and economies, differences in how proficiency has changed across different age groups are associated with a lower overall average score. This is the case in Estonia, where proficiency improved among adults aged 25-44, remained unchanged among adults aged 45-54 and declined for those aged 55-65 (Figure 3.11). The fact that older adults' proficiency deviates from the improvement among adults in prime working age is linked to a reduction of 10 points in the average proficiency of the overall population. In France, the declining proficiency of older adults, against a background of stable proficiency among 25-44 year-olds, also contributes negatively to the population's average proficiency (by -4 points).

Finally, immigration seems to have a limited impact on countries' average proficiency. Increases in the immigrant population (assuming constant proficiency in this group and net of impacts of age and education)

are only associated with lower mean scores in Norway and Sweden (Figure 3.18, Panel C). As shown in Figure 3.14, these countries saw considerable increases in the share of foreign-born adults in the population between 2012 and 2023 (9 percentage points in Norway and 8 percentage points in Sweden). Conversely, declines in the mean proficiency of the immigrant population relative to the native population (assuming a constant size of the immigrant population and net of impacts of age and education) contributed negatively to the overall level of proficiency in Austria, Germany, New Zealand and Singapore.

Box 3.4. Interpreting the results of the Oaxaca-Blinder decomposition analysis

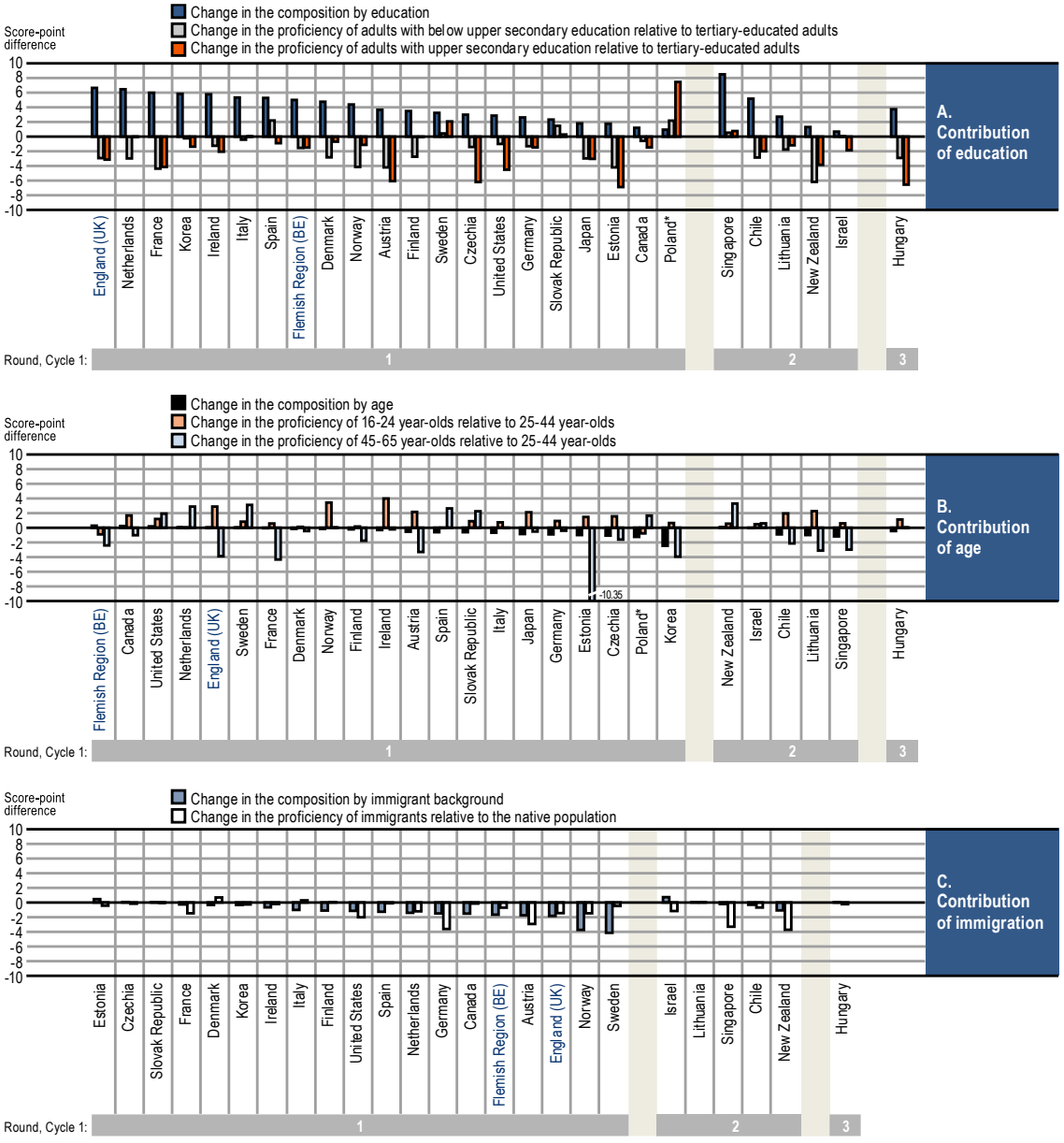
This section uses a counter-factual decomposition technique popularised by Blinder (1973[21]) and Oaxaca (1973[22]) to examine how differences in skills proficiency observed between Cycles 1 and 2 of the Survey of Adult Skills can be attributed to population ageing, immigration and educational expansion (see also Jann (2008[23])). The method decomposes the change in average proficiency between the cycles into two parts. The first part represents the change in average proficiency that one would predict based on the observed changes in the population composition by age, immigrant background and educational attainment, assuming that differences in proficiency according to such characteristics did not change over time. The second part considers how changes in the relative proficiency of low- versus highly educated adults, of immigrants versus non-immigrants, and of younger (16-24 year-olds) and older (45-64 year-olds) adults versus those aged 25-44, contribute to population trends, assuming that the size of these groups had remained constant.

The contribution of changes in the relationship between proficiency and socio-economic characteristics to the overall proficiency trend should be interpreted with care as it depends on the choice of a reference group. For example, the relationship between proficiency and educational attainment is expressed here through the proficiency gap between low- and highly educated adults. Choosing a different reference category (for instance, comparing adults with and without upper secondary education) would yield different results, because changes in relative proficiency depend on how the proficiency of the reference group (here the tertiary-educated) has changed. In Poland, for example, tertiary-educated adults experienced a larger decline in proficiency than those with upper secondary attainment. This is interpreted as an increase in “returns” to upper secondary education, because the relative position of upper-secondary educated adults has improved, which is why they are providing a positive contribution to the overall proficiency trend (Figure 3.18, Panel A).

When interpreting the results of the decomposition analyses, it is important to consider that they reflect hypothetical scenarios, in which some factors are kept constant in order to disentangle the contribution of other factors to the observed trends. In addition, all scenarios are based on relationships observed in cross-sectional regression analyses, which may not reflect a true causal relationship between skills and observed personal characteristics. Therefore, the results should be interpreted as associations rather than causal impacts.

Figure 3.18. Contribution of age, educational attainment and immigrant background to the change in literacy proficiency between cycles

Oaxaca-Blinder decomposition of the difference in mean literacy proficiency scores between Cycle 2 and Cycle 1



Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). The difference in mean literacy proficiency scores between Cycle 2 and Cycle 1 is decomposed into a component due to changes in the composition of the population by age, educational attainment and immigrant background, and a component due to the changing relationship between literacy proficiency and these characteristics. Estimates are computed following a "three-fold" Oaxaca-Blinder decomposition technique (Jann, 2008[23]). So-called "interaction terms" that account for possible simultaneity between changes in composition and changes in relationships are not presented. See Note 2 for an explanation of the classification of educational attainment.

Japan and Poland are excluded from Panel C due to small numbers of foreign-born adults. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the change in average literacy proficiency due to a change in the composition by education (Panel A), age (Panel B) and immigrant background (Panel C).

Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table A.3.28 (L) in Annex A.

Changes in inequalities in skills proficiency

Globalisation and technological change have made information-processing skills more important for individuals' success in work and life. It is therefore crucial to ensure that opportunities for developing skills are accessible to all, regardless of socio-economic background, religion, ethnicity, disability or gender. This section examines how skills disparities related to gender and parental education have changed between the cycles of the Survey of Adult Skills – key to evaluating how countries and societies are faring in their efforts to promote equal opportunities, gender equality and social mobility.

Changes in skills proficiency related to gender

The first cycle of the Survey of Adult Skills found that most OECD countries had a relatively narrow gender gap in proficiency in key information-processing skills (OECD, 2019[10]). There were no significant gender differences in literacy proficiency in most countries and economies, while almost all recorded moderate differences in numeracy in favour of men. These gender differences were typically more pronounced among older adults. Since the first cycle, gender differences in educational attainment have diminished among older adults in many countries, so gender gaps in skills proficiency might be expected to have decreased (OECD, 2024[24]).

Figure 3.19 shows how the skills proficiency of men and women changed between cycles of the survey. In one-third of the participating countries and economies, literacy proficiency has declined among men and has remained unchanged or declined to a lesser degree among women. In Norway, literacy proficiency improved significantly among women, but not among men. Meanwhile, proficiency in numeracy has developed similarly for both genders in most countries and economies. The exceptions are Israel and the United States, where numeracy proficiency declined more strongly among men, and Chile, where numeracy proficiency increased by 15 points among women and remained stable among men.

The stronger declines in literacy proficiency among men has led to a narrowing of the gender gap in literacy in 10 countries and economies (Figure 3.20, Panel A). In many countries, women now score higher than men (see Chapter 2). In numeracy, the proficiency gender gap narrowed only in Chile, Israel and the United States (Figure 3.20, Panel B). Accounting for differences in socio-demographic characteristics between men and women (such as educational attainment) has little impact on the observed changes in the gender gap.

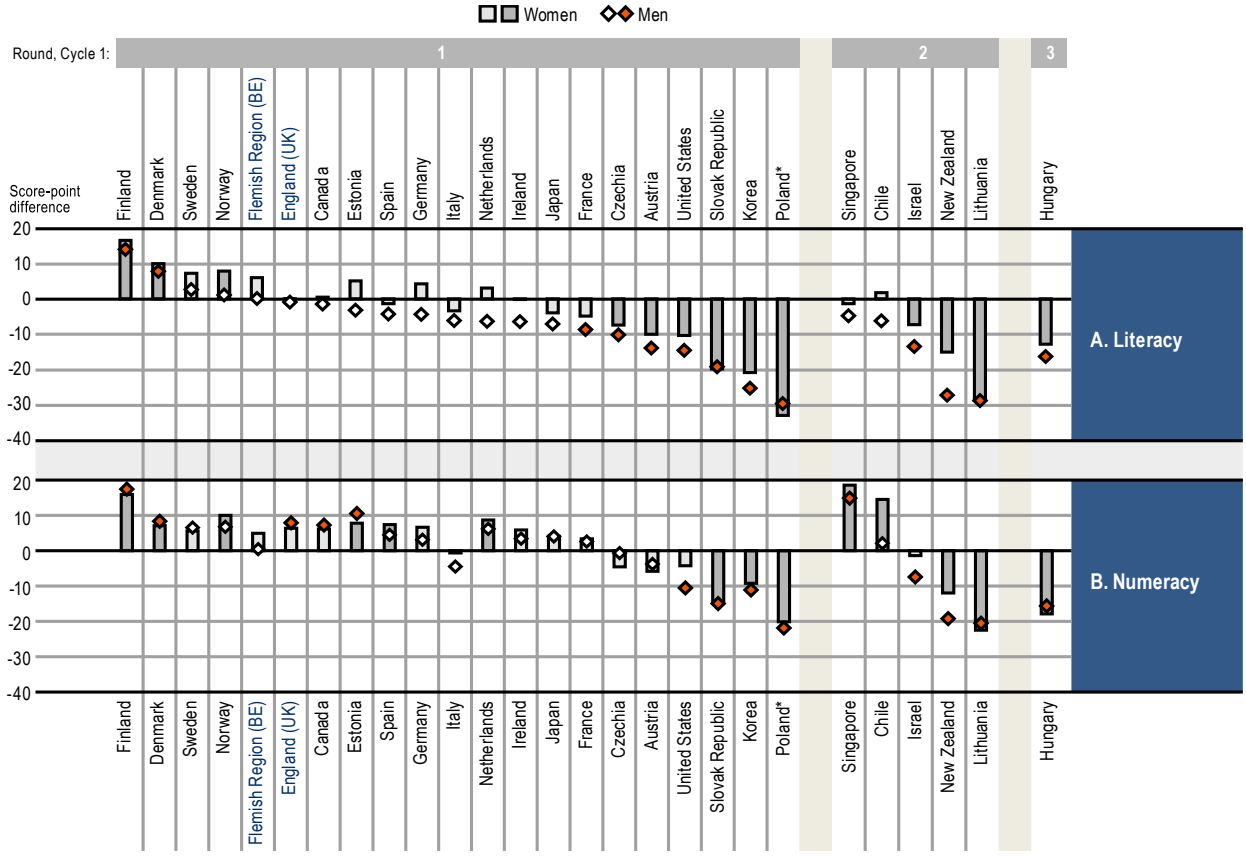
Changes in gender differences in skills proficiency among younger and older adults

Breaking down the analysis by age provides a more nuanced picture. Although most countries and economies have seen similar changes in the proficiency of men and women across different age groups, in some cases proficiency declined mostly among older men, while in other cases gender proficiency trends diverged among younger age groups. Figure 3.21 shows the resulting changes in the gender proficiency gap among adults aged 16-24, 25-44 and 45-65.

In literacy, differences by age emerge in several countries (Figure 3.21, Panel A). In Canada, Chile, Germany and Korea the gender gap in literacy in favour of men narrowed among older adults due to relatively larger declines in proficiency among older men. In Chile, this pattern also applies to 25-44 year-olds. In Israel, New Zealand and Singapore, a change in the literacy gender gap in favour of women was observed among those aged 25-44 due to greater proficiency declines among men in that age group.

Figure 3.19. Change in literacy and numeracy proficiency between cycles, by gender

Difference in mean literacy and numeracy scores between cycles (Cycle 2 *minus* Cycle 1)

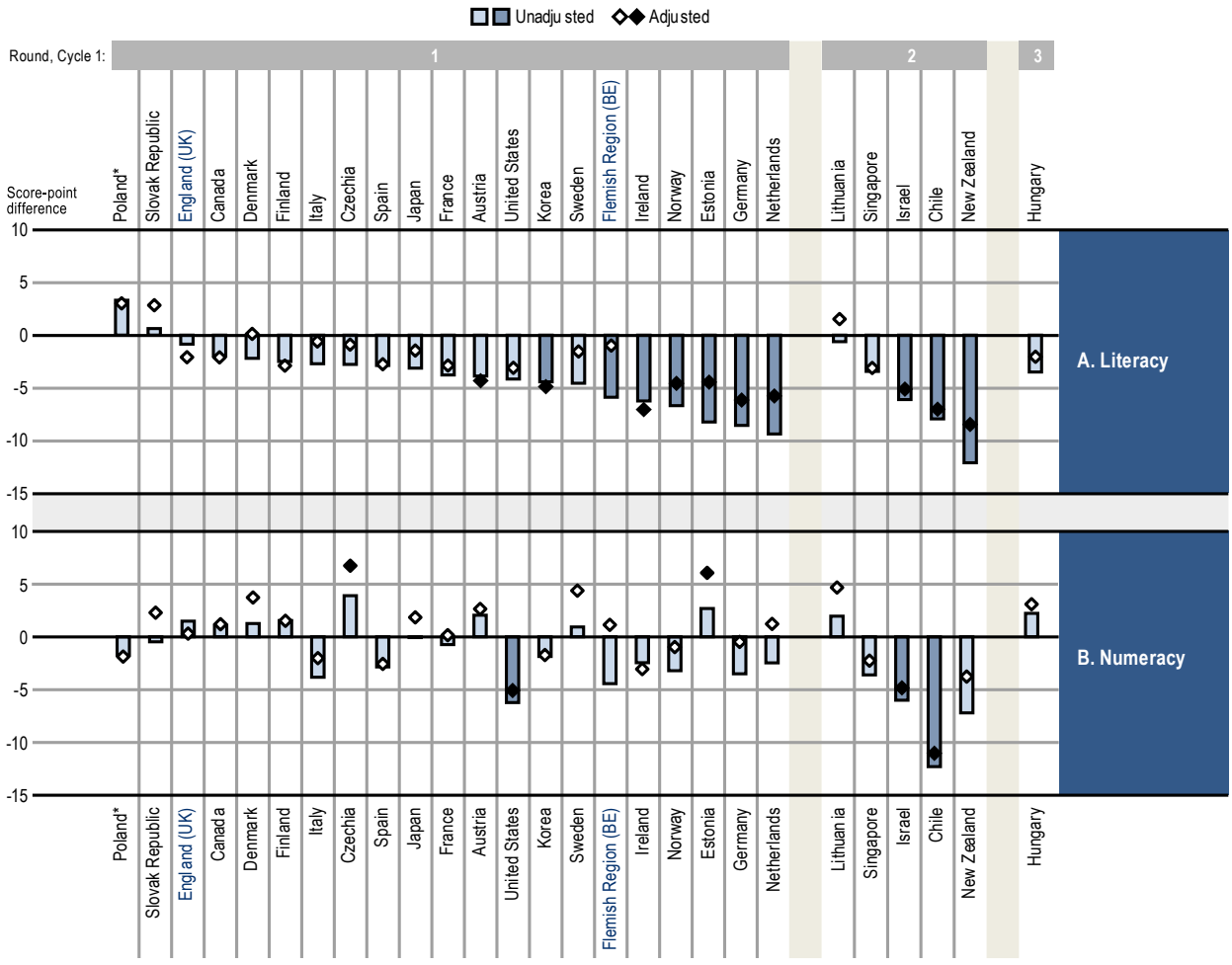


Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Differences are unadjusted. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the unadjusted change in literacy proficiency among men.
Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Tables A.3.4 (L) and A.3.4 (N) in Annex A.

A similar pattern is observed for numeracy (Figure 3.21, Panel B). Chile, Germany, Korea and the United States saw a narrowing gender gap in numeracy among the oldest age group. In Chile and the United States, men and women aged 45-65 now have equal numeracy scores, on average (see Table A.3.5 (N) in Annex A). Chile, Israel, New Zealand, Poland and Singapore saw gender differences in numeracy narrow among 25-44 year-olds. In Israel, New Zealand and Poland, men and women aged 25-44 now have the same level of numeracy proficiency, while in Chile and Singapore, men in this age group still have an advantage in numeracy over women (see Table A.3.5 (N) in Annex A).

Figure 3.20. Change in the gaps in literacy and numeracy proficiency between men and women

Adjusted and unadjusted change between cycles in the mean score difference between men and women (Cycle 2 *minus* Cycle 1)



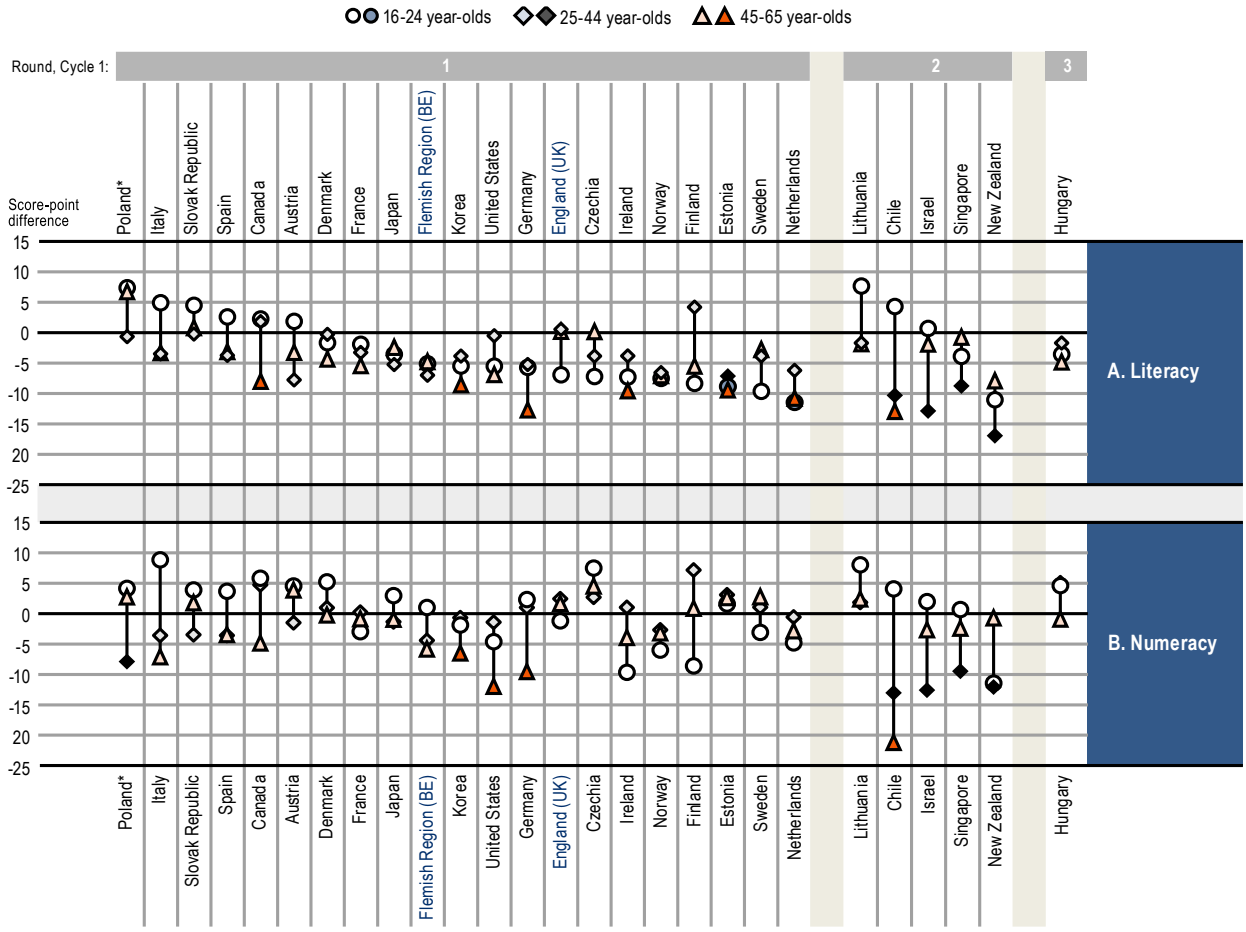
Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Unadjusted changes in the proficiency gap are the changes in the difference between the two contrast categories across the cycles. Adjusted changes are obtained by subtracting the coefficients of regression models estimated separately for each cycle. These coefficients show the difference between the categories in each cycle after accounting for: immigrant background, age, educational attainment, parental education and language spoken at home. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in ascending order of the unadjusted change in the gap in literacy.

Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Tables A.3.5 (L), A.3.5 (N), A.3.6 (L) and A.3.6 (N) in Annex A.

Figure 3.21. Change in the gaps in literacy and numeracy proficiency between men and women, by age

Change between cycles in the mean score difference between men and women (Cycle 2 *minus* Cycle 1)



Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Differences are unadjusted. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the unadjusted change in the literacy gender gap among 16-24 year-olds.
Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Tables A.3.5 (L), A.3.5 (N), A.3.6 (L) and A.3.6 (N) in Annex A

These findings suggest that, despite successes in reducing gender differences in educational attainment and skills proficiency, more can be done to promote gender equality. In particular, future policies should aim to further encourage girls and women to engage with numeracy-related tasks in school, work and everyday life, as gender differences in numeracy remain unchanged in many countries. Policies should also address the declining proficiency in literacy among men. This will require a deeper investigation of the factors behind this trend – whether it relates to different study choices, different career choices, or different patterns of use of reading at work and in daily life.

Changes in skills proficiency related to parental education

A vast empirical literature identifies three major sources of social inequalities in skills proficiency (Boudon, 1974[25]; Breen and Goldthorpe, 1997[26]; Erikson et al., 2005[27]; Lucas, 2001[28]). First, individuals from

disadvantaged backgrounds have a relatively weaker foundation of skills, as they have been raised in social settings that provide less support for learning. This reinforces further disadvantages by limiting their opportunities to advance in education and acquire further skills. Second, disadvantaged individuals tend to be less aware of the range of educational pathways available to them, as their parents typically lack education and familiarity with the education system. This leads to poor educational choices and reduced chances of progressing to higher levels of education. Third, individuals from disadvantaged backgrounds face greater financial constraints on their pursuit of education.

