OECD Skills Outlook 2025

Building the Skills of the 21st Century for All

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Please cite this publication as:
OECD (2025), *OECD Skills Outlook 2025: Building the Skills of the 21st Century for All*, OECD Publishing, Paris, https://doi.org/10.1787/26163cd3-en.

ISBN 978-92-64-92977-7 (print)
ISBN 978-92-64-50237-6 (PDF)
ISBN 978-92-64-85091-0 (HTML)

OECD Skills Outlook
ISSN 2521-1064 (print)
ISSN 2521-1072 (online)

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Foreword

The first quarter of the 21st century has been affected by repeated shocks and ongoing structural transformations, including pandemics and geopolitical dynamics, demographic shifts and the climate crisis, as well as continuous waves of technological change. These forces have not only reshaped economic and social systems and created uncertainty, but they have also compressed the time available for individuals, firms and governments to adapt. In addition, they have exposed and often widened the gaps in who can build, deploy and benefit from essential 21st-century skills. The negative consequences of unequal skills development extend from individuals to societies, with underutilised talent resulting in lower economic growth.

This edition of the *OECD Skills Outlook* shows that factors beyond people's control, such as gender, parental education and occupation, immigrant background, age, and where a person grows up, are strongly associated with the acquisition of essential 21st-century skills, including information-processing skills such as literacy, numeracy and adaptive problem solving, as well as social and emotional skills. A person's circumstances also shape how these skills translate into opportunities for economic empowerment over the life course.

The results of this edition of the *OECD Skills Outlook* point to a dual imperative: broadening access to high-quality learning from early childhood through to adulthood and ensuring that skills are effectively matched to productive and rewarding jobs. Achieving these goals requires agile, data-driven skills governance; integrated strategies that link education, adult learning, labour-market and social policies; and targeted measures that reduce non-financial barriers to learning while raising the quality and relevance of provision. It also calls for effective career guidance, skills-first hiring, and transparent, portable credentials that recognise learning wherever it happens.

By considering how public policies can reduce skills disparities, this *OECD Skills Outlook* sets a clear policy agenda for the 21st century. When talent is wasted, productivity suffers, and when opportunity depends on individuals' background, social cohesion is eroded. By investing in the conditions that allow people to build and use 21st-century skills, today's constraints can be turned into tomorrow's opportunities. The stakes are high. When early advantages compound and later opportunities diverge, societies waste potential and growth falters. But the reverse is also true: when countries invest early, keep doors open to meaningful adult learning, and ensure skills are recognised and rewarded fairly, gaps narrow, and economies can become more innovative and cohesive.

Acknowledgements

The development of this edition of the *OECD Skills Outlook* report was guided by the Education Policy Committee and the Skills Advisory Group. The OECD Skills Outlook series is the product of a close collaborative effort among several directorates in the OECD Secretariat.

This volume was prepared by Francesca Borgonovi, Helke Seitz, Samo Varsik and Maja Ochojska from the OECD Centre for Skills.

Stefano Scarpetta (Director for the Directorate of Employment Labour and Social Affairs), Andreas Schleicher (Director for the Directorate of Education and Skills), Mark Pearson (Deputy Director for the Directorate of Employment Labour and Social Affairs), and El Iza Mohamedou (Head of the OECD Centre for Skills), provided strategic oversight.

Colleagues from the Directorate for Employment, Labour and Social Affairs; the Directorate for Education and Skills; the Public Governance Directorate; the Centre for Entrepreneurship SMEs, Regions and Cities; the Economics Department; the Centre on Well-Being, Inclusion, Sustainability and Equal Opportunity. provided valuable comments at various stages in the preparation of this report.

The report was edited by Elizabeth Zachary. Francesca Borgonovi, Jennifer Cannon, Helke Seitz and Ana Cortes-Troncoso co-ordinated production. Communication and administrative support were provided by Jennifer Cannon, Ana Cortes-Troncoso, Della Shin and Anna Wahlgren.

This document was produced with the financial assistance of the European Union. The views expressed herein can in no way be taken to reflect the official opinion of the European Union.

Table of contents

Foreword 3

Acknowledgements 4

Reader's guide 9
References 13

Acronyms and abbreviations 14

Executive summary 15

1 Widening opportunities by investing in 21st-century skills 19
In Brief 20
1.1. Shocks, shifts and the evolving landscape of skills in the 21st century 21
1.2. What are 21st-century skills? 28
1.3. The nature of skills disparities 35
1.4. The role of policy making in addressing skills disparities 43
References 74
Notes 84

2 How background shapes 21st-century skills 85
In Brief 86
2.1. Evidence of socio-demographic disparities in 21st-century skills 88
2.2. The multi-layered nature of skill disparities 102
2.3. Between-country differences in 21st-century skills disparities 108
2.4. A glimpse into the future: Disparities in the skills of young people in school 116
References 125
Annex 2.A. Supplementary online results 134
Notes 135

3 How learning evolves across the life course 136
In Brief 137
3.1. Introduction: The importance of addressing lifelong learning gaps 138
3.2. Expenditure on education and skills gaps 140
3.3. Disparities in achievement growth: Exploring how gaps develop over time 143
3.4. The impact of educational attainment disparities on core 21st-century skills disparities 152
3.5. Differences in field of study across socio-demographic groups 162
3.6. Disparities in participation in non-formal adult education and training 173

3.7. Volunteering as an informal learning pathway 195
References 199
Annex 3.A. Supplementary online results 212

4 From skills to labour market opportunities 215
In Brief 216
4.1. Introduction 217
4.2. Disparities in employment across socio-demographic groups 219
4.3. Disparities in earnings across socio-demographic groups 223
4.4. Disparities in job satisfaction across socio-demographic groups 230
4.5. The role of occupational clustering in shaping disparities in labour market outcomes 233
4.6. Intergenerational transmission of occupation and education 246
References 257
Annex 4.A. Supplementary online results 261
Notes 261

FIGURES

Figure 1. Between- and within-country centring 11
Figure 1.1. Association between occupational-level skills change and earnings 27
Figure 1.2. Categorisation of 21st-century skills 29
Figure 1.3. Share of adults, by parental education, occupation and age 41
Figure 1.4. Share of adults, by childhood residential context and age 42
Figure 2.1. Disparities in core 21st-century skills, by age, gender, parental education and parental occupation 90
Figure 2.2. Trends in parental education and occupation 92
Figure 2.3. Disparities in core 21st-century skills, by immigrant background and childhood residential context 95
Figure 2.4. Linguistic distance and skills proficiency 97
Figure 2.5. Disparities in delayed gratification and social and emotional skills, by age, gender, parental education and parental occupation 100
Figure 2.6. Disparities in delayed gratification and social and emotional skills, by immigrant background and childhood residential context 101
Figure 2.7. Disparities in the distribution of core 21st-century skills among the highest and lowest achievers, by socio-demographic characteristic 104
Figure 2.8. Gender disparities in numeracy proficiency, by parental education and country 106
Figure 2.9. Disparities in numeracy proficiency related to childhood residential context, by parental education and country 108
Figure 2.10. Country-level association between gender gaps in core 21st-century skills and societal-level gender occupational integration 110
Figure 2.11. Gender occupational integration, by country 112
Figure 2.12. Country-level association between parental occupation gaps in core 21st-century skills and total income inequality 116
Figure 2.13. Gender disparities in mathematics and reading among 15-year-old students 118
Figure 2.14. Disparities in mathematics among 15-year-old students, by parental education 119
Figure 2.15. Disparities in mathematics among 15-year-old students, by school location 120
Figure 2.16. Gender disparities in ancillary 21st-century skills among young populations, OECD average 122
Figure 2.17. Disparities in ancillary 21st-century skills among young populations, by school location, OECD average 123
Figure 2.18. Disparities in ancillary 21st-century skills among young populations, by parental education, OECD average 124
Figure 3.1. Association between educational expenditure and disparities, by parental education in core 21st-century skills 141
Figure 3.2. Gender disparities in numeracy and literacy, by age 144
Figure 3.3. Disparities in mathematics and reading proficiency among school-aged children, by gender 146
Figure 3.4. Parental education disparities in numeracy and literacy, by age 149

Figure 3.5. Disparities in mathematics and reading proficiency among school-aged children, by parental education 150
Figure 3.6. Adults' educational attainment, by country 153
Figure 3.7. Adults' educational attainment, by socio-demographic characteristics 154
Figure 3.8. Association between educational attainment and numeracy proficiency 157
Figure 3.9. The role of disparities in educational attainment in explaining parental occupation disparities in numeracy, by country 157
Figure 3.10. Field-of-study, by educational attainment 163
Figure 3.11. Field-of-study, by gender and educational attainment 167
Figure 3.12. Field-of-study, by parental education and educational attainment 168
Figure 3.13. Field-of-study as a mediator of disparities in numeracy proficiency, by country 171
Figure 3.14. Disparities in participation in non-formal adult education and training activities, by socio-demographic characteristic 175
Figure 3.15. Educational attainment and occupation as mediators of disparities in participation in non-formal adult education and training activities, by socio-economic characteristic and country 179
Figure 3.16. Disparities in the main focus of training activities, by socio-demographic characteristic 182
Figure 3.17. Disparities in participation in job-related training, by socio-demographic characteristic 184
Figure 3.18. Disparities in participation in job-related non-formal adult education and training activities, by socio-economic characteristic and country 186
Figure 3.19. Disparities in the motivations for participating in job-related non-formal training, by socio-demographic characteristic 188
Figure 3.20 Satisfied and unmet demand for participation in non-formal education and training, by socio-demographic characteristic 190
Figure 3.21. Disparities in the absence of training activities of interest, by socio-demographic characteristic and by country 191
Figure 3.22. Reported reasons for not participating in training, by socio-demographic characteristic 194
Figure 3.23. Frequency of participation in volunteering activities, by country 196
Figure 3.24. Frequency of participation in volunteering activities, by socio-demographic characteristic 197
Figure 4.1. Disparities in the likelihood of employment, by socio-demographic characteristic and country 221
Figure 4.2. Disparities in hourly earnings, by socio-demographic characteristic and country 227
Figure 4.3. Disparities in job satisfaction, by socio-demographic characteristic and country 233
Figure 4.4. Projected employment growth and skills evolution by occupation 238
Figure 4.5. Association between the share of socio-economically advantaged workers in an occupation and occupational-level skills change 241
Figure 4.6. Association between the share of socio-economically advantaged workers in an occupation and occupational-level projected employment change 242
Figure 4.7. Gender composition of occupations by skills disruption and employment outlook 243
Figure 4.8. Association between occupational-level skills change and proficiency in adaptive problem solving 244
Figure 4.9. Association between occupational-level projected employment change and proficiency in adaptive problem solving 245
Figure 4.10. Occupational mobility among adults, by numeracy proficiency 248
Figure 4.11. Young people's expectations of occupational mobility, by mathematics proficiency 250
Figure 4.12. Jobseekers' engagement and employers' demands in a skills-first context 252
Figure 4.13. Intergenerational educational mobility, by country 253
Figure 4.14. Expected intergenerational educational mobility among 15-year-olds, by country 254
Figure 4.15. Intergenerational occupational mobility, by country 255
Figure 4.16. Intergenerational educational and occupational mobility among adults and young people, by country 256

INFOGRAPHIC

Infographic 1. Key facts and figures 18

TABLES

Table 1 Description of the social and emotional skills measures 10

Table 1.1. Correlations between information-processing skills, delayed gratification, and social and emotional skills 35
Table 1.2. Snapshot of skills disparities, by age 44
Table 1.3. Snapshot of skills disparities, by parental education 47
Table 1.4. Snapshot of skills disparities, by parental occupation 49
Table 1.5. Snapshot of skills disparities, by gender 50
Table 1.6. Snapshot of skills disparities, by childhood residential context 53
Table 1.7. Snapshot of skills disparities, by immigrant background 55
Table 2.1. Share of men in women-majority occupations, share of women in men-majority occupations and other labour market characteristics, by country 113
Table 2.2. Association between country-level characteristics and socio-economic disparities in information-processing skills 115
Table 3.1. AI-powered tools to assist language teaching 142
Table 3.2. Adults' educational attainment as a mediator of disparities in core 21st-century skills 156
Table 3.3. Skills returns to educational qualifications: Disparities within educational levels 159
Table 3.4. Field-of-study as a mediator of disparities in core 21st-century skills 169
Table 3.5. Adult education and training as mediators of disparities in core 21st-century skills 180
Table 3.6. Volunteering as a mediator of disparities in core 21st-century skills 197
Table 4.1. Disparities in the likelihood of employment, by socio-demographic characteristic 220
Table 4.2. Disparities in hourly earnings, by socio-demographic characteristic 224
Table 4.3. Wage returns to skills bundles 228
Table 4.4. Differences in the wage returns to skills, by gender and parental occupation 230
Table 4.5. Disparities in job satisfaction, by socio-demographic characteristic 231
Table 4.6. Proportion of the variation in 21st-century skills explained by occupation 235
Table 4.7. Occupations with the lowest and highest mean scores in core 21st-century skills 236

Annex Table 2.A.1. Changes in parental educational attainment, parental occupation across generations 134
Annex Table 2.A.2. Disparities in core 21st-century skills, by country and socio-demographic characteristic 134
Annex Table 2.A.3. Intersectional nature of disparities 134
Annex Table 2.A.4. Country-level associations 135
Annex Table 3.A.1. Disparities by adults' educational attainment 212
Annex Table 3.A.2. Disparities by adults' field of study 212
Annex Table 3.A.3. Disparities by adults' participation in adult education and training 212
Annex Table 3.A.4. Disparities by adults' engagement in informal learning 213
Annex Table 3.A.5. Achievement growth 214
Annex Table 3.A.6. Skills returns to educational qualifications 214
Annex Table 4.A.1. Country-level results for disparities in employment, earnings and job satisfaction 261
Annex Table 4.A.2. Occupations with lowest and highest mean scored in information-processing skills, delayed gratification and social and emotional skills 261

Reader's guide

Assessment data

This report uses various data sources. The most frequently used data source is the 2023 Survey of Adult Skills, a product of the OECD Programme for the International Assessment of Adult Competencies (PIAAC).

The 2023 Survey of Adult Skills (PIAAC) covers the following 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, and the United States.

Although two of the participating entities are economies (England [United Kingdom]) and the Flemish Region [Belgium]), for the sake of brevity, we refer to participants as countries rather than countries and economies throughout the report.

Other international large-scale assessment data used in this report include:

- Programme for International Student Assessment (PISA)
- International Civic and Citizenship Education Study (ICCS)
- International Computer and Information Literacy Study (ICILS)
- Trends in International Mathematics and Science Study (TIMSS)
- Progress in International Reading Literacy Study (PIRLS).

International averages and country-level results

The report presents international averages for the OECD ("OECD average"), the European Union ("EU average") and all countries participating in the 2023 Survey of Adult Skills (PIAAC) ("PIAAC 2023 average").

The international average for the OECD is based on data from all available OECD member countries and economies, while the international average for the European Union is based on data from all available European Union member countries and economies. The international average for PIAAC is based on all participating (OECD and non-OECD) countries and economies in the 2023 Survey of Adult Skills (PIAAC).

The OECD average, the EU average and the PIAAC 2023 average correspond to the arithmetic mean for the specific countries for which data is available of a specific data source.

For ease of exposition, many results provided in the figures and tables of this report display international averages. Underlying country averages are provided in the annex of each chapter.

Measurement of social and emotional skills

The conceptual framework for the measurement of social and emotional skills in the 2023 Survey of Adult Skills (PIAAC) is the Big Five model of personality (Soto and John, 2017[1]). The Big Five model distinguishes five broad personality domains: extraversion, agreeableness, conscientiousness, emotional stability and open-mindedness.

This report presents results from the 15-item extra-short form of the Big Five Inventory-2 (BFI-2-XS), as it is available for all 29 countries that chose to include the section on social and emotional skills in the background questionnaire.

In the BFI-2-XS, each personality domain is measured through three different facets (i.e. components of the personality domain), while each facet is defined by one item (i.e. a statement to which individuals respond to on a five-point Likert scale, from "strongly agree" to "strongly disagree"). Therefore, measures of individuals' social and emotional skills are based on individuals' self-reports across 15 items, one per facet. Table 1 provides details on the facets and items that make up the personality domains.

Table 1 Description of the social and emotional skills measures

Personality domain	Facet	Items
Extraversion	Assertiveness	I am dominant, act as a leader
	Energy level	I am full of energy
	Sociability	* I tend to be quiet
Agreeableness	Compassion	I am compassionate, have a soft heart
	Respectfulness	* I am sometimes rude to others
	Trust	I assume the best about people
Conscientiousness	Organisation	* I tend to be disorganised
	Productiveness	* I have difficulty getting started on tasks
	Responsibility	I am reliable, can always be counted on
Emotional stability	Anxiety	* I worry a lot
	Depression	* I tend to feel depressed, blue
	Emotional volatility	I am emotionally stable, not easily upset
Open-mindedness	Aesthetic sensitivity	I am fascinated by art, music or literature
	Intellectual curiosity	* I have little interest in abstract ideas
	Creative imagination	I am original, come up with new ideas

Note: The table represents the 15-item extra-short form of the Big Five Inventory-2 (BFI-2-XS), which measures each of the five domains with three items, one per facet. These short versions of the Inventory were derived from the BFI-2 by Soto and John (2017[1]; 2017[2]), a contemporary revision of the BFI-2-S by John et al (1991[3]).
Items marked with an asterisk * are reverse coded – respondents who agree less with these items score higher on the respective personality domain.
Source: OECD (2025[4]), *Survey of Adult Skills 2023 Technical Report,* https://doi.org/10.1787/80d9f692-en.

In the 2023 Survey of Adult Skills, scores for each personality domain (extraversion, agreeableness, conscientiousness, emotional stability, open-mindedness) were achieved by calculating the mean response per respondent for a particular domain [see (OECD, 2025[4])].

Comparison between groups and countries across different skills

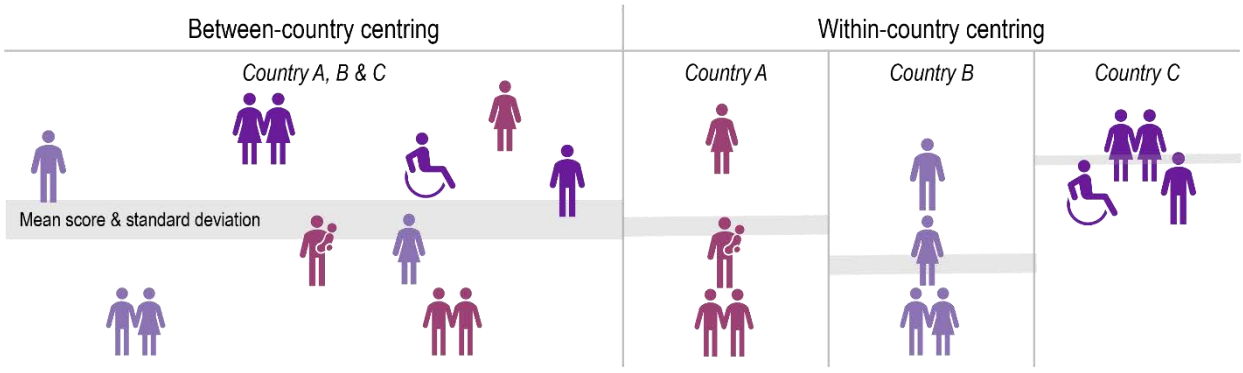
The possibility of making comparisons between countries, and the meaning of such comparisons, depends not only on the extent to which comparable instruments and administration conditions are implemented, but also on whether such instruments measure the same underlying skills. In the presence of full

comparability (or “scalar invariance”), the relationship (or “loading”) between each question, its underlying concept (“skill”), and the overall starting point (or “intercept”) are comparable across countries. As a result, scales can be constructed using between-country centring, meaning that the same mean and standard deviation are common across all countries.

By contrast, when only the relationship (or “loading”) between each question and its underlying concept are comparable across countries, individuals’ position in different countries cannot be compared directly, although it is possible to compare disparities between groups. Therefore, within-country centring was used in PIAAC to ensure that no between-country comparisons would be conducted for instruments that did not achieve full invariance.

In practice, between-country centring was used in the 2023 Survey of Adult Skills for information-processing skills (also referred to as core 21st-century skills in this report), while within-country centring was used for social and emotional skills. Because willingness to delay gratification was measured using a single item, it is considered as an observed scale rather than a latent construct, because no invariance testing could be conducted. Figure 1 illustrates for three theoretical countries, A, B and C, the consequences of adopting a between- and a within-country centring approach.

Figure 1. Between- and within-country centring



Note: The left side of the illustration, “Between-country centring”, illustrates an example where skills are comparable across countries, and mean scores and standard deviations are calculated using information across all countries. The right side of the illustration, “Within-country centring”, illustrates an example where skills are not comparable across countries, and averages and standard deviation are calculated separately for each country.

Information-processing skills and willingness to delay gratification are between-country centred

PIAAC ensures the comparability of assessment questions across countries and population groups through qualitative review of items, prescribed procedures for translation, and quantitative indicators aimed at identifying systematic deviations from expected results given the assumption of full comparability Information-processing skills are therefore standardised using a common mean and a common standard deviation across all countries and economies participating in the 2023 Survey of Adult Skills. This means that the scores of the entire participating population are pooled together when deriving means and standard deviations (OECD, 2025[4]). It is therefore possible to identify if a group of individuals living in country A have higher literacy achievement than a group of individuals living in country B and if the variation in literacy skills in the population in country A is more dispersed than in the population in country B.

Social and emotional skills are within-country centred

Invariance analyses of PIAAC data reveal that scalar invariance was not achieved by the PIAAC social and emotional skills instruments, whereas metric invariance was achieved. This likely reflects the fact that how people express themselves varies across countries (Cheng, Cheung and Montasem, 2014[5]). An extrovert in the cultural/social context of country A may only be considered moderately outgoing in country C when compared to those around them, despite behaving in the exact same way in both countries. Moreover, the value of high sociability and how it is interpreted by people in a community depends on broader social values, which differ across countries.

To account for the impact of cultural/social contexts when deriving measures of social and emotional skills, the scores of individuals were standardised in relation to others in the country in which they took the survey. As a result, whereas differences between groups (so called "effect sizes") can be compared, it is not possible to compare averages (i.e. mean scores of different groups) across countries (OECD, 2025[4]). The population scores of each PIAAC-participating country and economy were considered separately when deriving the measures of standard deviation and mean score of the population such that each country's mean and standard deviation are the same irrespective of average level of responses in the underlying questions in different countries [see (OECD, 2025[4])].

Interpreting the magnitude of differences between groups

To interpret the magnitude of standardised differences between groups for information-processing skills and delayed gratification (so called "standardised differences") and in social and emotional skills (so called "effect sizes") this report relies on "Cohen's d" benchmarks. Standardised differences are interpreted as small effects if Cohen's d (the standardised difference) is below 0.2, as medium for values between 0.2 and 0.5, as large for valued of 0.5 and greater. A different way to evaluate differences is to evaluate these in light of differences resulting from educational interventions. For example, the standardised difference in achievement over the course of a school year among participants in PISA (around 0.20 SD) (Avvisati and Givord, 2023[6]) and the majority of educational interventions have effects sizes on standardised achievement that are below the 0.2 SD threshold (Kraft, 2020[7]).

Interpretation of country-level results by immigrant background

Immigrant populations differ widely across countries and economies in terms of their size, composition, and migration histories. Readers are therefore encouraged to consult the country-level results provided in the annex tables of each chapter when interpreting findings by immigrant background. Caution is also advised when comparing results across countries and economies, since differences in composition and migration histories could not be fully accounted for in the analyses.

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Acronyms and abbreviations

The following are the main abbreviations and acronyms cited in the report.

Abbreviation/acronym	Full description
ACN	Australian College of Nursing
AI	Artificial intelligence
ALMP	Active labour market policies
BFI	Big Five Inventory
CEAV	Career Education Association of Victoria
CICA	Career Industry Council of Australia
DEIS	Delivering Equality of Opportunity in Schools
ECEC	Early childhood education and care
EIU	Economist Intelligence Unit
GEOM	Global Estimates of Opportunity and Mobility
GII	Gender Inequality Index
GOII	Gender Occupational Integration Index
HEAR	Higher Education Access Route
HRM	Human resource management
ICCS	International Civic and Citizenship Education Study
ICILS	International Computer and Information Literacy Study
ICT	Information and communication technology
ILA	Individual learning accounts
ISCO	International Standard Classification of Occupations
JVCCS	Jobs Victoria Career Counsellors Service
L1	Native language
L2	Second language
LDND	Levenshtein Distance Normalised by Divergence
LLM	Large language models
MEL	Money earlier or later
MOOC	Massive open online courses
NHS	National Health Service
PES	Public employment services
PIAAC	Programme for the International Assessment of Adult Competencies
PIRLS	Progress in International Reading Literacy Study
PISA	Programme for International Student Assessment
PPP	Purchasing power parity
RPL	Recognition of prior learning
RR	Representation ratio
SD	Standard deviation
SE	Standard error
SES	Socio-economic status
SME	Small and medium-sized enterprises
STEM	Science, technology engineering and mathematics
TAFE	Technical and further education
TIMSS	Trends in International Mathematics and Science Study
VET	Vocational education and training
WUI	World Uncertainty Index

Executive summary

Disparities in who possesses the skills essential to succeed in the 21st century reflect, among other things, people's backgrounds. In this edition of the *OECD Skills Outlook*, skills to succeed in the 21st century include information-processing skills – literacy, numeracy and adaptive problem solving – as well as social and emotional skills. Disparities in these skills reduce opportunities for economic growth by wasting and misallocating talent.