The impacts of social background on skills can be reduced through well-designed policies, including comprehensive and high-quality early childhood education and care services, education counselling services for students and parents, financial support for students, and education and training systems that offer learning opportunities to older adults. The results of the Survey of Adult Skills suggest that the effectiveness of such efforts varies widely since there are substantial cross-country differences in the association between skills proficiency and socio-economic background (see Chapter 2). This section examines how the association between key information-processing skills and social background has changed between the survey cycles across participating countries and economies. This comparison, coupled with detailed knowledge of how policies and institutions have evolved in individual countries and economies, can help identify their strengths and weaknesses in reducing social inequalities.

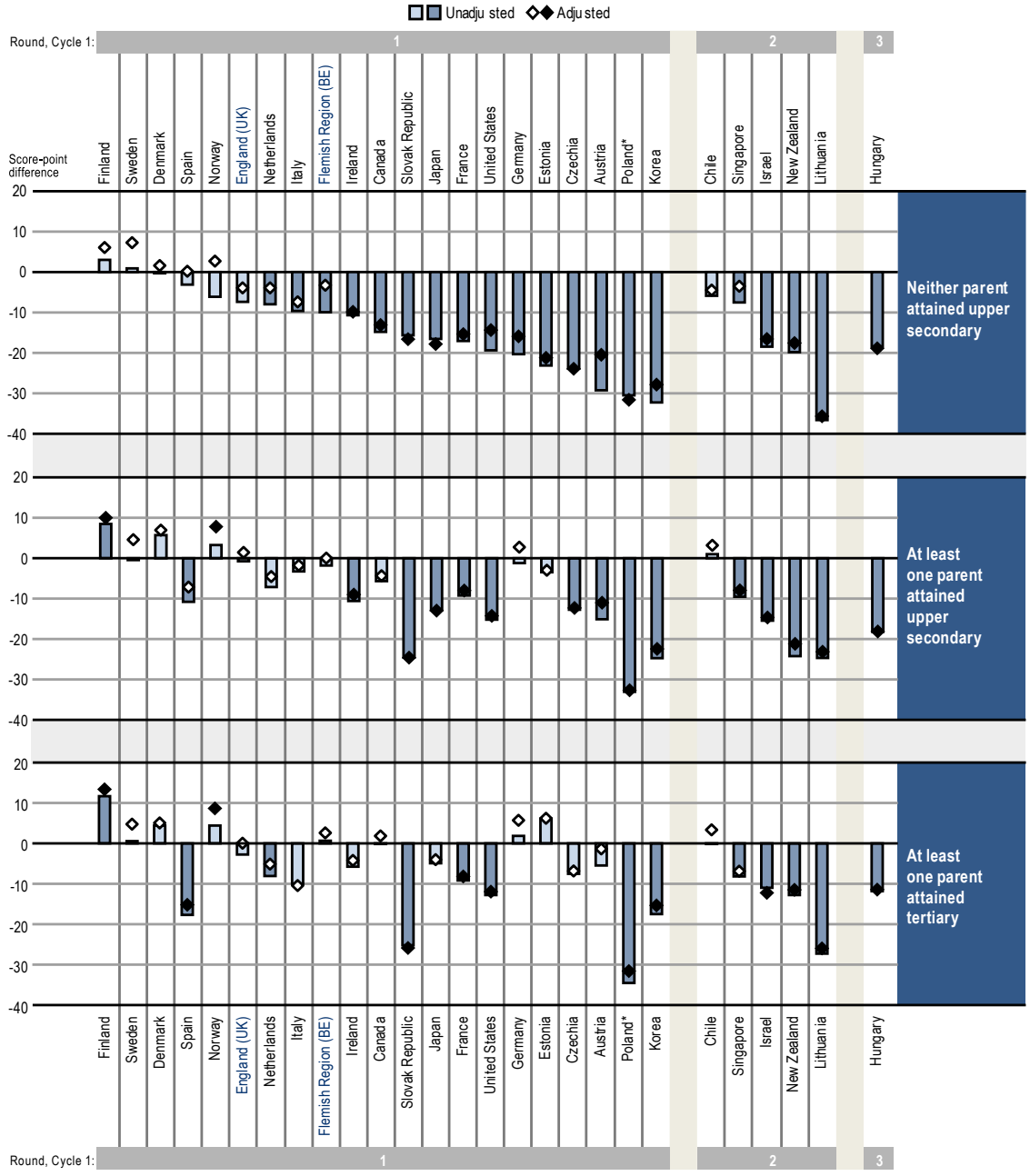
The analyses use parents' educational attainment as a proxy for socio-economic background. As in Chapter 2, it groups adults into three categories: those who have low-educated parents (neither parent has attained upper secondary education), those with medium-educated parents (at least one parent has attained upper secondary education) and those with highly educated parents (at least one parent has attained tertiary education). Measuring socio-economic background in this way requires separate analyses by age, since there are generational differences in how common it was to have highly educated parents and the advantages linked to it. Detailed analyses by age are presented in Tables A.3.18 (L) and (N) in Annex A and discussed in the next section, while Figure 3.22 presents trends for the entire adult population.

In all countries and economies except Chile, Denmark, England (United Kingdom), Finland, Norway, Spain and Sweden, the literacy proficiency of adults with low-educated parents has declined. These declines were not statistically significant in the Flemish Region (Belgium), Italy, the Netherlands and Singapore after accounting for changing demographics (i.e. age, immigrant background and gender). Literacy proficiency among adults with medium-educated parents declined in 15 countries and economies, while 12 experienced declines among those with highly educated parents. The declines in the latter group were generally smaller than among adults with lower-educated parents. Only Finland recorded significant improvements in literacy among adults with highly educated parents compared to the previous cycle.

In 14 countries and economies, the proficiency gap in literacy between adults with low-educated parents and those with highly educated parents has widened due to declining proficiency in the former group (Figure 3.23). Only the Slovak Republic and Spain have seen the gap narrow, due to declining proficiency among those with highly educated parents. Accounting for differences in various characteristics, including educational attainment, reduces the widening of the gap in most countries, indicating that changes in inequality are linked to a shift in the composition of socio-economic groups.

Figure 3.22. Change in literacy proficiency between cycles, by parental education

Adjusted and unadjusted difference in mean literacy scores between cycles (Cycle 2 *minus* Cycle 1)



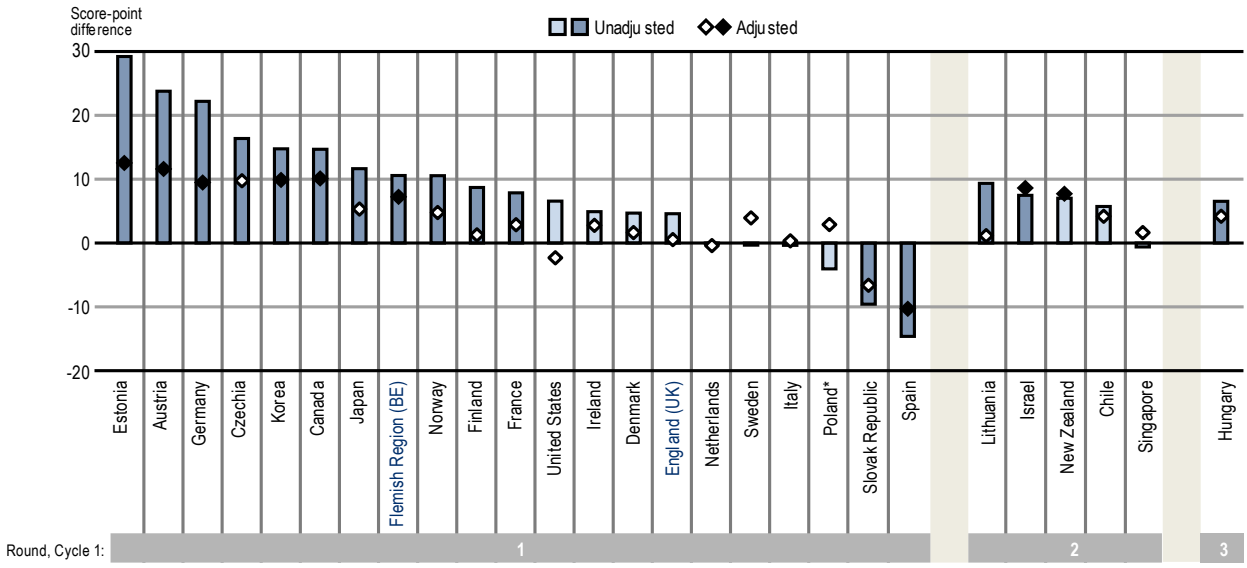
Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Unadjusted differences are the differences between the averages in each cycle. Adjusted differences are based on a method analogous to post-stratification that reweights the samples in Cycle 2 so that groups by parental education have the same demographic characteristics as in Cycle 1 (see Note 1). Demographic characteristics considered are: age, immigrant background and gender. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the unadjusted change in literacy proficiency among adults whose parents have below upper secondary education.

Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Table A.3.17 (L) in Annex A.

Figure 3.23. Change in the gap in literacy proficiency between adults with highly educated and low-educated parents

Adjusted and unadjusted change between cycles in the mean score difference between adults with at least one tertiary-educated parent and adults whose parents have below upper secondary education (Cycle 2 *minus* Cycle 1)



Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Unadjusted changes are the changes in the difference between the two contrast categories across the cycles. Adjusted changes are obtained by subtracting the coefficients of regression models estimated separately for each cycle. These coefficients show the difference between the categories in each cycle, after accounting for: immigrant background, age, educational attainment, gender and language spoken at home. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the unadjusted change in the literacy gap.

Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Tables A.3.19 (L) and A.3.20 (L) in Annex A.

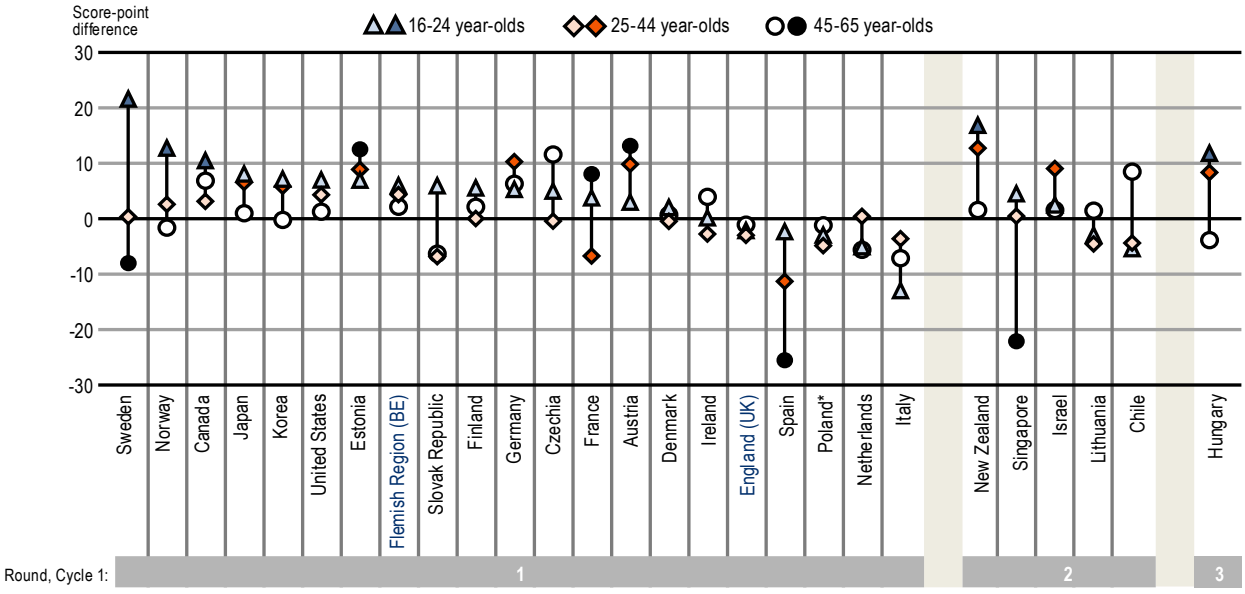
The numeracy proficiency of adults with low-educated parents has declined in 11 of the participating countries and economies (see Table A.3.17 (N) in Annex A). Most of these countries saw declines in the numeracy proficiency of adults with medium-educated parents as well. In Singapore, numeracy proficiency among adults with low-educated parents has increased, while in Chile, Finland and Spain this increase was only significant after accounting for demographic changes. In comparison, seven countries saw a decline and four recorded an increase in the numeracy proficiency of adults with highly educated parents. As numeracy generally developed more favourably in this group than among adults with low-educated parents, inequalities in numeracy proficiency increased in many countries (see Table A.3.19 (N) in Annex A).

Change in skills proficiency related to parental education among younger and older adults

This section shows how the proficiency gap associated with socio-economic background (as proxied by parental education) has changed across cycles within three age groups: 16-24 year-olds, 25-44 year-olds and 45-65 year-olds. Due to insufficient sample sizes of some groups, adults with low- and medium-educated parents are considered as a single group (denoted as adults whose parents have at most an upper secondary education) and compared to adults with at least one tertiary-educated parent.

Figure 3.24. Change in the gap in literacy proficiency between adults with highly educated and medium-/low-educated parents, by age

Change between cycles in the mean score difference between adults with at least one tertiary-educated parent and adults with parents with at most an upper secondary education (Cycle 2 *minus* Cycle 1)



Note: Adults aged 16-65; does not include adults who in Cycle 2 were only administered the doorstep interview due to a language barrier, to maximise the comparability across cycles (see Box 1.1 in Chapter 1 and Box 3.2). Differences are unadjusted. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the unadjusted change in the literacy gap among 16-24 year-olds.
Source: OECD (2018[4]; 2015[5]; 2012[6]), *Survey of Adult Skills (PIAAC) databases*, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Tables A.3.21 (L) and A.3.22 (L) in Annex A.

Skills-related inequalities in literacy have developed differently in different age groups (Figure 3.24). Canada, Norway and Sweden recorded an increase in the socio-economic gap in literacy among 16-24 year-olds, while socio-economic differences among older adults have remained stable or, in the case of Sweden, have decreased. In Hungary and New Zealand, the socio-economic gap in literacy has increased both among 16-24 and 25-44 year-olds. In another group of countries, including Austria, Estonia, Germany, Israel, Japan and Korea, inequalities increased among 45-65 year-olds and/or 25-44 year-olds, but not among the youngest adults. France saw an increase in social inequalities in skills among the oldest age group and a decrease among those aged 25-44. Next to Sweden, proficiency disparities among older adults narrowed in Singapore and Spain.

The socio-economic gap in numeracy increased especially among young adults (aged 16-24) in Hungary, New Zealand and Sweden, while Germany saw an increase in the gap among those aged 25-44 (see Table A.3.21 (N) in Annex A). In France, Lithuania and Spain, inequalities in numeracy proficiency declined among adults aged 25-44. Singapore and Spain saw a decline in the gap among those aged 45-65, while in Estonia this gap has widened.

To sum up, inequalities in education and skills remain a key policy challenge in many countries. Policies should aim to provide better access to educational opportunities for disadvantaged adults, particularly disadvantaged youth. Policies should also help socio-economically disadvantaged adults to make the most of these opportunities. Perhaps more important than further widening access to education is ensuring that

compulsory schooling provides a solid skills foundation. This would offer everyone an equal start in developing higher-order skills and knowledge, and pursuing higher levels of education.

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Notes

[1] A reweighting procedure, analogous to post-stratification, is used to adjust the sample characteristics of the 2023 sample to the observed composition of the sample in the first cycle. In the first step, the sample included in each assessment cycle is divided into discrete cells, defined by the respondents' immigrant status (five categories: foreign-born adults of foreign-born parents, native-born adults of foreign-born parents, native-born adults of mixed heritage, native-born adults of native-born parents, other/missing), gender (two categories: men, women) and age group (five categories: 16-24, 25-34, 35-44, 45-54, 55-65). This defines, at most, 50 discrete cells for the entire population.

In the second step, the cells are reweighted so that the sum of final weights within each cell is constant across assessments, and equal to the sum of final weights in the sample of the first cycle. Estimates of the mean and distribution of skills proficiency are then performed on these reweighted samples, representing the (counterfactual) proficiency that would have been observed, had the samples had the same composition as the sample in the previous assessment in terms of the variables used in this reweighting procedure.

[2] Educational attainment is based on the International Standard Classification of Education (ISCED) 2011, grouped into below upper secondary (ISCED 1, 2 and 3 short), upper secondary (ISCED 3 and 4) and tertiary (ISCED 5, 6, 7 and 8). Where possible, foreign qualifications are included as the closest corresponding level in the respective national education systems. Data from Cycle 1 were classified according to the ISCED 1997 classification. Between the first and the second cycle of the survey, some countries have changed the classification of some specific qualifications. These reclassifications have caused some qualifications to change ISCED level. Where possible, these qualifications were re-classified following the criteria used in Cycle 1, to maximise comparability across the two cycles (OECD, forthcoming[7]).

[3] Between 2012 and 2022, the number of new asylum applications received each year in the OECD has increased fourfold. In 2022, the number of new asylum seekers per million population was highest in Austria (11 851), Belgium (2 766), Ireland (2 697), Germany (2 616) and Canada (2 465) (OECD, 2023[29]).

[4] Chile, Hungary, Japan, Korea, Lithuania, Poland and the Slovak Republic have a small number of immigrants in their samples. These countries are excluded from the following analysis if the groups defined by immigrant background have less than 30 respondents in one cycle.

[5] Chapter 5 of the Reader's Companion presents, for each country and economy, the number of doorstep cases and what percentage they represent of the overall population and of foreign-born adults. These vary greatly across countries. For example, doorstep respondents represent less than 2% of foreign-born adults in Italy and England (United Kingdom), but up to 32% in Finland and almost 53% in Czechia.

4 Outcomes of investment in skills

Skills have a major impact on individuals' life chances. This chapter first investigates how information-processing skills and formal education affect labour-market outcomes and wages. It then analyses the relationship between information-processing skills and social outcomes, namely life satisfaction, health, political efficacy (i.e. trust in the ability to influence political affairs), trust in others and volunteering. Finally, it examines the extent of different types of skill mismatches across countries and their impact on labour-market and social outcomes. It finds that there are significant economic and social benefits associated with higher skills for adults, particularly in terms of employment, higher wages, reduced mismatches and improved overall well-being.

In Brief

- There are significant economic and social benefits associated with information-processing skills, which highlights the need for continued policy action to maintain, improve, recognise and value such skills.
- Skills and time spent in education are both independently related to the likelihood of being employed. An increase of one standard deviation in numeracy skills (58 points) and in years of education (3 years) are both associated with an increase of around 1 percentage point in the likelihood of being employed. The association between numeracy skills and employment is greatest in England (United Kingdom), Italy, Spain and Sweden.
- The link between skills, education and employment is weaker in 2023 than it was ten years ago. One possible explanation for this is the tighter labour-market conditions in most participating countries and economies in 2022-23 (when data from the second cycle of the Survey of Adult Skills were collected) compared with 2011-12 (when data from the previous cycle were collected in most countries). Skills continue to be important for employability over and above education.
- Both skills and education are associated with wages. On average, a one-standard-deviation increase in numeracy proficiency is associated with a 9% increase in wages. A one-standard-deviation increase in years of education is associated with a 16% increase in wages. The association between numeracy proficiency and wages is largest in Canada, Chile, England (United Kingdom), France, Germany and Singapore.
- Skills are closely related to individual well-being (as captured by self-reported health and life satisfaction), and civic engagement (as captured by political efficacy, trust and volunteering). Self-reported health and life satisfaction are both positively associated with skills; the association between skills and civic engagement varies more widely across countries.
- About one-third of workers across OECD countries are mismatched to their jobs, in terms of either qualifications, skills or fields of study. Although the extent of mismatch varies, most countries and economies would benefit from better alignment of workers' skills with jobs to increase productivity and the returns to human capital investment.
- Workers who are younger, foreign-born, employed in small and micro firms, on temporary contracts, working part-time, working in elementary occupations, or with lower skills are more likely to be over-qualified. Targeted measures aimed at these groups – such as career counselling or recognition of prior learning – can improve the matching of workers to jobs.
- Workers who feel under-skilled for their job are most likely to say this is because they need to improve their digital skills. Investment in digital skills is crucial to prepare workers for the increasing use of artificial intelligence and other digital technologies.
- Being over-qualified for one's job is associated with significant economic and social costs: specifically, a 12% reduction in wages and a 4-percentage-point reduction in the likelihood of reporting high life satisfaction. Reducing these costs by reducing mismatches is important, but countries should also consider employer incentives for matching workers to jobs based on skills rather than qualifications alone.

Introduction

Since the publication of results from the first Survey of Adult Skills in 2013, there has been growing interest in the importance of skills, as opposed to traditional educational qualifications, to individual and societal well-being. The OECD has repeatedly highlighted the importance of skills in today's rapidly evolving labour markets (OECD, 2023[1]; 2019[2]; 2019[3]; 2012[4]). It has also advocated policies that promote the development and use of skills, such as skills assessment and anticipation, upskilling and reskilling, and the recognition of skills acquired in non-formal and informal contexts (OECD, 2021[5]; 2021[6]; 2019[7]).

Similarly, governments around the world increasingly recognise the importance of aligning education and training with the changing needs of labour markets and societies, with an emphasis on the acquisition of skills for economic (e.g. employability or wages) and societal participation (e.g. well-being, health and political engagement). "Skills-based" or "skills-first" approaches[1] are gaining prominence in human resource management decisions in organisations worldwide (OECD, 2024[8]). This shift in emphasis reflects a wider recognition that, in the 21st century, it is skills, rather than formal qualifications alone, that determine individual employability and economic success, as well as societal well-being.

Policy makers are also interested in the efficient use of skills in the economy, and therefore in reducing mismatches between skill demand and supply. While some degree of mismatch is inevitable in dynamic labour markets, persistent mismatches impose costs on economies, firms and individuals – usually in the form of lower wages, productivity and job satisfaction (Adalet McGowan and Andrews, 2015[9]). In an era of widespread labour shortages, ensuring the efficient matching of workers to jobs is vital, and prioritising skills can be part of the solution (Causa et al., 2022[10]; OECD, 2024[8]; 2022[11]).

The 2023 Survey of Adult Skills offers valuable insights into these issues and can guide strategies to close skill gaps, increase productivity, promote equitable long-term economic growth, and foster social cohesion and societal well-being (Hanushek and Woessmann, 2021[12]). This chapter explores the importance of information-processing skills for the well-being of individuals, economies and societies.[2] It has three main objectives:

- examine how skills and education relate to labour-market outcomes and wages
- explore how skills affect social outcomes such as life satisfaction, health and political efficacy
- assess the extent of mismatches and their impact on wages and life satisfaction.[3]

How are skills and education rewarded in the labour market?

Skills enable adults to perform tasks more efficiently, leading to improved employability and higher wages. The relationship between skills, productivity and earnings is well established in economic theory and supported by empirical evidence. According to standard microeconomic theory, wages generally reflect workers' productivity; therefore, individuals with higher skills, who are more productive, are expected to earn higher wages. Moreover, as skilled individuals have more to gain from employment, they are more likely to participate in the labour market to realise these benefits. The results of the first cycle of the Survey of Adult Skills confirmed that literacy and numeracy skills play a key role in labour-market outcomes, over and above the influence of formal educational attainment.

Prior to the Survey of Adult Skills, few studies had examined the labour-market rewards of skills independently of formal qualifications. Instead, formal educational attainment had been used as a proxy for skill level, thus blurring the distinctions between the two (Barro and Lee, 2013[13]; Hanushek and Woessmann, 2011[14]). This is not an unfounded assumption in theory, as there are reasonable grounds to believe that individuals with greater skills will tend to pursue education, and that education itself is a means of developing skills – meaning that skills and education will be correlated. Indeed, this idea has roots in human capital theory (Becker, 1964[15]; Mincer, 1970[16]).

However, formal education is an imperfect proxy for skills. For example, typical measures of education are too coarse to accurately capture educational quality, cannot account for variation in individuals' own skills within educational levels and can be complicated to compare across countries. There are reasons to believe that an important purpose of formal education is teaching social and emotional skills and in developing attitudes and motivations that, though crucial, are not directly captured in achievement tests (Durlak et al., 2011[17]; Heckman and Kautz, 2012[18]). Moreover, further theoretical work has raised the possibility that skill development is not the only reason why families and individuals invest in education. Rather, knowing that true ability is difficult for an employer to assess directly, they may use education to send a signal about their ability or to pass an employer's screening process (Arrow, 1973[19]; Spence, 1973[20]; Stiglitz, 1975[21]), secure a favourable position in a job queue (Thurow, 1975[22]), or to maintain access to educational and occupational opportunities that are restricted to other segments of society (Collins, 2019[23]; Murphy, 1988[24]). There are, therefore, good reasons to examine skills independently of education.