In responding to these skills disparities, policymakers must work in a socio-economic environment that is evolving faster than ever before, which presents additional challenges. This *OECD Skills Outlook* identifies where and how an individual's background matters in terms of the skills they possess, and what countries can do to ensure that all people, regardless of their background, have the skills they need to thrive.

A person's skills and how they use them still largely depend on factors beyond their control. In most countries, who becomes proficient and whose skills are recognised and rewarded still depends to a large degree on factors beyond people's control, such as socio-economic background, gender, immigrant background and where a person grew up. These differences are not isolated; they stack and compound over time, shaping life chances and slowing growth and the capacity of countries to turn the challenges of the 21st century into opportunities for growth and well-being. The result is untapped talent, labour-market inefficiencies and large if not increasing social divides. However, countries differ widely showing that targeted investments in lifelong learning opportunities can reduce the size of skills gaps.

Socio-economic background is the strongest driver of skills disparities. Core 21st-century skills remain unevenly distributed across populations in OECD countries, with socio-economic background being the strongest and most pervasive driver of skills disparities. For example, adults with at least one tertiary-educated parent score higher in core 21st-century skills than those without tertiary-educated parents. Among low achievers, the advantage linked to parental education is even larger. These "sticky floors" reflect compensatory advantage: better resourced families can mobilise money, time and networks so that even when their children struggle to develop strong core 21st-century skills due to low baseline ability, they are nonetheless pushed towards their full potential.

Context mediates how large skills gaps become: in countries where income inequality is higher, socio-economic disparities in skills tend to be wider. Urban–rural differences favour city upbringings but reduce once parental background is considered, underscoring how place and family resources intertwine.

Disparities between men and women vary across skills. On average, women outperform men in literacy, but men outperform women in numeracy and adaptive problem solving. Crucially, differences in numeracy skills proficiency between men and women are largest among the most highly skilled men and women, reflecting a "glass ceiling" for high-achieving women in numeracy intensive domains. The gap is also larger among adults with tertiary-educated parents than among adults with non-tertiary educated parents.

Skills disparities start early. For example, boys have higher achievement than girls in financial literacy and mathematics, whereas girls have higher achievement than boys in collaborative problem solving, creative thinking and reading. Similarly, 15-year-old students with tertiary-educated parents have higher

achievement than their peers without tertiary-educated parents in mathematics, and this difference is even more pronounced among high-achieving students. Decisive action is necessary to ensure that today's inefficiencies are disrupted and do not persist across generations.

Education systems and workplaces perpetuate social advantage. Even though most education systems and workplace cultures are procedurally meritocratic, how individuals are selected into different educational programmes and workplaces means that in practice they tend to perpetuate social advantage. This social advantage begins early and is only partially offset during compulsory schooling, after which differential selection into further education and training tends to amplify socio-economic disparities in labour market opportunities and rewards. Across successive cohorts, socio-economic gaps in core skills narrow in adolescence but widen again after formal schooling.

Selection into and through tertiary education is a major engine of divergence in skills development. The choices and opportunities people from different backgrounds have in terms of whether, what and for how long to study is a significant cause of skills disparities. However, not all disparities are alike: disparities related to socio-economic background lie primarily in how long people study for, whereas differences between men and women also lie in *what* men and women study. For example, women are more likely than men to complete tertiary education overall but are markedly less likely to enter mathematics-intensive fields.

Opportunities for adult learning are unequally distributed and often reproduce initial disadvantage. Individuals with different educational attainment are employed in different types of jobs that offer different types of adult learning. On average, participation in non-formal learning is about 43% among adults; however, this breaks down to 61% among tertiary-educated adults and 19% among those with below upper secondary education. Adults from disadvantaged backgrounds are over-represented in courses on operating machinery, equipment and security protocols, whereas those from advantaged backgrounds are more likely to participate in upskilling and reskilling courses such as project management, foreign languages and numeracy.

Barriers to participation in adult training differ based on a person's background. Family obligations weigh more on younger workers and women; adults in rural areas cite scarce or inconvenient provision; and women are more likely to report unexpected events preventing participation, signaling how stretched they often are for time and support.

Educational attainment is a strong mitigator of socio-economic wage disparities. Access to opportunities to develop skills that pay is a key driver of socio-economic disparities in labour market outcomes; however, once individuals' own education and skills are considered, most employment and wage gaps by socio-economic origin shrink considerably. For example, on average, over three-quarters of socio-economic wage disparities can be explained by differences in learning trajectories and core skills, with adults from tertiary-educated families earning 11% more per hour than peers with similar socio-demographic characteristics but whose parents are not tertiary educated; however, the difference is less than 1% when further controlling for educational attainment, participation in non-formal learning and skills.

Upward educational mobility has increased but does not fully translate to upward occupational mobility. Parental circumstances greatly determine the opportunities their children have to reach their potential. However, over the course of the 20th century and first quarter of the 21st century, many working-age people experienced upward educational mobility relative to their parents, and expectations among today's youth remain high. At the same time, for many, upward education mobility does not translate into upward occupational mobility: only 12% of adults have a lower level of education than their parents yet as many as 36% work in an occupation with a lower social status than that of their parents' occupations.

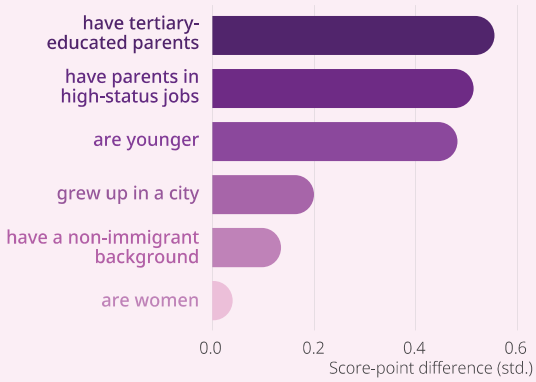
Employment differences between men and women are still significant. Whereas differential access to skills development is a key driver of socio-economic disparities in the labour market, this is not the case for disparities between men and women. Men's employment rates exceed women's by about 7 percentage

points even when comparing men and women with similar qualifications and skills. Among men and women who work for pay, the hourly wage gap is about 14% when comparing men and women with similar socio-demographic characteristics, and this gap is even larger (16%) when comparing men and women with similar educational trajectories and skills. Occupational segregation is entrenched – only 29% of workers are in jobs where their sex is a minority: 15% of men work in strongly women-majority occupations and 13% of women in strongly men-majority occupations – and men-majority occupations tend to command higher wages even at similar skills requirements.

Infographic 1. Key facts and figures

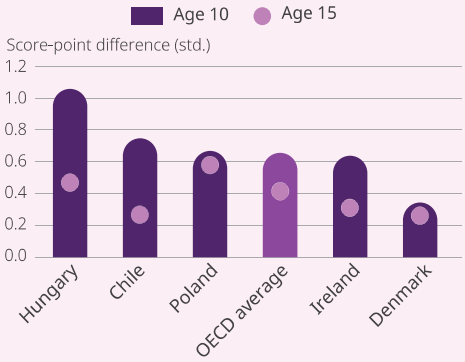
Socio-economic differences have a big impact on literacy skills

Adults are more likely to have higher literacy if they...



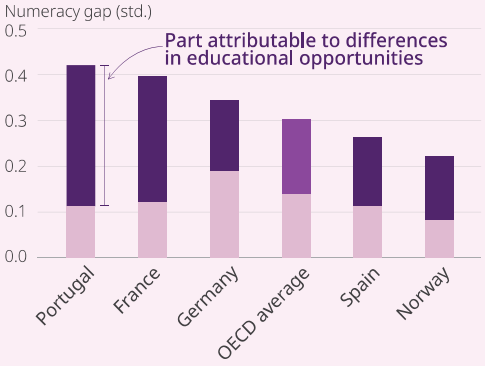
Schooling helps close socio-economic gaps in adolescence

Difference in maths between students with and without tertiary-educated parents, at ages 10 and 15

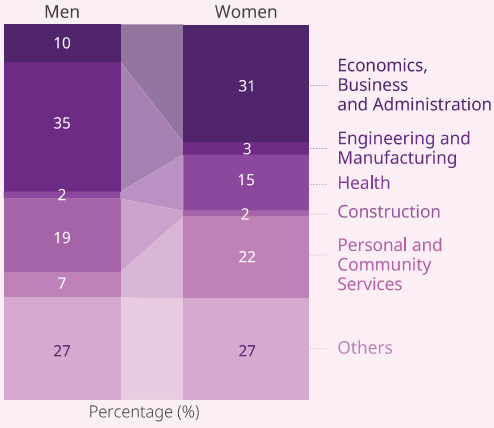


Parental background boosts skills mainly through access to educational opportunities

Numeracy gaps between adults with manager or professional parents vs. others



Men and women specialise in different fields in vocational education and training



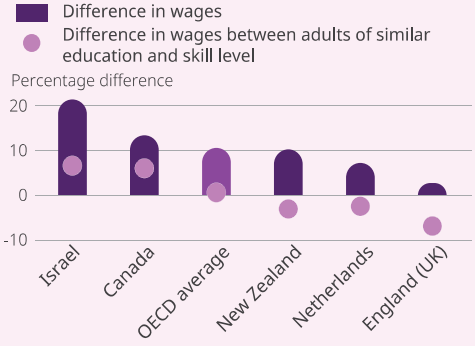
Parental background influences what kind of training adults attend

Percentage of adults attending different types of training, by parental occupation

Manager or professional parent		Non manager or professional parent
20%	Security	14%
8%	Machine and equipment operation	5%
4%	Foreign language	6%

Education and skills explain most of wage gap between adults from different parental backgrounds

% difference in wages between adults of advantaged and disadvantaged backgrounds



1 Widening opportunities by investing in 21st-century skills

The 21st century is being reshaped by crises and megatrends, including pandemics, geopolitical instability, climate change, demographic shifts and rapid technological innovation. These forces create uncertainty and change skills demands, widening existing socio-economic and regional disparities in access to opportunities. This chapter defines the set of skills needed to thrive in 21st-century labour markets and highlights the importance of reducing disparities in skills development. Factors outside the control of individuals, including gender, immigrant status or socio-economic and residential backgrounds, have a significant impact on skills acquisition and returns to skills. These factors can exacerbate skills shortages, constraining opportunities for economic growth and potentially fuelling social tensions. At the same time, rapid changes in technologies, economies and societies compress the window for policy adaptation. This chapter details how agile lifelong learning policy responses that are evidence-based, engage stakeholders, and are timely and responsive to 21st-century challenges can ensure that what appear as constraints can instead become opportunities for individuals to thrive.

In Brief

The challenges of the 21st century require timely policy solutions that can be adapted to respond to rapidly evolving circumstances. A central goal is to reduce skills disparities driven by circumstances beyond individuals' control, such as gender, parental education and occupation, immigrant background, age, and childhood residential context. Addressing them supports economic growth, innovation and the fairer distribution of benefits. Identifying the policy interventions needed to reduce skills disparities first requires mapping how skills are distributed across individuals with different socio-demographic characteristics, and which factors determine such disparities. By putting into place the initiatives detailed in this report, policymakers can make a concrete difference to the lives of their populations by reducing skills disparities and disparities in the returns to skills.

Agile governance is key. Lifelong learning policies can mitigate disparities between groups. Such policies should be flexible, data-driven and iterative, enabling rapid adjustments to address rapidly shifting circumstances based on continuous monitoring and feedback mechanisms. Effective systems rely on strategic collaborations between national and local governments, social partners, and learners.

Lifelong learning must be firmly embedded within broader economic development and innovation strategies. Effective lifelong learning frameworks integrate education at all stages, from early childhood through compulsory education, tertiary education and ongoing adult training. Collaboration across ministries aligns education and training goals with broader governance strategies, such as those related to digitalisation, health and well-being, or inclusion, resulting in greater efficiency and improving the outcomes of programmes and policies.

Investments should be made in initiatives that foster educational and occupational mobility. Collaboration with stakeholders should be reflected in investments to foster educational and occupational mobility, such as accessible education pathways that support horizontal and vertical mobility between vocational education, academic programmes, and adult upskilling and reskilling initiatives. This approach helps maintain workforce adaptability, ensuring that the supply of skills remains closely aligned with changing labour market requirements.

Reducing disparities related to socio-demographic characteristics from the earliest stages of education is essential. Skills disparities begin to take shape early through differences in access and quality of early childhood education and care (ECEC) services. The effects of these disparities on individuals' skills only widen with time. Investment in high-quality, comprehensive and universally accessible ECEC systems, combined with targeted support measures, can reduce the emergence of skills gaps that originate from circumstances that lie beyond individuals' control. Integrating services such as health, nutrition and parental employment support within early education provision further strengthens these interventions, particularly for disadvantaged communities.

Compulsory schooling systems must balance excellence, equity and labour market relevance. Funding formulas need to take into account skills disparities, while curricula should ensure academic proficiency in core 21st-century skills, social and emotional skills, and career readiness. Initiatives that promote inclusive and stereotype-free education, particularly those related to gender and social mobility, help reduce occupational segregation and improve long-term employment outcomes.

Adult training programmes must balance access, quality and labour market relevance. Working adults or those with caretaking responsibilities face significant time and financial constraints to accessing training, posing and worsening barriers to their uptake. Existing adult education systems frequently

favour individuals already advantaged by prior educational attainment, thus exacerbating skill divides. It is essential to ensure quality and relevance through rigorous accreditation processes, outcome-oriented funding mechanisms and robust provider accountability frameworks. Targeted support for underserved populations, including older adults, migrants, and individuals with low levels of skills proficiency or low levels of formal education, should also be prioritised.

Career guidance can be an important route to better opportunities and outcomes for individuals, while also helping to fill growing skill and labour shortages. Comprehensive and bias-free career guidance, including information and counselling, should be expanded and modernised to address information gaps and tackle persistent stereotypes. Career counselling capacities, especially in disadvantaged schools and public employment services, could be enhanced through the use of digital and personalised support services that channel people towards training and facilitate labour market entry.

A skills-first approach in labour markets could help reduce skills shortages and promote inclusion. Governments can lead by example, for instance by integrating skills-based hiring methods into public sector recruitment practices. They can also encourage employers to adopt skills-based hiring models through incentives. Standardised frameworks for skills assessment, recognition and credential portability should be developed to ensure transparency and facilitate job mobility. Together with policies related to adult training, skills-first talent management practices within firms can promote lifelong learning and broader policy goals related to innovation and addressing labour market shortages.

1.1. Shocks, shifts and the evolving landscape of skills in the 21st century

The first quarter of the 21st century has been marked by a series of acute crises – including global pandemics, geopolitical conflicts and economic disruptions – and long-term systemic changes, often referred to as megatrends, such as climate change, demographic shifts and digital innovations. The interplay between these crises and megatrends creates complex challenges for skills development, with sudden disruptions amplifying existing disparities, and structural changes redefining skills demands and altering the labour market.

For instance, although technological progress can drive economic growth, it may also exacerbate disparities in income and labour market opportunities, as uneven access to digital tools and education opportunities will mean that some individuals will be less able to become more productive through the use of technology. Disparities could also arise from differences in the suitability of technology to enhance the productivity of human work in certain, but not all, sectors and occupations, leading to divergent patterns in economic and labour market opportunities for workers. Climate change and its mitigation policies increase demand for certain skills while reducing demand for other skills, with transformations needed to reach net-zero targets creating opportunities for innovation, job creation and social progress. However, climate change also risks deepening regional inequalities, with lower-income areas often bearing disproportionate environmental burdens and lacking the resources for effective adaptation. Demographic shifts, particularly population ageing in high-income countries, further strain labour markets, underscoring the urgent need for policies that address emerging skills gaps. Understanding these forces, how they relate to each other and how they impact skills demands is essential for designing skills policies that respond to the evolving demands of 21st-century economies. By responding to these challenges effectively, socio-economic disparities in life chances both between and within countries can be reduced.

However, the rapidity of changes compresses the window for policy adaptation, stretching conventional governance cycles. In practice, education and training systems, which set curricula, qualifications

frameworks and funding agreements often several years in advance, find it difficult to redesign programmes, upskill instructors and scale delivery quickly enough to meet newly emerging skills requirements. Employment services, industrial strategies and social protection instruments face similar challenges: they must process labour market intelligence, align incentives and deploy resources quickly; however, they frequently rely on data and decision-making structures that are not well-suited to rapid decision making and shifts in service provision. These timing mismatches risk creating skills shortages, reducing the potential for economic growth and diminishing the return on public and private investments. If skills policies are to keep pace with rapid 21st-century economic and societal changes, more agile policy architectures, underpinned by timely data, iterative evaluation and close collaboration between government, employers, social partners and training providers, must be developed.

1.1.1. Increased uncertainty across the globe

Crises exert both direct and indirect effects on economies and societies by disrupting everyday activities and undermining the stability of institutional frameworks. They force economic and social actors to recognise the possibility of disruption and, by so doing, generate uncertainty. Perceptions of uncertainty appear to be higher and more volatile in the first quarter of the 21st century than in the last decades of the 20th century (Ahir, Bloom and Furceri, 2022[1]).

The rising frequency of crises (and the associated increase in uncertainty) could itself be viewed as a megatrend. Historians such as Adam Tooze argue that the global context is shaped by a “polycrisis” of overlapping and compounding challenges (Henig and Knight, 2023[2]). This perspective reflects the volatility that has marked the late 20th and early 21st centuries. However, others caution against viewing current turmoil as uniquely permanent (Frankopan, 2024[3]), and argue that from a longer historical perspective, periods of acute disruption have arisen in the past and may not necessarily imply a lasting transformation. While the short-term impacts of crises are clear, their long-term significance as a defining trend in the 21st century remains uncertain.

Against a background of interlinked crises and pervasive uncertainty, designing and implementing skills policies becomes increasingly complex. At the same time, heightened public awareness about the risks for economies and societies of systemic vulnerabilities can serve as a catalyst for improving skills policies. The 20th century saw the primacy of information-processing skills – numeracy, literacy and adaptive problem solving – established at the societal level, fuelling changes in many education systems, which adjusted their teaching to support the promotion of these skills. The 21st century could be the century that urges societies to embrace a more inclusive definition of what basic skills are and that values and recognises diverse talents and contributions, challenging policymakers, educators and employers to develop innovative approaches to broader skills development efforts. Therefore, although greater uncertainty poses risks and may increase social disparities, it also provides an opportunity to advance skills policies that benefit a wider set of adults.

1.1.2. Societal and demographic changes

Over the course of the 20th century, OECD countries experienced profound changes in their demographic profiles. A key development was the marked expansion of educational opportunities, which notably benefited women (Barro and Lee, 2013[4]; OECD, 2022[5]). This shift reflected growing awareness of education as a critical driver of economic growth and social mobility, and set the stage for higher female participation in the labour market and their greater voice in political decision making and representation in government.

Family structures also underwent major transformations during this period. For instance, dual-earner couples with higher levels of education tended to have fewer children than previous generations, a pattern that scholars have linked to changing family norms, delayed marriage and the realisation of women’s

career aspirations (Lesthaeghe, 2010[6]). Fertility rates declined overall (Bongaarts, 2009[7]), while heightened standards of living, advances in medical care and better access to healthcare contributed to increased life expectancy. Together, these changes reshaped household compositions, altered population age structures, and introduced new pressures on pension systems and care provision for older adults.

Urbanisation, driven by industrialisation and the search for employment opportunities in increasingly knowledge-based economies, has been another significant demographic trend of the 20th century. The movement from rural to urban areas has led to important societal changes, including the growth of metropolitan centres and new spatial patterns of work and residence. Meanwhile, international migration flows have intensified, adding another layer of complexity to demographic evolution in OECD countries and increasing ethnic and cultural diversity.

In the 21st century, many of these demographic shifts appear set to continue, although with different impacts across countries. In particular, falling fertility rates in OECD countries, combined with the high birth rates following the Second World War, are creating tensions as a shrinking pool of young workers struggles to support rising pension costs and the costs of public healthcare systems (United Nations, 2024[8]). Coupled with rising life expectancy, these trends heighten the need for policies to equip people of all ages with relevant skills to ensure that they remain available in the labour market for longer. Encouraging older adults to remain in the workforce longer is becoming increasingly common in many OECD countries to reduce dependency ratios and labour shortages. However, this will require substantial improvements in the provision, quality and attractiveness of lifelong learning opportunities so that workers can continue to adapt to new technologies and changing work environments.

As a result of all these factors, skills policies in the 21st century will need to be far-reaching and flexible. Beyond traditional academic pathways, greater investment in vocational education and training (VET), online learning, and credential-updating programmes will be vital to accommodate a workforce that is both ageing and increasingly diverse (OECD, 2021[9]). Policies promoting continuous reskilling – particularly for mid-career and older workers – will be critical, as will tailored support for migrants and vulnerable groups – such as adults with low levels of formal educational qualifications – to ensure that they can fully participate in the labour market. In this context, broadening what is counted as a “relevant skill” – from digital proficiency to interpersonal communication – might also prove necessary for effectively promoting economic and social well-being.

1.1.3. Social mobility and inequality

During the 20th century, social mobility and economic inequality among OECD countries changed drastically as a result of industrialisation, expansions in educational opportunities, globalisation and technological development. In particular, while the mid-20th century witnessed an unprecedented increase in opportunities for upward social mobility and a narrowing of income and wealth gaps, the last quarter of the century saw the re-emergence of pronounced income disparities and the solidification of class boundaries (OECD, 2018[10]). Education emerged as both a driver of opportunity and a mechanism of stratification, with skill-biased technological change – i.e. when new technologies make workers with certain skills much more productive, and therefore more in demand, than those without such skills – amplified the returns to advanced qualifications, while systemic disparities in educational quality perpetuated intergenerational disadvantage for many (Acemoglu, 2002[11]; Berman, Bound and Machin, 1998[12]).

Social mobility can be understood in two distinct ways: absolute mobility, which reflects changes in the socio-economic status of successive generations, and relative mobility, which reflects the likelihood that individuals with lower socio-economic backgrounds can catch up with those from more advantaged families. Rising absolute mobility may coexist with low relative mobility if the benefits of economic growth primarily accrue to those already in favourable positions.

The decades after the end of Second World War marked a “golden age” of social mobility in many OECD countries. Rapid industrial expansion, strong unionisation and progressive taxation created conditions in which 60% of children born into working-class families achieved a higher occupational status than their parents (Causa and Johansson, 2009[13]). Cohorts born between 1950 and 1970 experienced 22% higher upward mobility rates than pre-war generations. In the Nordic countries in particular, parents’ level of education was closely and consistently linked to positive outcomes for their children, showing a nearly direct progression from one generation to the next (Causa and Johansson, 2009[13]). The post-war period was also characterised by a convergence in living standards, facilitated by progressive taxation, the establishment of social welfare programmes and a marked increase in labour productivity.

However, from the mid-1970s onwards, while absolute poverty continued to decline in many parts of the world, relative inequality within countries increased (Cingano, 2014[14]). Moreover, a combination of deindustrialisation and skill-biased technological change significantly reshaped labour markets (Acemoglu, 2002[11]). For example, OECD data indicate that for cohorts born after 1975, the likelihood of upward mobility stagnated (OECD, 2018[10]). Income inequality also followed a U-shaped curve across the 20th century, with the Gini coefficient[1] falling from 0.55 in 1920 to 0.30 in 1970 in advanced economies (indicating reduced income inequality) before rebounding to 0.45 in 2020 (Coady and Dizioli, 2017[15]).

The first two decades of the 21st century have been defined by increasing precariousness among lower- and middle-income groups, alongside soaring incomes and wealth concentration at the very top of the distributions. New digital technologies and the transition to a knowledge-based economy have created opportunities for some, particularly those with in-demand technical and information-processing skills. However, many have been left behind, especially in regions heavily dependent on declining industries for employment opportunities (OECD, 2024[16]) or those where access to quality education and training remain constrained (UNESCO, 2024[17]). This polarisation has exacerbated social stratification, diminishing the prospects for upward mobility.

Although correlational in nature, evidence suggests that countries with higher levels of income inequality often exhibit lower rates of mobility from one generation to the next, an association that is referred to as the Great Gatsby Curve (Corak, 2013[18]). In fact, within countries, increases in income inequality have been accompanied by declines in social mobility, possibly reflecting the fact that when income or wealth disparities are wide, access to quality education, healthcare and social networks becomes highly stratified, enabling those from more privileged socio-economic backgrounds to maintain their advantage. Disparities in access to education and training, both during childhood and throughout adulthood, play a critical role in determining whether education fulfils its potential as the great equaliser. If only those in already privileged situations can benefit from high-quality learning opportunities, both absolute and relative mobility may suffer.

1.1.4. Climate change

Throughout the 20th century, economic growth in OECD countries often occurred at the expense of the environment, resulting in high CO_2 emissions and loss of biodiversity. Recognising the urgent need to address climate change, the 21st century has witnessed more determined efforts to cut greenhouse gas (GHG) emissions, reduce waste and transition to a low-carbon future. However, this shift requires individuals and firms to acquire new skills to adapt to rapidly changing labour markets. Managing this shift effectively necessitates an approach that anchors public investment in comprehensive re- and up-skilling programmes, creates clear job-to-job pathways, and establishes formal frameworks for information sharing, consultation, and collective bargaining.

Although the net effect of the green transition on total employment is projected to be modest, it will entail significant shifts across industries, occupations and regions (OECD, 2024[16]). Around 20% of workers in OECD countries are employed in green-driven occupations,[2] while 6% are in GHG-intensive jobs (OECD, 2024[16]). Green-driven jobs, particularly new and emerging ones, often require higher-level skills related

to management, technology and professional services, whereas jobs not driven by the green transition often call for more medium- and low-skilled competencies. Demand for interpersonal and digital skills is set to rise substantially, while the need for certain traditional manufacturing skills is expected to decline (OECD, 2023[19]). Without adequate education and training, low-carbon growth could be undermined by skills shortages.

In addition to reducing emissions, green-driven occupations tend to offer higher wages overall, although this advantage mostly applies to jobs that typically require tertiary-level qualifications and high levels of information-processing skills. By contrast, individuals in green-driven roles that do not require tertiary-level qualifications and associated skills proficiency are often paid less than similar roles in GHG-intensive or neutral sectors (OECD, 2024[16]). This is problematic, as attracting workers to these occupations is essential to avoid skills becoming a severe bottleneck for delivering the net-zero transition. Displaced workers in high-emission industries are often male, older and have lower educational attainment, making it harder for them to transition to similarly well-paid roles (Barreto et al., 2024[20]; OECD, 2024[16]).

1.1.5. Technological developments

Empirical estimates of the impact of digital technologies on employment in the 20th century and early part of the 21st century are mixed: whereas some reveal that technological developments have led to a growth in employment opportunities (Dixon, Hong and Wu, 2021[21]; Koch, Manuylov and Smolka, 2021[22]), others suggest that technological developments have reduced employment possibilities for workers (Acemoglu and Restrepo, 2020[23]). Overall, empirical evidence suggests that past waves of technological developments did not lead to overall lower employment opportunities and net job destruction in the long run (OECD, 2019[24]). In fact, throughout the 20th century, the employment-to-population ratio rose and the unemployment rate did not change (Autor, 2015[25]).

In the past, job losses resulting from computer automation tended to be more pronounced for low-wage occupations, occupations in the manufacturing sector (Mann and Püttmann, 2023[26]) and generally among workers conducting routine work (Gaggl and Wright, 2017[27]). As a result of past waves of technological progress, today's workplaces demand people who can solve non-routine problems. Few workers, whether in manual or knowledge-based occupations, use only repetitive actions to perform their job tasks. As technologies capable of performing rule-based tasks were introduced, the importance of people's ability to solve complex problems that could not simply be solved by applying pre-specified rules grew. While computers gradually took over "the expected", individuals increasingly had to deal with the "unexpected and the unfamiliar", often working alongside computers (Autor, Levy and Murnane, 2003[28]). Whereas technological developments in the past led to the creation of computers and robots that could only follow narrowly specified rules, today, machine learning algorithms allow automata to perform a considerably broader set of tasks that lack rule-based solutions. As a result, the set of tasks that can be performed by technologies is radically different. The advent of artificial intelligence (AI) systems may dramatically change the demand for skills in the future as non-routine tasks fall within the scope of what automata can perform reliably. On the one hand, technology may obviate the need for humans to perform certain tasks. On the other hand, technologies may complement humans, requiring workers to learn to work effectively with new technologies as some tasks, but not all, will be affected by automation.

Estimates suggest that as many as 80% of the US workforce could have at least one in ten tasks affected by the use of large language models (LLMs), and around two in five employees might experience an impact on at least half of their tasks (Eloundou et al., 2023[29]). Recent analyses of online job advertisements in the United Kingdom and the United States indicate that between 2021 and 2024, skills requirements for the average job changed by approximately one-third, with one in four jobs experiencing shifts in up to three-quarters of required skills (Lightcast, 2025[30]; 2025[31]). Moreover, in the United States, the pace of change between 2021 and 2024 (a three-year period) matched that observed between 2016 and 2021 (a five-year period) (Lightcast, 2025[31]). The most disrupted occupations generally require extensive training

or tertiary qualifications. In contrast, jobs experiencing minimal changes in skill requirements do not typically require advanced qualifications and frequently involve demanding physical tasks.

The labour market implications of LLMs are not yet fully understood and may shift over time, depending on technological developments and policy decisions. Early evidence points to mixed effects, with LLMs both substituting and complementing human labour. As the technology advances, LLMs are becoming capable of performing a wider range of tasks with greater speed and proficiency. Evidence from early 2025 shows that LLMs can substitute for human labour in tasks such as writing and translation (Demirci, Hannane and Zhu, 2025[32]; Qiao, Rui and Xiong, 2024[33]), and have also been shown to complement human skills and enhance the productivity of less experienced workers (Brynjolfsson, Li and Raymond, 2025[34]; Noy and Zhang, 2023[35]). In some cases, productivity gains arise when workers possess AI-related knowledge, particularly of machine learning systems, enabling them to command higher wages than peers with similar skills but without such expertise (Stephany and Teutloff, 2024[36]). Ultimately, policy decisions around adoption and regulation will determine their broader impact on workers and labour markets (Autor, 2024[37]).

The emerging literature on generative AI points to a complex interplay between displacement and augmentation. Some scholars warn of widespread automation of middle-skill tasks (Acemoglu and Restrepo, 2018[38]; Frey and Osborne, 2017[39]), while others highlight the potential for new job creation when AI is used to enhance, rather than replace, human capacities (Brynjolfsson and Mitchell, 2017[40]). Whether LLMs ultimately displace existing work or foster new forms of employment likely depends on how the technologies evolve and the related organisational adoption practices, regulatory frameworks and institutional incentives put in place (Autor, 2024[37]).

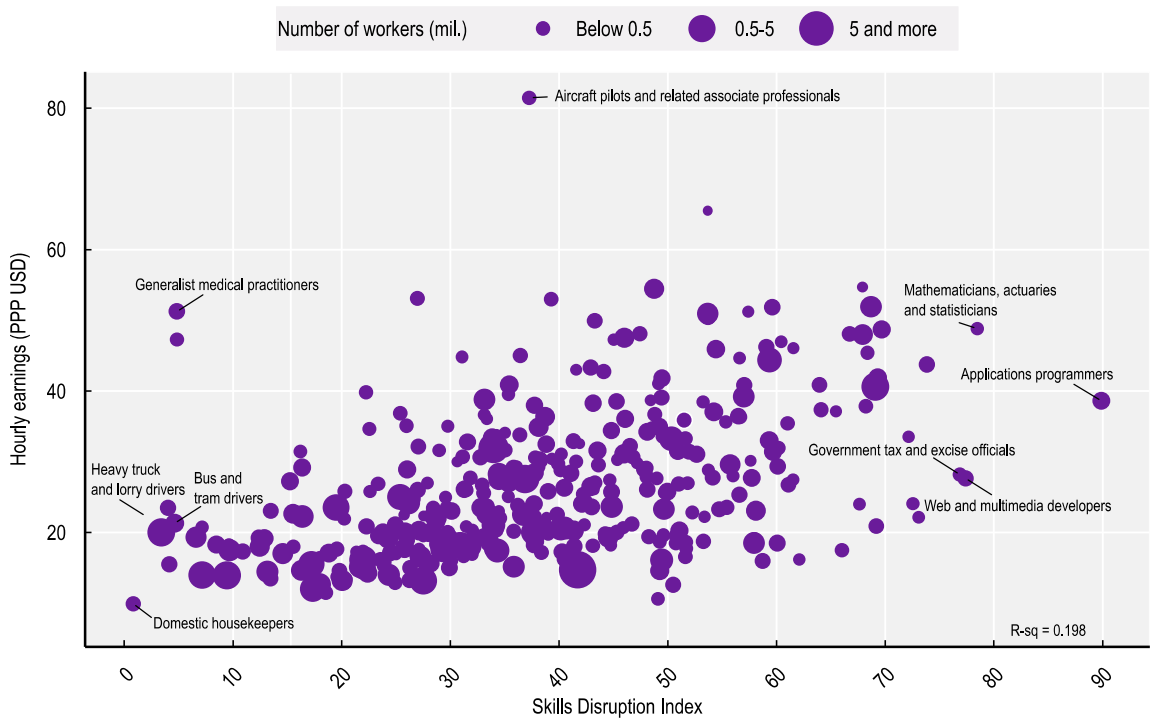
Evidence from consultancy markers and online freelancers, for which rapid shifts in skills demands and employment opportunities are more easily observable, indicate that demand tends to dry up for less experienced workers, whereas demand for more experienced workers remains sustained, with an increase in workers taking on complex tasks that currently lie beyond the capabilities of AI systems (Demirci, Hannane and Zhu, 2025[32]; Lysyakov and Viswanathan, 2021[41]; Teutloff et al., 2025[42]). On the supply side, workers in occupations highly exposed to generative AI substitution may suffer reductions in earnings and employment opportunities (Hui, Reshef and Zhou, 2023[43]; Liu et al., 2024[44]), whereas those in jobs complemented by AI may increase their earnings (Qiao, Rui and Xiong, 2024[33]). Current evidence, including the OECD's (2024[45]), indicates that negotiated adoption with worker consultation and training provision (including dedicated training time) is associated with better outcomes for workers and can help steer AI toward augmentation rather than displacement.

These findings can be reconciled by distinguishing task complexity and, by proxy, required experience: in online consultancy marketplaces, decreases in demand are especially pronounced for short-term jobs and for jobs requiring novice workers to perform tasks complementary to the capabilities of existing LLMs. These results imply that the increased productivity of novice workers within firms (Brynjolfsson, Li and Raymond, 2025[34]) may reduce the need for novice freelancers. At the same time, the developing capabilities of LLMs appear to increase the need for workers with experience working on complex tasks.

At the economy level, the pace of technological change is not affecting all jobs equally, as indicated in Figure 1.1. There is a trade-off between the speed of change (and consequent need for upskilling and reskilling) and wages: occupations experiencing rapid change tend to command higher-than-average wages, whereas occupations relatively unaffected by technological change tend to command below-average wages. Figure 1.1 uses data from Lightcast (2025[46]) to map, at the occupational level, how much the set of skills demanded by employers in online job advertisements changed between 2021 and 2024; it also shows monthly earnings for the same set of occupations, based on the 2023 Survey of Adult Skills (OECD, 2024[47]). Speed of change is measured through the Skills Disruption Index, a standardised index ranging from 0 to 100, where a higher score indicates a greater degree of skill change (Lightcast, 2025[46]). Occupations highly affected by technology – such as mathematicians, actuaries and statisticians, and

application programmers – show relatively high rates of skills change as well as high earnings. In contrast, occupations less affected by technology, such as domestic housekeepers, show relatively low wages as well as a low rate of skills change. Figure 1.1 suggests that a willingness to upskill and reskill is critical to be able to operate in many highly paid occupations, as the skills requirements in these occupations are changing rapidly.

Figure 1.1. Association between occupational-level skills change and earnings



Note: The Skills Disruption Index was calculated using Lightcast data and measures how employer skill requirements have evolved across different occupations. It ranges from 0 to 100, where a higher score indicates a greater degree of skill change. The size of the bubbles represents the number of workers (in million), categorised as fewer than 0.5 million, between 0.5 and 5 million, and more than 5 million. Monthly earnings and the number of workers in each occupation were calculated based on data from the OECD Survey of Adult Skills.
Source: Lightcast (2025[46]), *The Speed of Skill Change*, https://lightcast.io/resources/research/speed-of-skill-change and OECD (2024[48]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

StatLink https://stat.link/p8jqnh

1.1.6. Aligning skills policies with evolving global realities

As described in this section, crises and megatrends are reshaping the nature of work, influencing both the types of skills demanded and the ways in which individuals acquire, develop and update these skills. Preparing for future challenges requires not only an assessment of current skills needs and the extent to which they are met by individuals' existing skills, but also a fundamental re-evaluation of how skills policies must adapt to evolving social and economic realities. The uncertainty generated by megatrends and crises raises questions about whether skills policies, largely devised in the 20th century, remain fit for purpose.

Promoting high levels of skills development among as many individuals as possible and across diverse socio-demographic groups is essential in the 21st century. First, given the increasing diversity of societies and the complexity of the information landscape, a range of skills enable individuals to access, critically evaluate and effectively use information. Skills allow individuals to engage constructively in civic life,

reducing social divides and helping maintain trust in institutions (OECD, 2021[49]; 2024[47]). Second, in countries experiencing low fertility rates, a shrinking workforce can lead to persistent labour shortages, threatening both economic growth and existing welfare arrangements. Expanding the workforce pool requires equipping a larger share of the population with relevant skills and facilitating their entry into the labour force. Reducing disparities in skills development and removing barriers to the effective use of skills can mitigate demographic pressures, enhance adaptability to changing labour demands and sustain productivity. Third, cultivating a broad range of skills supports the development of diverse teams. When people from various backgrounds and expertise areas collaborate, they foster greater innovation and creativity – skills that drive competitiveness in an increasingly complex and uncertain marketplace.

This *OECD Skills Outlook* provides an overview of the skill set of adult populations in countries that took part in the 2023 Survey of Adult Skills, a product of the OECD's Programme for the International Assessment of Adult Competencies (PIAAC). It focuses on persistent and emerging disparities, notably those associated with gender, socio-economic background and childhood residential context. The report has two main objectives. First, to help countries identify the current stock of skills in their populations and evaluate their readiness to tackle social and economic challenges; and second, to highlight opportunities for how the 21st century can deliver on the defining narrative of the 20th century: equality of opportunity and meritocracy.

The analysis of adult skills data thus incorporates historical insights on how various countries and economies have attempted to reduce inequalities and encourage social mobility through skills development. The data in this report cover adults born between 1947 and 2006, corresponding to the oldest participants (65-year-olds) in the 2012 Survey of Adult Skills (PIAAC) cycle and the youngest respondents (16-year-olds) in the 2023 cycle. This means that the parents of the oldest cohort members were born during the First World War or even at the start of the 20th century. Because the analysis focuses on the 21st century, it also considers how education systems are equipping today's children for tomorrow's challenges. To that end, data from adult skills assessments are supplemented with information on school-aged populations, such as from the Programme for International Student Assessment (PISA), the Trends in Mathematics and Science Study (TIMSS), the Progress in International Reading Literacy Study (PIRLS), the International Civic and Citizenship Education Study (ICCS), and the International Computer and Information Literacy Study (ICILS).

Crises and megatrends shape skills demand by influencing job creation and destruction, and they impact skills supply by determining population movements and guiding individuals' choices about education and training. They can also redefine existing roles: if tasks within a job evolve, then the skill set required to perform that job changes. At a basic level, each worker possesses a unique combination of skills, with varying proficiency levels, and each job consists of tasks requiring specific skills and knowledge. Where demand and supply intersect, economic growth and individual well-being are enhanced. By contrast, persistent mismatches hamper both.

The value of understanding the processes through which skills develop, both within and outside formal education and training systems, increases in an environment marked by shifts in the nature of work, the rapid diffusion of new technologies and greater dependence on information access. Examining the distribution of skills across socio-demographic groups, as well as the opportunities to acquire and practice them, reveals whether individuals are well-prepared to contribute to shape the economies of the 21st century, and whether they will have the 21st-century skills required to thrive.

1.2. What are 21st-century skills?

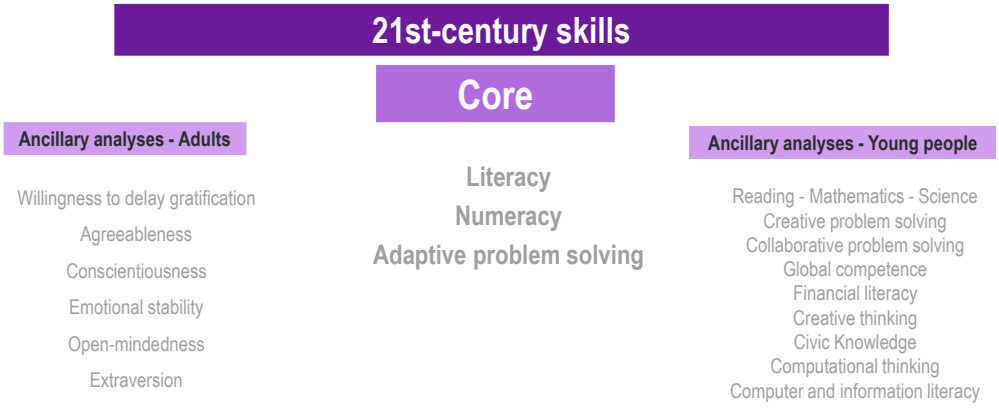
The term 21st-century skills began to be used in the early 2000s, as scholars, governments and others began to realise that the traditional approach to skills, which focused on gaining knowledge, needed to evolve as technology progressed, changing the nature of work. In the past 25 years, skills assessments

have been developed at the national and international level, with previous OECD work detailing the commonalities and differences in how they refer to 21st-century skills (Foster and Piacentini, 2023[50]). What these frameworks have in common is that they describe 21st-century skills as being relevant or applicable in many fields and associated with higher-order skills and behaviours that represent the ability to transfer knowledge, cope with complex problems and adapt to unpredictable situations. In contrast, this report uses the term 21st-century skills to refer to the set of skills needed to thrive in the 21st century and for which comparative evidence on representative samples of adults exists. This list is not exhaustive, as thriving in certain jobs or contexts that are growing in importance in the 21st century depends on a wide range of specialised skill sets. However, the goal of the report is to consider skills that underpin the capacity of individuals to acquire such specialised skills and to thrive in a wide range of contexts and situations.

This report considers nine 21st-century skills, as detailed in Figure 1.2. These include information-processing skills (also referred to as core 21st-century skills in this report), as well as the ancillary skills of willingness to delay gratification and the social and emotional skills of extraversion, emotional stability, agreeableness, conscientiousness and open-mindedness – measured through the Big Five personality module[3] – which are increasingly considered as critical determinants of labour market success (Almlund et al., 2011[51]; Heckman, Stixrud and Urzua, 2006[52]). By integrating information-processing skills (literacy, numeracy and adaptive problem solving), willingness to delay gratification, and social and emotional skills within a single conceptual framework, this report aims to provide policymakers, educators, training providers and employers with a comprehensive evidence base to re-evaluate or redesign their skills policies.

Selected analyses are presented to illustrate young people's readiness to tackle the emerging challenges of the 21st century, covering the domain-specific skills of science, global competence, collaborative problem solving, creative problem solving, creative thinking, financial literacy, computer and information literacy, and computational thinking. This holistic approach ensures that learners are equipped with the skills needed not only to meet immediate challenges, but also the emerging demands of a rapidly evolving economic and social landscape. Previous international assessments of adult populations have mostly focused on information-processing skills, particularly literacy, numeracy and problem solving in technology-rich environments (OECD, 2012[53]). While these skills remain essential, they must be complemented by an expanded set of skills. However, while all of the aforementioned skills are important, this report focuses on the core 21st-century skills as more data are available, enabling more meaningful analyses. Selected analyses are provided for the ancillary skills.

Figure 1.2. Categorisation of 21st-century skills



1.2.1. Information-processing skills

Proficiency in literacy, numeracy and adaptive problem solving was measured in the 2023 Survey of Adult Skills through a low-stakes, untimed, standardised assessment administered in respondents' homes by trained interviewers (OECD, 2024[47]). The low-stakes nature of the assessment meant that individuals who chose not to participate in the assessment were not penalised. Similarly, performance in the assessment had no consequences for participants, who did not receive any feedback on their score. This protocol means that the assessment design does not necessarily reveal respondents' maximal capacity to solve tasks in the relevant domains – as defined in the relevant assessment frameworks (OECD, 2021[49]) – rather, it captures the level of achievement individuals obtain by exerting the amount of effort and engagement they would typically invest in solving everyday online cognitive tasks. In effect, the scores represent "typical performance" under routine, low-stakes conditions rather than peak or optimal performance observed in high-stakes testing environments such as job searches, applications for positions into selective educational institutions, or tasks with large economic and financial consequences.

In high-stakes environments that focus on maximal performance (typically characterised by high-pressure and unavoidable consequences), test-takers often experience anxiety and a sense of hopelessness, especially when they receive no actionable feedback (Kankaraš and Suarez-Alvarez, 2019[54]). This might be especially critical for marginalised populations, who may have lower familiarity with the test format and content, or who may process information differently than their peers. By emphasising typical performance, assessments such as the Survey of Adult Skills can provide a more accurate representation of test-takers' skills and learning needs, thereby supporting fairer educational outcomes and more targeted support.

This distinction is important, as research in educational psychology has long indicated that test performance is significantly influenced by motivational factors (Kyllonen et al., 2024[55]; Ulitzsch et al., 2021[56]). In particular, research on school-aged populations, for which results from comparable assessments administered under low-stakes and high-stakes conditions are available, indicate that the level of effort individuals put in during a testing situation can result in large differences in outcomes, with differences having important implications for the evaluation of between-group differences (Braun, Kirsch and Yamamoto, 2011[57]; Duckworth and Yeager, 2015[58]; Sackett, Borneman and Connelly, 2008[59]). Furthermore, psychometric research indicates that results in low-stakes assessments capture not only underlying cognitive abilities but also situational factors – such as test-taking motivation and engagement – that are critical to the observed performance (Messick, 1989[60]; Wise and Kong, 2005[61]).

Of particular relevance to this report is the fact that motivational and contextual factors can contribute to shaping disparities in performance both across countries and economies and within different population groups (Borgonovi, Ferrara and Piacentini, 2023[62]). If motivation and effort truly capture how adults in different countries and economies handle literacy, numeracy and adaptive problem solving in everyday life, then the differences in performance on a low-stakes test like the Survey of Adult Skills represent valid distributions. This perspective is essential for understanding cross-national differences and socio-economic disparities in information-processing skills, as it suggests that part of the variation may be attributable to differential levels of test motivation and context-specific factors. Problems would only arise if motivation and effort reflected variations in attitudes towards testing.

The importance of motivation

In 21st-century societies and workplaces, the capacity to motivate oneself emerges as a potentially critical differentiator of labour market outcomes. As AI and other technologies handle routine information-processing tasks at high speeds, human value creation increasingly hinges on the desire to engage creatively with ambiguous, open-ended challenges. This involves not being satisfied with merely passable outcomes but rather actively seeking to engage with material beyond what is strictly necessary or

mandated. Such intrinsic motivation fosters innovative thinking and creative problem solving, attributes that, to date, remain beyond the full reach of automated systems.

Information-processing skills rarely develop into a fully automated process. To reason critically with mathematical content, evaluate and reflect on written text, or solve problems in dynamically evolving situations requires substantive and continuous cognitive effort. Even when individuals have gained basic levels of proficiency in a particular skill, applying such skill to many real-life tasks across domains necessitates a deliberate, ongoing investment of effort. In practice, people often default to pre-existing habits to minimise effort, implying that high-level proficiency in these domains remains linked to motivation.

Although technological advancements increasingly enable the use of monitoring devices to evaluate output and productivity with enhanced precision (Milanez, Lemmens and Ruggiu, 2025[63]), goods and services that are high in value added are increasingly "intangible", meaning that their production is linked to workers' intrinsic motivation. Even in environments where routine tasks are measurable, qualities such as creativity, critical thinking and the determination to exceed minimal requirements give firms a competitive edge; however, these are not easily captured by the quantitative metrics used in algorithmic management tools (Milanez, Lemmens and Ruggiu, 2025[63]). Consequently, assessing individuals' information-processing skills in conditions that reveal their willingness to put in effort and motivation under low-stakes conditions can help countries identify the readiness of workers to remain competitive in a rapidly evolving work environment.

Recent research suggests that generative AI technologies may help to reduce disparities in cognitive ability by automating routine intellectual tasks (Dell'Acqua et al., 2023[64]). If the gap in basic information-processing skills is narrowed by such technological innovations, then differences in outcomes are more likely to be driven by how individuals engage with tasks, as well as whether they are able to harness these tools by deciding if tasks are within the ability frontier of AI applications. In this scenario, the willingness to work beyond standard requirements becomes the decisive factor in individual productivity and innovation. This shift underscores the growing importance of motivational engagement as a primary driver of success in modern workplaces.

Against this backdrop, performance in literacy and numeracy as measured in the Survey of Adult Skills declined between 2012 and 2023 – see Chapter 3 in the Survey of Adult Skills (OECD, 2024[47]). Such a decline may indicate a broader erosion of individuals' ability to solve tasks or a decrease in motivation and engagement with challenging cognitive tasks. Irrespective of the cause, this trend is problematic when the demands of the 21st-century economy increasingly require workers to exceed routine performance. If adults are less inclined to engage deeply with complex material under low-stakes conditions, both individual competitiveness and overall societal advancement may be adversely affected.

Literacy

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" (OECD, 2021, p. 42[49]). Given the prevalence of written communication in various aspects of life, proficiency in literacy is crucial for adults across their personal, social and professional spheres. Throughout the day, adults engage in diverse reading activities, from delving into extensive pieces of continuous text to swiftly scanning pages for pertinent information. These activities encompass reading emails, leaflets, timetables and instruction manuals.

Numeracy

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" (OECD, 2021, p. 19[49]). To succeed in work, life and citizenship, the skills

and knowledge needed have changed. Individuals are being presented with ever-increasing amounts of information of a quantitative or mathematical nature through internet-based or technology-based resources. This information has to be located, selected, filtered, interpreted, at times questioned and doubted, and analysed for its relevance to the responses needed.