Box 4.1. Employment status in the doorstep interview

The 2023 Survey of Adult Skills introduced a doorstep interview as a short alternative to the background questionnaire with the aim of minimising literacy-related non-responses. The doorstep interview is a short, self-administered questionnaire offered in all the official languages and main languages of linguistic minorities of all the countries and economies taking part in the survey. The doorstep interview collects information on gender, age, years of education, employment status, country of origin and length of residence in the survey country from adults who lack the necessary proficiency in the language of the country to answer to the full background questionnaire or to participate in the direct skills assessment (for more information see Boxes 1.1 and 3.2 in Chapters 1 and 3).

The employment status of doorstep interview respondents is based on self-declared categories (e.g. full-time employed, part-time employed, unemployed or student), while the background questionnaire administered to all other respondents contains a detailed series of questions that allow their employment status to be derived in line with the official categorisation of the International Labour Organization (ILO): employed, unemployed and out of the labour force (inactive).

Analysis of the relationship between the self-declared categories of the doorstep interview and the official categorisation shows that they do not always coincide and that one cannot be easily derived from the other. This means the doorstep respondents have not been included in the analysis in this chapter, and the employment status used in this report relies exclusively on the more objective measure of employment status in line with the ILO definition.

An additional reason for not including doorstep respondents is that most of the analysis in this chapter is based on information that is not available for this group (e.g. wages, social outcomes, mismatches).

Source: OECD (2024[25]), *Survey of Adult Skills 2023 Reader's Companion*; OECD (forthcoming[26]), Survey of Adult Skills 2023 Technical Report.

The Survey of Adult Skills provides an opportunity to understand the relationship between skills and labour-market and social outcomes over and above their association with educational attainment. Results from the first cycle of the survey highlighted the importance of both educational attainment and skills in determining labour-market and social outcomes. The analysis also showed that the relationship between skills, employment and wages differs across countries, reflecting differences in labour-market institutions and employers in hiring, promotion and wage-setting practices (2019[27]; OECD, 2016[28]; OECD, 2013[29]). Further analysis using data from the first cycle has demonstrated that the returns to formal education tend to decline in the context of educational expansion, while this is not the case for skills (Araki, 2020[30]).

Moreover, the magnitude of the association between formal education and labour-market outcomes is greatest early on in individuals' careers, with skills becoming more important as adults gain work experience and enter their prime working years (Hanushek et al., 2015[31]). This may be because employers initially rely on easily observable indicators of worker quality, such as formal education, but learn about their employees' skills once they have been hired – a phenomenon known as "employer learning" – and reward them accordingly (OECD, 2014[32]).

Skills, education and employment status

The 2023 Survey of Adult Skills confirms that both skills and education are positively associated with the likelihood of being employed. This positive association reflects the fact that individuals with higher skills are more likely to be employed, as well as the fact that employment provides further opportunities for individuals to improve their skills. In addition, the analysis suggests that the strength of this relationship varies across countries and economies.

One possible explanation for differences in the extent to which formal qualifications, as opposed to skills, are associated with employment status is the degree of "skills transparency" in a given country: how informative formal qualifications are about the actual skills of individuals. If formal qualifications accurately reflect true skills (that are otherwise difficult to observe), employers may prefer to hire workers with higher qualifications (Heisig, Gesthuizen and Solga, 2019[33]). Countries with a larger gap in information-processing skills between low-educated workers and those with intermediate educational qualifications have been found to also have a larger gap between both groups in the likelihood of being employed, providing further evidence that employers treat higher qualifications as a proxy for ability (Abrassart, 2013[34]). Another possible explanation is that educational attainment captures a wider range of skills, including social and emotional skills such as perseverance or conscientiousness, that employers in some labour markets may value more than information-processing skills alone.

Average proficiency in literacy, numeracy and adaptive problem solving is higher among the employed population than the unemployed or inactive population (Table 4.1). This is true for both full-time and part-time employees. For literacy and adaptive problem solving, there are no significant differences in proficiency between full-time and part-time workers, on average across participating OECD countries and economies. In numeracy, the gap between full- and part-time workers is 13 points (272 points compared to 259). For all domains, there is a sizeable gap between the employed and the unemployed population, which in turn shows substantially greater average proficiency than the inactive population. For instance, the average numeracy proficiency for the employed population (270 points) is 23 points higher than that of the unemployed population and 36 points higher than that of the inactive population.

Table 4.1. Average proficiency scores, by employment status

	Employed			Unemployed	Out of the labour force
	Total	Full-time	Part-time		
Numeracy	270	272	259	247	234
Literacy	265	266	258	246	232
Adaptive problem solving	254	256	247	238	226

Note: Adults aged 25-65 not in formal education; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Part-time employment is defined as working less than 30 hours per week at one's main job. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Source: Tables A.4.1 (L), A.4.1 (N) and A.4.1 (A) in Annex A.

Analysing labour-market outcomes across different skill levels provides an alternative perspective on the relationship between skills and outcomes, focusing on comparisons between the highest and lowest skill levels. The largest differences in labour-market outcomes are in labour-force participation (Figure 4.1 Panel A). Across the OECD, 94% of high-skilled adults (numeracy proficiency of Level 4 and above) are in the labour force, compared with only 70% of low-skilled adults (at or below Level 1). The gap is 32 percentage points or greater in Austria, Finland, Germany and Italy, while Japan, Korea and Singapore have the smallest gaps at less than 15 percentage points. Even in Croatia and Korea, where only 87% of high-skilled people are active (the lowest rate among all countries and economies), this is still higher than Singapore's 79% activity rate for low-skilled adults, which is the highest rate for low-skilled workers among all countries.

Among all participating countries, high-skilled individuals are less likely to experience unemployment than low-skilled individuals (Figure 4.1, Panel B). The gap between the two groups is, on average, 5 percentage points (7% compared to 2%). In Spain and Italy, the gap is highest at 10 percentage points or more, while in Denmark, Israel, and Poland the gap is less than 1 percentage point.

High-skilled individuals are more likely to be employed full-time than their lower-skilled counterparts (Figure 4.1, Panel C). On average, 91% of high-skilled workers across OECD countries are employed full-time, compared to 82% of low-skilled workers. Czechia and Poland are exceptions, where a higher share of low-skilled individuals work full-time. The Netherlands has the lowest full-time employment rate overall, largely due to 34% of its low-skilled workers being employed part-time – the highest among participating countries.

Differences in employment status associated with numeracy proficiency persist when accounting for individuals' social and demographic characteristics. Figure 4.2 shows the estimated change in the probability of being active in the labour market (Panel A) and being employed (Panel B) that is associated with a one-standard-deviation increase in numeracy proficiency or a one-standard-deviation increase in the number of years of education. Results for numeracy proficiency control for years of education, and vice versa, which isolates each factor's relationship with labour market outcomes while holding the other factor constant.[4]

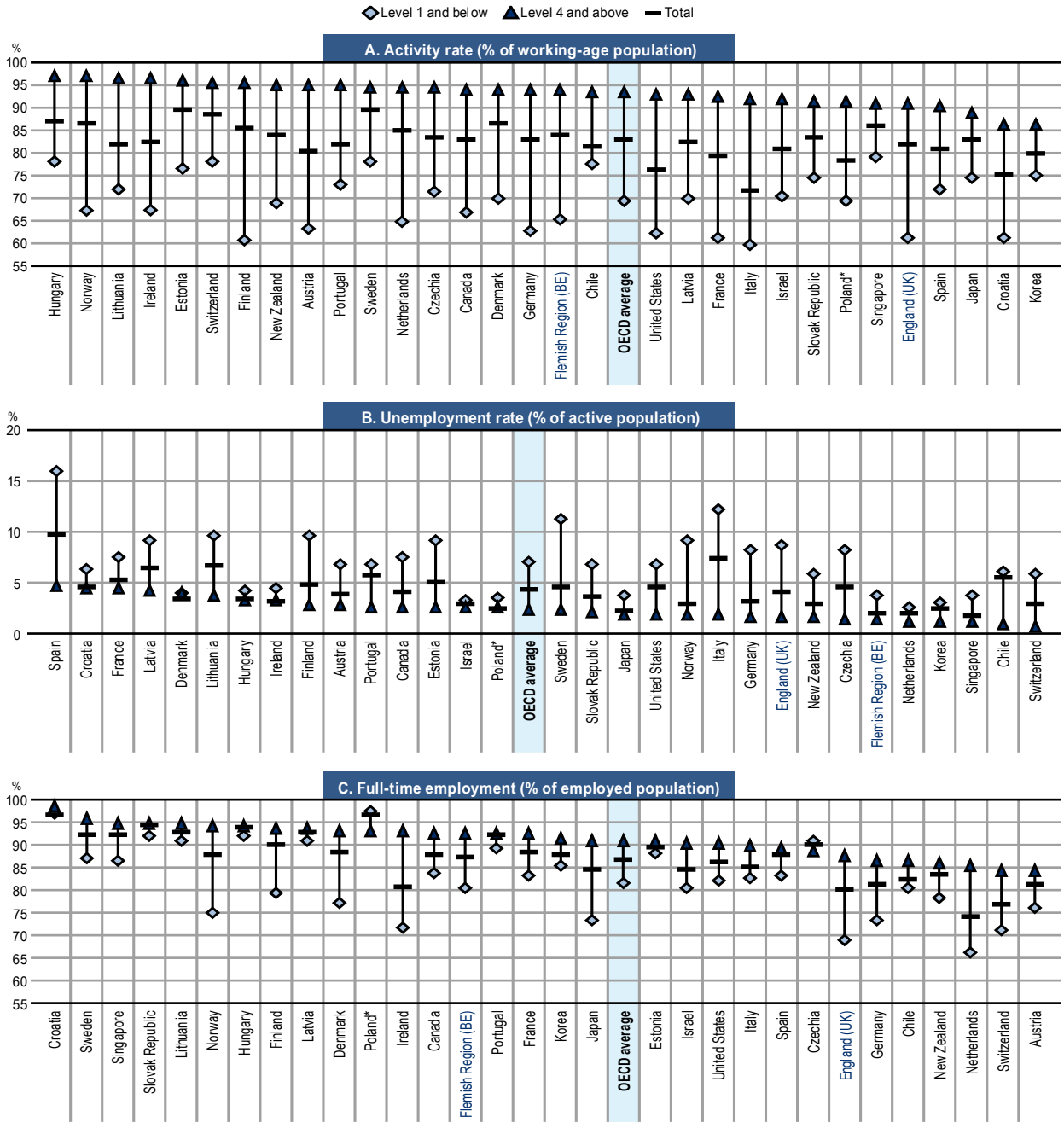
On average across participating OECD countries and economies, a one-standard-deviation increase in numeracy proficiency – 58 points on the numeracy scale – is associated with a 4-percentage-point increase in the likelihood of being active in the labour market. A similar increase in years of education results in a 5-percentage-point increase (Figure 4.2, Panel A). In this context, being "active" means that a person is either employed or actively looking for work, while being "inactive" refers to not participating in the labour market, such as those who are retired, full-time students or those not seeking employment for health or personal reasons. For education, the highest coefficients are found in Croatia, Ireland and Israel (8 percentage points or above), while for numeracy, the highest coefficients are found in Czechia, England (United Kingdom), Italy and the United States, at 7 percentage points.

Along the same lines, a one-standard-deviation increase in numeracy proficiency is associated with a 0.9-percentage-point increase in the likelihood of being employed as opposed to being unemployed (Figure 4.2, Panel B). This is similar in magnitude to the increase of 1.1 percentage points for a one-standard-deviation increase in years of education – approximately 3 years of education. The results for both numeracy proficiency and years of education are only statistically significant for some countries and economies. The largest coefficients for years of education are found for Lithuania and Spain at over 3 percentage points, while the largest coefficients for numeracy are in England (United Kingdom), Italy, Spain and Sweden, where the estimated change in probability is 2 percentage points or more.

The magnitude of the effect of numeracy on labour-market participation is greater than the effect on employment. This suggests that the decision to participate in the labour force is more closely linked to skills and education than the likelihood of employment.

Figure 4.1. Labour-market outcomes, by numeracy proficiency level

Adults aged 25-65 not in formal education



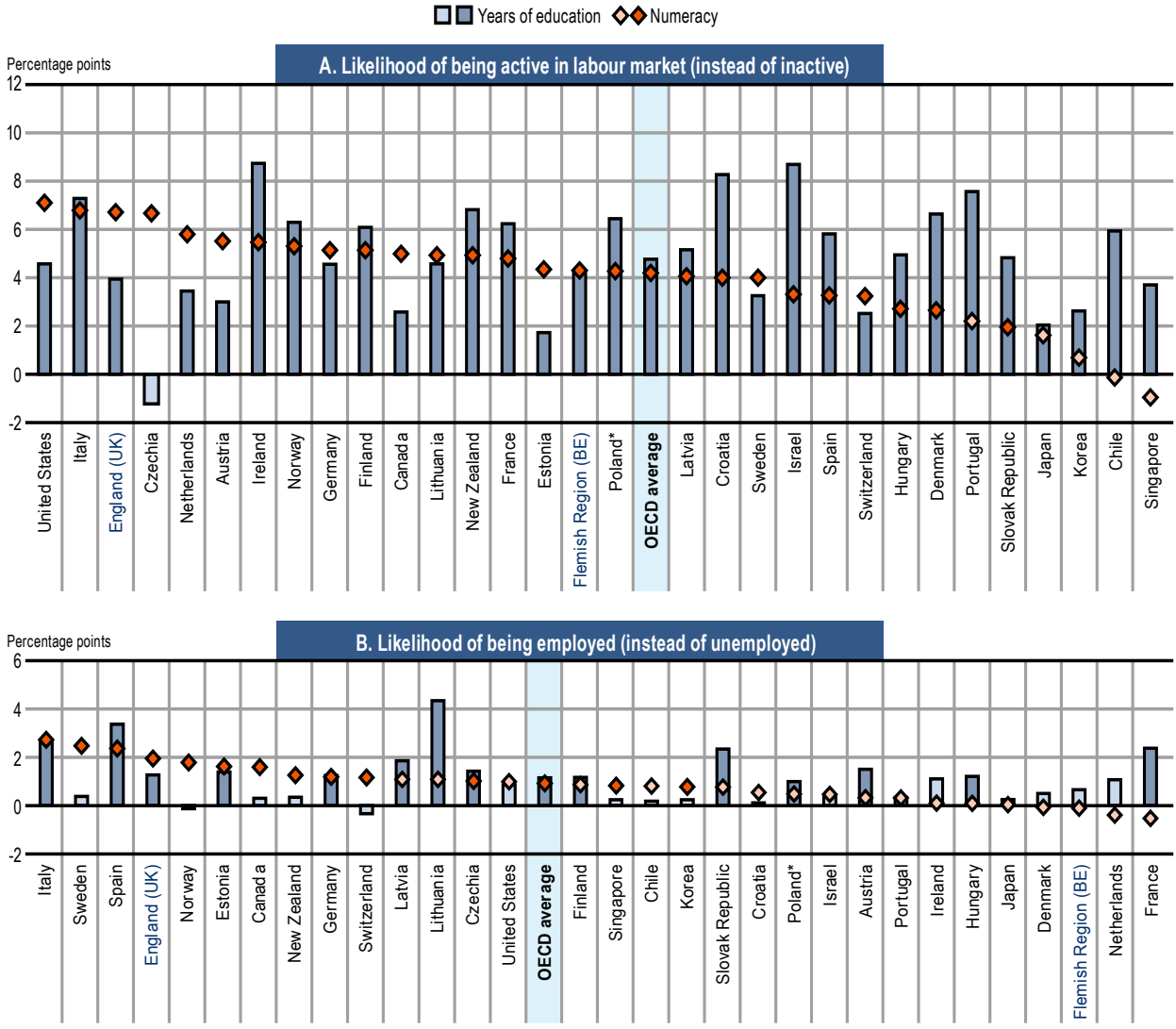
Note: Does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Full-time employment is defined as working more than 30 hours per week at one's main job. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of employment outcomes for Level 4 and above.

Source: Table A.4.2 (N) in Annex A.

Figure 4.2. Relationship between education, numeracy and labour-market outcomes

Change in likelihood for a one-standard-deviation increase in years of education or numeracy proficiency



Note: Adults aged 25-65 not in formal education; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). In addition to numeracy and years of education, estimates account for age, gender, immigrant background, parental education and whether one lives with a partner or has children. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the percentage effect of a one-standard-deviation increase in numeracy proficiency.

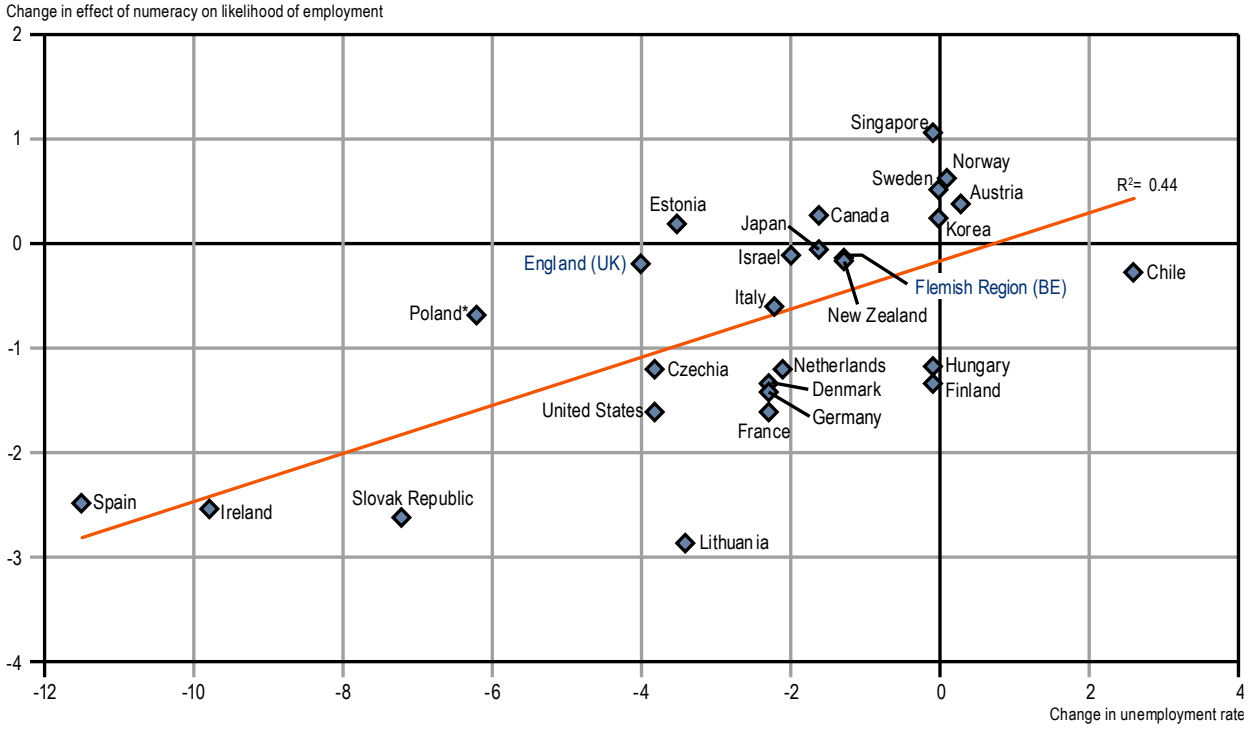
Source: Tables A.4.3 (L, N, A) and A.4.5 (L, N, A) in Annex A.

The link between skills, education and employment is weaker in 2023 than it was ten years ago, when data from the first cycle of the survey were collected in most of the countries and economies taking part. One possible explanation for this is the tighter conditions prevailing in most labour markets in 2022-23 compared to 2011-12. In a tight labour market, people find work more easily, meaning that even individuals with low skills may succeed in getting hired. Figure 4.3 explores this hypothesis, by plotting the change in the unemployment rate between the two cycles (on the x-axis) against the change in the relationship between numeracy skills and the probability of being employed (on the y-axis). Overall, it shows that a fall in the unemployment rate is accompanied by a corresponding fall in the estimated effect of numeracy skills on

the likelihood of being employed (it should be noted, however, that not all estimates for this effect in Cycle 1 or Cycle 2 are statistically significant at the 5% level). Tighter labour markets may thus have tended to bring workers into employment regardless of their skill level, thereby weakening the association between skills and employment.

Figure 4.3. Association between unemployment and effect of numeracy proficiency on employment

Percentage point change in unemployment rate and effect of numeracy proficiency on employment between cycles



Note: Adults aged 25-65 not in formal education; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). The horizontal axis plots the percentage point change in the unemployment rate between Cycle 1 and Cycle 2. The vertical axis plots the percentage point change in the estimated effect of numeracy proficiency on the likelihood of being employed (as opposed to unemployed) over this same period. Only countries and economies that participated in both cycles of the Survey of Adult Skills are included. Estimates for the effect of numeracy proficiency on the probability of being employed refer to the percentage point change associated with a one-standard-deviation increase in proficiency, accounting for years of education, age, gender, immigrant background, parental education and whether one lives with a partner or has children. Unemployment figures refer to the ILO definition of unemployment for the population aged 25 and older (15 and older for England [UK]). Cycle 1 data refer to 2012 for all countries except Chile, Israel, Lithuania, New Zealand, Singapore (all 2015) and Hungary (2017). All Cycle 2 data refer to 2023, except for the unemployment rate for England (UK) (2022). *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Source: International Labour Organisation; Eurostat (for Flemish Region [Belgium]); Office for National Statistics (for England [UK]); OECD (2018[35]; 2015[36]; 2012[37]), Survey of Adult Skills (PIAAC) databases, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024). Underlying data for the effect of numeracy on the likelihood of employment are reported in Table A.4.6 (N) in Annex A.

Skills, education and wages

Educational attainment and information-processing skills are thought to be positively associated with workers' productivity. While early research into the statistical effects of human capital tended to conflate skills with educational attainment, an important contribution of the Survey of Adult Skills is that it allows them to be examined independently. Studies using this distinction have confirmed the independent effects of information-processing skills on wages (Araki, 2020[30]; Hanushek et al., 2015[31]). Further evidence from

the 2023 Survey of Adult Skills suggests that the effects of educational attainment are greater than those of information-processing skills, although both remain positively associated with wages. This is possibly because educational attainment captures a wider range of skills, including social and emotional skills such as perseverance or conscientiousness. A future thematic report will explore this question by analysing data on social and emotional skills collected in the 2023 Survey of Adult Skills (OECD, 2024[25]).

While in the aggregate the returns to qualifications outweigh the returns to skills, there are important caveats. For example, it has been found that as individuals age and progress in their careers, skills become relatively more important and educational qualifications relatively less so. This suggests that employers rely on qualifications as the best indicator of potential productivity in the early years of a worker's career, while in later years the importance of educational qualifications diminishes relative to skills acquired through work experience, enabling individuals with a skill advantage to differentiate themselves (Hanushek et al., 2015[31]). In addition, the economic returns to qualifications have been found to decline in a context of overall educational expansion, whereas skills retain their premium even as the overall level of skills in a population increases. Notably, a higher overall level of skills proficiency in a population is associated with diminishing returns to qualifications (Araki, 2020[30]).

Indeed, results from the first cycle of the Survey of Adult Skills showed that skills proficiency and educational attainment have positive, significant, yet distinct effects on wages (OECD, 2019[27]; 2016[28]; 2013[29]). This section revisits this analysis, focusing on the effects of skills and years of education on wages using data from the second cycle.

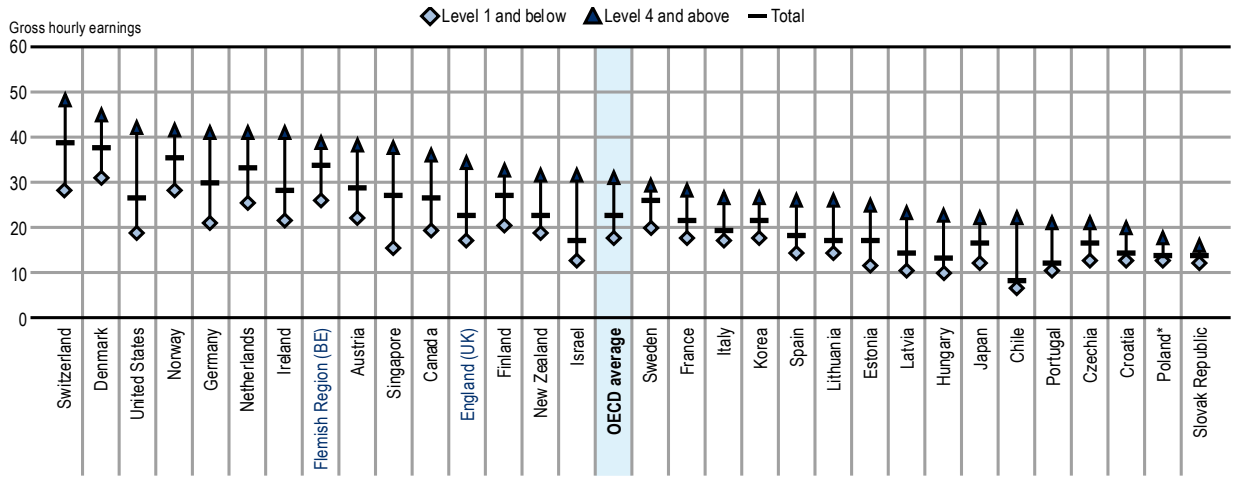
Individuals with higher levels of proficiency are much more likely to be high earners (Figure 4.4). The median earner with high levels of skills earns USD 31 per hour on average, 75% more than the median earner with low levels of skills (USD 18 per hour).[5] Median earnings for high-skilled workers are highest in Denmark, Switzerland and the United States, while median earnings for low-skilled workers are highest in Denmark, Norway and Switzerland. The largest absolute gaps between high- and low-skilled workers can be observed in Singapore and the United States, where high-skilled workers earn over USD 20 more per hour than low-skilled workers. Relative gaps are highest in Chile, Israel and Singapore; in Chile, the median high-skilled worker earns over three times the hourly wage of the median low-skilled worker (USD 22 per hour compared to USD 7).