Adaptive problem solving

Adaptive problem solving 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" (OECD, 2021, p. 19[49]). Adaptive problem solving captures the fact that individuals need to be vigilant to changes, adaptive and willing to modify their plans in pursuit of their goals. It comprises three key features that emphasise individuals' capacity to flexibly and dynamically adapt their problem-solving strategies to a dynamically changing environment; identify and select among a range of available physical, social and digital resources; and monitor and reflect on their progress in solving problems through metacognitive processes (i.e. the ability to calibrate one's comprehension of the problem, evaluate potential solutions and monitor progress towards the goals).

1.2.2. Willingness to delay gratification

The ability to delay gratification has long been recognised as a crucial determinant of individual and collective outcomes (Hanushek et al., 2025[65]). Willingness to delay gratification reflects how people trade off immediate benefits against potentially greater future gains, influencing personal savings, educational investment, health choices, retirement planning and many other domains of life (Chao et al., 2009[66]; Hunter et al., 2018[67]; Borghans and Golsteyn, 2006[68]; Kang and Ikeda, 2013[69]; Becker and Mulligan, 1997[70]; Ross and Mirowsky, 1999[71]). Access to high-speed internet and smartphones provides immediate gratification in the form of social media, news, entertainment and constant communication, conditioning users towards short-term rewards (Przybylski and Weinstein, 2012[72]). At the same time, rapid shifts in consumer services such as same-day delivery, instant food delivery apps and streaming media platforms foster expectations for immediacy, leading individuals to increasingly favour immediate satisfaction over long-term planning and restraint. Constant exposure to instant gratification may decrease individuals' ability to delay gratification, making the achievement of long-term goals more challenging. The modern workplace rewards employees who demonstrate long-term strategic planning, emotional intelligence and disciplined behaviour. Workers who can delay gratification are better able to persevere through challenging tasks, commit to long-term projects and invest in their professional development. Furthermore, personal growth demands the ability to delay immediate comfort for future gains. Whether acquiring new skills, pursuing health goals or achieving financial independence, delayed gratification underpins effective decision making, discipline and perseverance (Baumeister, Vohs and Tice, 2007[73]).

In the 2023 Survey of Adult Skills, respondents were asked to report how willing they would be to delay gratification, i.e. to give up something that is beneficial to them today in order to benefit more from it in the future (Falk et al., 2018[74]). The survey uses an 11-point scale ranging from (0) "completely unwilling to do so" to (10) "very willing to do so" (Falk et al., 2018[74]). This measure is easy to translate into different languages and cultural contexts. Because it does not specify what is being given up, it avoids a major criticism of the widely used "money earlier or later" (MEL) paradigm in which participants choose between monetary rewards at different points in time (Cohen et al., 2020[75]). With such time-preference experiments, empirical findings suggest that discount rates (the rate an individual is willing to delay gratification, with higher rates meaning less likely to delay) vary across different types of rewards, with primary rewards such as food being discounted more steeply than money. In other words, when given a choice between receiving something now or later, individuals are often less willing to delay gratification (or

apply a higher discount rate) for certain types of rewards; for example, they would be less willing to delay gratification for food than for money.

Individuals who are more willing to delay gratification often exhibit better academic performance, higher income levels and improved health outcomes than those less willing to delay gratification. This willingness to defer immediate rewards is closely linked to self-regulatory capacities that enable individuals to invest in education, adopt healthy lifestyles and plan effectively for retirement. In contrast, those who report lower willingness to delay gratification are more likely to engage in impulsive behaviours, potentially exacerbating long-term socio-economic inequalities and increasing health risks. Over generations, deficits in willingness to delay gratification can have a compounding effect, as children of parents with a low willingness to delay gratification may inherit or learn similar behaviours (Brenøe and Epper, 2022[76]), reinforcing existing disparities. If certain socio-demographic groups systematically exhibit a lower willingness to delay gratification, inequalities may widen in terms of wealth, employment, health, education and overall quality of life. Given that preferences and behaviours can be passed from one generation to the next, any existing disparities in willingness to delay gratification risk compounding over time.

1.2.3. Social and emotional skills

This report refers to behavioural tendencies as “social and emotional skills” (Kankaraš, 2017[77]; OECD, 2024[47]) rather than as “traits”. It does this to emphasise their malleability and teachability and to align with previous OECD work on children (OECD, 2024[78]) and adults (OECD, 2025[79]). In the context of this report, social and emotional skills refer to the Big Five personality traits of extraversion, emotional stability, agreeableness, conscientiousness and open-mindedness (Soto and John, 2017[80]). Contrary to popular belief, social and emotional skills are not fixed individual attributes but should be viewed as dispositions subject to change over time and amenable to concerted cultivation. What is common across the nine skills analysed in this report is that they are essential for adaptability, interpersonal effectiveness and long-term success in uncertain environments.

There is growing evidence that social and emotional skills have a profound influence on an individual’s academic performance, employability and capacity to adapt to rapidly shifting economic and technological landscapes. For example, conscientiousness has been linked to higher levels of achievement and dependable work habits, while openness to experience fosters innovation and receptivity to learning new skills, which are critical attributes in an age marked by the rise of AI. Meanwhile, emotional stability helps individuals cope with stress and uncertainty. Even outside of labour markets, social and emotional skills play a key role in maintaining healthy relationships and civic engagement, making them an integral component of public and social policy considerations (OECD, 2015[81]).

The social and emotional skills identified in the 2023 Survey of Adult Skills were measured using instruments originally developed in the context of the Big Five personality model, but there are differences between psychological studies that consider personality traits and social studies that adopt social and emotional skills as their preferred terminology, with the latter considering social and emotional skills in terms of functional capabilities and personality traits as behavioural tendencies (Steponavičius, Gress-Wright and Linzarini, 2023[82]). In the past, the promotion of social and emotional skills in educational contexts was driven by the aim of identifying vulnerabilities and deficits (Steponavičius, Gress-Wright and Linzarini, 2023[82]). By contrast, current studies of social and emotional skills stress their importance for obtaining positive outcomes and typically consider how these skills can enable young people to reach their ambitions (Kern et al., 2016[83]; Taylor et al., 2017[84]). There are important conceptual differences between how measurements of information-processing skills and socio-emotional skills are to be interpreted (e.g. whereas a higher literacy score is always better, the same is not true for higher extraversion “score”), which are discussed in the following section. The Reader’s Guide provides an overview of how the Big Five domains are measured.

1.2.4. Measurement and interpretative considerations

A critical conceptual difference exists between information-processing skills and social and emotional skills (a detailed explanation is provided in the Reader's Guide). Information-processing skills are often regarded as unidimensional because an increase in literacy, numeracy and adaptive problem solving is inherently beneficial. For example, more capacity to process information typically improves labour market outcomes, civic engagement and the ability to reach one's goals, implying that *"more is always better".* By contrast, the optimal level of social and emotional skills varies depending on context and over the life course. For instance, greater perseverance can be beneficial in some settings but may hinder flexibility in others; being highly agreeable can aid collaboration and teamwork but reduce one's ability to exert authority and achieve decisions in time sensitive, conflictual situations. Thus, the normative judgement of "more is better" does not apply to social and emotional skills. This is especially the case in the 21st century, where contexts are rapidly shifting and evolving because of uncertainty arising from crises and megatrends.

This context dependency underscores why a system aiming solely to maximise social and emotional skills may not be optimal. Instead, adaptability often emerges from a balance of different skills – both cognitive and social and emotional – in a diverse population. If uncertainty is a key feature of the 21st century, then adaptability becomes paramount. Megatrends demand a labour force skilled not just in abstract thinking – typical of information-processing skills – but also in social and emotional skills, enabling them to collaborate, innovate and modulate their responses to rapid changes.

From a measurement perspective, information-processing skills were assessed in the 2023 Survey of Adult Skills using a test specifically designed to distinguish individuals with different levels of proficiency, rather than relying on individuals' self-perceptions. The tasks within this test were developed to capture what it means to have different levels of literacy, numeracy and adaptive problem solving skills proficiency, thereby offering a more direct and accurate evaluation of these competencies. By contrast, willingness to delay gratification and social and emotional skills were assessed using self-reporting questionnaire instruments and are thus not objective assessments but rather reflect the image individuals have of themselves and the extent to which they believe those particular behavioural tendencies are seen as desirable by the people they value and in the circumstances they are generally exposed to. This difference, alongside the role of context, has implications for the cross-country comparability of different sets of skills. The measurement framework adopted to assess information-processing skills, and their unidimensional nature, means that a cross-country comparable scale could be established. This allows the identification of increasing levels of proficiency that reflect individuals' abilities to solve tasks of a particular level of difficulty. By contrast, social and emotional skills are context specific, and, as such, no cross-country comparable scale was established. As a result, although it is possible to establish whether an individual is more extroverted or more introverted than others within their country, it is not possible to compare levels of extraversion across countries. Similarly, because behavioural deviations from a country's standard behaviour are likely to be country specific, the variability in each social and emotional skill is constrained to be the same within each country. This means that it is not possible to derive absolute comparisons between countries in the levels and variability of social and emotional skills.

Table 1.1 details correlations between information-processing skills and social and emotional skills across OECD countries. Literacy, numeracy and adaptive problem solving are highly correlated: the average correlation between literacy and numeracy is 0.87, between literacy and adaptive problem solving is 0.86, and between numeracy and adaptive problem solving it is 0.84. By contrast, social and emotional skills appear to be little correlated with each other except for emotional stability and extraversion (correlation 0.20), conscientiousness and extraversion (0.22), conscientiousness and emotional stability (0.27), and conscientiousness and agreeableness (0.25). These estimates are in line with meta-analytic evidence and reflects the specific measurement tool adopted (self-rating and small number of questions per skill) (Park et al., 2020[85]). While Table 1.1 presents averages of country-specific correlation coefficients across OECD countries, patterns of relations can differ within countries. These results align with the literature on

information-processing skills and social and emotional skills, and guided the analytical approach used in this report to derive skills profiles based on the nine skills dimensions.

Table 1.1. Correlations between information-processing skills, delayed gratification, and social and emotional skills

OECD average, 2023

	Numeracy	Adaptive problem solving	Delayed gratification	Extraversion	Emotional stability	Agreeableness	Conscientiousness	Open-mindedness
Literacy	**0.87**	**0.86**	**0.17**	**0.03**	**0.06**	0.00	**-0.04**	**0.15**
Numeracy		**0.84**	**0.17**	**0.04**	**0.11**	**-0.03**	**-0.02**	**0.12**
Adaptive problem solving			**0.16**	**0.03**	**0.06**	**-0.03**	**-0.05**	**0.13**
Delayed gratification				**0.10**	**0.07**	**0.06**	**0.05**	**0.15**
Extraversion					**0.20**	0.01	**0.22**	**0.20**
Emotional stability						**0.15**	**0.28**	**0.04**
Agreeableness							**0.25**	**0.14**
Conscientiousness								**0.06**

Note: All coefficients are statistically significant at the 1% level except for those between literacy and agreeableness, and extraversion and agreeableness.

r is greater than 0.8; r is between 0.2 and 0.8; r is between 0.1 and 0.2; r is below 0.1

Source: Calculations based on OECD (2024[86]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/oihd7n

1.3. The nature of skills disparities

In today's rapidly changing economic landscape, skills disparities pose significant challenges to both labour market efficiency and broader economic growth. Market failures often mean that some individuals are not afforded the opportunities necessary to develop the skills increasingly needed for success in the 21st century. Disparities in skills development opportunities, stemming from unequal access to economic and cultural resources inherited from previous generations, have large social and economic costs. The economic costs of skills disparities are manifested through skills shortages, reduced productivity and ultimately lowered growth.

By examining observable gaps in skills across various population groups, this report considers how structural barriers and policy limitations currently hinder many individuals from realising their full potential. The inability to develop essential skills for the 21st century restricts innovation and economic dynamism, and exacerbates labour market imbalances. Addressing these failures can improve outcomes for individuals and serve the broader economic objectives of enhancing productivity and stimulating growth. Societies that constrain opportunities for social advancement for individuals with unfavourable circumstances do not make the most of the potential that exists in the population.

Disparities in the skills individuals possess and in the economic and social returns associated with these skills can arise because of factors that individuals can control – such as the choices they make – and those they cannot control – such as the characteristics of their parents. Identifying the role played by circumstances that lie beyond an individual's control, also referred to as the "accidents of birth", is critical

if skills policies are to effectively expand opportunities for all while respecting individuals' personal preferences and agency.

These issues have been explored by economists and political scientists. According to Roemer, success in life is broadly determined by two elements: "circumstances", over which individuals have no control and for which they should not be held responsible, and "effort", which represents factors within an individual's control (Roemer, 2012[87]). In an ideal meritocratic system, rewards should reflect effort rather than the advantages conferred by birth. Rawls (1971[88]) and Dworkin (1977[89]) have further contended that evaluating individual welfare requires looking at both outcomes and the processes leading to them, ensuring that personal responsibility is maintained while mitigating the undue influence of structural disadvantages. Amartya Sen's capability approach similarly emphasises that genuine equality of opportunity depends on enhancing individuals' abilities to pursue lives they value, rather than merely equalising access to resources (Sen, 1999[90]).

Empirical evidence supports the notion that people tend to accept disparities stemming from differential effort over those arising from unearned advantages (Benabou and Ok, 2001[91]; Fong, 2001[92]; Starmans, Sheskin and Bloom, 2017[93]). This behavioural preference underscores the importance of using neutral terminology – such as "disparities" – to describe gaps in skills. Unlike "inequality" and "inequity", which carry moral judgements of fairness, "disparities" simply denote observable differences between groups.

Nonetheless, the theoretical distinction between effort and circumstance is challenging in practice. An individual's background invariably shapes their capacity to exert effort by imposing physiological, psychological and material constraints. As Sapolsky has questioned, the very concept of free will is interwoven with these constraints, complicating the separation between choice and circumstance (Sapolsky, 2023[94]).

Philosophical debates on equality of opportunity provide a useful framework for understanding these issues. On the one hand, meritocratic ideals suggest that outcomes should reward genuine talent and hard work. On the other, sociological research reveals that structural factors can restrict individuals' choices and impede skill development. As such, market failures occur when structural barriers prevent individuals from realising their full potential, leading to skills shortages that have broader economic consequences in terms of lower growth and productivity.

This report distinguishes between two types of disparities. Within-group disparities refer to differences in skills among individuals sharing similar socio-demographic characteristics. Such variations can result from differences in talent, motivation or random life events. By contrast, between-group disparities arise from structural barriers and unequal access to opportunities, for example, differences in educational attainment or labour market outcomes between men and women or between individuals with socio-economic backgrounds. These disparities often stem from long-standing institutional practices and require targeted policy interventions.

The meritocratic ideal assumes that individual success is primarily a function of ability, effort and achievement. Yet, in practice, meritocratic systems may inadvertently perpetuate existing disparities if they overlook the structural constraints that limit some individuals' opportunities. Rapid digitalisation, the transition to a green economy and shifting demographic trends have amplified the importance of continually developing relevant skills. However, unequal access to economic and cultural resources across generations means that not everyone has the same opportunity to adapt to these changes. Lack of opportunities for skills development of certain population groups can contribute to labour shortages in high-growth sectors and undermine overall economic productivity.

From an economic perspective, addressing these disparities is not simply a question of fairness – it is a strategic imperative. By improving access to high-quality education and training, policymakers can enhance the productive capacity of the workforce, stimulate innovation and support sustainable economic growth. Moreover, targeted interventions can help to bridge the gap between structural disadvantages and

the demands of modern labour markets, ensuring that the benefits of technological and environmental transformations are more widely shared.

Equality of opportunity is achieved when the distribution of outcomes depends only on effort, rather than on circumstances. Identifying and enabling individuals to exert the effort they are capable of and to fully exploit the talents they have is at the core of the meritocratic ideal. According to proponents of meritocracy, the advantage of economic and social structures organised around this ideal is that it allows individuals to translate raw ability into positive outcomes through effort, without being constrained by society.

Individual responsibility should be maintained and rewarded because it is an important motivational driver at both the individual and social level, leading to innovation and growth. However, disparities that arise because of circumstances beyond individuals' control should be reduced because they harm social cohesion rather than enhance drive and motivation.

Analyses show that people's preferences for policy action to reduce socio-economic disparities in life outcomes reflect their beliefs about the role of effort rather than circumstances in explaining such outcomes (Alesina and Giuliano, 2011[95]), with individuals more accepting of inequality resulting from differential effort rather than unequal circumstances (Fong, 2001[92]). Even in contexts with high levels of economic disparities, when individuals believe that their children will be socially mobile and benefit from unequal resource distributions that will reward their effort, they refrain from supporting redistributive policies (Benabou and Ok, 2001[91]). From a behavioural perspective, individuals favour fair distributions – i.e. distributions that reflect the level of effort individuals put in to achieving certain outcomes – over equal distributions – i.e. distributions in which outcomes are the same irrespective of effort. In fact, when fairness and equality clash, people prefer fair inequality to unfair equality (Starmans, Sheskin and Bloom, 2017[93]). These insights underscore the importance of carefully distinguishing between the source of disparities observed in people's life outcomes and whether they arise from "choice factors" or from "accidents of birth".

The term "accidents of birth" highlights that differences in skills are observed across population groups – whether by gender, socio-economic background, migration history or other characteristics – and that these differences sometimes translate into varying returns, such as higher or lower pay and better or worse working conditions. The intention is not to dismiss concerns about fairness or the importance of equality of opportunity; rather, it is simply an acknowledgement that skills and their benefits vary for many reasons. Some of these reasons are likely linked to broader social structures or institutional practices, while others reflect the varied ways people exercise their own agency.

The extent to which individuals' skills vary across populations reflects the degree of skills inequality within societies, raising crucial questions about fairness and efficiency. To better understand the underlying dynamics of these disparities, it is essential to quantify not only the overall variation in a population's core 21st-century skills, but also to identify how much of this variance can be attributed to socio-demographic characteristics beyond individuals' control. In this report, these socio-demographic characteristics constitute gender, parental education and occupation, immigrant background, and childhood residential context.[4] These characteristics shape individuals' developmental trajectories, potentially forming opportunities for talent to flourish irrespective of effort.

To illustrate the role that "accidents of birth" play in shaping skills development and the returns to skills, this report examines key dimensions that reflect structural factors influencing individuals' opportunities to develop their skills. These dimensions include: parental education, parental occupation, gender, childhood residential context, immigrant background and age (which also reflects birth cohort effects). Each of these indicators provides insights into the socio-economic and cultural resources that are inherited at birth, and the extent to which market failures can restrict skill development.

1.3.1. Emergence of disparities in skills development and labour market outcomes

Disparities in skills development and how they translate into labour market outcomes can emerge through multiple pathways: educational access and quality, socio-economic barriers, discrimination and bias, and policy and institutional frameworks. Differential access to high-quality education and training programmes can result in significant skill gaps between different groups. Factors such as funding disparities, geographic location and availability of advanced coursework contribute to these disparities. Socio-economically disadvantaged individuals may face additional challenges in acquiring skills, including limited access to resources and financial constraints, which may lead them to combine the pursuit of education with part-time work or engagement in caregiving duties. Individuals living in poverty also suffer from higher stress levels (Brisson et al., 2020[96]) and poor nutrition (Vilar-Compte et al., 2021[97]), which can impede their cognitive, psychological and physical development (Black et al., 2008[98]; Bryan et al., 2004[99]; Lupien et al., 2009[100]). In severe cases, material deprivation and psychological trauma can limit individuals' ability to acquire skills. Systemic discrimination based on race, ethnicity, gender or other socio-demographic characteristics can hinder individuals' ability to attain and use their skills effectively in the labour market, resulting in unequal employment opportunities and outcomes. The design and implementation of skills policies play a critical role in either mitigating or exacerbating inequalities. Policies that fail to consider the diverse needs of different demographic groups may inadvertently reinforce existing disparities. The rapidly changing nature of skills demands in the 21st century can further entrench disparities if policies do not adapt to support continuous skills development among different groups.

Parental educational attainment and occupational status

Parental education and occupation are widely recognised as central determinants of the socio-economic environment into which an individual is born and develops. Higher parental education often correlates with greater access to information, networks and cultural capital, all of which can enhance a child's learning environment. Similarly, parental occupation reflects not only economic resources but also social status and the opportunities for parents to provide for their children's cognitive and social development. By identifying if the distribution of skills in the population varies systematically across individuals with parents who have different levels of educational attainment and occupational status, this report traces the transmission of advantages and disadvantages from one generation to the next, detailing some of the structural barriers that constrain skills development.

In this report, adults are categorised into two groups depending on the occupation their parents or guardians held when they were 14. The first group comprises adults with at least one parent/guardian who worked as a manager, professional, technician or associate professional (these are high-status occupations, classified as groups 1, 2 and 3 according to the occupational categories defined in the International Standard Classification of Occupations [ISCO]). The second group comprises adults with parents/guardians who worked as clerical support workers; service and sales workers; skilled agricultural, forestry and fishery workers; craft and related traded; plant and machine operators, and assemblers; and elementary occupations (these are low-status occupations, classified as ISCO occupation groups 4-9).[5]

Adults are also categorised into two groups depending on the educational attainment of their parents or guardians at the time respondents were age 14, as defined by the International Standard Classification of Education (ISCED) 2011. The first group comprises adults who have at least one parent/guardian with a tertiary-level qualification (ISCED levels 5, 6, 7 and 8). The second group comprises adults whose parents/guardians did not complete a tertiary-level degree. Educational attainment was assessed based on qualifications currently or formerly available in the country concerned, followed by the conversion from the national educational attainment levels to ISCED 2011.

Childhood residential context

The environment in which a person grows up – whether rural, small town or large city – plays a significant role in shaping access to quality education, opportunities to engage in extra-curricular activities, exposure to labour market opportunities and local economic resources. In some countries, non-urban settings may offer less in terms of resources and access to advanced educational programmes than urban centres, curtailing opportunities for skills development for individuals from these areas. In other countries, inner-city neighbourhoods may expose young people to economic deprivation. For some, this could be a motivational driver to change their circumstances, but for others, it may foster a lack of aspirations. By incorporating residential context, the analysis in this report acknowledges how geographic factors, often beyond individual control, contribute to long-term disparities in skills development and in the returns to skills. Residential context in childhood is captured by an indicator showing whether the respondent lived in a city, the suburbs/outskirts of a big city, a town, or a village/farm in the countryside at age 14.

Gender

Men and women continue to experience different educational and labour market trajectories. By analysing disparities in the skills men and women have, as well as differences in the labour market returns to skills, it is possible to consider some of the persistent barriers related to gender stereotypes, societal expectations and potential biases in access to education and training. Through this analysis, this report highlights the economic implications of these disparities.

Immigrant background

In terms of immigrant background, the focus of this report is on the children of immigrants, i.e. individuals who were born in the country in which they reside but whose parents were not, and those who were born in a different country and moved to their current country of residence as children (before the age of 18), but not those who migrated to their country of residence as adults. This captures another critical dimension of the “accidents of birth”, as for these individuals, migration was not a choice they made but a circumstance that shaped their life. Migration often comes with both challenges and opportunities, ranging from linguistic and cultural barriers to enhanced diversity and exposure to varied skill sets. This dimension is essential for understanding how inherited cultural capital and the integration process influence skills development and subsequent labour market outcomes. Because immigrant populations differ widely across countries and economies in terms of their size, composition and migration histories, average results on differences by immigrant background may, more than for other dimensions, differ greatly from results for specific countries or economies.

Age and birth cohort

Age serves as an important proxy not only for an individual’s life-course stage but also for the historical and economic context in which they were raised. Because the data used in the report are mostly cross-sectional, age generally reflects lifecycle effects, cohort-specific influences and period effects (namely the specific time at which the data were collected). Age differences reflect differences related to the ageing process but also differences across generations in education policy, technological advancements and economic conditions, which all contribute significantly to shaping the opportunities available to different generations to develop their skills and use them effectively in the labour market. This dual lens is crucial for identifying trends that may be masked if only one of these aspects is considered. In this report, adults are categorised into three groups depending on their age: 16-29, 30-49 and 50-65. The first category (16-to-29 year-olds) groups individuals who are in the “learning” phase. According to prior evidence, young adults generally improve their proficiency in information-processing skills up until their late 20s (Borgonovi

et al., 2017[101]; Paccagnella, 2016[102]). The second category (30-49 year-olds) groups prime-age workers, and the third category (50-65 year-olds) groups mature adults.

1.3.2. The local impact of crises and megatrends

Countries differ in how crises and megatrends have shaped their populations in the past and in how they are expected to continue shaping them in the future. For example, over the course of the 20th century, some countries have shifted from being primarily places of emigration to predominantly destinations for newcomers. Likewise, distinct patterns of urbanisation, educational participation and economic development have led to marked differences in population structures across countries and over time.