Conversely, the smallest absolute gaps in median wages (USD 7 or less) are in Croatia, Poland and the Slovak Republic, which are also the countries with the lowest overall wages for high-skilled workers. Relative wage gaps in these countries are also small – Poland and the Slovak Republic are the only countries where median earnings for high-skilled adults are no more than 40% greater than median earnings for those with low skills.

Income differences become even more pronounced at the upper end of the wage distribution. Among workers with skills at Level 4 or above, high earners – i.e. at the 75th percentile for that skill level – earn USD 43 per hour, on average, compared to USD 23 per hour for the high earners among those at or below Level 1 (see Table A.4.7 (N) in Annex A). The high-skilled high earners thus earn 88% more than their low-skilled counterparts.

Figure 4.4. Median wages, by numeracy proficiency level

PPP-adjusted 2022 USD



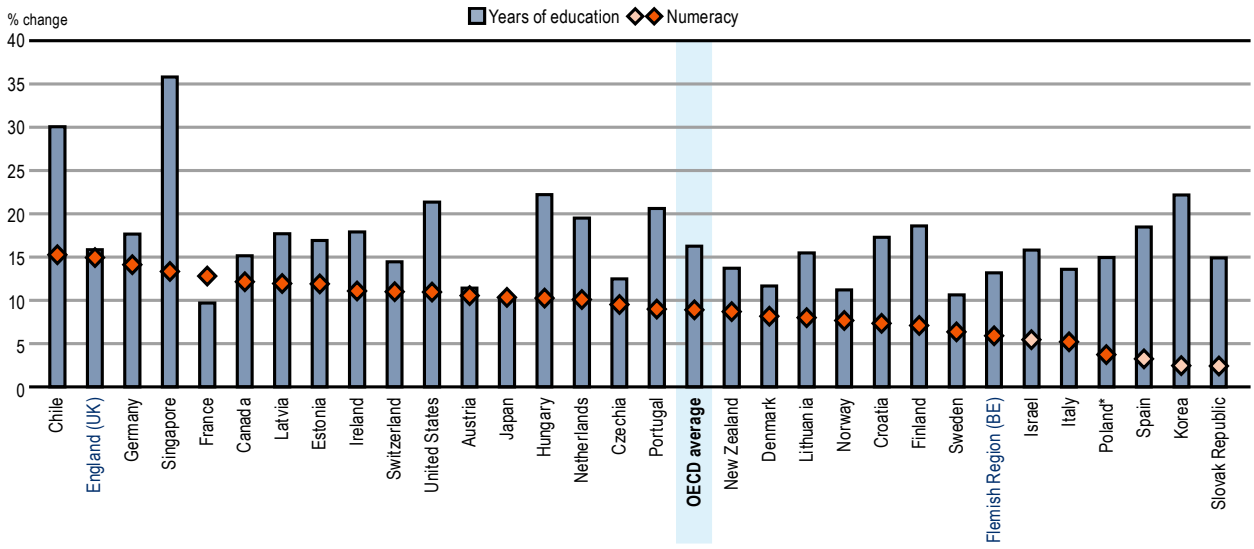
Note: Employed adults aged 25-65 not in formal education; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Includes bonuses and earnings by self-employed individuals. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of median gross hourly earnings for Level 4 and above.
Source: Table A.4.7 (N) in Annex A.

Numeracy skills and years of education continue to have statistically significant associations with wages independently of one another, and the magnitude of these effects varies considerably across participating countries and economies (Figure 4.5). The results presented here are adjusted for socio-demographic characteristics. On average, an increase of one standard deviation in an individual's years of education is associated with a 16% increase in wages. This is broadly in line with existing international evidence (Clark and Abildgaard Nielsen, 2024[38]; Patrinos, 2023[39]). An increase of one standard deviation in numeracy proficiency is associated with a 9% increase in wages.[6]

It is important to note that skills are associated with workers' wages even after accounting for years of education. For 27 out of 31 participating countries and economies, the relationship between numeracy and wages is statistically significant, and in France the estimated effect for numeracy proficiency in fact exceeds that of years of education. The greatest differences between the effects of numeracy and years of education are found in Singapore (22 percentage points). Numeracy proficiency has the largest estimated relationship with wages in Chile, England (United Kingdom) and Germany (over 14%), and the smallest (statistically significant) relationship in the Flemish Region (Belgium), Italy and Poland (under 6%). For education, the largest estimated relationships are in Chile and Singapore (30% or more) and the smallest are in France and Japan (10% or less).

Figure 4.5. Relationship between education, numeracy and wages

Effect of a one-standard-deviation increase on hourly wages



Note: Employed adults aged 25-65 not in formal education; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). In addition to numeracy and years of education, estimates account for work experience, age, gender, immigrant background, and whether one lives with a partner or has children; wages are gross hourly earnings for employed and self-employed individuals, including bonuses, in PPP-adjusted 2022 USD. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the percentage effect of a one-standard-deviation increase in numeracy proficiency.

Source: Table A.4.8 (L, N, A) in Annex A.

Decomposition of variation in wages

This section considers how much of the observed variation in wages is accounted for (or "explained") by differences in observable characteristics such as education, numeracy and literacy proficiency, work experience and socio-demographic factors. It decomposes the variance in earnings to understand how important different factors are in explaining the observed differences in wages between individuals. Wage decomposition has been used to explain, for example, gender, race or geographical wage differences (Akee, Jones and Porter, 2019[40]; Blau and Kahn, 2017[41]; He and Jiang, 2023[42]).

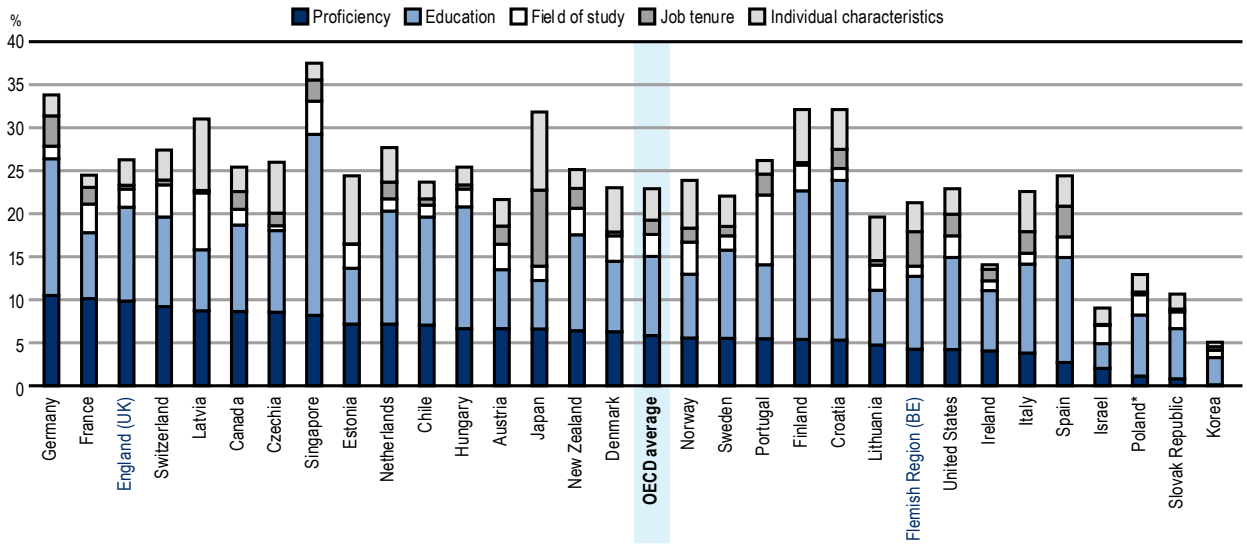
On average, 23% of wage variation can be accounted for by the observable variables of skills proficiency, educational attainment, field of study, job tenure, and individual characteristics – age, gender, immigrant background, and whether one lives with a partner or has children (Figure 4.6). In Croatia, Finland, Germany, Japan, Latvia and Singapore, they account for over 30% of the variation in wages, compared to less than 15% in Ireland, Israel, Korea, Poland and the Slovak Republic. The fact that observable characteristics explain only 23% of the variation in earnings on average means that 77% of the variation is determined by other factors.

Together, years of education and numeracy and literacy proficiency account for around two-thirds of the total explained variation on average. In Chile and Hungary this share exceeds 80%, whereas for Japan it is less than half. Education consistently accounts for the greatest share of wage variation. It accounts for 9% of the total variation on average and is the greatest single factor in 27 out of 31 participating countries and economies. Proficiency – across both numeracy and literacy domains – accounts for 6% of the variation in wages on average across OECD countries, and at least 10% in England (United Kingdom),

France and Germany. In Korea and the Slovak Republic, conversely, skills account for less than 1% of overall wage variation.

Figure 4.6. Contribution of observable characteristics to variation in wages

Variation explained by each factor



Note: Employed adults aged 25-65 not in formal education; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Decomposition calculates the percentage contribution to variation in log wages of the following factors: skills proficiency (numeracy and literacy), years of education, job tenure, field of study (nine categories) and individual characteristics (age, gender, immigrant background, and whether one lives with a partner or has children); wages are (log) gross hourly earnings for employed and self-employed individuals, including bonuses, in PPP-adjusted 2022 USD. See Fields (2003[43]) for further details on the decomposition method. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the percentage of variation in wages explained by skills proficiency.

Source: Table A.4.9a (L, N) in Annex A.

Observable individual characteristics do not typically account for a large proportion of variation in wages, at just 4% on average across participating OECD countries and economies. However, the share is 6% in Finland and is at least 8% in Estonia, Japan and Latvia. Japan is also an outlier in the explanatory power of years of job tenure, which accounts for 9% of its wage variation, compared to the OECD average of 2%. For 11 countries the share attributable to job tenure is less than 0.5% (Figure 4.6).

The explanatory power of these observable characteristics differs by age. The total share of wage variation explained increases from 22% on average among 25-34 year-olds to 27% for 45-54 year-olds. This increase is driven in part by changes in the explanatory power of skills, which rises from 5% among 25-34 year-olds to 7% among 45-54 year-olds. This suggests that numeracy and literacy proficiency matter more for the wages of older workers than for younger ones (see Table A.4.9b (L, N) in Annex A). This increase in the salience of skills proficiency is consistent with the concept of "employer learning", noted above (OECD, 2014[32]). Even where workers change employers, as their careers progress their formal education recedes further into the past, whereas the concrete skills they develop and demonstrate regularly during their work will remain relevant.

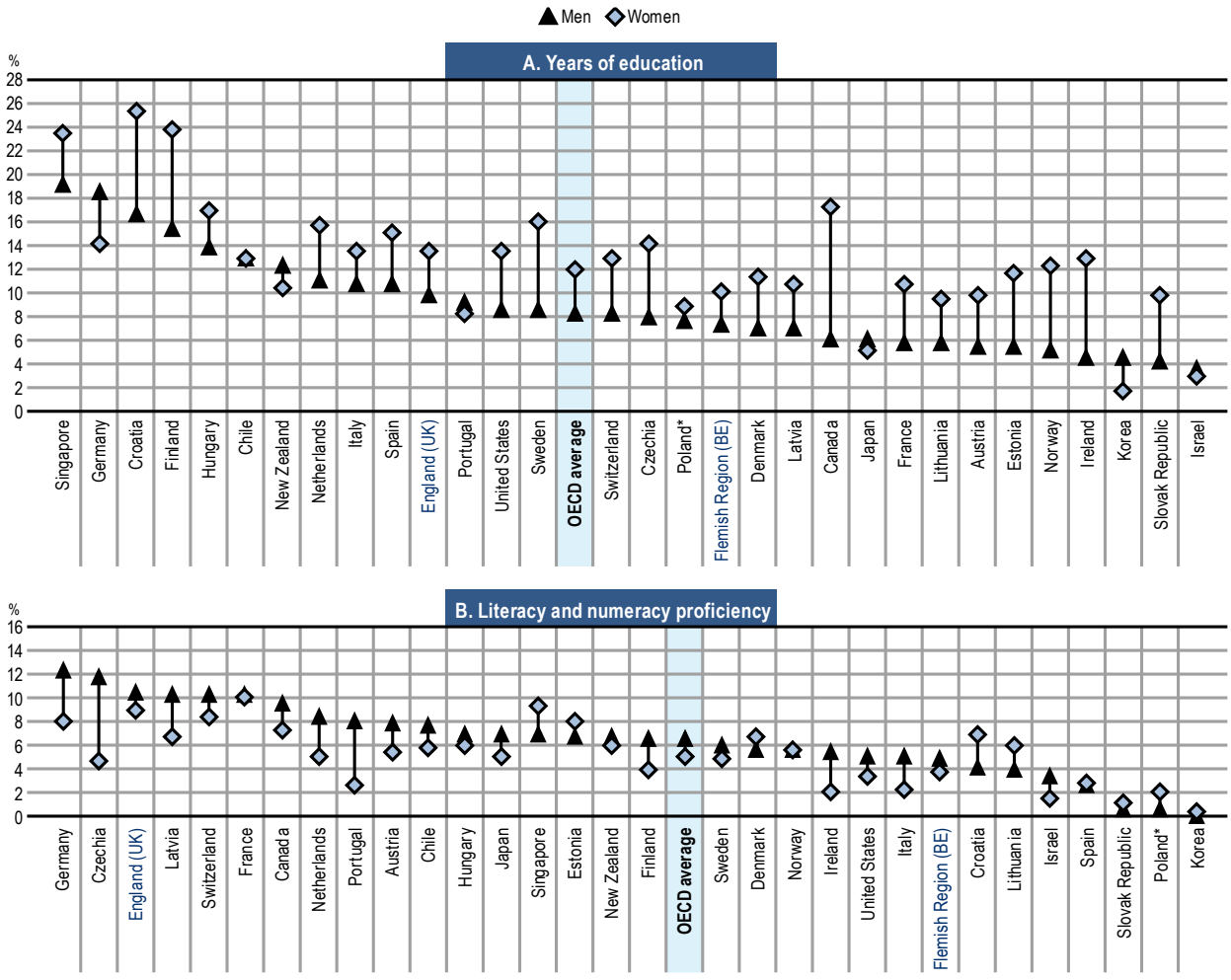
There are small differences in the patterns of explained wage variation by gender (Figure 4.7). On average, years of education explain a larger share of variation in wages for women than for men (Panel A), whereas numeracy and literacy proficiency accounts for a greater share of variation for men than for women (Panel B). This is consistent with research that finds that women's wages are more closely linked to formal

education, as they are often concentrated in sectors where qualifications are crucial for advancement (notably the public sector), and they may face greater barriers to being rewarded for skills acquisition alone.

However, these gender differences are small across countries. The OECD averages for men and women differ by 2 percentage points in favour of men for skills proficiency and 4 percentage points in favour of women for years of education. Differences are much more pronounced in some countries. In Canada, Croatia, Finland and Ireland, the gender gap in the share of variation explained by years of education is greater than 8 percentage points, while in Czechia, Germany and Portugal, there is a gap of 4 percentage points and more in the variance explained by numeracy and literacy proficiency.

Figure 4.7. Contribution of education and skills to variation in wages, by gender

Variation explained by education and literacy and numeracy proficiency



Note: Employed adults aged 25-65 not in formal education; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Decomposition calculates the percentage contribution to variance in log wages of the following factors: skills proficiency (numeracy and literacy), years of education, job tenure, field of study (9 categories) and individual characteristics (age, immigrant background, and whether one lives with a partner or has children); wages are (log) gross hourly earnings for employed and self-employed individuals, including bonuses, in PPP-adjusted 2022 USD. See Fields (2003[43]) for further details on the decomposition method. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

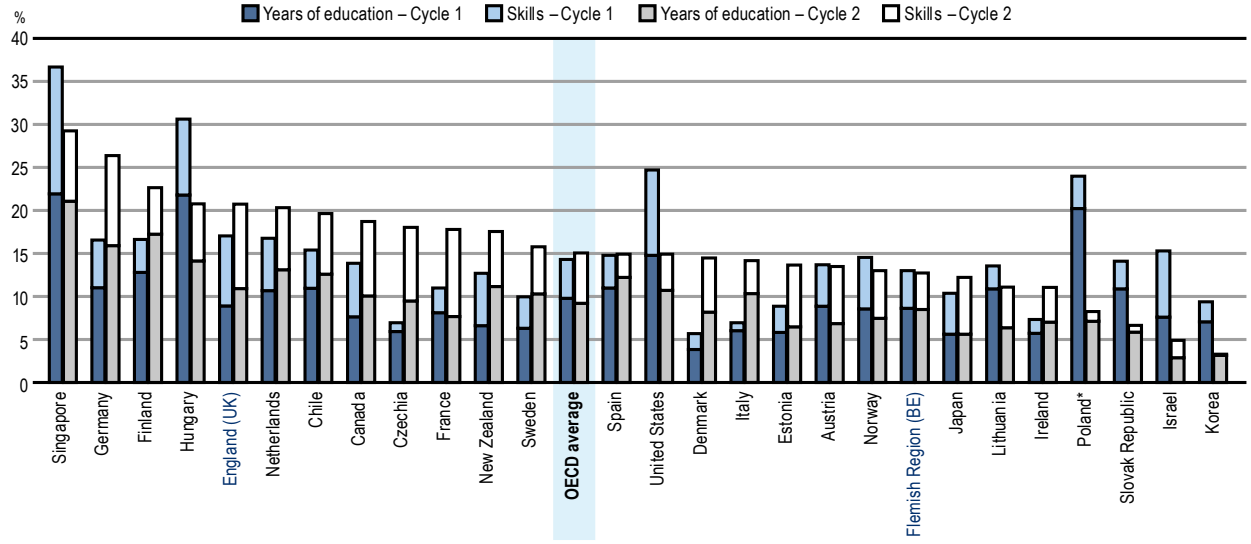
Countries and economies are ranked in descending order of the percentage of the variation in men's wages explained by each factor.

Source: Table A.4.9c (L, N) in Annex A.

The average total variation in wages accounted for by numeracy and literacy skills and education increased slightly between the two cycles of the Survey of Adult Skills, from 14% to 15%, although this relatively stable picture conceals considerable changes in many countries (Figure 4.8). Looking at the variation in wages accounted for by skill proficiency reveals an increase of 1.3 percentage points, from 4.5% to 5.8%, between cycles. This increase was most pronounced in Czechia (8 percentage points) and France (7 percentage points). On the other hand, there were marked decreases in Singapore (7 percentage points), the United States (6 percentage points) and Israel (6 percentage points). The change is particularly striking in Singapore, where proficiency in literacy and numeracy accounted for the greatest share of variation in wages of any country in the first cycle.

Figure 4.8. Trends in the contribution of education and skills to variation in wages

Variation explained by skills and education, Cycle 1 and Cycle 2



Note: Employed adults aged 25-65 not in formal education; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Decomposition calculates the percentage contribution to variance in log wages of the following factors: skills proficiency (numeracy and literacy), years of education, job tenure, field of study (9 categories) and individual characteristics (age, gender, immigrant background, and whether one lives with a partner or has children); wages are (log) gross hourly earnings for employed and self-employed individuals, including bonuses, in PPP-adjusted 2022 USD. See Fields (2003[43]) for further details on the decomposition method. Cycle 1 data refer to 2012 for all countries except for Chile, Israel, Lithuania, New Zealand, Singapore (all 2015) and Hungary (2017). All Cycle 2 data refer to 2023. Only countries and economies that participated in both cycles of the Survey of Adult Skills are presented. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the share of the variation in wages explained by skills and education in Cycle 2.

Source: OECD (2018[35]; 2015[36]; 2012[37]), Survey of Adult Skills (PIAAC) databases, http://www.oecd.org/skills/piaac/publicdataandanalysis/ (accessed on 23 September 2024); Tables A.4.9a (L, N) in Annex A.

As this analysis shows, skills and education continue to be rewarded in the labour market, particularly in terms of wages, which have a much clearer relationship with numeracy and literacy skills than with employment. As discussed above, one explanation for the smaller relationship with employment is the comparatively tighter labour markets that prevailed during the second cycle (2022-23) compared to the first cycle (2011-17) of the survey; high demand for labour may have led to high employment rates regardless of skill proficiency. Although much of the variation in wages remains unexplained, information-processing skills and, particularly, education do explain a substantial proportion. It is perhaps unsurprising that education remains more important for wages, as it captures a much wider range of the knowledge, skills and attitudes that are rewarded in the labour market (Durlak et al., 2011[17]; Heckman and Kautz,

2012[18]). However, it is notable that the relative explanatory contribution of skills has increased slightly between cycles of the Survey of Adult Skills. Examining this result may provide insights into the importance that employers attach to skills and qualifications when making decisions about hiring and developing their workforce.

Large cross-country differences remain in the extent to which the labour market rewards skills and qualifications. These reflect differences in labour-market institutions, such as wage-setting mechanisms, but also employer preferences and hiring practices. In the future, policy makers could work with employers and social partners to promote wage-setting practices that reward skills rather than qualifications, thereby encouraging a wider uptake of adult learning and the continuing development of skills during people's lives (OECD, 2024[8]). More generally, policy makers need to maintain their focus on developing the skills and qualifications of the workforce; this must be accompanied by demand-side measures, such as industry development and innovation policies, to achieve more equitable outcomes across the skills spectrum.

How do skills relate to social outcomes?

While employability and wages are essential contributors to individual well-being, non-economic factors contribute significantly not just to individual well-being but to social cohesion and civic engagement. Results from the first cycle of the Survey of Adults Skills showed that information-processing skills are positively associated with important aspects of well-being such as health, political efficacy, trust and volunteering, even after accounting for a range of socio-demographic variables (OECD, 2019[27]; 2016[28]; 2013[29]). However, the strength of these associations varies across countries. Generally, adults with low skills and education are least likely to report positive social outcomes, while those with high skills and education are most likely to report positive outcomes.

The first cycle of the Survey of Adult Skills also found that trust is positively associated with educational attainment and literacy proficiency. There is further evidence that education helps to develop the capacities and skills needed to build and maintain trust (Borgonovi and Burns, 2015[44]; Borgonovi and Pokropek, 2022[45]). Research has found a positive association between political efficacy and information-processing skills, with information-processing skills less associated with efficacy in societies with stronger respect for the rule of law and lower perceived corruption (Borgonovi and Pokropek, 2017[46]). Further, individuals with greater educational attainment are more likely to engage in health-promoting behaviour, benefit from better diagnosis and management of illnesses, and have longer life expectancy overall (Kakarmath et al., 2018[47]). These findings are consistent with research using other data sources finding that information-processing skills are associated with important life outcomes, such as self-reported health, teenage pregnancy or criminality (Carneiro, Crawford and Goodman, 2007[48]; Deming, 2009[49]).

This section sheds light on how literacy, numeracy and adaptive problem solving are linked to a range of social outcomes: trust in others, political efficacy, volunteering, self-reported health and general life satisfaction. Life satisfaction is a new addition to the 2023 Survey of Adult Skills (Box 4.2). The interpretation of these results is nuanced and has a normative dimension. The most favourable outcome for a country would be to have a high proportion of adults reporting positive outcomes, and for this to be irrespective of skill or educational background. Such a scenario would suggest that even individuals who are at a disadvantage in terms of skills or qualifications enjoy positive outcomes along dimensions of well-being and civic engagement at rates equal to those who are more advantaged.

Findings from the analysis of social outcomes can inform the development of education, training and workforce policies that not only improve labour-market outcomes, but also promote social cohesion and individual well-being. This broader perspective on the benefits of skills underlines their importance in promoting both personal and societal well-being.

Box 4.2. Measuring social outcomes in the 2023 Survey of Adult Skills

The 2023 Survey of Adult Skills included five non-economic measures: political efficacy, social trust, volunteering, self-reported health and life satisfaction. Some of these items are equivalent to those included in the first cycle, while others are new or adapted:

- **Life satisfaction** is a new measure in the 2023 Survey of Adult Skills and is based on items from the European Social Survey. Responses are on a scale from 0 (extremely dissatisfied) to 10 (extremely satisfied). High life satisfaction is defined as 7 or higher for the purpose of this report, with 75% meeting this criterion on average across participating OECD countries and economies.
- **Self-reported health** was carried over from the first cycle and included in the same format. There are five response options on a Likert scale (excellent, very good, good, fair or poor). Scores of "very good" or "excellent" were assigned the "positive" health outcome, which accounts for 41% on average.
- **Political efficacy** was carried over from the first cycle, but the scale was updated to be consistent with the European Social Survey. Respondents were asked about the extent to which they feel that people "like them" have a say in what government does, with responses scaled from 0 to 10. Responses of 7 or higher are categorised as "positive" and 19%, on average, meet this criterion.
- **Social trust** was carried over from the first cycle, and its scale was also updated for consistency with the European Social Survey. Respondents rated the extent to which they agreed with the following sentiments on a scale from 0 to 10: that "you can't be too careful" (0), or "people can be trusted" (10). Responses of 7 or higher are categorised as "positive", accounting for 36% on average.
- **Voluntary work** was carried over from the first cycle and included in the same format. Answer options are recorded on a five-point scale reflecting increasing frequency (never, less than once a month, less than once a week but at least once a month, at least once a week but not every day or every day). For this report, any volunteering activity in the past year is categorised as a positive outcome, accounting for 32% on average.

Individual well-being: Life satisfaction and self-reported health

Life satisfaction and health are integral components of individual well-being. According to the 2023 Survey of Adult Skills, they are both correlated to skills, though the relationship is more consistently statistically significant for health than for life satisfaction (Figure 4.10). It is important to note that data on life satisfaction and health are based on self-reports in the survey. For cultural reasons, citizens of one country may be more likely overall to respond positively to such subjective questions, so cross-country comparisons should be made with caution. However, the data presented in this section can still shed light on the significant differences in the proportions of respondents reporting positive outcomes at different levels of ability within societies.

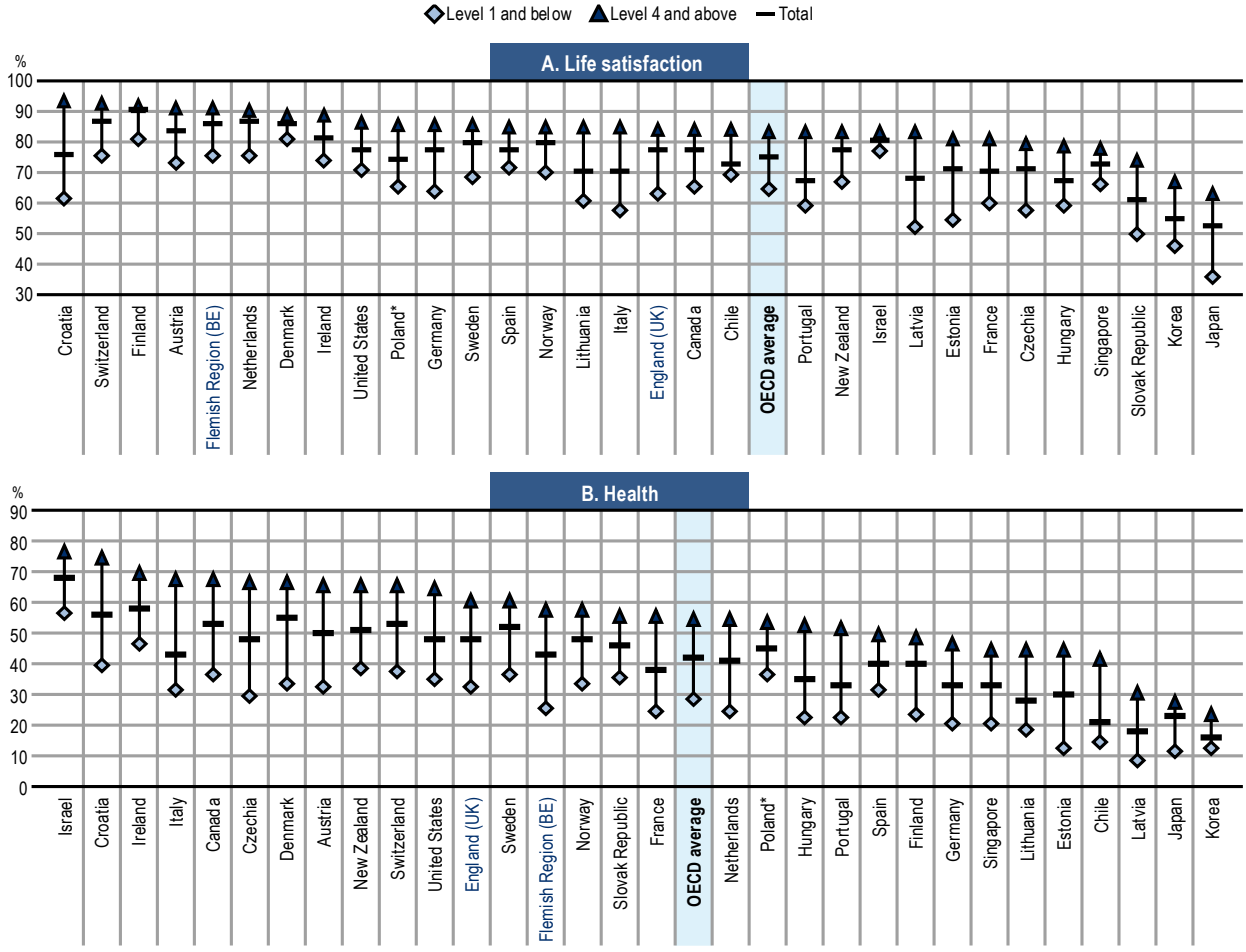
Across the OECD, on average, three-quarters of individuals rank their life satisfaction as high Figure 4.9, Panel A). In Denmark, Finland, the Flemish Region (Belgium), the Netherlands and Switzerland over 85% of respondents report high life satisfaction, compared to below 55% in Japan and Korea. Across all participating countries and economies, the share of adults reporting high levels of life satisfaction is positively correlated with literacy and numeracy proficiency. On average, 84% of individuals with high numeracy skills (Level 4 and above) report high levels of life satisfaction, but only 65% of individuals with low numeracy skills (at or below Level 1) do. These averages mask considerable cross-country

differences: while 92% of adults in Finland and Switzerland with high numeracy skills report high life satisfaction, only 63% of adults in Japan with such high numeracy skills do so, and the proportion falls to just 36% for Japanese with low numeracy skills compared to 81% of Finns.

When it comes to self-reported health, 41% of individuals reported having "very good" or "excellent" health on average across participating countries and economies (Figure 4.9, Panel B). Adults in Croatia, Ireland and Israel were most likely to report such positive health (at least 55%), while those in Chile, Japan, Korea and Latvia were least likely (23% or less). The differences between adults with high and low numeracy skills are pronounced: on average, 55% of adults with high numeracy skills report positive health outcomes, compared to only 28% of adults with low numeracy. Again, the OECD average masks significant heterogeneity. At the bottom end of the scale, the share of adults with low levels of numeracy reporting positive health outcomes is only 9% in Latvia and 12% in Estonia and Japan.

Figure 4.9. Individual well-being outcomes, by numeracy proficiency level

Adults aged 25-65 reporting positive outcomes for life satisfaction and self-reported health

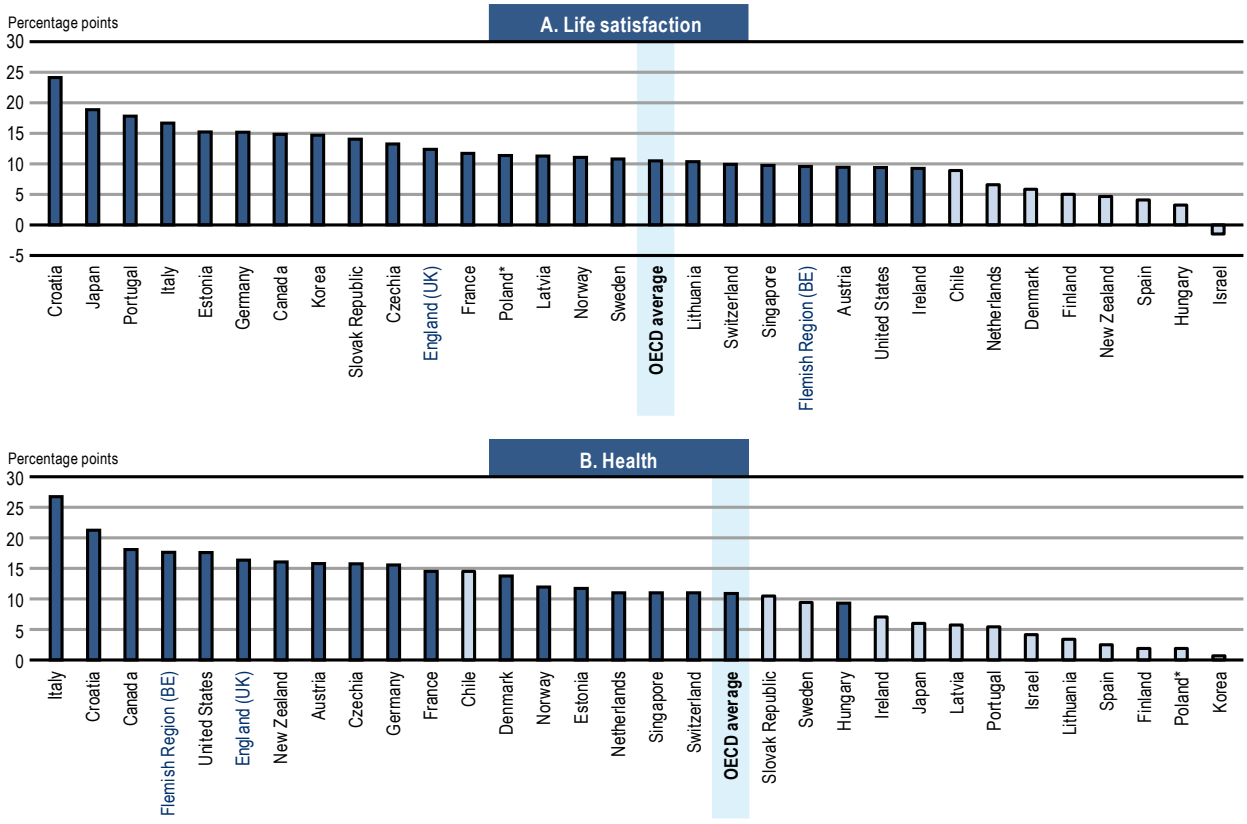


Note: Does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Figure plots the unadjusted share of respondents reporting a positive outcome (see Box 4.2 for definitions). *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the share of respondents at Level 4 and above reporting positive outcomes.
Source: Table A.4.10 (N) in Annex A.

This positive relationship between life satisfaction, health and numeracy holds even after accounting for a number of personal characteristics. Figure 4.10 shows the percentage point difference in reporting high life satisfaction (Panel A) and positive health outcomes (Panel B) between adults with low and high numeracy skills. The regression model underlying these estimates controls for age, gender, years of education, immigrant background, parental educational attainment and whether an individual lives with a partner or has children. As the sample includes people who are not employed, no occupational controls are included.

Figure 4.10. Relationship between numeracy and individual well-being

Difference in likelihood of reporting positive outcomes (high proficiency *minus* low proficiency)



Note: Adults aged 25-65; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Positive outcomes for life satisfaction and for self-reported health are defined in Box 4.2. High proficiency refers to numeracy proficiency at Level 4 and above and low proficiency to at or below Level 1. In addition to proficiency level, estimates account for years of education, age, gender, immigrant background, parental education and whether one lives with a partner or has children. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the difference in the likelihood of reporting positive outcomes.
Source: Table A.4.11 (N) in Annex A.

On average, across OECD countries and economies, individuals with high numeracy skills are 11 percentage points more likely to report positive health outcomes – and 10 percentage points more likely to report high life satisfaction – than individuals with low numeracy skills. Nevertheless, some cases stand out: in Croatia, for instance, individuals with high numeracy skills are 24 percentage points more likely to report high life satisfaction, a larger effect than in any other country, while the greatest gap in health occurs

in Italy (27 percentage points). In Chile, Finland, Israel and Spain, the relationship between numeracy proficiency and both health and life satisfaction outcomes is not statistically significant at the 5% level, while in 15 of the participating countries and economies there are sizeable and statistically significant associations for both outcomes. Future research into differences in the social policy environment and economic opportunities is important to contextualise differences in the relationship between skill levels and social outcomes.

Civic engagement: Political efficacy, trust and volunteering

The 2023 Survey of Adult Skills offers an insight into the prevalence of measures of civic engagement – political efficacy (i.e. an individual's confidence in their ability to understand and influence political affairs), trust in others and a propensity to volunteer – and how these measures relate to adult skills (see Box 4.2 for a definition of these measures). For most countries, statistically significant associations exist between numeracy proficiency and measures of civic engagement.

On average across OECD countries and economies, 19% of individuals reported high political efficacy (Figure 4.11). Switzerland has the highest share (51%), with Czechia (33%), Finland (31%), Japan (30%) and Sweden (30%) the only other participating countries where the share was over 30%. On the other hand, in France, Italy and Croatia, less than 8% of adults report high political efficacy.

Political efficacy is generally lower among low-skilled adults. On average across participating OECD countries and economies, only 16% of individuals with numeracy proficiency at or below Level 1 report high political efficacy, compared with 26% at Level 4 and above (Figure 4.11, Panel A). However, this relationship varies considerably between countries. In 11 countries and economies, the likelihood of reporting high political efficacy increases or stays constant with each proficiency level, while in 13, the pattern follows a "U" shape, where political efficacy is higher for those at or below Level 1 than for those at Level 2 or Level 3, while adults at Level 4 and above are then most likely to report high political efficacy (see Table A.4.10 (N) in Annex A). Conversely, in Hungary, Poland, Portugal and Spain, the highest-skilled individuals report the lowest levels of political efficacy.

A high degree of trust in others is more prevalent across OECD countries and economies, with 36% of individuals reporting high trust on average. Denmark (71%), Finland (68%) and Norway (66%) have by far the highest levels of trust, whereas Chile (8%), Czechia (18%) and France (19%) are the only countries where less than one-fifth of individuals report high trust.

In all participating countries and economies, individuals with high numeracy skills are more likely than lower-skilled individuals to report high levels of trust (Figure 4.11, Panel B). On average, 25% of individuals at or below Level 1 report high levels of trust, compared to 51% of individuals at Level 4 and above. The greatest difference between high- and low-skilled individuals can be observed in the Netherlands (42 percentage points), Denmark (40 percentage points) and Sweden (40 percentage points).

Finally, 32% of adults reported at least some volunteering activity in the past year on average, with adults in Norway (52%), the United States (48%), Finland (45%), New Zealand (45%) and Denmark (44%) most likely to volunteer. The propensity to volunteer is lowest in Lithuania (15%), Korea (16%), Spain (19%) and Croatia (20%). In all participating OECD countries and economies, high-skilled individuals are more likely to volunteer than the lowest skilled: 41% compared to 22% on average (Figure 4.11, Panel C). The biggest gaps are in Germany and the United States, with differences of 32 percentage points between the two groups.

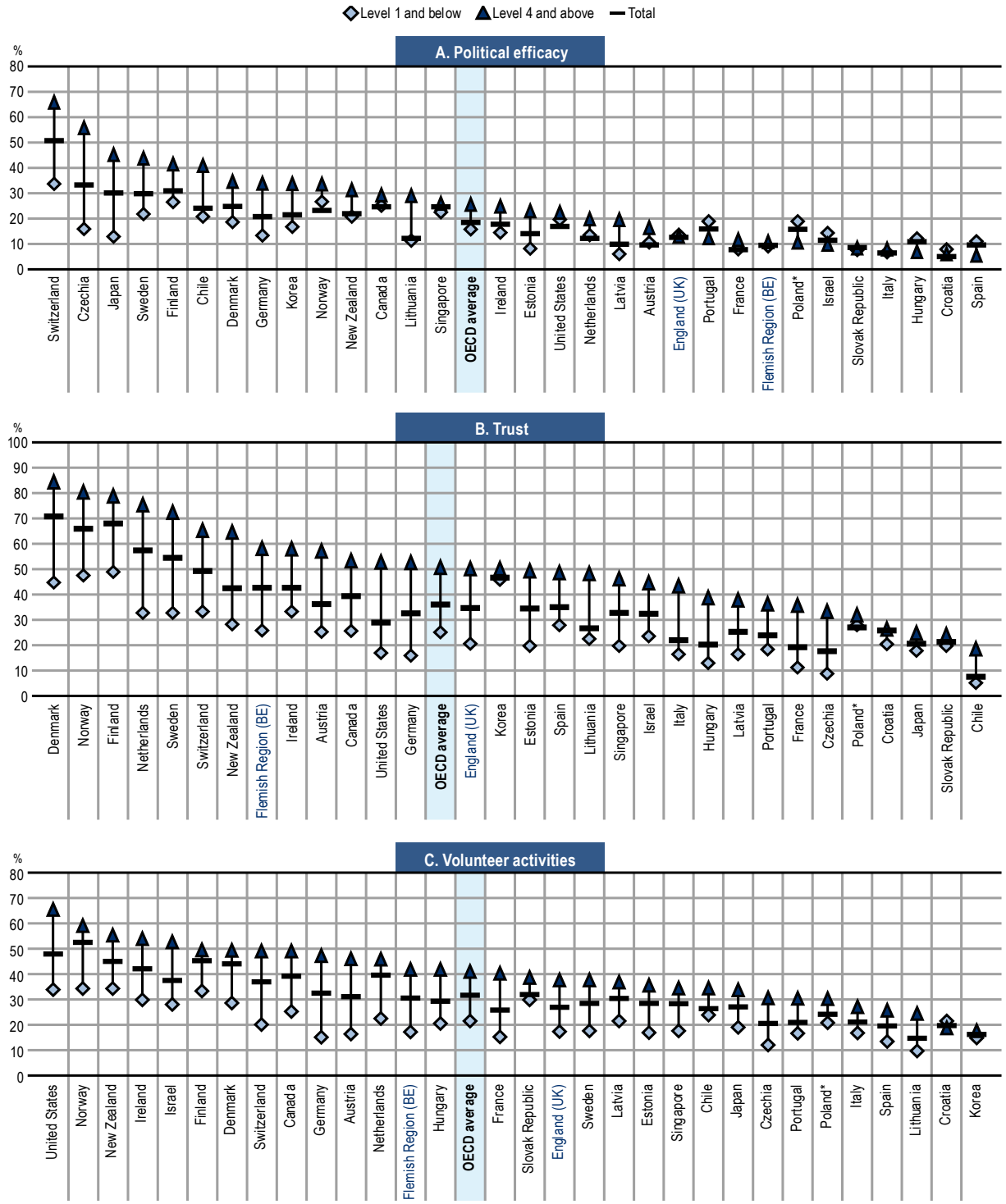
These relationships hold even when accounting for a number of socio-demographic characteristics (Figure 4.12). Roughly a quarter of participating countries and economies display some statistically significant associations across all three dimensions of civic engagement and skill levels; only Portugal and the Slovak Republic show no statistically significant associations for any of them.

For trust and the propensity to volunteer, there is a clear positive association with skills proficiency. On average across OECD countries and economies, high-skilled individuals are 10 percentage points more likely to volunteer and 18 percentage points more likely to report high trust in others than their low-skilled counterparts. The association with trust is most pronounced in Denmark, Germany and the Netherlands (all between 28 and 30 percentage points), while the propensity to volunteer has the strongest associations in Austria, France and Germany (18 to 20 percentage points). In contrast, for political efficacy, the most notable finding is that several countries show sizeable, statistically significant negative associations with proficiency level. This is the case for Poland (-9 percentage points), Hungary (-8 percentage points) and Spain (-8 percentage points) (Figure 4.12, Panel A).

The overall picture that emerges from the 2023 Survey of Adult Skills is that, on average, skills proficiency matters significantly for both well-being and civic engagement, but the strength and nature of this relationship varies across countries. This underlines the critical importance of investing in skills development, not simply to improve labour-market outcomes, but also to enhance individual and societal well-being. Countries experiencing significant disparities in the well-being and civic outcomes of adults with different skill levels should increase their efforts to reduce these gaps through initiatives to develop skills. It will also be crucial to address the disproportionate impact of skills on social outcomes such as political efficacy. The combination of many low-skilled adults feeling unable to influence political decisions and lacking the skills to navigate complex digital information landscapes should be a concern for modern democracies. Policy makers must work to empower people of all skill levels to participate in civic life and to manage their health and well-being.

Figure 4.11. Civic engagement outcomes, by numeracy proficiency level

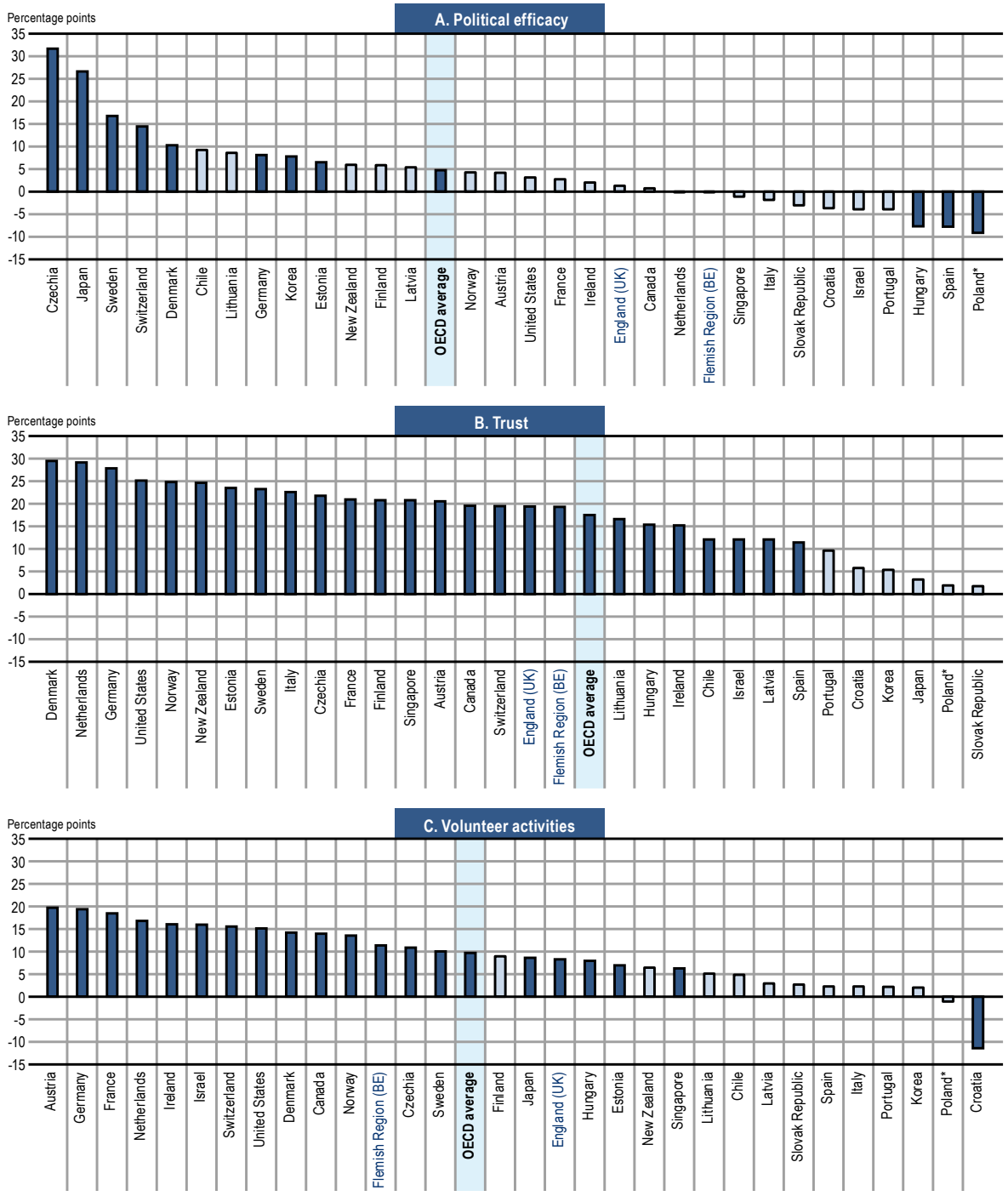
Adults aged 25-65 reporting positive outcomes for political efficacy, trust and volunteering



Note: Does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Figure plots the unadjusted share of respondents reporting a positive outcome (see Box 4.2 for definitions). *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Countries and economies are ranked in descending order of the share of respondents at Level 4 and above reporting positive outcomes.
Source: Table A.4.10 (N) in Annex A.