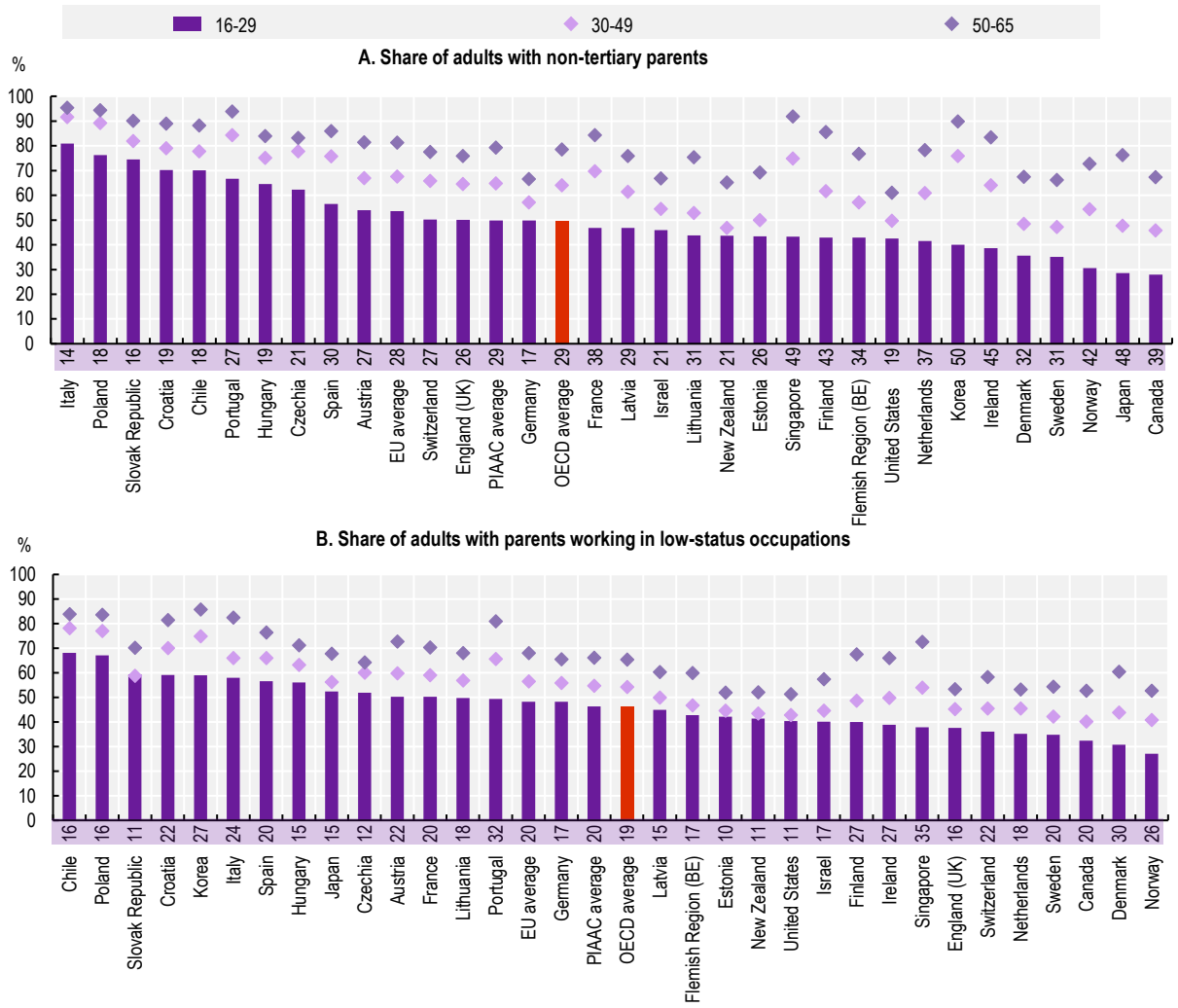
Given that the 2023 Survey of Adult Skills collects representative data on adult populations aged 16 to 65, it offers a unique opportunity to compare birth cohorts of population groups that are often central to skills interventions and whose prevalence has changed over the course of the second part of the 20th century and the first quarter of the 21st century. These groups may not participate equally in skills development, may encounter barriers to labour market entry or broader social engagement, or may receive uneven rewards for their skill sets.

When comparing cohorts of individuals born between 1958 and 2007, all countries and economies participating in the 2023 Survey of Adult Skills experienced a decline in the share of individuals classified as socio-economically disadvantaged, as measured by parental education (Figure 1.3, Panel A) and occupation (Panel B). On average across OECD countries for which data are available, 79% of adults born between 1958 and 1973 (aged between 50 and 65 in 2023) did not have a tertiary-educated parent. This share stood at 49% for adults born between 1994 and 2007 (aged between 16 and 29 in 2023). Some of the most pronounced decreases in the proportion of individuals without tertiary-educated parents are observed in East Asian countries such as Japan, Korea and Singapore, while smaller decreases appear in Germany, Italy and the Slovak Republic. Similarly, on average across OECD countries, the share of individuals with parent(s) working in low-status occupations dropped from 65% for individuals born between 1958 and 1973 to 46% for those born between 1994 and 2007. This share decreased in all 31 countries and economies participating in the 2023 Survey of Adult Skills, with the largest changes in Denmark, Portugal and Singapore, and the smallest in Estonia, New Zealand and the Slovak Republic.

Urbanisation has led to internal migration from rural to urban settings. On average across OECD countries with available data, the share of individuals who spent their formative years on a farm or in a rural environment declined from 39% among adults born between 1958 and 1973 (aged between 50 and 65 in 2023) to 30% among adults born between 1994 and 2007 (aged between 16 and 29 in 2023) (Figure 1.4, Panel A). By contrast, the proportion of individuals who grew up in towns or small cities rose from 28% among the older cohorts to 33% among the younger cohort (Panel B), and the share of those raised in large cities or their suburbs increased from 33% to 37% (Panel C). However, not all countries experienced similar patterns.

These patterns of internal migration have implications for skills development. Rural to urban shifts influence educational and labour market opportunities, with larger metropolitan areas often offering broader access to advanced training and employment options. Ensuring that those in rural areas are not disadvantaged requires addressing gaps in infrastructure, digital connectivity and local training programmes. Similarly, rapid urban growth can strain existing systems in towns and cities, underscoring the need for policies that distribute resources and services proportionately, enabling both older and younger residents to acquire relevant skills for a changing labour market.

Figure 1.3. Share of adults, by parental education, occupation and age



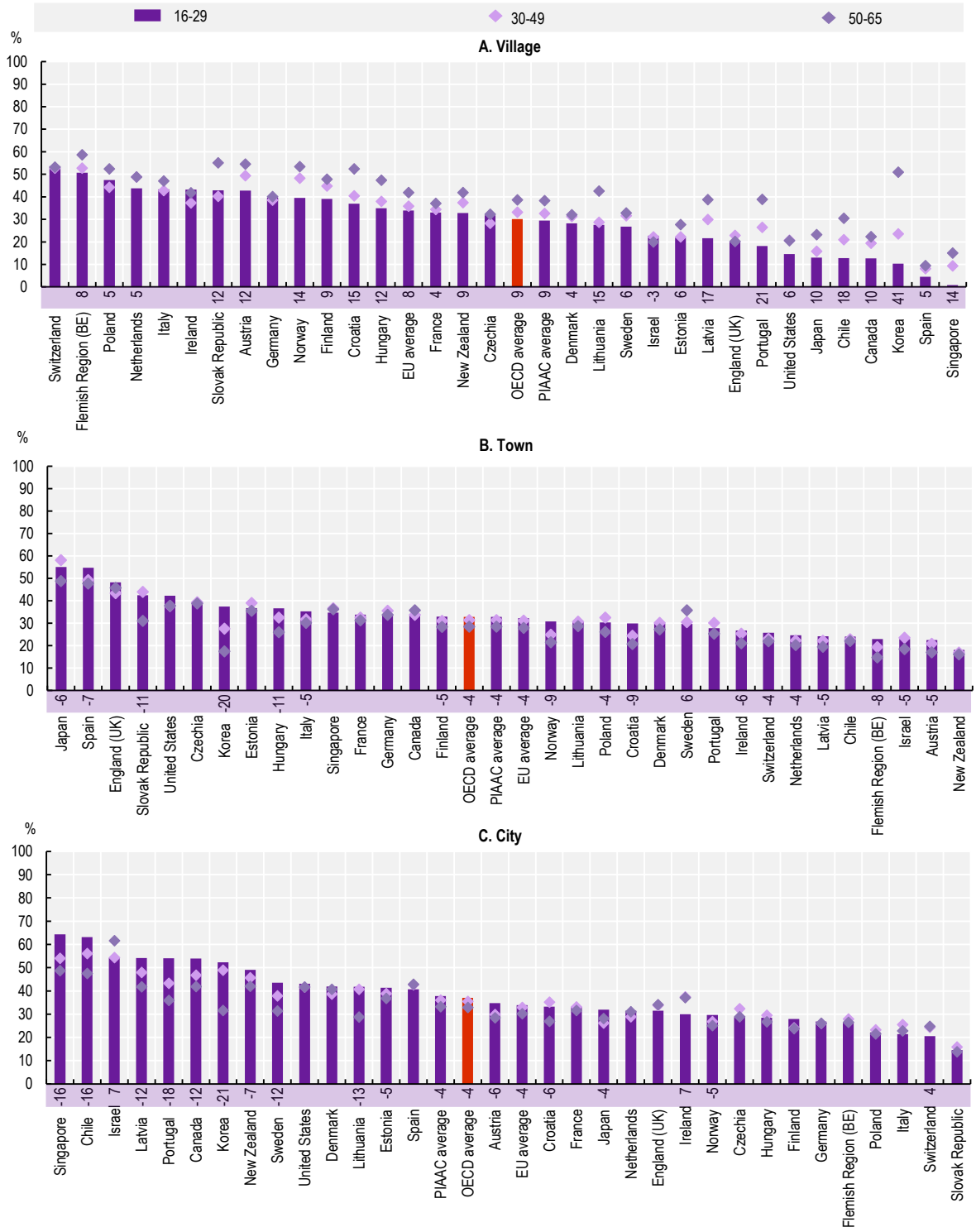
Note: Panel A: Differences between the shares of 50-65 year-olds and 16-29 year-olds are shown next to country names. All differences are statistically significant. Parental education (at respondents' age 14) distinguishes between adults with at least one parent who attained tertiary qualifications (ISCED 2011 5, 6, 7 and 8) and those with no parent educated at the tertiary level. Panel B: Differences between the shares of 50-65 year-olds and 16-29 year-olds are shown next to country names. All differences are statistically significant. Parental occupation (at respondents' age 14) is based on the International Classification of Occupations (ISCO) and grouped into high-status: managers, professionals, and technicians and associate professionals (ISCO 1-3); and low-status: clerical support workers; service and sales workers; skilled agricultural, forestry and fishery workers; craft and related trades workers; plant and machine operators, and assemblers; and elementary occupations (ISCO 4-9).

Countries and economies are ranked in descending order of the share of 16-29 year-olds.

Source: OECD (2024[48]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

StatLink https://stat.link/uvm1ns

Figure 1.4. Share of adults, by childhood residential context and age



Note: Statistically significant differences between the shares of 50-65 year-olds and 16-29 year-olds are shown next to country and economy names. Childhood residential context (at respondents' age 14) refers to whether the respondent grew up in a village, town or city.
Countries and economies are ranked in descending order of the share of 16-29 year-olds.
Source: OECD (2024[48]), *PIAAC data and* methodology, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

StatLink https://stat.link/wgm5bi

1.4. The role of policy making in addressing skills disparities

The analyses presented in this report indicate that skills disparities remain pervasive across OECD countries, carrying significant consequences for individuals and economies. Core 21st-century skills – literacy, numeracy and adaptive problem solving – as well as social and emotional skills and willingness to delay gratification, remain unevenly distributed across groups, as explored in Chapter 2. There are also unequal opportunities in education and training throughout the life course, which often widen initial skills gaps, as those with advantaged socio-economic backgrounds attain more and higher-quality education and participate more in upskilling over time, as explored in Chapter 3. The analyses also show that skills disparities translate into pronounced differences in labour market outcomes, with important inefficiencies in how talent is developed and used, as explored in Chapter 4.

Together, these findings highlight a dual challenge for policymakers: first, to broaden access to skills development from early childhood into adulthood, and second, to ensure that those skills are effectively matched to productive and rewarding jobs. Meeting this challenge is essential for both equity and economic growth. Inequalities in skills and opportunity not only undermine fairness but also impede economic potential by wasting talent and hampering productivity growth. By inhibiting social mobility and the efficient allocation of talents, inequality of opportunities may trigger slower growth (Soldani et al., 2024[103]). Expanding access to quality education from childhood and upskilling throughout working lives is key to achieving more inclusive growth.

The discussion of policy actions in this chapter is structured around critical policy domains spanning the lifecycle – from early childhood education to formal schooling, lifelong adult learning systems, and career guidance and labour market practices – reflecting the need for a comprehensive, system-wide response. For each domain, targeted policies that can narrow skills gaps, address inefficiencies in skill development and matching, and promote both greater equity and stronger economic performance are discussed. Examples of best practices from across the OECD are explored to illustrate how countries can tackle these challenges in practice. The overarching message is clear: closing skills disparities and improving skills matching is not only a social imperative but also an economic necessity in the 21st century, one that requires co-ordinated action from education systems, employers and governments to unlock the full productive capacity of communities.

1.4.1. Skills disparities from early childhood through to adulthood: Key findings

Skills are a strong predictor of success in modern knowledge-driven economies. Initial skills disparities related to socio-demographic circumstances beyond an individual's control – such as gender, parental education and occupation, childhood residential context, and immigrant background – strongly shape 21st-century skills acquisition, as revealed in Chapters 2 and 3. Although such disparities are widespread across countries, the size of the gaps varies greatly, suggesting that policy action and interventions can reduce the depth of the disadvantage faced by specific population groups.

The uneven distribution of skills results in unequal employment opportunities and outcomes in the labour market: workers with higher proficiency in literacy, numeracy and adaptive problem solving are more likely to be employed and, once employed, tend to earn significantly more. For example, other things being equal, a one standard deviation (SD) increase in numeracy proficiency is associated with about 5% higher hourly earnings (see Chapter 4, Table 4.2, Column 5). Similarly, higher educational qualifications are associated with markedly higher earnings: adults with an upper secondary qualification with a vocational orientation earn 3% more than otherwise similar adults who have not completed upper secondary education (see Chapter 4, Table 4.2, Column 5). Groups with lower skills and who did not pursue advanced qualifications face severe disadvantages in the labour market, with most disparities in employment rates and wages across socio-economic groups explained by differences in skills and engagement in lifelong learning. For example, adults whose parents did not attain tertiary education are less likely to be employed

(78% employment rate) than those with tertiary-educated parents (86%), but there is almost no difference after controlling for individuals' own education and skills (see Chapter 4, Figure 4.1).

Age

Across OECD countries, mature adults (50-65 year-olds) have lower core 21st-century skills than young adults (16-29 year-olds). For example, on average across OECD countries, 50-65 year-olds have a numeracy proficiency that is 0.36 SD lower than the proficiency of 16-29 year-olds. Age-related differences in 21st-century skills are especially pronounced in Chile and Singapore, where mature adults score 0.89 SD lower than their younger counterparts, whereas in New Zealand and Sweden, mature adults score at the same level as younger adults (Table 1.2).These differences reflect expansions in educational opportunities in past decades and the fact that many young adults are actively engaged in skills development because they are still students or participate in non-formal learning.

Large skills gaps between individuals with different socio-economic backgrounds and gender emerge early and often widen as individuals age. For example, children from socio-economically disadvantaged families already lag behind their more advantaged peers in core skills in primary school: by age 10, on average across OECD countries, the difference in numeracy proficiency between children with and without tertiary-educated parents is 0.64 SD, ranging from 0.34 SD in the Denmark to 1.06 SD in Hungary (Table 1.2). As students progress through compulsory schooling, schools in most countries play an equalising role, partly narrowing initial gaps in core 21st-century skills such as literacy and numeracy. For example, for the same cohort of students as above, the average gap by age 15 was 0.42 SD, standing at 0.60 SD in the Czech Republic (hereafter 'Czechia') but only 0.26 SD in Denmark (Table 1.2).

Table 1.2. Snapshot of skills disparities, by age

Country	Numeracy		Educational attainment	Adult education and training	Disparities in achievement growth					
	Score-point difference (std.) (50-65 minus 16-29)	Score-point difference (std.) (50-65 minus 30-49)	Percentage-point difference (50-65 minus 30-49)		Mathematics		Mathematics		Reading	
			Bachelor's degree or above	Participation rate	Score-point difference (std.) (tertiary-educated minus non-tertiary educated parents)[2]		Score-point difference (std.) (boys minus girls)[2]			
	Mean, unadjusted[1]	Mean, unadjusted[1]			Age 10	Age 15	Age 10	Age 15	Age 10	Age 15
OECD average	-0.36	-0.33	-14	-13	0.64	0.42	0.07	0.10	-0.24	-0.18
Austria	-0.51	-0.39	-14	-15					-0.20	-0.08
Canada	-0.37	-0.35	-16	-22	0.50	0.40	0.12	0.13	-0.24	-0.16
Chile	-0.89	-0.62	-16	-20	0.75	0.27	0.02	0.18	-0.06	-0.20
Croatia	-0.29	-0.19	-16	-12						
Czechia	-0.33	-0.31	-9	-14	0.78	0.60	0.10	0.08	-0.28	-0.14
Denmark	-0.31	-0.37	-20	-12	0.34	0.26	0.08	0.13	-0.20	-0.18
England (UK)	-0.36	-0.24	-16	-7			0.09	0.16	-0.16	-0.21
Estonia	-0.62	-0.55	-12	-18						
Finland	-0.43	-0.62	-21	-17	0.44	0.36	-0.13	-0.05	-0.44	-0.30
Flemish Region (BE)	-0.24	-0.33	-12	-16	0.56	0.52	0.08	0.09	-0.26	-0.14

Country	Numeracy		Educational attainment	Adult education and training	Disparities in achievement growth					
	Score-point difference (std.) (50-65 minus 16-29)	Score-point difference (std.) (50-65 minus 30-49)	Percentage-point difference (50-65 minus 30-49)		Mathematics		Mathematics		Reading	
			Bachelor's degree or above	Participation rate	Score-point difference (std.) (tertiary-educated minus non-tertiary educated parents)[2]		Score-point difference (std.) (boys minus girls)[2]			
	Mean, unadjusted[1]	Mean, unadjusted[1]			Age 10	Age 15	Age 10	Age 15	Age 10	Age 15
France	**-0.59**	**-0.54**	**-15**	**-15**	**0.73**	**0.43**	**0.08**	**0.11**	**-0.20**	**-0.11**
Germany	**-0.30**	**-0.21**	**-6**	**-14**			0.05	**0.12**	**-0.19**	**-0.16**
Hungary	**-0.25**	**-0.33**	**-12**	**-13**	**1.06**	**0.47**	0.08	**0.16**	**-0.17**	**-0.18**
Ireland	**-0.41**	**-0.29**	**-19**	**-13**	**0.64**	**0.31**	0.06	**0.14**	**-0.18**	**-0.16**
Israel	**-0.36**	**-0.38**	**-10**	**-8**					**-0.22**	**-0.19**
Italy	**-0.30**	**-0.19**	**-9**	**-8**	**0.48**	**0.28**	**0.27**	**0.23**	**-0.19**	**-0.10**
Japan	**-0.33**	**-0.30**	**-13**	**-11**	**0.61**	**0.49**	-0.01	**0.10**		
Korea	**-0.70**	**-0.51**	**-22**	**-3**	**0.68**	**0.46**	**0.10**	0.05		
Latvia	**-0.48**	**-0.42**	**-14**	**-20**						
Lithuania	**-0.32**	**-0.22**	**-15**	**-10**	**0.75**	**0.49**	-0.03	**0.06**	**-0.30**	**-0.28**
Netherlands	**-0.40**	**-0.27**	**-16**	**-14**			**0.11**	**0.12**	**-0.25**	**-0.15**
New Zealand	0.06	-0.13	**-11**	**-10**			0.03	**0.11**	**-0.25**	**-0.30**
Norway	**-0.23**	**-0.22**	**-16**	**-15**			-0.05	-0.01	**-0.41**	**-0.30**
Poland	**-0.38**	**-0.27**	**-21**	**-11**	**0.67**	**0.58**	0.02	0.06	**-0.28**	**-0.25**
Portugal	**-0.52**	**-0.41**	**-16**	**-21**	**0.74**	**0.50**	**0.15**	**0.12**	**-0.20**	-0.02
Singapore	**-0.89**	**-0.62**	**-30**	**-18**						
Slovak Republic	-0.05	**-0.08**	**-11**	**-11**	**0.84**	**0.46**	**0.15**	0.01		
Spain	**-0.24**	**-0.17**	**-7**	**-13**	**0.52**	**0.37**	**0.16**	**0.11**	**-0.25**	**-0.12**
Sweden	0.02	**-0.12**	**-15**	**-12**	**0.50**	**0.35**	-0.01	0.02	**-0.36**	**-0.21**
Switzerland	**-0.46**	**-0.28**	**-10**	**-13**						
United States	**-0.14**	**-0.19**	**-8**	**-11**			**0.09**	**0.14**	**-0.21**	**-0.11**

Note: Numbers in bold indicate that the respective indicator of a specific country is significantly different from zero at the 5% level. Parental education (at respondents' age 14) is based on the International Standard Classification of Education (ISCED) 2011 and grouped into tertiary-educated (having at least one parent who had attained tertiary education [ISCED 5, 6, 7 and 8]) and non-tertiary-educated parents.

1. Unadjusted differences in numeracy are the differences between the two averages for each contrast category.
2. Achievement growth in mathematics at age 10 and 15 is based cohorts born 2004/2005.

A country's performance is statistically significantly above the OECD average at the at the 5% level.

A country's performance is statistically significantly below the OECD average at the at the 5% level.

Source: Calculations based on OECD (2024[104]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html; IEA (2011[105]), *TIMSS 2011 Grade 4 Database*, https://doi.org/10.58150/IEA_TIMSS_2011_G4; IEA (2015[106]), *TIMSS 2015 Grade 4 Database*, https://doi.org/10.58150/IEA_TIMSS_2015_G4; OECD (2018[107]), *PISA 2018 Database*, www.oecd.org/pisa/data/2018database/; and OECD (2022[108]), *PISA 2022 Database*, www.oecd.org/en/data/datasets/pisa-2022-database.html.

StatLink https://stat.link/mny68s

Socio-economic background

Once formal schooling ends, skills disparities between different socio-economic groups widen during youth and adulthood, reflecting differences in formal and informal learning opportunities. Individuals from advantaged backgrounds are more likely to complete tertiary educational qualifications, select into fields of study with high labour market returns and engage in continuous adult learning, whereas disadvantaged individuals more often end their education earlier and have fewer upskilling opportunities. This cumulative advantage means that education pathways, and who gains and maintains skills throughout life, still critically depends on family resources.

Disparities in access to adult-learning opportunities mean that highly skilled workers, who often have an advantaged upbringing, keep improving their skills while those with lower levels of skills proficiency risk falling further behind, a pattern that tends to reinforce existing disparities. Socio-economic differences in adult learning largely stem from structural factors such as educational pathways and job contexts. Workers in occupations that do not typically require advanced qualifications at entry or who work in occupations with a large share of precarious employment contracts have fewer training opportunities offered by employers and face more barriers (e.g. cost, time, lack of information) to pursuing learning themselves. Meanwhile, adults with strong foundations and resources are often more able and motivated to engage in continuous learning, and employers tend to invest more in their training. The content of training also differs, with adults from disadvantaged backgrounds over-represented in narrow, job-specific courses, whereas adults from advantaged backgrounds more often pursue courses that develop skills such as management, foreign languages or advanced information and communication technology (ICT). In short, early disparities tend to compound over time: initial gaps in schooling lead to different employment and training trajectories, which then further widen the skills divide in adulthood.

Disparities in skills development and educational qualifications are a major channel through which socio-economic advantage (or disadvantage) is passed across generations, with spillover effects onto employment prospects. Wage disparities between those from high and low socio-economic backgrounds shrink dramatically when accounting for skills differences: adults with tertiary-educated parents on average earn 9% more than those without tertiary-educated parents – a difference that is fully explained by differences between the two groups in skills and educational qualifications (Table 1.3). It is important to note, however, that the regression models for parental education and parental occupation each control for the other. Because these two dimensions of socio-economic background are closely linked (the average correlation across OECD countries is around 0.5) this approach may understate the full effect of family background. In statistical terms, this reflects multicollinearity between highly correlated predictors, which can lead to attenuation bias and smaller estimated coefficients. In practice, many individuals experience overlapping disadvantages across parental education and occupation, meaning that the cumulative impact of social origin on skills and earnings is often stronger than what each measure in isolation suggests.