Figure 4.12. Relationship between numeracy and civic engagement

Difference in likelihood of reporting positive outcomes (high proficiency *minus* low proficiency)



Note: Adults aged 25-65; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Positive outcomes for trust, political efficacy and volunteering are defined in Box 4.2. High proficiency refers to numeracy proficiency at Level 4 and above and low proficiency to at or below Level 1. In addition to proficiency level, estimates account for years of education, age, gender, immigrant background, parental education and whether one lives with a partner or has children. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the difference in the likelihood of reporting positive outcomes.

Source: Table A.4.11 (N) in Annex A.

How widespread are skills mismatches?

Good matches between workers' skills and qualifications and those required by their jobs are essential to a well-functioning, productive economy. At the individual level, workers who are not well-matched to their jobs may experience lower job satisfaction and wages. At the aggregate level, mismatches may mean economies experience lower productivity and lose out on valuable human capital investment (Adalet McGowan and Andrews, 2015[9]; Allen, Levels and van der Velden, 2013[50]). Investment in human capital can be wasted when workers are not allocated efficiently to jobs. This is especially the case for workers who are over-qualified or over-skilled for their jobs.

Some natural degree of mismatch in the economy is inevitable as workers sort themselves into suitable jobs. This is particularly true for younger workers or those (re-)entering the labour force. Some people may choose to work in jobs that do not match their skills, qualifications or field of study due to factors such as personal preferences, location or family responsibilities. Nonetheless, policy makers should try to maximise the return on investment in education by promoting an efficient use of skills in the economy and therefore reducing the different types of mismatches that can occur, be they qualification mismatches, skills mismatches or field-of-study mismatches.

Structural changes in the labour market, driven by an ageing population, digitalisation and the green transition, are leading to rapidly changing demand for skills and qualifications (OECD, 2023[51]). If the skills and qualifications of the workforce do not evolve at the same pace, this can lead to mismatches. The 2023 Survey of Adult Skills provides an opportunity to assess how mismatches have evolved over the past decade as these megatrends have gathered pace.

The 2023 Survey of Adult Skills introduces some innovations in the measurement of skills mismatches, including more detailed information on self-reported skills mismatches and more detailed information on fields of study (Box 4.3). This section describes the extent of different types of mismatches – in qualifications, skills and field of study – across countries and economies (see Table 4.2 for the full set of mismatch indicators used in this chapter). It also analyses which socio-demographic groups are most likely to experience mismatches.

Table 4.2. Glossary of key terms related to mismatches

	Mismatch concept	Measure used in this chapter
Qualification mismatch	**Over-qualification**	A worker is classified as over-qualified when the level of their highest qualification is above the qualification level required for their job.
	Under-qualification	A worker is classified as under-qualified when the level of their highest qualification is below the qualification level required for their job.
	Required qualification	Based on respondents' answers to the question "If applying today, what would be the usual qualification, if any, that someone would need to get this type of job?"
Skills mismatch	**Over-skilling**	A worker is classified as over-skilled if their skills are higher than is required by their job.
	Under-skilling	A worker is classified as under-skilled if their skills are lower than is required by their job and need to be further developed.
	Required skills	Based on respondents' self-assessments of whether their skills are in line with the skills required to do their job.
Field of study mismatch	**Mismatch by field of study**	A worker is classified as mismatched by field of study if the area of study of their highest qualification is not related to the field that is most relevant to their job.
	Well-matched by field of study	A worker is classified as well-matched by field of study if the area of study of their highest qualification is related to the field that is most relevant to their job.

Box 4.3. Measuring mismatches with the 2023 Survey of Adult Skills

There are several ways to measure mismatches. Surveys can ascertain respondents' self-assessment of potential mismatch (subjective measures) or compare respondents with what is common in their country (statistical approach) or to what is appropriate *(*normative approach). This report uses a combination of approaches to measure mismatches. A future thematic report will extend this analysis, making full use of the innovations introduced in the measurement of skills mismatches in the 2023 Survey of Adult Skills.

Qualification mismatches

A qualification mismatch occurs when a worker has higher or lower levels of educational attainment than required for their job. In the 2023 Survey of Adult Skills, the response to the question "If applying today, what would be the usual qualification, if any, that someone would need to get this type of job?" provides an estimate of the required qualification for a person's job. Respondents are classified as over-qualified if the level of their highest qualification is above the required qualification and under-qualified if it is below it. This measure of qualification mismatch is equivalent to that used in the first cycle (OECD, 2013[29]; OECD, 2016[28]; OECD, 2019[27]).

Although potentially biased by individual perceptions, cross-country differences in the meaning and relevance of qualifications, and period or cohort effects[1] such self-reported qualification requirements have the advantage of being job-specific rather than assuming that all jobs within the same occupation require the same level of qualification. It is also based on expected qualifications for jobs today, unlike statistical approaches that usually combine current and past qualification requirements (because they are based on the most common qualification of current job holders) thereby reflecting the required qualifications at hiring at different times.

Qualification levels are based on the International Standard Classification of Education (ISCED) 2011 levels. These were grouped into four categories: lower secondary education or below (ISCED 0, 1 or 2), upper secondary education (ISCED 3), post-secondary non-tertiary education (ISCED 4) and tertiary education (ISCED 5, 6, 7 and 8) (UNESCO Institute for Statistics, 2012[52]).

Skills mismatches

A skills mismatch occurs when a worker has either higher or lower skills than required for their job. This measure uses the addition of an improved self-reported measure of skills mismatch in the 2023 Survey of Adult Skills. Respondents are asked "Overall, which of the following statements best describes your skills in relation to what is required to do your job?" Those who answer "Some of my skills are lower than what is required by my job and need to be further developed" are classified as under-skilled in their job, while those answering "My skills are higher than required by my job" are classified as over-skilled. Respondents who answer "My skills are matched to what is required by my job" are considered well-matched.

Due to improvements made to the wording of the background questionnaire, this measure of skills mismatch is not comparable to the one used in the first cycle. Although this measure may be subject to some bias (namely under- or over-confidence) it assumes that workers are best placed to report on their own skills and the requirements of their own job. This measure captures general skills mismatch without reference to the skill area in which the mismatch occurs.

The 2023 Survey of Adult Skills also collected data on the skill areas respondents need to further develop. Under-skilled workers are asked a follow-up question "What skills were you thinking of when you answered this question?", which provides further detail on the nature of self-assessed skills mismatch. The response options were: 1) computer or software skills; 2) skills in operating

machinery/equipment; 3) project management or organisational skills; 4) teamwork or leadership skills; 5) skills in dealing with customers/clients/patients or students; 6) communication and presentation skills; 7) foreign language skills; 8) literacy skills; 9) numeracy skills; and 10) other skills. Respondents could tick all that applied.

Field-of-study mismatches

Field-of-study mismatches arise when workers are employed in a different field from that of their highest qualification. This mismatch measure is constructed based on a list of occupations (at the 3-digit ISCO classification) that are considered as an appropriate match – in a normative sense – for each field of study. Workers who are not employed in an occupation that is considered a good match for their field are considered mismatched.

The 2023 Survey of Adult Skills contains information on 16 fields of study. To ensure comparability with the first cycle, these have been grouped into nine fields: 1) general programmes; 2) teacher training and education science; 3) humanities, languages and arts; 4) social sciences, business and law; 5) science, mathematics and computing; 6) engineering, manufacturing and construction; 7) agriculture and veterinary medicine; 8) health and welfare; and 9) services. Those who studied general programmes are excluded from analysis under this measure.[2]

Source: Quintini (2011[53]), "Right for the job: Over-qualified or under-skilled?", https://doi.org/10.1787/5kg59fcz3tkd-en; Montt (2015[54]), "The causes and consequences of field-of-study mismatch: An analysis using PIAAC", https://doi.org/10.1787/5jrxm4dhv9r2-en.

1. A cohort effect is a change that characterises populations born at a particular time but is independent of the ageing process. A period effect is a chang1e that occurs at a particular point in time and affects all age groups and cohorts equally.
2. It is worthwhile to note that the share of respondents undertaking general programmes differs by country. This is largely due to different educational systems which set students onto different pathways of general education and vocational education from secondary school.

Overall prevalence of mismatches

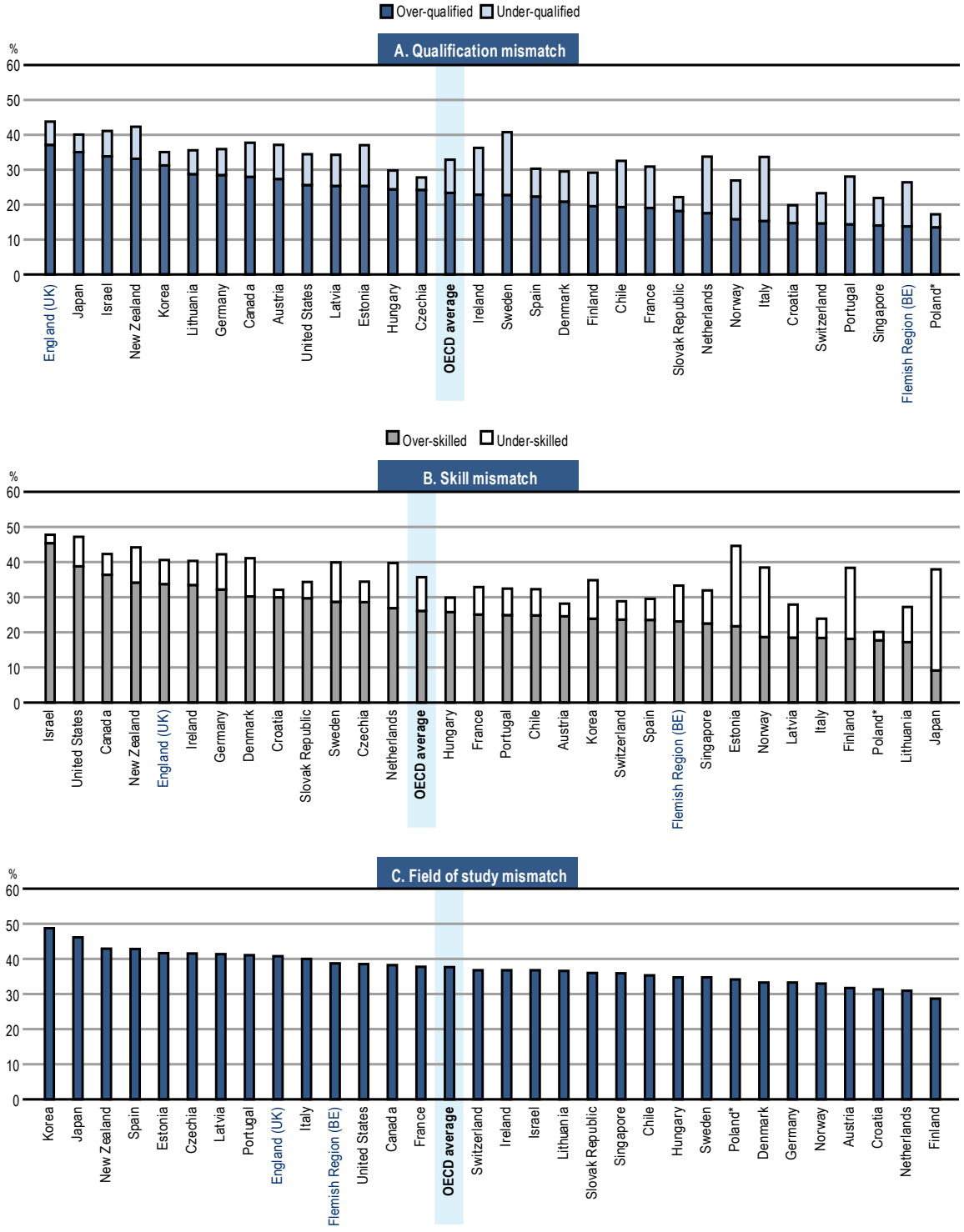
On average across the OECD, about 23% of workers are over-qualified for their current job, while 9% are under-qualified, leaving just over 67% well-matched (Figure 4.13). England (United Kingdom) (37%), Japan (35%) and Israel (34%) have the highest rates of over-qualification, while the Flemish Region (Belgium) (14%), Singapore (14%) and Poland (14%) have the lowest.

The extent of over-skilling across countries and economies is similar to over-qualification. About 26% of workers consider themselves to have higher skills than their job requires, while 10% report that some of their skills are lower than what is required by their job and need to be further developed. This leaves about 64% of workers who report that their skills are well-matched to their jobs on average. Everywhere except Estonia, Finland, Japan and Norway, workers are more likely to report that they are over-skilled than that they are under-skilled.

Although over-skilling is correlated to over-qualification, there are noticeable deviations for some countries and economies (Figure 4.14). Over-skilling is highest in Israel (45%), the United States (39%) and Canada (36%) and lowest in Japan (9%), Finland (18%) and Lithuania (17%). Several factors may explain divergence between over-qualification and over-skilling rates. For example, differences in how respondents from various countries approach self-assessment questions could lead to over- or under-estimation of skills. Differences in labour-market institutions are also likely to contribute to these cross-country disparities. Even among highly educated workers, training programmes might not always be well aligned with the specific skills needed in the workplace, underscoring the importance of targeted on-the-job training and continuous adult learning.

Figure 4.13. Mismatches in qualifications, skills and field of study

Employed adults aged 25-65 who are not self-employed



Note: Does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Mismatch measures are defined in Table 4.2 and Box 4.3. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the share of workers who are over-qualified (Panel A), over-skilled (Panel B) and field of study mismatched (Panel C).

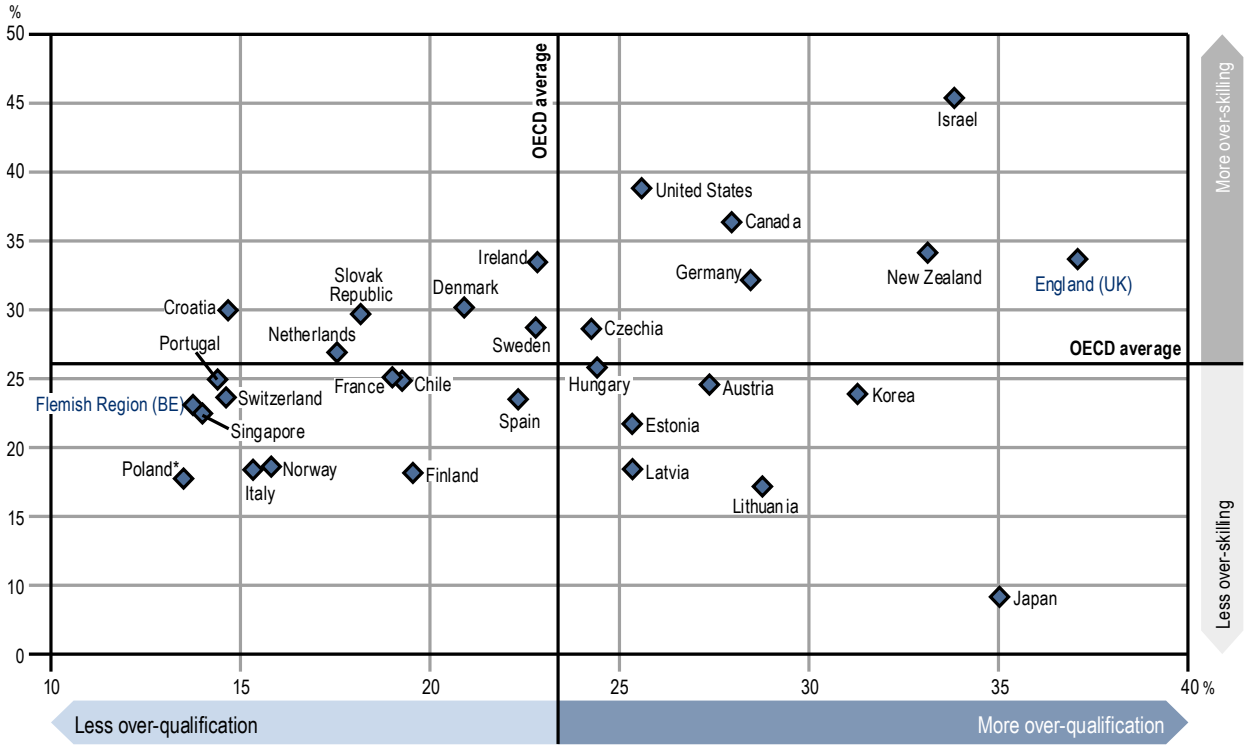
Source: Table A.4.12 in Annex A.

Finally, with regards to field of study, for 38% of workers on average the field of study of their highest qualification does not align with the typical requirements in their job. Korea (49%), Japan (46%) and New Zealand (43%) have the highest field-of-study mismatch rates while Finland (29%), Croatia (31%) and the Netherlands (31%) have the lowest. Mismatches in field of study tend to be more common than over-qualification and skill mismatches. This is less of a concern if workers are choosing jobs that match their preferences and the labour market, or if they are matched to their jobs based on transferable skills. Some mismatches may include adults who have retrained in a field that is better suited to their current job, but at a lower qualification level than their highest qualification. This will be explored further in future reports.

Although it is not possible to compare skills mismatch measures between the two cycles of the Survey of Adult Skills (as explained in Box 4.3), comparisons can be made for mismatches in qualifications and field of study, due to the minimal changes in question wording and measurement. In general, mismatch rates for both have remained relatively stable over the last decade. Qualification mismatches have fallen only slightly, from 34% to 33%. This appears to be mainly due to a drop in under-qualification (from 13% to 9%), while over-qualification increased (from 21% to 23%). Meanwhile, field-of-study mismatches have fallen from 40% of workers in the first cycle to 38% in the current study (OECD, 2019[27]). Despite these small improvements, the magnitude of mismatch on both measures remains high with more work needed across the OECD to improve the matching of workers to their jobs. Moreover, more work is needed to assess whether skills-based approaches are effective in reducing skills mismatches (OECD, 2024[8]).

Figure 4.14. Comparison of over-qualification and over-skilling

Employed adults aged 25-65 who are not self-employed



Note: Does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Over-qualification and over-skilling are defined in Table 4.2 and Box 4.3. The horizontal line represents the OECD average rate of over-skilling and the vertical line the OECD average rate of over-qualification. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.
Source: Table A.4.12 in Annex A.

Box 4.4. Results on skill gaps from the PIAAC Employer Module

The PIAAC Employer Module is a unique survey that captures employers' perspectives on skill gaps. For employers, skill gaps are mismatches between the skills available in a workforce and those required to meet their current and future business needs. They can be understood as the employer perspective on under-skilling, which denotes a situation where workers believe they do not have the necessary skills for their current job (Marcolin and Quintini, 2023[55]). While skill gaps and under-skilling are closely related, they are not identical.

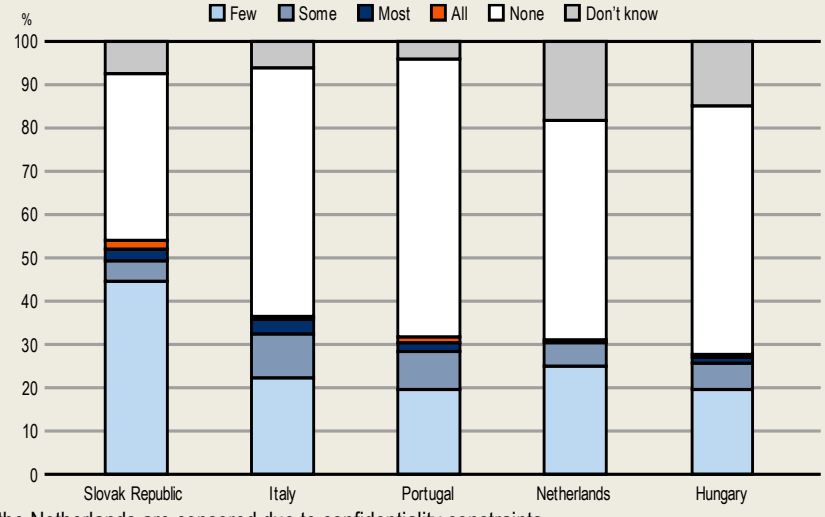
The 2023 Survey of Adult Skills and the PIAAC Employer Module are conceptually linked, as they were jointly designed to compare employee and employer perspectives on skill gaps. Data for both surveys were collected simultaneously. The first wave of the PIAAC Employer Module took place in five OECD countries – Hungary, Italy, the Netherlands, Portugal and the Slovak Republic.

According to the PIAAC Employer Module, a sizeable share of firms report skill gaps in their organisation. Over half of enterprises in the Slovak Republic state that their workforce has some degree of skill gap (54%), the highest of all countries (Figure 4.15). This is followed by Italy (37%), Portugal (32%), the Netherlands (31%) and Hungary (27%). Where enterprises identify skill gaps, these most often concern only a few or some of their employees. Much smaller proportions of enterprises (<5%) report that most or all their employees do not have the skills needed to perform their jobs.

A notable proportion of enterprises report that they did not know whether they had a skill gap, with high shares in the Netherlands (18%) and Hungary (15%). The uncertainty expressed by many firms about the skill gaps in their workforce is likely to reflect a wider problem of inadequate skills assessment and anticipation, particularly in smaller firms (OECD, 2021[56]). Detailed results of the PIAAC Employer Module are available in OECD (2024[57]).

Figure 4.15. Extent of skill gaps in countries participating in the PIAAC Employer Module

Share of all firms reporting skill gaps, by the proportion of their workforce affected



Note: Some data for the Netherlands are censored due to confidentiality constraints.
Countries are ranked in descending order of the share of firms identifying any skill gaps in their workforce.
Source: PIAAC Employer Module (2022).

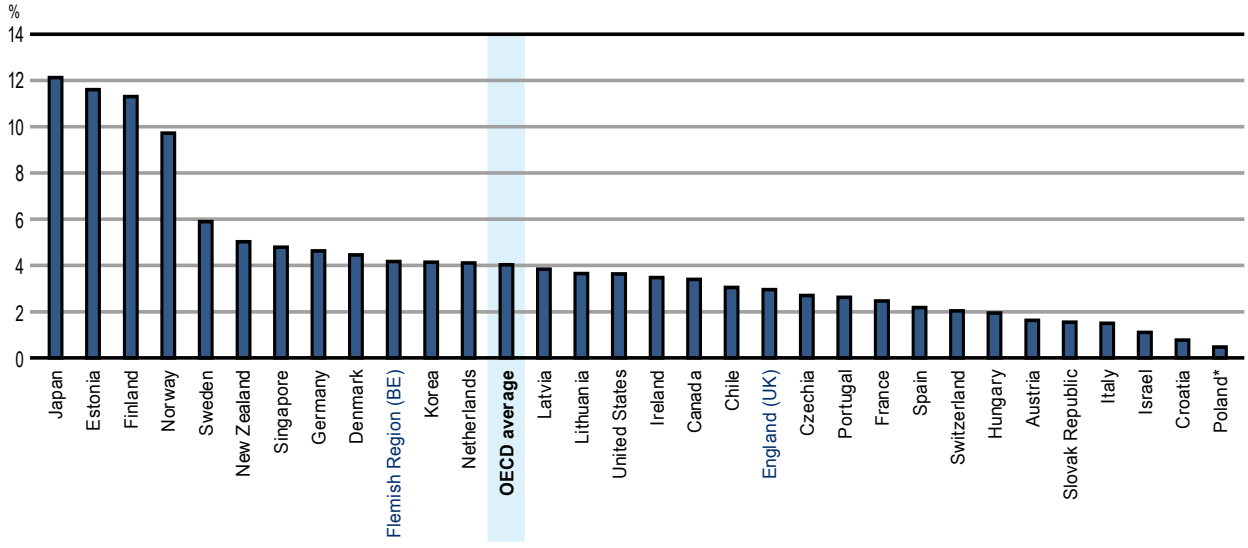
Prevalence of under-skilling related to digital skills

The 2023 Survey of Adult Skills included a new question on the types of skills that under-skilled workers feel they would need to improve to be well-matched to their jobs (Box 4.3). On average across participating OECD countries and economies, 42% of under-skilled respondents feel they need to improve their computer and software skills (see Table A.4.13 in Annex A). This is significantly more than for any other type of skill – perhaps an indication of the rapid changes to labour markets being brought about by artificial intelligence and digitalisation, and the urgency with which respondents feel they need to keep abreast with these trends. Other skills such as project management and organisational skills (26%), communication and presentation skills (26%), and teamwork or leadership skills (24%) are also cited by respondents as areas they most need to develop (see Table A.4.13 in Annex A).

However, after taking into account the overall share of under-skilled respondents, the share of all workers stating that they lack sufficient computer and software skills is only 4% across OECD countries and economies. Japan (12%), Estonia (12%), Finland (11%) and Norway (10%) have the highest overall proportions of workers who lack the digital skills required for their current jobs (Figure 4.16). This is largely because these countries have higher shares of self-reported under-skilling. Cross-country differences reflect both the supply of skills (i.e. individuals already have strong digital skills) and the demand for such skills in the labour market (i.e. their jobs may not yet require advanced digital skills). Therefore, high levels of self-reported under-skilling may indicate not only a skill gap but also a greater awareness and desire to improve, highlighting the continued need for countries to invest in digital upskilling and training initiatives to keep pace with technological progress.

Figure 4.16. Share of workers reporting inadequate computer and software skills for their job

Employed adults aged 25-65 who are not self-employed



Note: Does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Figure plots the share of respondents who answered, "Some of my skills are lower than what is required by my job and need to be further developed," to the question, "Overall, which of the following statements best describes your skills in relation to what is required to do your job?", and marked “Computer and software skills” in response to the question, “Which skills were you thinking of when you answered this question?”. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader’s Guide.

Countries and economies are ranked in descending order of the share of all workers reporting inadequate digital skills.

Source: Tables A.4.12 and A.4.13 in Annex A.

Prevalence of qualification mismatches by socio-demographic groups

Some groups of people may be more likely to be over-qualified for their jobs, which can have negative social and economic consequences for them. To understand this better, a regression analysis was carried out to estimate the probability of different groups being over-qualified, accounting for individual and job characteristics. This ensures that comparisons are only made for similarly skilled individuals working in similar occupations. Figure 4.17displays the likelihood of over-qualification by various individual characteristics, while Figure 4.18 does the same for job characteristics. See Table A.4.15 (N) in Annex A for a similar analysis on over-skilling.

The analysis of the relationship between socio-demographic characteristics and over-qualification shows that (Figure 4.17):

- **Age:** Theory suggests that it may take time for workers to sort themselves into well-matched jobs, with younger workers, who are new in the labour market, more likely to be mismatched (Quintini, 2011[58]). This is especially the case for younger workers who enter the labour market during a downturn, with recessions disrupting the quality of initial firm-worker matches and reducing earnings (Andrews et al., 2020[59]). The empirical analysis confirms this pattern, with older workers (45-65 year-olds) approximately 2 percentage points less likely to be over-qualified than younger workers (25-44 year-olds) on average, though this pattern is not statistically significant in many countries and economies.[7]
- **Gender and partnership status:** Workers with family responsibilities – which are still disproportionately borne by women – may choose to take a job for which they are over-qualified if it is better suited to their caring responsibilities (Goldin, 2014[60]). Previous analyses do not show a clear relationship between gender and over-qualification, with some studies finding that women are less likely to be over-qualified than men after accounting for other factors (OECD, 2016[28]; Quintini, 2011[58]). Other studies indicate that women tend to be more over-qualified than men, and in fact over-display their qualifications and education in order to attain leadership positions (Niessen-Ruenzi and Zimmerer, 2023[61]). The 2023 Survey of Adult Skills finds that on average, after accounting for occupation, single women, partnered women and partnered men are less likely to be over-qualified than single men on average (see Table A.4.14 (N) in Annex A). It should be noted that this analysis would not capture any over-qualification due to differential sorting into occupations by gender, as it only compares individuals in the same occupation (see further discussion on occupation below).
- **Immigrant background:** Foreign-born – or, more specifically, foreign-educated – workers may be more likely to experience mismatch due to lack of recognition of their qualifications and skills in the host labour market or because of language issues (Altorjai, 2013[62]; Larsen, Rogne and Birkelund, 2018[63]; Pivovarova and Powers, 2022[64]). Indeed, the first cycle of the Survey of Adult Skills found that foreign-born workers were more likely to be over-qualified. This finding is repeated in the current cycle, with foreign-born workers being around 5 percentage points more likely to be over-qualified than their native-born counterparts on average. Immigrant workers in Chile, Korea, Latvia, and Spain have particularly strong likelihoods of being over-qualified. This highlights the importance of immigrant integration policies, robust systems for the recognition of prior learning and the need to tackle labour-market discrimination. There are exceptions, however: in one-third of participating countries and economies, native-born adults are more likely to be over-qualified, although differences are often not significant.
- **Educational attainment and skills**: On average across the OECD, having more years of education is associated with a greater likelihood of over-qualification. This is partly by construction, because workers with more years of education tend to have higher qualification levels and are therefore more likely to be classified as over-qualified if they don't work in jobs corresponding to

their qualification level. Moreover, higher numeracy proficiency reduces the chance of a worker being over-qualified, although not significantly so in most countries.

The analysis of the relationship between job characteristics and over-qualification shows that (Figure 4.18):

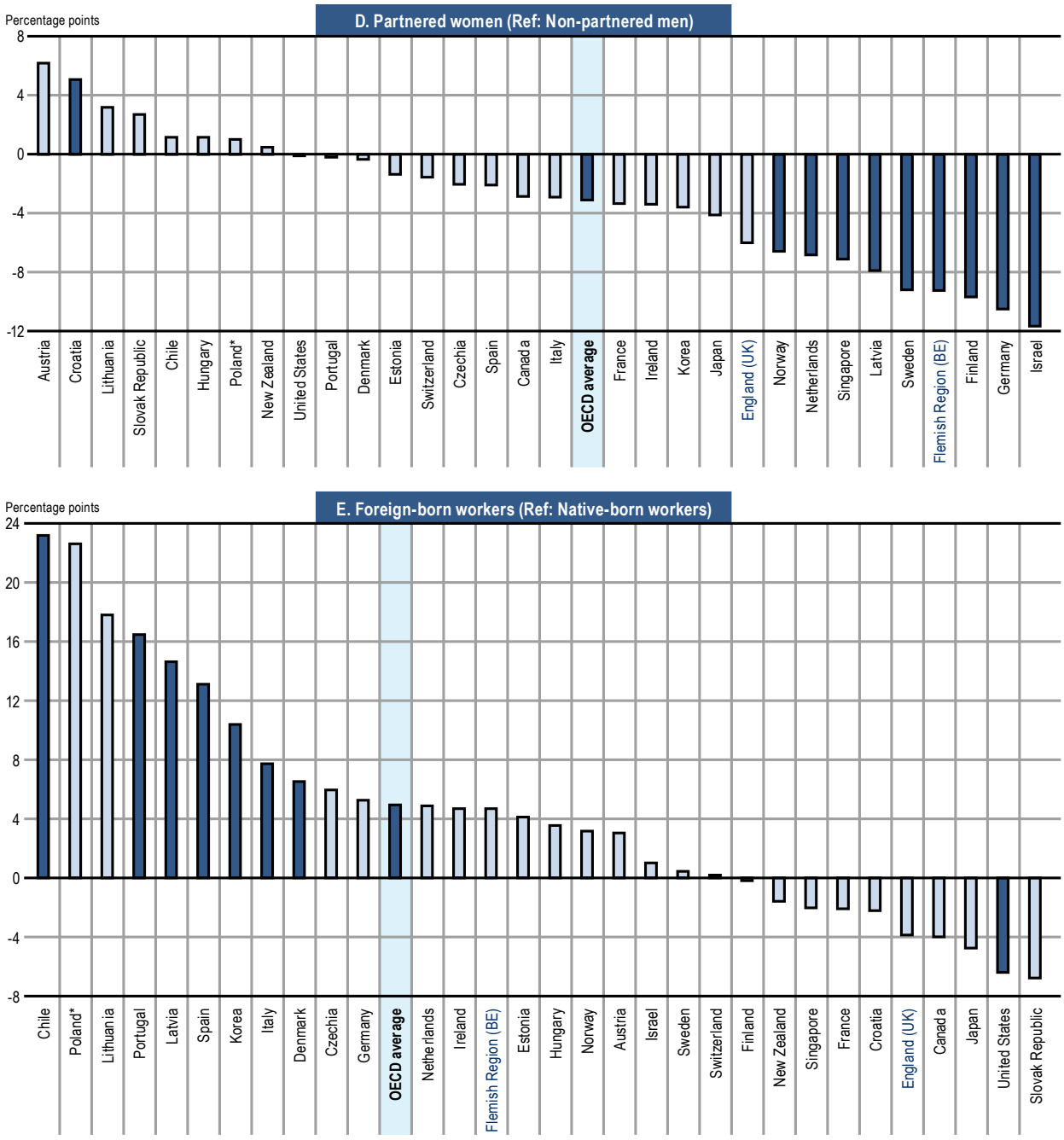
- **Firm size**: The economic literature suggests that larger firms tend to pay higher wages, although this relationship has been declining over the decades (Bloom et al., 2018[65]). This may be because larger firms attract more highly skilled workers – who are in turn better at using their skills and may therefore be less likely to be over-qualified. This is supported by the analysis of the 2023 Survey of Adult Skills, which finds that on average workers in small firms are significantly more likely to be over-qualified for their job than those in large firms (1 000+ employees). The contrast is particularly stark when compared to workers in micro-enterprises (1-10 employees), who are 10 percentage points more likely to be over-qualified than workers in very large enterprises. The relationship is even stronger – over 20 percentage points – in England (United Kingdom), Japan, Korea, New Zealand and the United States. Larger firms may be better at matching workers to jobs or may have greater capacity to provide training to ensure that workers' skills match the needs of the job. Larger firms may also have more established internal labour markets through which workers can be moved into teams, projects and tasks that better match their skills and qualifications.
- **Employment contract**: Mismatch levels may also be related to the type of contract an individual holds – be that permanent or temporary (OECD, 2016[28]). Firms offer, and workers choose, different types of contracts for different reasons. For example, workers who require greater work-life flexibility may prefer fixed-term or temporary contracts. These workers may also be more likely to be over-qualified if firms set lower skill or qualification requirements for such contracts than for permanent or open-ended ones. The 2023 Survey of Adult Skills finds that workers on fixed-term contracts are slightly more likely to be over-qualified than those on permanent contracts on average. This may reflect temporary mismatches, where skilled workers have not yet found permanent work. Among employers, it may indicate a lack of appropriate matching mechanisms, such as difficulties in the recruitment and hiring process, or being unable to adequately screen and test the skills of candidates for temporary roles (OECD, 2024[8]). However, differences are mostly not statistically significant and, in some countries the relationship is in the opposite direction, highlighting the importance of context and local labour-market conditions.
- **Part-time work**: Workers employed on a part-time basis are 6 percentage points more likely to be over-qualified than full-time workers on average. In Czechia, Denmark, Finland, Norway and the United States, the relationship is even stronger, at 14-16 percentage points. Over-qualified workers may prefer to choose part-time jobs for reasons such as family commitments or caring responsibilities. However, this result highlights the significant aggregate loss of human capital when highly skilled individuals do not work full-time.
- **Occupation**: Workers employed in elementary occupations are 40 percentage points more likely to be over-qualified than workers employed in skilled occupations on average.[8] This pattern holds across all countries and economies. This estimate includes any mismatch that occurs when workers switch occupations – which may be the case for some groups of workers, such as women with children, who have been found to move into different, perhaps less demanding, jobs after the arrival of children (Goldin, Kerr and Olivetti, 2022[66]; Goldin, 2014[60]).

Figure 4.17. Likelihood of over-qualification, by socio-demographic characteristics [1/2]

Change in likelihood of over-qualification (relative to reference category)

Figure 4.17. Likelihood of over-qualification, by socio-demographic characteristics [2/2]

Change in likelihood of over-qualification (relative to reference category)



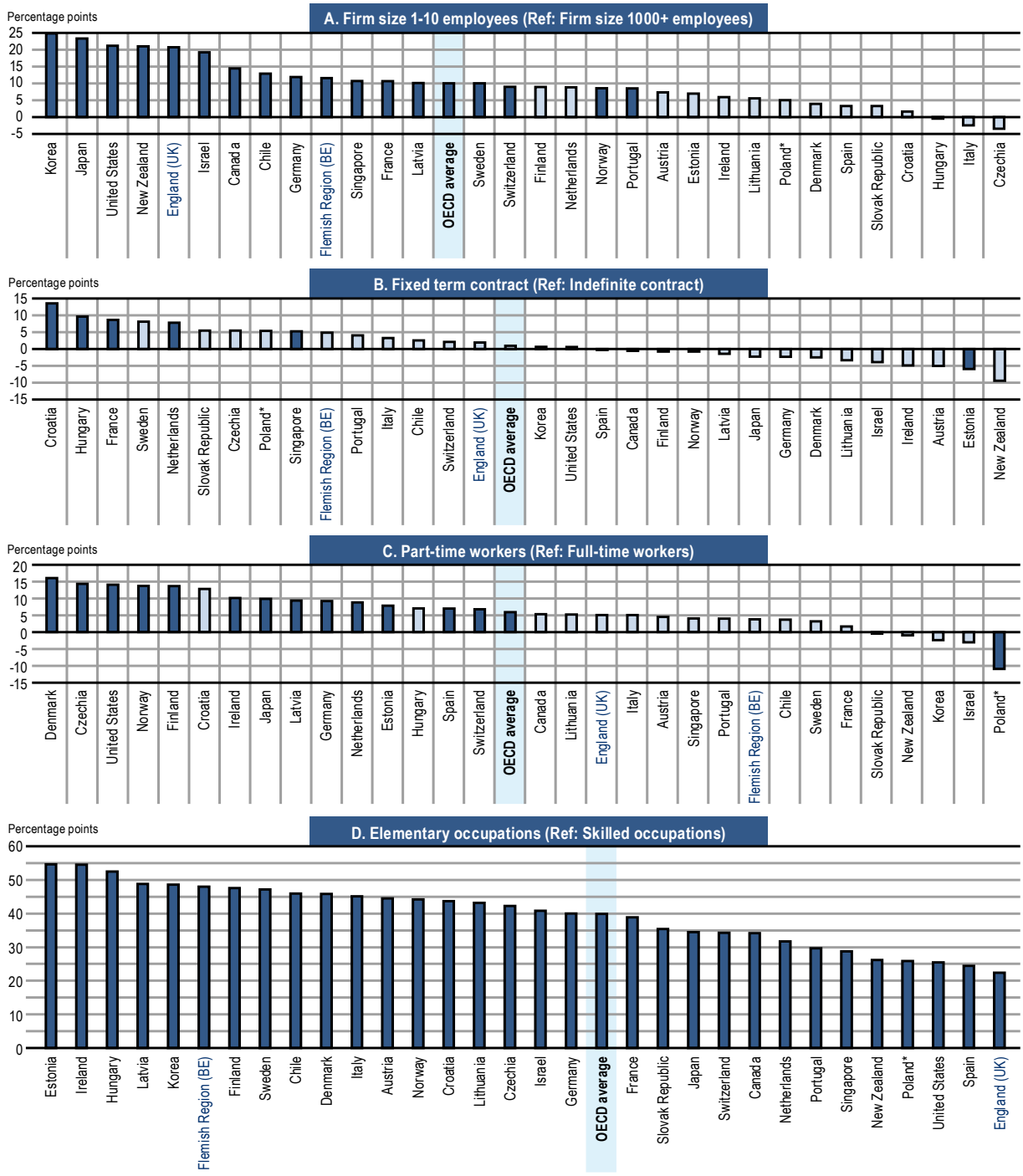
Note: Employed adults aged 25-65 who are not self-employed; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Over-qualification is defined in Table 4.2 and Box 4.3. Figure shows the estimated change in likelihood for a one-standard-deviation increase in numeracy or years of education (Panels A and B) or the change relative to the reference category (Panels C, D and E). Estimates account for years of education, numeracy proficiency, age, the interaction of gender and partner, immigrant status, firm size, contract type, full- or part-time status, and occupation. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the change in the likelihood of over-qualification by each characteristic.

Source: Table A.4.14 (N) in Annex A.

Figure 4.18. Likelihood of over-qualification, by job characteristics

Change in likelihood of over-qualification (relative to reference category)



Note: Employed adults aged 25-65 who are not self-employed; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Over-qualification is defined in Table 4.2 and Box 4.3. Figure shows change relative to the reference category for each panel. Estimates account for years of education, numeracy proficiency, age, the interaction of gender and partner, immigrant status, firm size, contract type, full- or part-time status, and occupation. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the change in the likelihood of over-qualification by each characteristic.

Source: Table A.4.14 (N) of Annex A.

The results for over-skilled workers are similar but the effects are much smaller (see Table A.4.15 (N) in Annex A). Moreover, the results presented in this section are in line with those of the first cycle. Taken together, these findings suggest that some socio-demographic groups are more likely to be mismatched, although the precise reasons are not yet well understood. A combination of sorting, preferences and inefficient matching mechanisms are likely to underpin the results for different groups. Different groups are also more likely to experience mismatches in different countries, highlighting the importance of context, policy and local labour-market conditions.

What are the economic and social costs of mismatches?

It is well established that mismatches have individual costs for workers – such as lower job satisfaction and wages – and wider economic costs – such as lower social welfare, lower productivity and lost investment in human capital (Adalet McGowan and Andrews, 2015[9]; Allen, Levels and van der Velden, 2013[50]). Over-qualification and over-skilling imply unused human capital and therefore a loss of potential productivity, as mismatched workers tend to under-utilise their skills. Over-qualification and over-skilling can also reduce job satisfaction and overall well-being when workers feel they are not using their skills and education to the best of their abilities. Under-qualification and under-skilling also have costs, especially when workers feel inadequately prepared to do their jobs and do not receive sufficient training to develop their skills. However, the literature has generally found that over-qualification and over-skilling result in greater economic and social costs than under-qualification and under-skilling (OECD, 2016[28]; Quintini, 2011[58]). This section investigates the economic (i.e. wages) and social (i.e. life satisfaction) costs associated with mismatches.

Wage penalties of mismatches

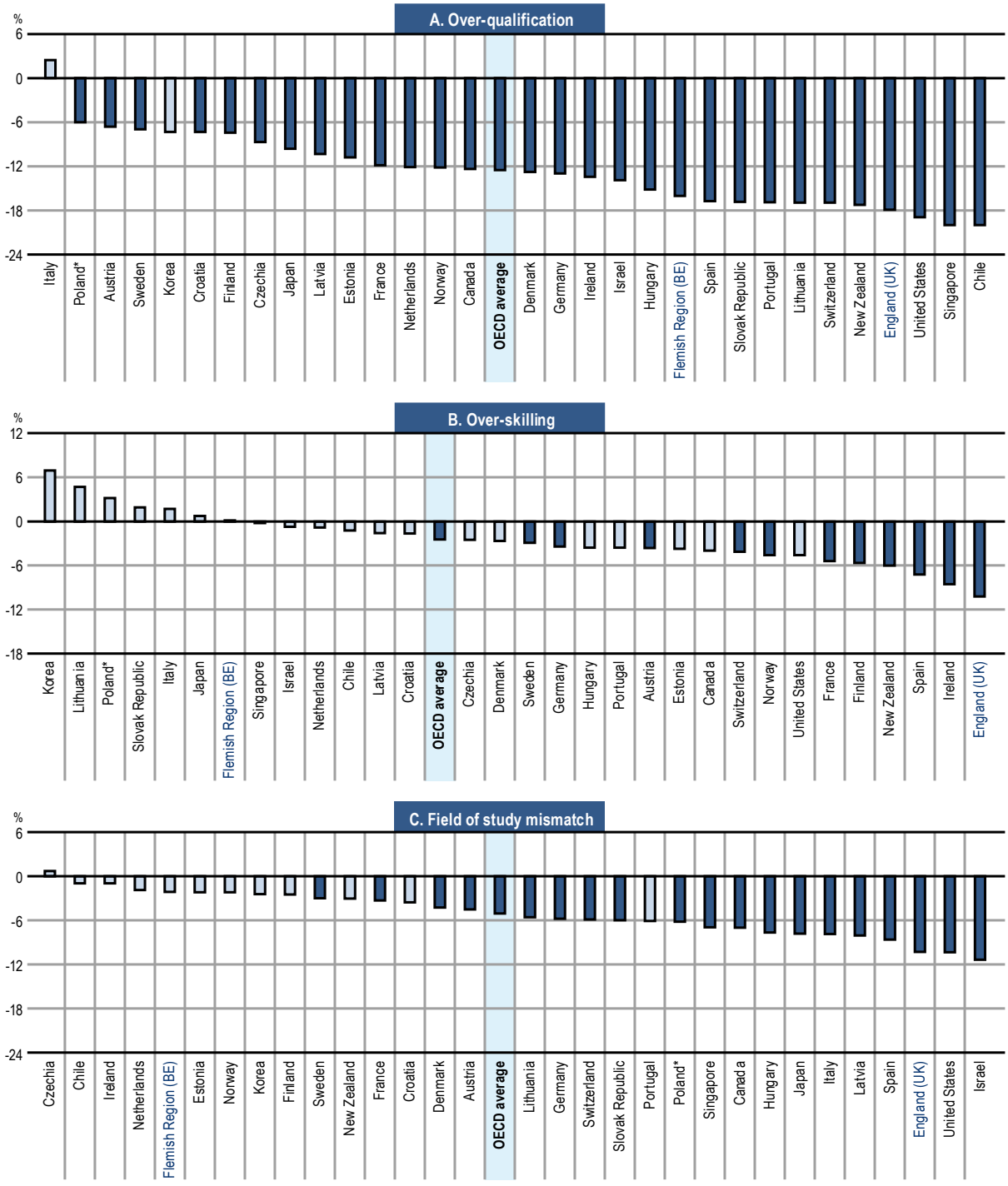
Analysis from the first cycle of the Survey of Adult Skills found that over-qualified workers earn about 14% less than well-matched workers with the same skills proficiency (OECD, 2016[28]). This effect is more pronounced than the effect of mismatches in skills or field of study. This section revisits the wage penalty analysis for different kinds of mismatches. It uses regression analysis to identify the association between wages and over-qualification, over-skilling and field-of-study mismatches, accounting for a range of relevant individual and job-specific characteristics. Importantly, each regression compares mismatched individuals to their equally skilled and equally educated well-matched counterparts working in the same industry and occupation. Figure 4.19 details the estimated wage penalties of mismatches.

The 2023 Survey of Adult Skills confirms the findings from the first cycle. On average across the OECD, over-qualified workers face a 12% wage penalty compared to equally skilled, well-matched workers in the same occupation and industry (Figure 4.19, Panel A). This suggests that over-qualified workers would benefit financially if they moved to a job that made better use of their highest qualification. The size of the wage penalty associated with over-qualification varies across countries and economies, with the highest penalties in Singapore (20%), Chile (20%) and the United States (19%). The results are significant for all countries and economies except for Italy and Korea.

Over-skilling is associated with a smaller wage penalty than over-qualification in most participating OECD countries and economies and the relationship is not statistically significant everywhere. On average, the over-skilled earn 2% less than their well-matched counterparts in the same occupation and industry (Figure 4.19, Panel B). This is after accounting for information-processing skills, which suggests that it is the mismatch itself and not the level of skills which drive the wage penalty. England (United Kingdom) (10%), Ireland (8%) and Spain (7%) have the highest wage penalties associated with over-skilling.

Figure 4.19. Relationship between wages and mismatches, by type of mismatch

Change in gross hourly wages associated with mismatches



Note: Employed adults aged 25-65 who are not self-employed; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Mismatch measures are defined in Table 4.2 and Box 4.3. Estimates account for age, gender, immigrant background, parental education, whether one lives with a partner or has children, work experience, use of numeracy skills at work, industry and occupation. Wages are (log) gross hourly earnings for employed and self-employed individuals, including bonuses, in PPP-adjusted 2022 USD. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the effect of mismatches on wages.

Source: Table A.4.16 of Annex A.

Unlike over-qualification and over-skilling, in theory, field-of-study mismatches may not necessarily lead to wage penalties where skills are transferable across jobs. If their skills are not transferable, they can translate into lower wages if this results in workers becoming over-qualified or over-skilled (Montt, 2015[54]). The 2023 Survey of Adult Skills finds that on average, field-of-study mismatches attract a 5% wage penalty, with the highest penalties occurring in Israel (11%), the United States (10%) and England (United Kingdom) (10%) (Figure 4.19, Panel C).

Taken together, these results suggest that being over-qualified remains the most important driver of lower wages among mismatched workers. This may reflect differences in underlying wage-setting structures in many OECD countries which typically tie wages to qualifications, rather than acquired skills. Cross-country differences will thus reflect the importance of these wage-setting mechanism in local labour markets as well as other differences such as bargaining models, employer preferences and hiring practices. This again highlights that policy makers should work with employers and social partners to encourage wage-setting practices that financially reward skills rather than qualifications (OECD, 2024[8]).