Table 1.3. Snapshot of skills disparities, by parental education

Country	Numeracy				Educational attainment	Adult education and training	Wage gap	
	Score-point difference (std.) (tertiary minus non-tertiary educated parents)				Percentage-point difference (tertiary minus non-tertiary educated parents)		Percentage change in hourly earnings associated with tertiary-educated parents (ref.: non-tertiary educated parents)	
	Mean, unadjusted[1]	Mean, adjusted[2]	10th percentile	90th percentile	Bachelor's degree or equivalent or above	Participation rate	Basic adjusted[3]	Fully adjusted[4]
OECD average	**0.53**	**0.12**	**0.68**	**0.00**	**35**	**15**	**10.6**	0.7
Austria	**0.56**	0.09	**0.71**	**0.34**	**35**	**13**	**8.9**	0.7
Canada	**0.48**	0.08	**0.64**	**-0.57**	**26**	**13**	**13.4**	**6.0**
Chile	**0.68**	0.08	**0.78**	**0.98**	**34**	**22**	**21.2**	-1.4
Croatia	**0.47**	0.10	**0.57**	**-1.09**	**41**	**22**	**9.5**	1.2
Czechia	**0.52**	0.06	**0.48**	**-2.11**	**34**	**13**	6.2	-1.1
Denmark	**0.43**	0.03	**0.62**	**-0.67**	**30**	**12**	**4.4**	0.0
England (UK)	**0.47**	**0.14**	**0.61**	**-0.61**	**30**	**12**	2.8	-6.8
Estonia	**0.52**	**0.14**	**0.62**	**-0.87**	**27**	**11**	**15.5**	**7.2**
Finland	**0.53**	**0.14**	**0.70**	**0.20**	**28**	**10**	**9.1**	3.2
Flemish Region (BE)	**0.57**	**0.12**	**0.85**	**1.93**	**36**	**18**	**6.5**	-0.2
France	**0.65**	**0.14**	**0.92**	**2.76**	**37**	**13**	1.9	**-5.5**
Germany	**0.61**	**0.22**	**0.92**	**2.76**	**29**	**15**	**9.5**	0.6
Hungary	**0.74**	**0.15**	**0.88**	**2.70**	**43**	**21**	**16.0**	3.8
Ireland	**0.49**	**0.14**	**0.65**	**-0.29**	**34**	**16**	**12.9**	-0.5
Israel	**0.58**	**0.17**	**0.74**	**0.66**	**32**	**18**	**21.3**	6.6
Italy	**0.53**	0.09	**0.78**	**0.84**	**53**	**33**	13.9	0.4
Japan	**0.43**	0.05	**0.55**	**-1.70**	**27**	**15**	**5.6**	0.0
Korea	**0.58**	**0.16**	**0.70**	**0.34**	**44**	**4**		
Latvia	**0.59**	**0.24**	**0.66**	**-0.27**	**32**	**17**	**13.7**	1.2
Lithuania	**0.46**	**0.15**	**0.50**	**-2.83**	**32**	**18**	**10.7**	0.1
Netherlands	**0.49**	**0.11**	**0.63**	**-0.56**	**34**	**10**	7.2	-2.4
New Zealand	**0.64**	**0.24**	**0.88**	**1.27**	**31**	**10**	10.2	-3.0
Norway	**0.41**	**0.13**	**0.53**	**-1.96**	**32**	**8**	3.0	-3.5
Poland	**0.46**	0.01	**0.47**	**-1.55**	**54**	**15**	11.2	1.3
Portugal	**0.80**	**0.20**	**1.07**	**2.66**	**52**	**26**	**19.0**	4.0
Singapore	**0.72**	**0.13**	**1.10**	**5.42**	**47**	**20**	**29.3**	4.0
Slovak Republic	**0.38**	0.04	**0.46**	**-2.15**	**44**	**18**	**6.3**	-0.7
Spain	**0.34**	-0.02	**0.45**	**-2.50**	**33**	**15**	**13.6**	3.0
Sweden	**0.35**	**0.09**	**0.36**	**-2.65**	**22**	**6**	3.7	0.5
Switzerland	**0.48**	**0.11**	**0.78**	**1.18**	**32**	**15**	**12.1**	2.9
United States	**0.70**	**0.19**	**0.77**	**0.82**	**31**	**22**	**21.2**	0.0

Note: Numbers in bold indicate that the respective indicator of a specific country is significantly different from zero at the 5% level. Parental education (at respondents' age 14) is based on the International Standard Classification of Education (ISCED) 2011 and grouped into tertiary-educated (having at least one parent who had attained tertiary education [ISCED 5, 6, 7 and 8]) and non-tertiary-educated parents.
1. Unadjusted differences are the differences between the two averages for each contrast category.
2. Adjusted differences are based on a regression model that takes into account differences associated with gender, age, parental occupation, childhood residential context, immigrant background and respondents' educational attainment.
3. Basic adjusted differences in hourly earnings are adjusted for differences in gender, age, parental occupation, childhood residential context, immigrant background. Korea is not included in these estimates.
4. Fully adjusted differences in hourly earnings are adjusted for differences in gender, age, parental occupation, childhood residential context, immigrant background, respondents' educational attainment, skills, volunteering activities, and participation in non-formal adult education and training. Korea is not included in these estimates.
A country's performance is statistically significantly above the OECD average at the at the 5% level.
A country's performance is statistically significantly below the OECD average at the at the 5% level.
Source: Calculations based on OECD (2024[104]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/b2kxet

Unequal participation in education and training after the end of compulsory schooling is rooted in different skills levels, as well as choices and opportunities, and is a major driver of widening skills disparities between individuals with different socio-economic backgrounds. Individuals from more advantaged socio-economic backgrounds not only tend to study longer (achieving higher formal qualifications), but they also often study differently, choosing fields and formats that yield greater skills payoff. For example, 62% of adults whose parents had high-status professions attain a bachelor's degree or higher compared to only 14% of adults whose parents had low-status professions (see Chapter 3, Figure 3.7).

There are also striking disparities in adult learning between those from different socio-economic backgrounds. Adults whose parents had high-status professions are 14 percentage points more likely to participate in non-formal learning than adults whose parents had low-status professions, a difference that was larger than 20 percentage points in Italy and as low as 4 percentage points in Korea (Table 1.4).

Gender

Girls outperform boys in reading during secondary school, but this advantage diminishes in adulthood. For boys, their advantage in numeracy grows larger from adolescence into adulthood. These patterns point to "sticky floors" and "glass ceilings" in skills development – i.e. lower-skilled groups (often those from low socio-economic backgrounds or certain minority groups) struggle to rise from the bottom, and some high-skilled groups (e.g. women) face barriers in reaching the very top skills levels. Even though women are more likely than men to pursue advanced educational qualifications, they are less likely to pursue educational trajectories in science, technology, engineering and mathematics (STEM) fields. For example, on average across OECD countries, women are 28 percentage points less likely than men to have completed bachelor's or more advanced programmes with a STEM orientation and 52 percentage points less likely to have completed vocational programmes with a STEM orientation. The difference between men and women in participation in bachelor programmes is the smallest in Portugal, at 19 percentage points, and the largest in Germany, where it is as high as 40 percentage points. Disparities in participation in VET courses are largest in Canada, the Flemish Region (Belgium) and New Zealand and smallest in Israel (Table 1.5).

Women are less likely than men to be employed and, when employed, earn less than men. These differences remain pronounced even when differences in skills and qualifications are accounted for. After controlling for socio-demographic characteristics, on average across OECD countries, men are 8 percentage points more likely to be employed than women (Chapter 4, Table 4.1). In addition, women earn roughly 16% less per hour than men on average – a gap that remains large even after controlling for educational attainment and skills proficiency (Table 1.5). This implies that factors beyond skills – such as

occupational stereotypes, discrimination, differences in work hours or caregiving responsibilities and access to information and to opportunities – play a significant role in explaining gender labour market disparities. Women and men tend to work in different jobs and industries, with women-majority occupations often paying less than men-majority occupations, even when they have similar skills requirements. On average, around 13% of women work in men-majority occupations and 15% of men work in women-majority occupations. These patterns reinforce wage gaps, as fields with more men (such as technology or engineering) usually offer higher wages than fields with more women (such as care and education) at equivalent skills levels (Table 1.5).

Table 1.4. Snapshot of skills disparities, by parental occupation

Country	Numeracy			Educational attainment	Adult education and training	Occupational status		
	Score-point difference (std.) (high-status minus low-status parental occupation)			Percentage-point difference (high-status minus low-status parental occupation)		Percentage-point difference of respondents working in high-status occupations (high-status minus low-status parental occupation)	Percentage of adults working in higher socio-economic status occupations than their parents	Percentage of students aged 15 expecting to work in higher socio-economic status occupations than their parents
	Mean, unadjusted[1]	10th percentile	90th percentile	Bachelor's degree or equivalent or above	Participation rate			
OECD average	0.51	0.62	0.42	48	14	21	42	38
Austria	0.55	0.60	0.48	36	15	26	42	41
Canada	0.47	0.55	0.36	40	12	14	38	31
Chile	0.68	0.79	0.54	51	19	20	51	62
Croatia	0.39	0.45	0.33	52	16	24	50	47
Czechia	0.49	0.46	0.45	46	11	20	34	40
Denmark	0.49	0.68	0.37	46	13	18	40	22
England (UK)	0.54	0.73	0.44	39	12	16	40	34
Estonia	0.51	0.63	0.42	55	12	19	37	37
Finland	0.50	0.63	0.39	55	12	20	43	31
Flemish Region (BE)	0.56	0.81	0.41	58	15	21	46	44
France	0.64	0.84	0.47	41	13	21	48	40
Germany	0.60	0.84	0.49	49	14	23	45	40
Hungary	0.65	0.75	0.58	60	20	33	43	38
Ireland	0.41	0.48	0.36	48	14	18	46	28
Israel	0.56	0.70	0.47	58	15	19	40	31
Italy	0.49	0.55	0.43	37	21	23	47	53
Japan	0.37	0.50	0.25	31	11	13	40	41
Korea	0.36	0.43	0.29	43	4	18	50	38
Latvia	0.53	0.60	0.46	54	15	16	42	42
Lithuania	0.39	0.42	0.39	55	13	23	40	38
Netherlands	0.49	0.67	0.39	47	9	19	43	34

Country	Numeracy			Educational attainment	Adult education and training	Occupational status		
	Score-point difference (std.) (high-status minus low-status parental occupation)			Percentage-point difference (high-status minus low-status parental occupation)		Percentage-point difference of respondents working in high-status occupations (high-status minus low-status parental occupation)	Percentage of adults working in higher socio-economic status occupations than their parents	Percentage of students aged 15 expecting to work in higher socio-economic status occupations than their parents
	Mean, unadjusted[1]	10th percentile	90th percentile	Bachelor's degree or equivalent or above	Participation rate			
New Zealand	**0.62**	**0.74**	**0.49**	**40**	**14**	**17**	**39**	**28**
Norway	**0.42**	**0.52**	**0.33**	**53**	**6**	**17**	**42**	**24**
Poland	**0.40**	**0.48**	**0.38**	**61**	**14**	**35**	**44**	**40**
Portugal	**0.66**	**0.84**	**0.52**	**54**	**22**	**28**	**44**	**49**
Singapore	**0.60**	**0.89**	**0.35**	**50**	**15**	**19**	**56**	**28**
Slovak Republic	**0.33**	**0.40**	**0.29**	**50**	**20**	**27**	**40**	**44**
Spain	**0.34**	**0.42**	**0.25**	**39**	**14**	**18**	**45**	**47**
Sweden	**0.44**	**0.52**	**0.36**	**44**	**8**	**19**	**37**	**25**
Switzerland	**0.55**	**0.76**	**0.39**	**51**	**13**	**19**	**42**	**36**
United States	**0.67**	**0.67**	**0.65**	**49**	**18**	**19**	**39**	**38**

Note: Numbers in bold indicate that the respective indicator of a specific country is significantly different from zero at the 5% level. Parental occupation (at respondents' age 14) is based on the International Classification of Occupations (ISCO) and grouped into high-status: managers, professionals, and technicians and associate professionals (ISCO 1-3); and low-status: clerical support workers; service and sales workers; skilled agricultural, forestry and fishery workers; craft and related trades workers; plant and machine operators, and assemblers; and elementary occupations (ISCO 4-9).

1. Unadjusted differences are the differences between the two averages for each contrast category.

A country's performance is statistically significantly above the OECD average at the at the 5% level.

A country's performance is statistically significantly below the OECD average at the at the 5% level.

Source: Calculations based on OECD (2024[104]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/kpojtd

Table 1.5. Snapshot of skills disparities, by gender

Country	Numeracy			STEM-focused education		Occupations		Gender wage gap	
	Score-point difference (std.) (men minus women)			Percentage point difference in enrolment (men minus women)		Percentage in occupations		Percentage change in hourly earnings associated with men (ref.: women)	
	Mean, unadjusted[1]	10th percentile	90th percentile	Upper and post-secondary (vocational)	Bachelor's degree or above	Men in women-majority	Women in men-majority	Basic adjusted[2]	Fully adjusted[3]
OECD average	**0.17**	**0.05**	**0.28**	**52**	**28**	**15**	**13**	**14.5**	**16.0**
Austria	**0.26**	**0.22**	**0.30**	**54**	**25**	**15**	**11**	**17.8**	**16.8**

Country	Numeracy			STEM-focused education		Occupations		Gender wage gap	
	Score-point difference (std.) (men minus women)			Percentage point difference in enrolment (men minus women)		Percentage in occupations		Percentage change in hourly earnings associated with men (ref.: women)	
	Mean, unadjusted[1]	10th percentile	90th percentile	Upper and post-secondary (vocational)	Bachelor's degree or above	Men in women-majority	Women in men-majority	Basic adjusted[2]	Fully adjusted[3]
Canada	**0.27**	**0.19**	**0.31**	**62**	**23**	**19**	**18**	**16.0**	**14.5**
Chile	**0.15**	-0.14	**0.34**	**57**	**30**	**15**	**11**	**29.8**	**29.0**
Croatia	-0.01	-0.06	0.05	**47**	**20**	**9**	**12**	**16.4**	**17.2**
Czechia	**0.22**	0.11	**0.32**	**51**	**28**	**18**	**13**	**21.1**	**16.8**
Denmark	**0.20**	0.06	**0.29**	**49**	**27**	**22**	**14**	**12.7**	**14.3**
England (UK)	**0.27**	**0.26**	**0.33**	**45**	**30**	**16**	**15**	**19.9**	**14.6**
Estonia	**0.15**	0.00	**0.25**	**54**	**31**	**9**	**14**	**21.2**	**28.3**
Finland	**0.20**	0.09	**0.28**	**56**	**37**	**16**	**15**	**17.6**	**21.4**
Flemish Region (BE)	**0.20**	0.08	**0.31**	**62**	**26**	**14**	**13**	**6.5**	**9.4**
France	**0.17**	0.03	**0.28**	**53**	**27**	**14**	**13**	**7.1**	**8.6**
Germany	**0.24**	0.11	**0.34**	**56**	**40**	**17**	**10**	**16.6**	**14.8**
Hungary	**0.09**	-0.07	**0.21**	**59**	**36**	**13**	**13**	**11.9**	**15.2**
Ireland	**0.16**	0.02	**0.26**	**50**	**21**	**20**	**13**	**6.8**	**9.4**
Israel	**0.10**	-0.08	**0.35**	**38**	**22**	**13**	**16**	**17.5**	**25.8**
Italy	**0.12**	-0.03	**0.29**	**46**	**30**	**20**	**8**	**10.4**	**15.3**
Japan	**0.21**	0.05	**0.35**	**56**	**27**	**22**	**12**	**38.7**	
Korea	**0.15**	**0.17**	**0.17**	**43**	**28**	**15**	**10**		
Latvia	**0.13**	0.00	**0.31**	**42**	**28**	**8**	**18**	**22.0**	27.8
Lithuania	**0.07**	-0.05	**0.14**	**52**	**35**	**5**	**10**	**11.9**	**17.9**
Netherlands	**0.25**	0.05	**0.37**	**45**	**23**	**15**	**12**	**14.1**	**10.5**
New Zealand	0.09	-0.17	**0.29**	**62**	**31**	**12**	**15**	**12.7**	**13.6**
Norway	**0.20**	0.05	**0.29**	**50**	**23**	**20**	**14**	**11.0**	**11.1**
Poland	0.00	-0.03	0.05	**55**	**37**	**5**	**10**	**11.6**	**14.1**
Portugal	**0.23**	**0.27**	**0.25**	**43**	**19**	**12**	**11**	**12.1**	**18.5**
Singapore	**0.19**	**0.23**	**0.12**	**53**	**28**	**21**	**14**	**12.0**	**10.7**
Slovak Republic	0.03	-0.02	**0.12**	**53**	**24**	**14**	**9**	**10.3**	**12.0**
Spain	**0.17**	0.10	**0.28**	**50**	**23**	**23**	**19**	**12.8**	**15.0**
Sweden	**0.25**	0.14	**0.29**	**55**	**25**	**19**	**14**	**7.3**	**9.2**
Switzerland	**0.29**	**0.21**	**0.35**	**50**	**28**	**16**	**15**	**17.7**	**13.5**
United States	**0.14**	-0.10	**0.27**	**59**	**21**	**22**	**19**	**12.6**	

Note: Numbers in bold indicate that the respective indicator of a specific country is significantly different from zero at the 5% level.
1. Unadjusted differences in numeracy are the differences between the two averages for each contrast category.
2. Basic adjusted differences in hourly earnings are based on a regression model that takes into account differences in age, parental education, parental occupation, childhood residential context, immigrant background, and part-time and public sector employment.

3. Fully adjusted differences in hourly earnings are based on a regression model that takes into account differences in age, parental education, parental occupation, childhood residential context, immigrant background, part-time and public sector employment, respondents' educational attainment, skills, volunteering activities, and participation in non-formal adult education.

A country's performance is statistically significantly above the OECD average at the at the 5% level.

A country's performance is statistically significantly below the OECD average at the at the 5% level.

Source: Calculations based on OECD (2024[104]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/736i14

Childhood residential context

Adults who grew up in cities on average have higher levels of proficiency in core 21st-century skills than those who grew up in towns or villages. For example, across OECD countries, adults who grew up in cities have, on average, 0.18 SD higher numeracy proficiency than those who grew up in villages. Differences related to childhood residential context are especially pronounced in Chile, where adults who grew up in cities have considerably higher proficiency in numeracy than those who grew up in villages (0.72 SD), and in the Netherlands, where adults who grew up in villages have considerably higher proficiency in numeracy compared to those who grew up in cities (0.29 SD) (Table 1.6). These differences reflect, to an extent, differences in the socio-economic background of urban and rural communities: on average, the difference decreases from 0.18 SD to 0.11 SD when controlling for parental education and occupation, and from 0.11 SD to 0.04 SD when further controlling for educational attainment (Table 1.6).

Youth from urban communities are far more likely to complete tertiary education than those from rural areas. On average across OECD countries, 40% of adults who grew up in cities completed a bachelor's degree or higher qualification compared to only 26% of those who grew up in villages (see Chapter 3, Figure 3.7). The gap in the percentage of adults who obtained a bachelor's degree or higher qualification between those growing up in cities and villages is largest in Korea (30 percentage points) and smallest in the Flemish Region (Belgium) (1 percentage point) (Table 1.6).

Adults who grew up in cities are also more likely to participate in adult education than those who grew up in villages. The difference is 5 percentage points on average across OECD countries, and fully reflects differences in socio-economic condition between the two groups. The largest advantage for those growing up in cities is observed in Chile (19 percentage points), whereas in the Netherlands, there is no statistically significant difference between the different groups (Table 1.6).

Differences in labour market outcomes are also pronounced. For example, on average across OECD countries, individuals who grew up in cities earn 7% more than adults with similar socio-demographic characteristics who grew up in villages. This difference is most pronounced in Chile, where it is as large as 23%, whereas there are no differences in the United States and Israel. Crucially, the wage penalty associated with growing up in rural areas is mostly the result of differences in educational attainment and skills between adults growing up in different contexts: the difference is reduced to around 3% once controlling for educational attainment and skills (Table 1.6).

Table 1.6. Snapshot of skills disparities, by childhood residential context

Country	Numeracy			Educational attainment	Adult education and training		Wage gap	
	Score-point difference (std.) (city minus village)			Percentage-point difference (city minus village)			Percentage change in hourly earnings associated with city (ref.: village)	
	Mean, unadjusted[1]	Mean, basic adjusted[2]	Mean, fully adjusted[3]	Bachelor's degree or above	Participation rate		Basic adjusted[6]	Fully adjusted[7]
					Unadjusted[4]	Adjusted[5]		
OECD average	**0.18**	**0.11**	**0.04**	**14**	**5**	-0.04	**7**	**3**
Austria	0.03	0.02	-0.07	**14**	3	-3.80	5	3
Canada	**0.26**	0.09	0.02	**17**	3	-0.82	6	2
Chile	**0.72**	**0.50**	**0.23**	**19**	**19**	2.20	**23**	-3
Croatia	**0.35**	**0.17**	0.06	**29**	**16**	1.95	**12**	4
Czechia	**0.25**	**0.12**	0.08	**13**	2	-5.26	**11**	**8**
Denmark	0.08	0.02	-0.04	**13**	**6**	**4.54**	4	2
England (UK)	**-0.15**	-0.03	-0.10	**12**	1	-1.67	4	4
Estonia	**0.34**	**0.23**	**0.14**	**16**	**6**	-1.01	4	-2
Finland	**0.13**	0.09	0.05	**13**	**6**	1.48	**7**	4
Flemish Region (BE)	**-0.14**	-0.03	-0.05	1	-2	-0.27	4	3
France	-0.01	0.04	-0.03	**9**	-1	-0.58	1	-1
Germany	-0.06	-0.05	-0.04	**7**	-2	-3.00	2	2
Hungary	**0.52**	**0.24**	**0.10**	**25**	**14**	0.47	**15**	**7**
Ireland	0.04	-0.03	0.00	3	1	0.52	1	6
Israel	**0.28**	**0.24**	**0.19**	**8**	**7**	3.48	6	4
Italy	-0.06	-0.07	-0.08	2	3	0.75	5	4
Japan	**0.39**	**0.26**	**0.17**	**21**	**7**	0.44	**15**	0
Korea	**0.53**	**0.26**	**0.13**	**30**	**4**	2.12		
Latvia	**0.44**	**0.26**	**0.19**	**18**	**12**	**-5.34**	**14**	**7**
Lithuania	**0.44**	**0.30**	**0.17**	**28**	**12**	-2.28	**20**	**10**
Netherlands	**-0.29**	**-0.13**	**-0.16**	5	-5	0.76	4	3
New Zealand	**0.19**	0.09	0.01	**14**	6	3.48	4	1
Norway	-0.01	-0.02	-0.02	**10**	3	3.26	0	0
Poland	**0.29**	**0.22**	**0.17**	**17**	**12**	**8.21**	6	-1
Portugal	**0.30**	**0.18**	0.01	**18**	**12**	-0.03	9	4
Singapore	**1.00**	**0.60**	**0.40**	**19**	**11**	0.95	**21**	0
Slovak Republic	**0.15**	0.11	0.07	**16**	5	-6.87	**11**	8
Spain	**0.28**	**0.17**	0.05	**13**	5	-2.89	7	4
Sweden	-0.04	0.02	-0.02	**10**	-2	-3.58	**5**	4
Switzerland	-0.04	0.07	-0.02	**11**	**5**	1.52	**7**	3
United States	**0.23**	0.02	-0.10	**17**	**10**	3.00	-4	0

Note: Numbers in bold indicate that the respective indicator of a specific country is significantly different from zero at the 5% level. Childhood residential context (at respondents' age 14) refers to whether the respondent grew up in villages, towns or cities. Estimates for the unadjusted participation rate in adult education and training exclude Japan, Korea and the United States.
1. Unadjusted differences in numeracy are the differences between the two averages for each contrast category.
2. Basic adjusted differences in numeracy are based on a regression model that takes into account differences associated with gender, age, parental education, parental occupation and immigrant background.
3. Fully adjusted differences in numeracy are based on a regression model that takes into account differences associated with gender, age, parental education, parental occupation, immigrant background and respondents' educational attainment.
4. Unadjusted differences in the participation rate are the differences between the two averages for each contrast category.
5. Adjusted differences in the participation rate are based on a regression model that takes into account gender, age, parental education, parental occupation, immigrant background, respondents' education and occupation.
6. Basic adjusted differences in hourly earnings are based on a regression model that takes into account differences in gender, age, parental education, parental occupation, immigrant background, and part-time and public sector employment.
7. Fully adjusted differences in hourly earnings are based on a regression model that takes into account differences in gender, age, parental education, parental occupation, immigrant background, part-time and public sector employment, respondents' educational attainment, skills, volunteering activities, and participation in non-formal adult education.
A country's performance is statistically significantly above the OECD average at the at the 5% level.
A country's performance is statistically significantly below the OECD average at the at the 5% level.
Source: Calculations based on OECD (2024[104]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/obdfz7

Immigrant background

Adults who are the children of immigrants on average have lower levels of proficiency in core 21st-century skills than those who do not have an immigrant background.[6] For example, across OECD countries, adults who are the children of immigrants have 0.14 SD lower literacy proficiency than those who do not have an immigrant background. Differences related to having an immigrant background are especially pronounced in the Flemish Region (Belgium) (0.53 SD), whereas in Canada, Chile, Hungary, and Israel adults who are the children of immigrants have higher literacy proficiency than individuals without an immigrant background (Table 1.7). These differences reflect variations across countries in migrant composition as well as integration opportunities and selection mechanisms. On average across OECD countries, skills differences based on immigrant background do not reflect to a large extent differences in socio-demographic characteristics nor educational trajectories.

Across OECD countries, differences in participation in further education based on immigrant background are small: when adults with similar background characteristics are compared, the children of immigrants are 1.82 percentage points more likely than adults without an immigrant background to have completed a bachelor's degree or higher (Table 1.7).

The gap in the percentage of adults who obtained a bachelor's degree or higher qualification in favour of the children of immigrants is widest in Canada (18 percentage points), whereas adults without an immigrant background are more likely to have obtained a bachelor's degree or more advanced qualifications in the Estonia, Flemish Region (Belgium), Italy and Latvia (Table 1.7).