Mismatches and life satisfaction

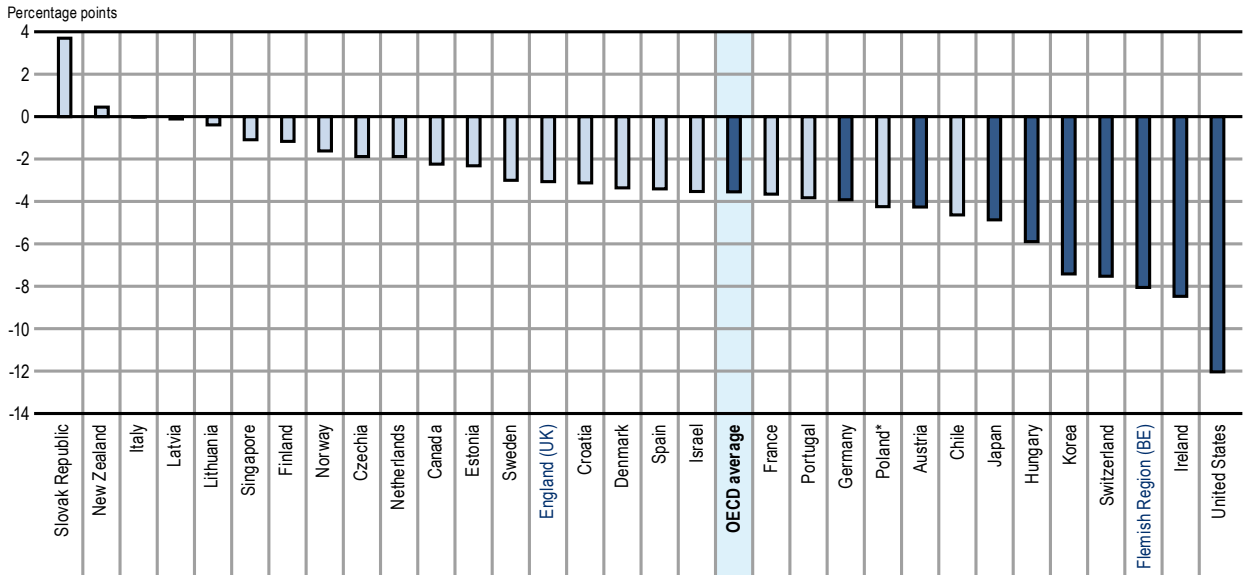
Mismatches can also have wider social costs for individuals and societies in terms of reduced well-being and life satisfaction. These social costs may themselves lead to poorer labour-market outcomes, in the form of reduced productivity. To complement the above analysis of economic costs, this section uses the new measure of life satisfaction included in the 2023 Survey of Adult Skills to estimate the relationship between mismatches and life satisfaction. It uses regression analysis to examine the relationship between life satisfaction and mismatches in qualifications, skills and field of study, accounting for a range of individual characteristics. Importantly, it includes wages in the regression to accounts for the fact that wages are strongly associated with happiness.

The analysis finds a negative association between over-qualification and life satisfaction, with over-qualified individuals almost 4 percentage points less likely to report being highly satisfied with their life compared to their well-matched peers, on average (Figure 4.20). This negative relationship between over-qualification and life satisfaction is strongest in the United States (12 percentage points), followed by the Flemish Region (Belgium), Ireland and Switzerland (all about 8 percentage points). Under-qualification has a similar negative relationship with life satisfaction, with those who are under-qualified being 2 percentage points less likely to report high life satisfaction. This effect is most pronounced in Italy (9 percentage points) and France (7 percentage points). Under-skilling is associated with a 5-percentage-point reduction in life satisfaction, and over-skilling with a 1 percentage point reduction (see Table A.4.17 in Annex A), although the result for over-skilling is not statistically significant. This suggests that workers' own perceptions of their skills and how well-matched they are to their jobs is an important factor in their overall happiness, with under-skilling being a more important factor.

Furthermore, after accounting for wages, field-of-study mismatches are not significantly associated with life satisfaction suggesting that workers can still be happy working in a different field if they earn enough money. Taken together, these results suggest there may be some link between mismatch and life satisfaction, although more research is needed to understand the underlying drivers of this relationship.

Figure 4.20. Relationship between over-qualification and life satisfaction

Change in likelihood of over-qualified workers reporting high life satisfaction



Note: Employed adults aged 25-65 who are not self-employed; does not include adults who were only administered the doorstep interview due to a language barrier (see Box 1.1 in Chapter 1 and Box 4.1). Over-qualification is defined in Table 4.2 and Box 4.3. Life satisfaction is defined in Box 4.2. Estimates account for age, gender, immigrant background, whether one lives with a partner or has children and (log) wages. Darker colours denote differences that are statistically significant at the 5% level. *Caution is required in interpreting results due to the high share of respondents with unusual response patterns. See the Note for Poland in the Reader's Guide.

Countries and economies are ranked in descending order of the effect of over-qualification on life satisfaction.

Source: Table A.4.17 of Annex A.

Table 4.3. Chapter 4 figures and tables

StatLink https://stat.link/7vcmjl

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Notes

[1] Skills-based or skills-first approaches prioritise an individual's skills over traditional markers such as education, qualifications or work experience in areas such as recruitment, career progression and training.

[2] Unlike previous chapters that classify education by levels of the International Standard Classification of Education (ISCED), this chapter uses total years of education (not including incomplete qualifications) to analyse educational attainment. This approach treats education as a continuous variable, allowing a more nuanced analysis of its relationship with outcomes. However, it should be noted that years of education are an imperfect measure of attainment and do not reflect the quality of education received.

[3] The figures presented in this chapter refer to numeracy skills, but the same analysis using the literacy or adaptive problem solving domains finds very similar results. This is unsurprising given that these three skill domains are highly correlated with one another. This is consistent with an interpretation that literacy, numeracy and adaptive problem solving represent distinct, but closely related, aspects of an underlying general level of skill proficiency.

[4] The average standard deviation for OECD countries is 58 points for numeracy and 3.1 years of education; note, however, that the results presented are for a change of one standard deviation within the country being analysed. This allows the estimated statistical effects to reflect the distribution of skills and education unique to each country.

[5] These hourly wages are averages across participating OECD countries and economies, adjusted for purchasing power parity (PPP) and expressed in 2022 US dollars.

[6] Table A.4.8 (L, N, A) shows that literacy proficiency is similarly associated with an expected wage increase of 8%.

[7] Unlike the first cycle of the Survey of Adult Skills, this study excludes analysis of workers aged 16-24 under the assumption that this group is most likely to still be in education or training and therefore may not yet have found a well-matched job.

[8] Elementary occupations are those defined in ISCO-08 as 9-Elementary Occupations. Semi-skilled blue-collar occupations include 6-Skilled Agricultural, Forestry and Fishery Workers; 7-Craft and Related Trades Workers; and 8-Plant and Machine Operators, and Assemblers. Semi-skilled white-collar occupations include 4-Clerical Support Workers and 5-Service and Sales Workers. Skilled occupations include 1-Managers, 2-Professionals, and 3-Technicians and Associate Professionals.

Annex A. Tables of results for countries and economies

Table A A.1. Literacy, numeracy and adaptive problem solving among adults in 2023. Chapter 2 tables

WEB	Table A.2.1 (L)	Mean literacy score and variation
WEB	Table A.2.1 (N)	Mean numeracy score and variation
WEB	Table A.2.1 (A)	Mean adaptive problem solving score and variation
WEB	Table A.2.2 (L)	Percentage of adults who performed at each proficiency level in literacy
WEB	Table A.2.2 (N)	Percentage of adults who performed at each proficiency level in numeracy
WEB	Table A.2.2 (A)	Percentage of adults who performed at each proficiency level in adaptive problem solving
WEB	Table A.2.3	Overlap in low-performing adults across proficiency levels in literacy, numeracy and adaptive problem solving
WEB	Table A.2.4 (L)	Literacy proficiency, by age group
WEB	Table A.2.4 (N)	Numeracy proficiency, by age group
WEB	Table A.2.4 (A)	Proficiency in adaptive problem solving, by age group
WEB	Table A.2.5 (L)	Literacy proficiency, by educational attainment
WEB	Table A.2.5 (N)	Numeracy proficiency, by educational attainment
WEB	Table A.2.5 (A)	Proficiency in adaptive problem solving, by educational attainment
WEB	Table A.2.6 (L)	Literacy proficiency, by educational attainment and field of study (STEM versus non-STEM)
WEB	Table A.2.6 (N)	Numeracy proficiency, by educational attainment and field of study (STEM versus non-STEM)
WEB	Table A.2.6 (A)	Proficiency in adaptive problem solving, by educational attainment and field of study (STEM versus non-STEM)
WEB	Table A.2.7 (L)	Literacy proficiency, by gender
WEB	Table A.2.7 (N)	Numeracy proficiency, by gender
WEB	Table A.2.7 (A)	Proficiency in adaptive problem solving, by gender
WEB	Table A.2.8 (L)	Literacy proficiency, by gender and age group
WEB	Table A.2.8 (N)	Numeracy proficiency, by gender and age group
WEB	Table A.2.8 (A)	Proficiency in adaptive problem solving, by gender and age group
WEB	Table A.2.9 (L)	Literacy proficiency, by gender, educational attainment and field of study (STEM versus non-STEM)
WEB	Table A.2.9 (N)	Numeracy proficiency, by gender, educational attainment and field of study (STEM versus non-STEM)
WEB	Table A.2.9 (A)	Proficiency in adaptive problem solving, by gender, educational attainment and field of study (STEM versus non-STEM)
WEB	Table A.2.10 (L)	Literacy proficiency, by immigrant background
WEB	Table A.2.10 (N)	Numeracy proficiency, by immigrant background
WEB	Table A.2.10 (A)	Proficiency in adaptive problem solving, by immigrant background
WEB	Table A.2.11 (L)	Literacy proficiency of foreign-born adults of foreign-born parents, by adults' migration history
WEB	Table A.2.11 (N)	Numeracy proficiency of foreign-born adults of foreign-born parents, by adults' migration history
WEB	Table A.2.11 (A)	Proficiency in adaptive problem solving of foreign-born adults of foreign-born parents, by adults' migration history
WEB	Table A.2.12 (L)	Literacy proficiency, by parental education
WEB	Table A.2.12 (N)	Numeracy proficiency, by parental education
WEB	Table A.2.12 (A)	Proficiency in adaptive problem solving, by parental education

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Table A A.2. How adults' proficiency in key information-processing skills has changed over the past decade. Chapter 3 tables

WEB	Table A.3.1 (L)	Mean and variation of literacy proficiency, Cycle 1 and Cycle 2
WEB	Table A.3.1 (N)	Mean and variation of numeracy proficiency, Cycle 1 and Cycle 2
WEB	Table A.3.2 (L)	Percentage of adults scoring at each proficiency level in literacy, Cycle 1 and Cycle 2
WEB	Table A.3.2 (N)	Percentage of adults scoring at each proficiency level in numeracy, Cycle 1 and Cycle 2
WEB	Table A.3.3 (L)	Distribution of literacy scores, Cycle 1 and Cycle 2
WEB	Table A.3.3 (N)	Distribution of numeracy scores, Cycle 1 and Cycle 2
WEB	Table A.3.4 (L)	Literacy proficiency by gender and age, Cycle 1 and Cycle 2
WEB	Table A.3.4 (N)	Numeracy proficiency by gender and age, Cycle 1 and Cycle 2
WEB	Table A.3.5 (L)	Gender differences in literacy proficiency, Cycle 1 and Cycle 2
WEB	Table A.3.5 (N)	Gender differences in numeracy proficiency, Cycle 1 and Cycle 2
WEB	Table A.3.6 (L)	Gender differences in literacy proficiency (adjusted), Cycle 1 and Cycle 2
WEB	Table A.3.6 (N)	Gender differences in numeracy proficiency (adjusted), Cycle 1 and Cycle 2
WEB	Table A.3.7 (L)	Literacy proficiency by age, Cycle 1 and Cycle 2
WEB	Table A.3.7 (N)	Numeracy proficiency by age, Cycle 1 and Cycle 2
WEB	Table A.3.8 (L)	Age differences in literacy proficiency, Cycle 1 and Cycle 2
WEB	Table A.3.8 (N)	Age differences in numeracy proficiency, Cycle 1 and Cycle 2
WEB	Table A.3.9 (L)	Age differences in literacy proficiency (adjusted), Cycle 1 and Cycle 2
WEB	Table A.3.9 (N)	Age differences in numeracy proficiency (adjusted), Cycle 1 and Cycle 2
WEB	Table A.3.10 (L)	Mean literacy proficiency in Cycle 1 and Cycle 2 for corresponding cohorts
WEB	Table A.3.10 (N)	Mean numeracy proficiency in Cycle 1 and Cycle 2 for corresponding cohorts
WEB	Table A.3.11 (L)	Literacy proficiency by educational attainment and age, Cycle 1 and Cycle 2
WEB	Table A.3.11 (N)	Numeracy proficiency by educational attainment and age, Cycle 1 and Cycle 2
WEB	Table A.3.12 (L)	Differences in literacy proficiency between low- and highly educated adults, Cycle 1 and Cycle 2
WEB	Table A.3.12 (N)	Differences in numeracy proficiency between low- and highly educated adults, Cycle 1 and Cycle 2
WEB	Table A.3.13 (L)	Differences in literacy proficiency between low- and highly educated adults (adjusted), Cycle 1 and Cycle 2
WEB	Table A.3.13 (N)	Differences in numeracy proficiency between low- and highly educated adults (adjusted), Cycle 1 and Cycle 2
WEB	Table A.3.14 (L)	Literacy proficiency by immigrant background, Cycle 1 and Cycle 2
WEB	Table A.3.14 (N)	Numeracy proficiency by immigrant background, Cycle 1 and Cycle 2
WEB	Table A.3.15 (L)	Differences in literacy proficiency between immigrants and non-immigrants, Cycle 1 and Cycle 2
WEB	Table A.3.15 (N)	Differences in numeracy proficiency between immigrants and non-immigrants, Cycle 1 and Cycle 2
WEB	Table A.3.16 (L)	Differences in literacy proficiency between immigrants and non-immigrants (adjusted), Cycle 1 and Cycle 2
WEB	Table A.3.16 (N)	Differences in numeracy proficiency between immigrants and non-immigrants (adjusted), Cycle 1 and Cycle 2
WEB	Table A.3.17 (L)	Literacy proficiency by parental education, Cycle 1 and Cycle 2
WEB	Table A.3.17 (N)	Numeracy proficiency by parental education, Cycle 1 and Cycle 2
WEB	Table A.3.18 (L)	Literacy proficiency by parental education and age, Cycle 1 and Cycle 2
WEB	Table A.3.18 (N)	Numeracy proficiency by parental education and age, Cycle 1 and Cycle 2
WEB	Table A.3.19 (L)	Differences in literacy proficiency between adults with low- and highly educated parents, Cycle 1 and Cycle 2
WEB	Table A.3.19 (N)	Differences in numeracy proficiency between adults with low- and highly educated parents, Cycle 1 and Cycle 2
WEB	Table A.3.20 (L)	Differences in literacy proficiency between adults with low- and highly educated parents (adjusted), Cycle 1 and Cycle 2
WEB	Table A.3.20 (N)	Differences in numeracy proficiency between adults with low- and highly educated parents (adjusted), Cycle 1 and Cycle 2
WEB	Table A.3.21 (L)	Differences in literacy proficiency between adults with low-/medium-educated parents and highly educated parents , by age, Cycle 1 and Cycle 2
WEB	Table A.3.21 (N)	Differences in numeracy proficiency between adults with low-/medium-educated parents and highly educated parents , by age, Cycle 1 and Cycle 2
WEB	Table A.3.22 (L)	Differences in literacy proficiency between adults with low-/medium-educated parents and highly educated parents , by age (adjusted), Cycle 1 and Cycle 2
WEB	Table A.3.22 (N)	Differences in numeracy proficiency between adults with low-/medium-educated parents and highly educated parents , by age (adjusted), Cycle 1 and Cycle 2
WEB	Table A.3.23 (L)	Mean literacy proficiency in the International Adult Literacy Survey (IALS) and the Survey of Adult Skills (PIAAC)

WEB	Table A.3.23 (N)	Mean numeracy proficiency in the Adult Literacy and Life Skills Survey (ALL) and the Survey of Adult Skills (PIAAC)
WEB	Table A.3.24 (L)	Distribution of literacy proficiency in the International Adult Literacy Survey (IALS) and the Survey of Adult Skills (PIAAC)
WEB	Table A.3.24 (N)	Distribution of numeracy proficiency in the Adult Literacy and Life Skills Survey (ALL) and the Survey of Adult Skills (PIAAC)
WEB	Table A.3.25 (L)	Percentage of adults scoring at each proficiency level in literacy in the International Adult Literacy Survey (IALS) and the Survey of Adult Skills (PIAAC)
WEB	Table A.3.25 (N)	Percentage of adults scoring at each proficiency level in numeracy in the Adult Literacy and Life Skills Survey (ALL) and the Survey of Adult Skills (PIAAC)
WEB	Table A.3.26	Oaxaca decomposition: Frequencies of educational levels, age categories and immigrant background
WEB	Table A.3.27 (L)	Oaxaca decomposition: Effects of education, age and immigrant background on literacy proficiency
WEB	Table A.3.27 (N)	Oaxaca decomposition: Effects of education, age and immigrant background on numeracy proficiency
WEB	Table A.3.28 (L)	Oaxaca decomposition of the trends in literacy
WEB	Table A.3.28 (N)	Oaxaca decomposition of the trends in numeracy

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Table A A.3. Outcomes of investment in skills. Chapter 4 tables

WEB	Table A.4.1 (L)	Average proficiency in literacy by labour force status
WEB	Table A.4.1 (N)	Average proficiency in numeracy by labour force status
WEB	Table A.4.1 (A)	Average proficiency in adaptive problem solving by labour force status
WEB	Table A.4.2 (L)	Probability of labour force outcome by level of literacy proficiency
WEB	Table A.4.2 (N)	Probability of labour force outcome by level of numeracy proficiency
WEB	Table A.4.2 (A)	Probability of labour force outcome by level of adaptive problem solving proficiency
WEB	Table A.4.3 (L,N,A)	Effect of education and information-processing skills on the likelihood of being employed
WEB	Table A.4.4 (L,N,A)	Effect of education and information-processing skills on the likelihood of full-time employment
WEB	Table A.4.5 (L,N,A)	Effect of education and information-processing skills on the likelihood of being in the labour force
WEB	Table A.4.6 (N)	Effect of numeracy on the likelihood of being employed, Cycle 1 and Cycle 2
WEB	Table A.4.7 (L)	Distribution of wages among employees and self-employed by level of literacy proficiency
WEB	Table A.4.7 (N)	Distribution of wages among employees and self-employed by level of numeracy proficiency
WEB	Table A.4.7 (A)	Distribution of wages among employees and self-employed by level of adaptive problem solving proficiency
WEB	Table A.4.8 (L,N,A)	Effect of education and information-processing skills on wages
WEB	Table A.4.9a (L,N)	Contribution of information-processing skills, education and other characteristics to variation in hourly wages, Cycle 1 and Cycle 2
WEB	Table A.4.9b (L,N)	Contribution of information-processing skills, education and other characteristics to variation in hourly wages, by age group, Cycle 1 and Cycle 2
WEB	Table A.4.9c (L,N)	Contribution of information-processing skills, education and other characteristics to variation in hourly wages, by gender, Cycle 1 and Cycle 2
WEB	Table A.4.10 (L)	Percentage of adults reporting positive social outcomes by level of literacy proficiency
WEB	Table A.4.10 (N)	Percentage of adults reporting positive social outcomes by level of numeracy proficiency
WEB	Table A.4.10 (A)	Percentage of adults reporting positive social outcomes by level of adaptive problem solving proficiency
WEB	Table A.4.11 (L)	Effect of literacy proficiency on likelihood of reporting positive social outcomes
WEB	Table A.4.11 (N)	Effect of numeracy proficiency on likelihood of reporting positive social outcomes
WEB	Table A.4.11 (A)	Effect of adaptive problem solving proficiency on likelihood of reporting positive social outcomes
WEB	Table A.4.12	Incidence of qualification, skills and field of study mismatch
WEB	Table A.4.13	Incidence of under-skilling by skill type
WEB	Table A.4.14 (N)	Effect of numeracy, education, and other characteristics on likelihood of over-qualification
WEB	Table A.4.15 (N)	Effect of numeracy, education, and other characteristics on likelihood of over-skilling
WEB	Table A.4.16	Effect of qualification mismatches, skills mismatches and field of study mismatches on wages
WEB	Table A.4.17	Effect of qualification mismatches, skills mismatches and field of study mismatches on life satisfaction

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Annex B. Additional tables

Table A B.1. Additional tables: main characteristics of the sampled population

WEB	Table B.3.1	Percentage of adults at each educational level, Cycle 2
WEB	Table B.3.1 (Trend)	Change in the percentage of adults in each educational level, Cycle 1 and Cycle 2
WEB	Table B.3.2	Percentage of adults in STEM and non-STEM fields, by educational attainment, Cycle 2
WEB	Table B.3.3	Percentage of adults in each education level, by gender, Cycle 2
WEB	Table B.3.3 (Trend)	Change in the percentage of adults in each education level, by gender, Cycle 1 and Cycle 2
WEB	Table B.3.4	Percentage of tertiary-educated women and men, by STEM and non-STEM fields, Cycle 2
WEB	Table B.3.5	Percentage of employed adults, by gender and age group, Cycle 2
WEB	Table B.3.6	Percentage of adults in each age group, Cycle 2
WEB	Table B.3.6 (Trend)	Change in the percentage of adults in each age group, Cycle 1 and Cycle 2
WEB	Table B.3.7	Percentage of adults in each education level, by age group, Cycle 2
WEB	Table B.3.7 (Trend)	Change in the percentage of adults in each education level, by age group, Cycle 1 and Cycle 2
WEB	Table B.3.8	Educational attainment of young adults, Cycle 2
WEB	Table B.3.9	Percentage of employed adults, by age group, Cycle 2
WEB	Table B.3.10	Percentage of adults in each immigrant background, Cycle 2
WEB	Table B.3.10 (Trend)	Change in the percentage of adults in each immigrant category, Cycle 1 and Cycle 2
WEB	Table B.3.11	Characteristics of migration history of foreign-born adults of foreign-born parents, Cycle 2
WEB	Table B.3.11 (Trend)	Change in the characteristics of migration background of foreign-born adults of foreign-born parents, Cycle 1 and Cycle 2
WEB	Table B.3.12	Percentage of adults in each education level, by immigrant background, Cycle 2
WEB	Table B.3.12 (Trend)	Change in the percentage of adults in each education level, by immigrant background, Cycle 1 and Cycle 2
WEB	Table B.3.13	Percentage of adults in each age group, by immigrant background, Cycle 2
WEB	Table B.3.14	Percentage of employed adults, by immigrant background and age group, Cycle 2
WEB	Table B.3.15	Percentage of adults in each parental educational level, by age group, Cycle 2
WEB	Table B.3.15 (Trend)	Change in the percentage of adults in each parental educational level, by age group, Cycle 1 and Cycle 2
WEB	Table B.3.16	Percentage of adults in each educational level, by parental educational level, Cycle 2
WEB	Table B.3.17	Percentage of adults in each age group, by educational level, Cycle 2
WEB	Table B.3.18	Number of Doorstep interviews in each sample, by country of birth
WEB	Table B.3.19	Share of doorstep interviews in the target population and among foreign-born of foreign-born parents

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OECD Skills Studies

Do Adults Have the Skills They Need to Thrive in a Changing World?

SURVEY OF ADULT SKILLS 2023

The 2023 Survey of Adult Skills, a product of the OECD Programme for the International Assessment of Adult Competencies (PIAAC), provides a comprehensive overview of adults' literacy, numeracy, and adaptive problem solving skills – skills that are fundamental for personal, economic, and societal development. These key information-processing skills provide the foundation for access to employment, higher wages and continuous learning, while enabling individuals to navigate the complexities of their personal and civic lives. A total of 31 countries and economies, mostly OECD members, participated in the 2023 survey. As 27 of these countries also participated in the previous cycle of the Survey of Adult Skills, the data provide valuable insights into how literacy and numeracy skills have evolved over the past decade.

This publication presents the state of adult skills and their evolution over the last decade and explores the relationship between these skills and economic and social outcomes. It highlights the importance of developing and maintaining skills in today's dynamic world.

PRINT ISBN 978-92-64-70680-4
PDF ISBN 978-92-64-98704-3

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