Wages are similar, on average across OECD countries, between adults who are the children of immigrants and adults without an immigrant background. However, in Hungary, the children of immigrants earn 21% less than adults without an immigrant background but with similar socio-demographic characteristics, a difference that remains large, at 19%, when educational attainment and skills differences between the two groups are also taken into account. By contrast, in Estonia, the children of immigrants earn 18% more than adults without an immigrant background but with similar socio-demographic characteristics, a difference that remains large, at 12%, when educational attainment and skills differences between the two groups are also taken into account (Table 1.7).

Table 1.7. Snapshot of skills disparities, by immigrant background

Country	Literacy			Educational attainment	Adult education and training		Wage gap	
	Score-point difference (std.) (non-immigrants minus children of immigrants)			Percentage-point difference (non-immigrants minus children of immigrants)			Percentage change in hourly earnings associated with non-immigrants (ref.: children of immigrants)	
	Mean, unadjusted[1]	Mean, basic adjusted[2]	Mean, fully adjusted[3]	Bachelor's degree or above	Participation rate: Unadjusted[4]	Participation rate: Adjusted[5]	Basic adjusted[6]	Fully adjusted[7]
OECD average	**0.14**	**0.14**	**0.12**	**1.82**	-0.37	0.24	0.5	-1.3
Austria	**0.17**	**0.23**	**0.14**	2.78	-0.96	2.65	**6.3**	0.1
Canada	**-0.14**	-0.05	0.04	**17.54**	**6.75**	1.39	-6.7	-2.7
Chile	**-0.31**	-0.27	-0.29	7.64	-10.28	17.64	0.0	0.0
Croatia	0.07	**0.16**	0.13	4.91	**9.99**	**-9.14**	1.5	-1.0
Czechia	0.12	0.11	0.05	**-8.69**	-2.80	-1.28	5.0	3.5
Denmark	**0.21**	**0.19**	**0.21**	**9.37**	2.52	-3.48	2.4	1.7
England (UK)	0.07	0.08	**0.16**	**15.65**	-2.60	**9.03**	-8.6	-5.1
Estonia	**0.38**	**0.33**	**0.29**	**-7.31**	**-12.11**	**5.55**	**17.5**	**12.0**
Finland	**0.39**	**0.33**	**0.32**	-6.06	-2.50	-3.42	-1.6	-1.3
Flemish Region (BE)	**0.53**	**0.47**	**0.32**	**-12.13**	-5.36	-3.23	-0.6	-6.6
France	**0.17**	**0.21**	**0.18**	1.80	**-3.77**	**5.92**	-2.9	**-6.3**
Germany	**0.37**	**0.20**	**0.19**	-2.07	-3.09	-1.01	1.5	-2.2
Hungary	**-0.17**	-0.03	0.01	7.65	1.38	3.32	**-20.7**	**-18.7**
Ireland	-0.08	0.01	-0.01	1.71	3.45	-4.98	2.2	2.3
Israel	**-0.20**	**-0.17**	**-0.10**	**4.81**	**8.79**	-1.44	-0.8	1.1
Italy	0.08	**0.23**	**0.21**	**-8.50**	3.52	-3.68	10.8	0.4
Korea	**0.57**	0.00	0.00					
Latvia	0.03	0.05	0.01	**-7.14**	-1.69	-4.51	6.2	2.3
Lithuania	0.01	0.02	0.02	2.56	2.80	-3.93	-5.8	**-7.6**
Netherlands	**0.36**	**0.35**	**0.30**	-3.35	-5.08	3.62	3.0	1.8
New Zealand	-0.03	0.09	0.15	**8.84**	0.14	4.33	**-8.5**	-6.5
Norway	**0.25**	0.11	0.09	**8.76**	**6.54**	-2.96	0.0	-0.6
Poland	0.12	0.11	0.12	2.38	-4.20	0.00	0.0	0.0
Portugal	-0.08	0.00	0.06	**7.88**	4.76	0.86	-0.6	0.8
Singapore	**0.13**	**0.14**	**0.19**	0.58	-0.10	-0.92	-6.1	-6.7
Slovak Republic	0.04	0.07	0.02	-2.36	9.30	**-12.64**	1.2	0.9
Spain	0.09	**0.19**	0.11	-6.37	-6.23	4.26	10.4	5.2
Sweden	**0.44**	**0.24**	**0.20**	-4.12	0.96	-6.20	-0.8	-3.5
Switzerland	**0.19**	**0.20**	**0.13**	-3.11	-1.55	0.21	1.8	-2.3
United States	**0.23**	**0.22**	**0.21**	**6.68**	2.54		-11.4	0.0

Note: Numbers in bold indicate that the respective indicator of a specific country is significantly different from zero at the 5% level.

Groups by immigrant background distinguish between children of immigrants and non-immigrants. Children of immigrants were born in the country in which they reside, but their parents were not, or they were born in a different country and moved to their current country of residence before the age of 18. Non-immigrants are born in the country of residence as well as their parents. Japan is not shown due to small sample size.
1. Unadjusted differences in literacy are the differences between the two averages for each contrast category.
2. Basic adjusted differences in literacy are based on a regression model that takes into account differences associated with gender, age, parental education, parental occupation and childhood residential context.
3. Fully adjusted differences in literacy are based on a regression model that takes into account differences associated with gender, age, parental education, parental occupation, childhood residential context and respondents' educational attainment.
4. Unadjusted differences in the participation rate are the differences between the two averages for each contrast category.
5. Adjusted differences in the participation rate are based on a regression model that takes into account gender, age, parental education, parental occupation, childhood residential context, respondents' education and occupation, and social and emotional skills.
6. Basic adjusted differences in hourly earnings are based on a regression model that takes into account differences in gender, age, parental education, parental occupation, childhood residential context, and part-time and public sector employment.
7. Fully adjusted differences in hourly earnings are based on a regression model that takes into account differences in gender, age, parental education, parental occupation, childhood residential context, part-time and public sector employment, respondents' educational attainment, skills, volunteering activities, and participation in non-formal adult education.
A country's performance is statistically significantly above the OECD average at the at the 5% level.
A country's performance is statistically significantly below the OECD average at the at the 5% level.
Source: Calculations based on OECD (2024[104]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/zydmvf

1.4.2. Promoting the agility and co-ordination of skills policies

To navigate uncertainty and rapid change, OECD countries need to reform not just which skills are taught, but how skills policy itself is made, moving away from rigid, fragmented policy processes towards agile, co-ordinated and lifelong approaches. By embracing governance models that support quick adaptation, cross-sector collaboration and integration across all stages of learning, countries can be better positioned to respond to emerging skills demands by supporting all population groups.

Agility means that policy frameworks should be framed in ways that can be adapted quickly as new information emerges, rather than remaining fixed until the next reform cycle. For example, the Danish Ministry of Children and Education is considering recommendations put forward by a specially convened expert group on AI in education to shortening the timelines and streamlining the process of reform to national assessments, enabling testing formats to keep pace with technological progress (Danish Government, 2024[109]). This entails moving away from one-off reforms towards an iterative approach, where policies are regularly evaluated and refined.

Some countries have treated the implementation of curriculum changes not as the end point but as a learning phase: feedback is gathered during rollout, and mid-course corrections are made in real time. Such an approach shortens the impact lag of policy reforms by addressing problems early and prevents the entrenchment of ineffective measures. This approach is particularly relevant for policies related to 21st-century skills, which require an agile governance that embraces pilots, rapid feedback loops and experimental adjustments, allowing skills policies to recalibrate in real time as conditions evolve. This stands in contrast to the prevailing "plan then implement" approach of the 20th century and is better suited for an age when foresight is imperfect and change is constant.

Cross-ministerial co-ordination is a key pillar of the governance model needed for responsive reform in the 21st century. Skills development and effective skills use cut across the traditionally separate domains of education, labour, local economic development, migration, social protection and industrial policies. However, government structures are often compartmentalised, with different ministries and agencies overseeing early childhood education, schooling, vocational training, higher education and workforce adult learning programmes (OECD, 2020[110]; 2024[111]). These silos can lead to fragmented actions and missed opportunities for synergy. No single ministry can tackle emerging skills challenges alone; for instance,

ensuring that workers have the skills for a green economy involves not just education ministries but also those concerned with industry, energy and the environment. Whole-of-government co-ordination, co-operation and collaboration is therefore essential, and how to effectively promote this remains a key challenge in strengthening skills systems governance in many OECD countries (OECD, 2020[110]; 2024[111]). An agile reform process rests, for example, on the establishment of joint governance mechanisms – such as inter-ministerial skills councils or strategy units reporting to the centre of government – to align objectives and actions across departments. Such bodies can enable rapid collective responses – for example, aligning a sudden upskilling initiative with both education providers and employment services. Agility in skills policy goes hand in hand with collaboration: flexible governance must be underpinned by strong horizontal co-ordination so that the left and right hands of government move in the same direction.

Current governance arrangements for skills are not only slow but are also often fragmented. Responsibilities for developing and using skills are widely distributed across levels of government, as well as ministries and public agencies, with little active co-ordination. People acquire and apply skills throughout their life – in early childhood, schools, technical and tertiary education, and through adult learning and labour market programmes – but each of these stages tends to fall under different institutional mandates. The result is that the governance of skills policy does not follow the learner's life-course journey but remains split into silos: one agency oversees school curricula, another manages vocational training incentives, another handles unemployment retraining, and so on. Often, even within adult learning, there is a divide; for example, labour ministries focus on training the unemployed while education ministries support other adult learners (OECD, 2024[112]).

This fragmentation leads to gaps, overlaps and inefficiencies. Formal mechanisms to co-ordinate adult learning policy are "rare" and frequently ad hoc, resulting in inconsistent decisions across programmes and a lack of synergy between initiatives. Without co-ordination, well-intended policies can work at cross purposes or leave critical needs unaddressed. For instance, a labour ministry might subsidise training in isolation from education authorities, leading to duplicated efforts in some areas and blind spots in others. Such misalignment exacerbates skills mismatches in the economy: training supply does not fully correspond to labour market demand when educational planning is disconnected from employment strategy. In practical terms, this means that employers face shortages of workers in certain fields while workers in other fields cannot find jobs commensurate with their qualifications. Fragmented governance thus undermines the overall effectiveness of skills investments, wasting resources and eroding public trust in reform. Addressing this issue is not merely a bureaucratic concern but central to reducing mismatches and improving productivity.

Breaking these silos requires institutionalised co-ordination across the policy cycle – from joint design of reforms, to synchronised implementation, to shared monitoring and evaluation (OECD, 2024[112]). Some countries have moved to create umbrella structures for skills policy, such as national skills councils or inter-agency task forces that bring together education, labour and economic actors under one strategy (OECD, 2020[110]; 2024[111]). Such bodies can help align funding streams, reconcile differing priorities and ensure information flows between stakeholders. The guiding principle is that all relevant actors should be "on the same page" about skills needs and policy responses. International experience shows that when co-ordination is strong – whether via formal councils, cross-ministerial agreements or unified strategies – it is possible to reduce duplication and fill the gaps between programmes. Overcoming fragmentation, therefore, is a precondition for an effective and responsive skills policy system. It enables a shift from a patchwork of initiatives to a cohesive ecosystem in which education and training provision, at all levels, actively complements labour market and economic development goals.

Many OECD countries are recognising the need for a coherent national lifelong learning strategy that creates learning pathways that span from early childhood, through formal schooling and tertiary education, into adult upskilling and reskilling. The aim is to enable seamless transitions at every stage so that

individuals can continuously develop new competencies and navigate career shifts. Effective roadmaps for lifelong learning transformations involve creating flexible pathways that connect different levels and types of learning to enhance learning opportunities for youth and adults and avoid dead ends. In practice, this might involve strengthening links between secondary vocational programmes and higher education, or between university degrees and on-the-job training, so that learners can move vertically or horizontally without unnecessary barriers. It also means improving the recognition and portability of skills – for example, via national qualifications frameworks that ensure credentials from different institutions or regions are comparable and valued across the labour market (OECD, 2025[113]). Likewise, international and national quality assurance frameworks that can strengthen the quality and recognition of non-formal training are essential for promoting the credibility of alternative learning pathways and skills validation mechanisms (OECD, 2024[114]).

A national lifelong learning strategy also provides a platform to better align the supply of skills with evolving demand. When all relevant ministries and stakeholders co-operate under one vision, it becomes easier to steer the education and training system in line with economic needs. For instance, co-ordinated foresight exercises can be embedded into a lifelong learning strategy to anticipate emerging skills requirements from megatrends (such as the digital or green transitions) and to feed this intelligence into curriculum updates, career guidance and training investments across the board. Skills foresight data, as well as normative efforts (e.g. competence frameworks and guides, policies, and clear governance) can help in this endeavour. An integrated strategy can thereby act as a bridge between the education sector and employers, ensuring that what learners are taught reflects the competencies actually required in workplaces. International policy research emphasises that fostering more flexible learning pathways goes hand in hand with enhancing the labour market relevance of individuals' skills. Flexibility – in programme design, delivery and credentialing – is associated with improved agility and customisation of learning to meet both learner needs and industry demand. More concretely, a coherent lifelong learning strategy could set common goals (e.g. increasing STEM skills or digital literacy across age groups), align funding to those priorities, and create accountability for outcomes such as reduced skills mismatches or higher adult training participation. This approach represents a shift from piecemeal policies to a system-wide plan for skills development. Several countries have already moved in this direction.

1.4.3. Early childhood education and care: Levelling the playing field from the start

Investing in high-quality, well-funded early childhood education and care (ECEC) – with qualified, multi-disciplinary staff and access to continuing professional development – is one of the most powerful strategies to reduce skill disparities and promote equity. The early years (from birth to age 5) are when critical cognitive, social and emotional capacities take shape, and when disadvantages rooted in family circumstances can take hold. Research shows that high-quality early education can mitigate the effects of socio-economic disadvantage by boosting children's development before formal schooling begins. Conversely, gaps that exist at school entry tend to persist or widen over time, making it harder (and more costly) to remedy them later. Thus, OECD countries increasingly recognise ECEC as a cornerstone of an inclusive skills strategy. For example, the UK's Sure Start Children's Centres continue to be recognised as an essential, wide-ranging and cost-effective policy tool to reduce the disparities in skills and outcomes that begin in childhood and widen and accumulate over the life course. Sure Start was launched in 1999 as a network of "one-stop shops" that provide a variety of services, including health services, early learning, parenting support and parental employment help, to the communities – often in the most deprived areas of England – in which they were set-up (Carneiro et al., 2025[115]) (see Chapter 3, Box 3.5). Independent evaluations and workforce evidence identify stable funding (pre-2010) and specialist capacity as central to this impact (Carneiro, Cattan and Ridpath, 2024[116]; unison, 2024[117]).

Expanding access to affordable and high-quality ECEC, especially for disadvantaged children, should be a primary policy goal for countries. Currently, participation in early childhood programmes varies widely across countries and socio-economic groups. Children from higher-income families are more likely to be

enrolled in preschool or childcare, while those with disadvantaged socio-economic backgrounds – who have the most to gain – often face barriers such as cost, limited provision in their area or non-flexible hours that conflict with parents' work. To close these gaps, countries should work toward universal access for at least one or two years of preschool before primary school, as well as affordable childcare options for younger children. Given finite budgets, an equitable approach entails targeted subsidies and fee waivers to eliminate financial obstacles for low-income households. For example, several OECD countries cap parental fees as a share of household income or provide free ECEC hours for families below certain income thresholds. Such measures have proven effective in raising participation among disadvantaged children. In Finland, the Right to Learn Program promotes equal learning opportunities for all children by targeting those facing socio-economic, language or learning barriers. Parents may receive allowances to cover ECEC fees, while schools in deprived areas may receive additional resources, such as specialised teachers and support staff, as well as teacher training to help them identify and support students requiring additional help, enhancing learning outcomes in the long run (OECD, 2022[118]) (see Chapter 3, Box 3.5).

Expanding the supply of ECEC services in underserved areas is crucial. Rural or low-income urban communities often have fewer high-quality centres. Governments can invest in infrastructure and provide incentives for providers to operate in these areas so that no community is left behind. Innovative delivery models – for instance, mobile ECEC units, public-private partnerships or flexible provision during non-standard hours – can help reach families with irregular work schedules or those in remote locations. The overarching goal should be that all children, regardless of socio-economic background, can access early education at least from age 3 or 4, if not earlier, setting them on an equal footing as they enter compulsory schooling.

The quality of ECEC is critical to achieving positive outcomes. Disadvantaged children in particular benefit from enriching, nurturing ECEC environments that support all areas of development (language, cognitive skills, social-emotional learning, self-regulation, etc.). Policy should therefore focus on providing high-quality ECEC across all settings and for all children, while also directing additional support to those with greater needs. Key policy levers include establishing strong quality standards and curricula, investing in the ECEC workforce through training and decent working conditions, and monitoring and supporting continuous improvement in providers. Many countries are adopting curriculum frameworks for ECEC that balance play-based, child-centred approaches with intentional skill-building aligned to children's developmental stages. Such curricula ensure that early learning is holistic – fostering social and emotional development alongside early literacy, numeracy and motor skills – and culturally responsive. To promote equity, curriculum guidelines can include strategies for supporting children with additional needs (e.g. second language learners or those with special educational needs) within mainstream settings. Equally important is the professional development of ECEC staff. Caregivers and teachers need the skills to create responsive, language-rich interactions and to address diverse needs. The OECD's Starting Strong studies emphasise building a competent ECEC workforce, including through minimum qualification requirements, ongoing training and coaching for educators on inclusivity and bias awareness. Governments should ensure that resources and training for quality improvement are particularly targeted at centres serving high proportions of disadvantaged children so that quality gaps do not compound existing inequities (OECD, 2025[119]).

Making ECEC a vehicle for reducing skills disparities also means designing inclusive services that are linked with broader support systems for children and families. Some countries provide additional bilingual aides or cultural liaisons in ECEC centres to ensure that children of immigrant or minority backgrounds feel represented and supported. Beyond the classroom, ECEC can serve as a hub connecting families to other services. Integrating early education with health, nutritional and parental support programmes yields multiple benefits (see Sure Start Children's Centre's in the United Kingdom [England]; Chapter 3, Box 3.5). For example, offering parenting workshops through ECEC centres can empower low-income parents to better support their children's development. Smoothing transitions to primary school is also important: sharing child development records with primary teachers, aligning curricula between preschool and first

grade, and familiarising children with their future schools help sustain the gains from early education and maximise the positive equalising effects of schooling.

In sum, a policy mix that combines universal entitlements with targeted support – universal in the sense that every child can participate, targeted in providing extra resources to those who start from behind – can reduce early skill gaps and reduce disparities later on. Countries such as Finland and Sweden, for instance, have near-universal enrolment in ECEC and invest heavily in quality, which has been associated with smaller socio-economic disparities in academic readiness. The economic case is strong: evaluation studies suggest that investments in the early years have high returns, particularly for disadvantaged children, as money spent yields high long-term societal benefits through better education and employment and reduced social costs (Barnett, 2011[120]; Heckman, 2006[121]; Heckman et al., 2010[122]).

1.4.4. Formal education: Strengthening opportunities for all

As children move into formal education (primary, secondary and tertiary levels), the challenge for policy is to sustain early interventions or reduce disparities that emerge early on, ensuring that the education system provides equal opportunities for all learners to develop 21st-century skills. Formal schooling remains the single biggest influence on skills acquisition in youth and an engine of social mobility, or conversely, of social reproduction. The evidence from Chapter 3 indicates that compulsory schooling often narrows socio-economic skills gaps relative to early childhood, but significant disparities remain, and what happens after secondary school (in higher education or entry to work) can widen disparities yet again. By contrast, gender disparities widen as children progress in their education, with evidence from France suggesting that a gender gap in mathematics favouring boys is established as soon as children enter school (Martinot et al., 2025[123]). The gender gap extends beyond mathematics to science subjects more generally, as TIMSS 2023 data show an 8-point performance advantage for boys over girls in science in CM1, a gap that was previously non-significant (La Direction de l'évaluation, de la prospective et de la performance, 2024[124]).Therefore, policymakers must pursue a two-fold strategy in formal education: 1) improve the quality of education for all; and 2) target interventions to support disadvantaged students and reduce the effect of societal norms and stereotypes that shape the relative achievement possibilities of boys and girls. In this way, all students will be able to achieve their full potential.

To achieve this, all schools must have the resources and capacity to deliver high-quality education, regardless of the socio-economic or geographic context. Within-country differences in school quality (e.g. availability of trained teachers, class sizes, curricular breadth) often map to socio-economic divides, as wealthier communities can attract more resources. To counter this, many OECD countries use funding formulas to allocate additional resources to schools serving disadvantaged or high-needs student populations. Ensuring adequate and progressive funding – more per-pupil spending on those who need it most – has been linked to smaller learning gaps. This can be achieved either by providing more teachers to classes catering for disadvantaged populations or more qualified and trained teachers who can better manage the additional challenges arising from working with children with disadvantaged socio-economic backgrounds.

Countries with higher cumulative public investment up to secondary level have narrower adult skills disparities by socio-economic background, but the association is not strong, as highlighted in Chapter 3. This means that it is not merely about spending more but about spending effectively: directing funds to evidence-based programmes (such as early literacy interventions, tutoring for struggling students or teacher incentives for remote areas) yields the greatest impact. To break the link between socio-economic background and educational outcomes, inclusive practices and targeted support must reach into the daily practices of schools and classrooms. One key policy is early identification and support for struggling students. Diagnostic assessments and monitoring can help flag learning gaps early (for instance, difficulties in reading or mathematics in primary years), triggering additional help such as reading specialists, small-group tutoring or individualised learning plans. Targeted support can also address the

non-academic barriers that often impede learning for disadvantaged youth; for example, countries may provide school meals, mental health counsellors or after-school programmes in low-income communities to mitigate the effects of poverty on learning readiness.

The rigid tracking of students into “vocational” vs. “academic” streams at an early age tends to reinforce social disparities, because disadvantaged students are disproportionately placed into less challenging/rewarding tracks, limiting their skills development. Policies that delay tracking, promote comprehensive schooling or ensure permeability between tracks (so that late bloomers can advance) are associated with more equitable skills outcomes. Moving forward, advances in the personalisation that AI affords could help education systems combine the benefits of tracking and ability grouping, which include the possibility to provide learning in ways that best align with students’ preferences, talents and interests, with the benefits of comprehensive schooling, which allows for diverse developmental trajectories and being stimulated by diversity.

Because of its personalisation potential, AI adoption may allow education systems to reap the benefits of differentiation as well as integration, allowing greater flexibility in educational offering without the stigma associated with rigid differentiation. Adaptive algorithms can tailor content, pace and feedback to each learner’s needs, supporting mastery for high-achievers and targeted remediation for struggling students. For example, the Canadian government has invested in the development and integration of AI into an existing digital language learning platform to help students learning French as a second language. The platform gathers information about each student’s unique learning profile and provides them with personalised educational content (Government of Canada, 2025[125]). These types of tools may be particularly well-suited to address the varied challenges faced by students with an immigrant background or those whose native language is different than that of the language of instruction. This is important, as across the OECD, students from these groups perform less well and report a lower sense of belonging in schools than those without an immigrant background (see Chapter 3, Box 3.1 and Box 3.6). Furthermore, schools can adopt heterogeneous grouping and individualised expectations that are tailored to all students’ individual abilities. In this way, AI may enable differentiation within the classroom (such as more challenging material for advanced students and remedial support for those behind) without sacrificing students’ outcomes, rather than separating students into different schools or programmes too early.

To supplement this, providing strong guidance and support for transitions is crucial – for example, helping students from under-represented groups prepare for and apply to tertiary education through mentorships or college/career counselling can increase their access to higher levels of study. In Spain, the Programme for Educational Guidance, Advancement, and Enrichment (Programa para la orientación, avance y enriquecimiento educativo; PROA+) aims to reduce school dropout and low performance, especially in disadvantaged areas, with a focus on digitalisation and modernisation of educational infrastructure from ECEC to higher education. The programme channels resources into schools with high levels of need, often in rural or socio-economically disadvantaged areas. Schools commit to responsive service provision through agreements with educational authorities that outline the shared objectives and define the specific actions and resources needed to achieve these objectives (See Chapter 3, Box 3.10).

Tertiary education – including university and high-level vocational programmes – has become increasingly important for 21st-century skills and labour market prospects. However, access to tertiary education remains highly unequal, with students from wealthier, urban or university-educated families far more likely to enrol and complete degrees. To narrow skill gaps, OECD countries should pursue policies that broaden participation in tertiary education and improve completion rates for under-represented groups. Measures can include financial support (needs-based scholarships, reduced tuition or free college for low-income students), outreach and bridging programmes (special admission pathways or preparatory courses for first-generation college students). Strong academic and social support should also be provided on campus (tutoring, peer mentoring, etc.) to ensure that students not only enter but also succeed in higher education. For example, the Irish Higher Education Access Route helps facilitate entry into higher education for

students with disadvantaged socio-economic backgrounds, with applicants who meet certain financial, social and cultural criteria able to access reserved places with amended entry requirements at participating higher education institutions (see Chapter 3, Box 3.5). Additionally, some countries fund "second-chance" routes for adult entry into tertiary programmes, which allows individuals (often with disadvantaged socio-economic backgrounds) who did not continue education after secondary school to access higher qualifications later in life. Expanding such pathways – including through part-time and online tertiary study options – can reduce socio-economic disparities in advanced skills.

All of these policies are compatible with maintaining the high quality and labour market relevance of the knowledge and skills taught in higher education institutions. Policies tying funding to student support services and graduate outcomes can involve employers in their design and scope (especially in vocational tertiary tracks) and can help align tertiary expansion with skills needs and student success. Quality assurance mechanisms – such as school inspections or performance monitoring – should specifically attend to equity indicators, ensuring that disadvantaged students are not left behind. Some countries have successfully implemented targets to reduce socio-economic disadvantage, with goals including reducing the proportion of low-performing students or the gap between different student groups in core subjects, and are holding the system accountable to these goals. Quality assurance mechanisms can exist at the system level or beyond – for example, the European Union's Education and Training Monitor provides regular updates on member states' progress towards EU-level targets for education policy for 2025 and 2030. The Monitor provides updates for all 27 EU member countries, linking evidence and experiences across contexts, and proposing linkages and policy solutions (European Commission, 2024[126]).

Beyond access to tertiary education, there is a notable form of disparity regarding differences in field-of-study choices between men and women, which have long-term implications for skills and careers, as explored in Chapter 3. For instance, despite the fact that women now often have higher overall tertiary attainment than men, they remain under-represented in STEM fields and mathematics-intensive courses. Furthermore, students with disadvantaged socio-economic backgrounds may be less likely to pursue advanced science or technology studies due to lack of initial preparation or encouragement, or because, despite their talent, in purely rank systems they may have lower achievement than their advantaged peers. While procedurally meritocratic, these systems are substantively unequal because achievement disparities determining access to advanced qualifications arise because of factors that lie beyond individuals' control.

These enrolment patterns contribute to skill gaps in areas such as numeracy and digital skills, and later to pay gaps, as STEM careers are often higher paying. Policymakers should thus implement initiatives to broaden participation in high-value fields. Examples include providing extra tutoring and orientation in mathematics/science for under-represented students; promoting role models and mentors (such as women engineers visiting schools to inspire girls); offering scholarships for low-income students in STEM; and combating stereotypes through curriculum and career counselling. Some countries have introduced targeted programmes such as coding camps for girls or partnerships between elite universities and disadvantaged secondary schools to demystify fields such as engineering and computer science. For example, the French "Girls and Maths" (Filles et Maths) plan has recently introduced measures to encourage girls to choose more mathematics-intensive study pathways throughout their formal schooling, and ultimately enrol in mathematics-related higher education pathways. In the Slovak Republic, the "You too in IT", (Aj Ty v IT) initiative supports girls and women to pursue careers in ICT by offering coding workshops for secondary school girls, upskilling for career changers and teacher training (see Chapter 3, Box 3.3).

Setting out clear and achievable targets or quotas for the enrolment of individuals from under-represented groups can incentivise training providers and other social partners to mobilise towards a common goal, especially if the process of target-setting was transparent and participatory. The Austrian National Strategy for the Social Dimension in Higher Education, which aims for a minimum of 10% of women and men in any field of education at any higher education institution (excluding doctoral studies) by 2025 and has

longer-term goals to increase this to 30%, exemplifies such an approach (Federal Ministry of Science, Research and Economy, 2017[127]).

Within vocational education, encouraging a diversity of enrolments can both reduce labour market gender segregation and ensure that talent is developed in all sectors. Targeted campaigns can help students identify VET and apprenticeships of interest to them. For example, the Irish National Apprenticeship Office oversees the "Facts, Faces, Futures" campaign, which promotes the participation of women in apprenticeships by targeting all-girls schools with specific content, which is delivered by female role models (see Chapter 3, Box 3.3).

In addition to addressing pressures and hurdles external to the school environment (such as broader societal stereotypes and segregation in the labour market, as discussed above), policymakers should consider pressures internal to the school environment, such as the development of social and emotional skills for lifelong learning and success in the labour market. Such initiatives can be implemented throughout the formal schooling lifecycle; for example, the Spanish "In their Shoes" (En Sus Zapatos) programme models the positive impacts of a school environment that fosters skills related to conflict resolution and emotional management for children aged between 4 and 17, while France's "Roped party of Success" (les Cordées de la réussite) programme boosts academic ambition and combats self-censorship among disadvantaged secondary school students towards higher education (see Chapter 3, Box 3.6). In Chile, the Life Skills Program (Programa Habilidades para la Vida, HPV) supports students from pre-kindergarten to 12th grade by fostering emotional, social and cognitive development throughout all stages of schooling. The programme tackles emotional regulation and adaptation, school co-existence and psychosocial well-being, and academic-related challenges (see Chapter 3, Box 3.10).

In short, achieving equity in formal education is not just about getting everyone through the door, but also guiding all students towards the full range of learning opportunities that match their interests and the economy's needs. It should be noted that education policy alone cannot equalise outcomes without support from other social policies. Issues such as child poverty, housing and health affect students' ability to learn. A holistic approach that co-ordinates education with social protection (income support for poor families), healthcare (vision, dental, mental health services in schools) and community development amplifies the impact of school-based interventions. Some OECD countries have moved towards "community schools" or integrated service models that provide a wraparound support system for disadvantaged students (for example, co-locating health clinics and social workers on school campuses). These approaches recognise that to truly give every child a fair shot at developing their skills, barriers outside the classroom must also be addressed.

1.4.5. Lifelong learning and adult training systems: Promoting continuous skills development for all

Closing skills gaps and adapting to fast-changing skills demands require that learning does not stop at graduation. A strong adult learning system that encompasses on-the-job training, continuing education, reskilling and upskilling programmes, and second-chance education is critical to both economic dynamism and social inclusion. Yet, as highlighted in Chapter 3, participation in adult learning remains highly unequal and, in some countries, worryingly low or even declining. Those who could benefit most from retraining (older workers in declining industries, adults without basic qualifications, migrants needing language skills, etc.) often face the greatest obstacles to accessing adult learning. Meanwhile, employers may lack the resources to provide training that could be especially valuable for low-skilled or temporary workers. As a result, adults' skills stagnate or become obsolete, even as job vacancies for skilled workers go unfilled and new technologies demand continuous learning. To address this, OECD countries need to fundamentally rethink and strengthen their adult learning systems. Incremental tweaks are unlikely to suffice; instead, comprehensive policy packages are required to incentivise lifelong learning, lower barriers to access and ensure training provision is aligned with future skills needs.

The first priority is to make adult learning more accessible and attractive, particularly to under-represented groups. Cost and time are two major barriers often cited. Many adults, especially in low-paid jobs, cannot afford tuition fees or income loss during training. Governments can tackle cost barriers through public financial incentives: for example, grants or learning vouchers for low-income adults, tax credits or subsidies for employers who train low-skilled workers, and individual learning accounts (ILAs) that give every adult a personal budget for training. A number of countries are experimenting with ILAs – France's Compte Personnel de Formation provides a notable example of a nationwide scheme that credits training hours/money to individuals, with higher credits for the low-qualified. Singapore's SkillsFuture Credit is another, providing direct training credits (e.g. SGD 500 at age 25 plus top-ups at later ages) to encourage continuous learning (OECD, 2025[113]). To be effective, these instruments must be designed with inclusion in mind, with more support targeted at those with lower qualifications or in non-standard work (who tend to receive less employer training).

The other major barrier is time, with busy working adults with care responsibilities struggling to find time for training. To counter this barrier, policies such as training leave and more flexible learning options are crucial. Many OECD countries have introduced or expanded rights to training leave – allowing employees to take paid or unpaid time off for education. To make these policies inclusive, it is important to ensure that training leave is usable by those who need it most. This may entail providing wage replacement or stipends during leave so that low-income workers can afford to take time off, raising awareness about the entitlement, and incentivising employers to approve leave requests. Training opportunities can also be provided through intra-organisational mobility. For example, the Belgian Federal Public Administration developed a "Talent Exchange" programme through which 21 public organisations and agencies can request for temporary staff from the other organisations within the network for help on a specific project. The programme has been used as a tool to address skills shortages while giving civil servants the opportunity to develop their skills and learn on-the-job (OECD, 2025[113]). Where training leave is statutory, governments should monitor uptake among different groups and adjust parameters if, for example, only high-skilled workers are found to be benefitting.

Flexible training formats are another way of helping to reconcile learning with work and life schedules. This includes offering modular courses, evening/weekend classes, and online or blended learning. The rise of micro-credentials – short courses certifying specific skills – is a promising development to allow adults to upskill in small, manageable steps. Policymakers should support the expansion of accredited micro-credential programmes and ensure that they can be "stacked" towards larger qualifications, enabling continuous progression. The recognition of prior learning (RPL) is another powerful tool, as by assessing and crediting skills that individuals have acquired informally (through work or other experiences) it can reduce the time and cost needed for adults to obtain new qualifications. Countries such as Portugal (via its Qualifica Centres) and Finland have established robust RPL systems to help adults, especially those with low formal education, get credentials for skills they already have. Scaling up RPL and making the process simpler could greatly improve uptake, as many adults are unaware of or may be intimidated by current RPL procedures. The promotion of RPL systems and their benefits can incentivise the uptake of non-formal skills development opportunities, as highlighting the potential labour market and other benefits of learning can encourage individuals to reconcile learning with competing priorities that share common goals. For example, volunteering opportunities can provide individuals with an immigrant background the language learning and networking opportunities needed to integrate into local labour markets, and incentives such as tax-breaks or priority access to jobs can encourage learning through volunteering or other community-based initiatives (see Chapter 3, Box 3.11).

Overall, adult learning must be made easy to access, with minimal bureaucratic hurdles, and be actively promoted and incentivised. Outreach and guidance are needed to engage adults who do not naturally seek training. This could involve local one-stop centres for adult education advice, online portals linking individuals to courses and subsidies, and community-based initiatives to motivate learning (such as volunteering opportunities, peer learning groups, or leveraging public libraries and community colleges as

access points for lifelong learning). Some local governments are reinvesting in physical spaces that provide wraparound services for young and adult learners while also regenerating urban spaces. For example, the UTOPÍAS initiative in Iztapalapa, Mexico City, aims to transform neglected urban spaces into free-access centres offering educational, cultural, health and recreational services (see Chapter 3, Box 3.10).

A robust adult learning system depends on a partnership between the public sector, individuals and employers. Currently, responsibilities are often blurred or fragmented: some firms invest heavily in training their staff (although training quality and relevance varies), while others, especially small and medium-sized enterprises (SMEs), have limited resources to dedicate to employee upskilling or reskilling. To address this, policies can foster a culture of shared investment in skills. For instance, some countries use training levies or collective schemes whereby employers contribute to a national training fund, often with the option for firms to recoup funds when they train employees. Such schemes, when well-designed, encourage all firms to play a role and generate pooled resources to finance training for SMEs or for the workforce at large. For example, Norway's "Skills Plus" Work agenda includes resources for employers to provide workplace-based literacy, numeracy, digital and communication skills training on-the-job for individuals with low qualifications (see Chapter 3, Box 3.5). In Poland, there are efforts encouraging employers to aid unemployed individuals to re-enter the labour market, with co-financing for salaries and certain social security contributions exemptions available for employers onboarding senior workers who may need significant upskilling or other support transitioning back into the workforce (Polish Government, 2024[128]).

Another approach to boost adult learning within firms is to highlight the business case for training: governments and industry bodies can disseminate evidence that training improves productivity and innovation, thus incentivising firms to invest. Small firms may need support to navigate training options, for example through sector-based training consortia or public programmes that provide training needs assessments for companies. Ireland and Estonia have achieved notable progress in adult learning participation in the past decade by implementing long-term reforms that combine financial incentives, training leave, employer involvement and quality assurance of training. These comprehensive approaches signal that piecemeal efforts will not solve the issue, and that the incentives of all actors must be aligned.

As countries ramp up adult learning, they must also ensure that the training provided is of high quality and relevant to evolving skill demands (OECD, 2024[114]). One risk of expanding decentralised adult training through financial incentives is the proliferation of low-quality courses or credentials that do not actually improve workers' prospects. Strong quality assurance mechanisms are needed that include accrediting providers, setting standards for curricula and instructors, and monitoring outcomes (such as employment or wage gains for training participants). New forms of learning, such as online courses and micro-credentials, pose particular quality challenges, and several countries (e.g. New Zealand) have moved to establish specific quality criteria for micro-credentials and frameworks to integrate them into the national qualification system. Sharing information on provider performance and course outcomes can empower learners to choose effective programmes. This calls for improved labour market intelligence and mechanisms to feed this intelligence into training provision. For example, skills forecasting and sector skills councils can identify emerging skills needs (related to digitalisation, green transition, etc.). Public training funds can prioritise courses in those areas, while forecasting data and competence frameworks can help design criteria to both guide this prioritisation and ensure course quality. Some countries have created "occupation skill frameworks" in partnership with industry. For example, Singapore's Industry Transformation Maps (Workforce Singapore, 2025[129]) involve industry leaders in defining evolving occupational standards, which are used to guide modular training development. Moreover, jobs and skills frameworks that identify the key competencies required in each job can help design training programmes and career mobility. In France, the Public Service Jobs Directory (Répertoire des métiers de la fonction publique – RMFP) offers such a framework by systematically mapping the skills associated with each public job. The RMFP is regularly updated to reflect changes in jobs and skills, and upcoming developments aim to strengthen its alignment with labour market evolutions. This tool not only helps French public employers anticipate changes and guide training provision, but also helps French citizens

understand the evolving skills needs of French public institutions. The public employment service can also play a role by steering jobseekers towards training for occupations in shortage. In essence, an adaptive and forward-looking adult learning system is needed that not only responds to current skills gaps but that also anticipates future ones, thereby enabling workers to prepare for the jobs of tomorrow rather than jobs that may be in decline. Lessons from higher education institutions that have integrated some micro-credentials and massive open online courses (MOOCs) into their broader curricula can be valuable for employers looking to outsource or procure training content or tools for their employees.

Given the evidence that market forces alone leave many disadvantaged adults behind, reducing skills disparities must be a design principle of adult learning policies. This means continuously asking questions such as: are our programmes reaching those with the lowest skills? Are older workers and migrants seeing improved access? Considering the needs of vulnerable populations and offering learning in non-formal settings, such as in the community, can make upskilling more approachable for adults with negative schooling experiences or low initial skills levels.

In summary, a reinvigorated adult learning system in OECD countries should be inclusive, proactive and well-coordinated. It should treat learning as a lifelong right and necessity, just as health systems treat healthcare as an essential service with universal access, but with extra care given to those most at risk of "skills poverty". This is not just a social policy agenda – it is an economic one, as continuous skills development is essential for productivity, innovation and resilience in the face of technological and demographic changes. Investments and reforms in adult learning will mitigate skills shortages and enable broader participation in an economy's growth by creating a more adaptable and skilled workforce.

1.4.6. Career guidance and transitions: Supporting informed and inclusive pathways

Individuals face transitions throughout their lives: from school to further education or work, from one job to another, or back into the workforce after a break. How well people navigate these transitions can significantly affect whether skills are effectively utilised and whether labour market disparities widen or narrow. Individuals' ability to steer through professional challenges effectively at least partially relies on the education and training support available to them, as well as complementary services that support decision making. Career guidance and career development support are key policy domains to facilitate smoother transitions and better skills matching. Particularly for young people, access to quality career guidance during schooling can help ensure they make informed decisions aligned with their talents and labour market opportunities, rather than being derailed by lack of information or social biases.

Misalignments often begin early, as highlighted in Chapter 4. For example, youth with disadvantaged socio-economic backgrounds may have limited awareness of certain careers or underestimate the level of education and training needed, leading to sub-optimal choices that perpetuate inequality. Students with a disadvantaged socio-economic background generally have lower levels of career development activities and networks than students with advantaged socio-economic backgrounds (OECD, 2024[130]), relying more on schools for career information. Girls and boys also still exhibit gendered career aspirations in line with stereotypes, contributing to later occupational segregation and wage gap (Korlat et al., 2022[131]). Strengthening career guidance systems with an equity focus is therefore a high-impact policy lever.

Ensuring universal access to career guidance from an early age is critical**.** Policymakers should make career-related learning and guidance a standard part of the education journey for all students, beginning well before the end of secondary school. Evidence suggests that children start forming ideas about jobs early in life and that by early adolescence, many have already narrowed their aspirations, often based on gender norms or the limits of the information and role models they have been exposed to. Introducing age-appropriate career education in primary school – for instance, activities that broaden children's awareness of different occupations and counter stereotypes (e.g. female scientists, male nurses as role models) – can plant the seed for broader and higher aspirations. By lower secondary (around age 13-15), all students should receive guidance on the diverse educational pathways and careers available, including vocational

routes, apprenticeships, academic routes, etc., so that they can make informed choices for upper secondary. Schools with a large concentration of disadvantaged or vulnerable students may require additional resources to provide high-quality career guidance in a systemic way. Governments must be cognisant of this and provide the additional support needed. For example, in Ireland, the Delivering Equality of Opportunity in Schools programme provides preferential and extra funding for eligible schools to provide career guidance activities. In the United Kingdom, programmes such as Inspiring the Future and Speakers for Schools connect schools with volunteers and public figures who work exclusively with public institutions to try to democratise access to hard-to-reach networks, information and ultimately career pathways (see Chapter 3, Box 3.9). Countries can also set policies that guarantee every student has access to a certain minimal provision – for example, a mandated number of career counselling sessions or compulsory participation in work exploration activities (such as workplace visits or job shadowing). Some education systems allocate extra counsellor positions or partner with community organisations to reach at-risk youth. The guiding principle is early and proactive engagement: waiting until the end of secondary school to offer career advice is too late for many, as they might have already made curriculum choices that limit their options. Starting guidance early, and making it an ongoing process throughout schooling, leads to better alignment between students' capabilities and interests, and the needs of the labour market.

Enhancing the quality and inclusiveness of career guidance is as important as broadening access. Many teachers or school counsellors feel under-prepared to guide students in a rapidly changing world of work and require additional training on labour market trends, counselling techniques and bias-free guidance. In some countries, guidance is delivered by a mix of professionals, including dedicated career counsellors and teachers or social workers who integrate career development into their roles. Building this professional capacity with the proper resources is vital to ensure that students get expert support.

Beyond informing students about options, career guidance is an important way of imparting career management skills and employability skills to students. Guidance programmes should actively teach young people how to make decisions, set goals, search for opportunities and present themselves (CV writing, interview training, etc.). These competencies help level the playing field, as more advantaged students often pick up such skills from family and social capital, whereas disadvantaged students rely on school to learn how to navigate careers. An inclusive guidance approach also means tailoring support to those who need extra help: for example, special outreach to students who are disengaged or at risk of dropping out, providing alternate pathways such as vocational training or re-engagement programmes so that no young person is left without a pathway. Some best practices include "career coaching" schemes targeting disadvantaged youth or mentorship programmes that pair professionals from industry with students lacking role models.

In conjunction with guidance, all students should have the opportunities to build social capital and gain exposure to the world of work. One consistent finding is that students with lower socio-economic backgrounds have less access to informal networks and work experience that can inform their career choices. For example, they may not have family friends who are engineers or lawyers to ask for advice, and their part-time job opportunities or internships might be limited. Schools can act as connectors to the world of work to compensate for this gap. Policies encouraging partnerships between schools and employers are highly beneficial. This might involve organising career talks where diverse professionals (including women in STEM, leaders from minority communities, etc.) come to speak about their jobs; facilitating short work placements or job shadowing for students; and running programmes such as "career fairs" or "industry days" in schools. These activities help demystify professional environments and expand students' horizons. They also allow students to develop social capital – contacts and insights that are often concentrated among those with more advantaged socio-economic backgrounds. Inviting workplace volunteers or alumni from the school (especially those with similar backgrounds) to mentor students can be powerful. Some countries have national initiatives linking schools with local businesses and community mentors to ensure that every student gets at least one meaningful work-based learning experience before graduation. For example, the State of Maryland in the United States fosters partnerships between public

higher education institutions, local employers and non-profits that promote local workforce development and the uptake of relevant learning and training opportunities throughout young adults' educational and early professional trajectories. Non-profits provide students with career guidance while local employers provide information, mentorship and employment opportunities (Robbins, 2024[132]). Such measures can democratise access to career-related networks.

Involving students' families is also key: schools can engage parents, including those with disadvantaged socio-economic backgrounds, in the career guidance process by providing them with information and encouraging career conversations at home. Family-oriented career workshops or one-on-one meetings between counsellors and parents can help align support around the student while providing crucial information to parents, who may need to engage in upskilling or reskilling themselves.

Gender imbalances in career choices contribute significantly to persistent labour disparities. Career guidance can play a critical role in addressing gender stereotypes and broadening the aspirations of individuals belonging to groups under-represented in certain industries. Career guidance policies should explicitly aim to challenge gender stereotypes and encourage the exploration of non-traditional careers for all genders. This can be done by ensuring that career materials and activities are free of bias (e.g. showing men and women in diverse roles), providing specific programmes to boost the confidence of under-represented groups (for example, coding clubs for girls, or nursing career camps for boys), and offering experiential learning that breaks down gender norms. For instance, some education systems have introduced "Girls' Days", where female students visit companies in engineering/manufacturing, as well as campaigns to attract more boys into teaching or healthcare. In Germany, such events are part of a larger, annual campaign, supported by several federal ministries, that mobilises resources and political capital to support women entering men-majority fields. Adjacent initiatives and support include investments in childcare at universities and co-ordination with employers to ensure equity in recruitment practices (see Chapter 3, Box 3.8).

Career counselling should pay attention to different needs by gender, with evaluations suggesting that work experience and positive role models can significantly impact young people's decision making. Adolescent boys often exhibit more career uncertainty and could benefit from earlier intervention to engage them in thinking about their futures. Meanwhile, girls, despite high academic performance, may self-select out of certain careers due to confidence gaps or societal messages (OECD, 2024[130]). Just as it is important to promote the uptake of STEM subjects for girls in schools to ensure that they are able to access high-paying and in-demand skills and occupations, such as those related to STEM, there is a range of actions that governments can undertake to bring more men into historically women-majority fields, such as health and social care. Australia, Germany and the United Kingdom have all invested in targeted outreach campaigns, research, setting up new training institutions, and recruitment drives and educational materials to promote men's enrolment in training related to nursing (see Chapter 3, Box 3.8). Similarly, the Norwegian government has used targets and positive discrimination policies to bring more men into teaching and childcare professions (see Chapter 3, Box 3.8), while some Spanish public higher education institutions have established promotion plans to ensure women can access the same STEM teaching roles as men (see Chapter 3, Box 3.8). Thus, guidance should encourage self-exploration and critical thinking about career-social relationships – essentially helping youth critically examine why they might be inclined towards certain jobs and to question limiting narratives. At the same time, structural issues, such as societal expectations and the working conditions and renumeration pertaining to these occupations, should be addressed to address the problems pertinent to all teachers and health and social care workers across many OECD countries.

While schools are a major focus, career guidance is equally important for adults at transition points – such as those unemployed, considering a career change or re-entering the workforce (e.g. parents returning after childcare break or older workers). Public employment services (PES) and adult career counselling centres should be strengthened, with the centralisation of personalised counselling, skills assessment and

the navigation of training options able to greatly help adults find pathways to better employment. For example, the Australian Victoria's Jobs Victoria Career Counsellors Service has been offering free, personalised career guidance to all adults, regardless of employment status. The services are delivered by the Career Education Association of Victoria and staffed by professionally endorsed practitioners through the Career Industry Council of Australia, including specialists for Aboriginal communities and people with disabilities (see Chapter 3, Box 3.9). This type of support can only be mobilised in collaboration with social partners and requires targeting and tailoring to particular groups. For example, Austrian labour foundations (Arbeitsstiftungen) offer tailored training programmes, career counselling and job placement services in contexts such as mass lay-off events, or help disadvantaged populations to re-enter the workforce (Cedefop, 2020[133]; OECD, 2025[134]; 2025[135]).

Such support, supplemented by targeted interventions that consider local labour market dynamics and issues, are particularly critical in the context of industrial transitions (e.g. coal miners needing to shift to new sectors due to the green transition) and technological disruptions. Investing in career guidance for adults – including digital tools such as online skills assessment and job matching platforms – helps to reduce labour market mismatches and shortens unemployment spells. For example, the Danish "Boss Ladies" project seeks to attract more women into construction, an industry where women currently represent just 9% of the workforce. The project employs ambassadors, collaborates with VET institutions, provides career guidance and apprenticeship matching, and connects women with training opportunities, providing critical entry points into the industry (see Chapter 3, Box 3.3).

PES providers also play a crucial role in guiding unemployed individuals back into the labour market, and there are a range of possible interventions for the diverse needs of these populations. Policies such as Luxembourg's FutureSkills Initiative targets unemployed individuals with secondary education, offering three months of training followed by a six-month public sector internship. Spain's "Vives Emplea Saludable" integrates physical, emotional and social well-being into employment support programmes among unemployed individuals (see Chapter 3, Box 3.5). In designing coherent and comprehensive strategies to increase labour force participation through career guidance and adjacent programmes, policymakers should consider the breadth of support that can be provided and different means of delivery.

Career guidance complements adult learning policies, as even if training opportunities exist, many adults will not utilise them optimally without guidance to identify which skills to develop for sustainable careers. Some countries have introduced individual case management for those who are long-term unemployed or vulnerable workers, pairing them with career counsellors or job coaches. Others have created mid-career "check-ups", where workers at mid-life (age 40-50) are offered a free career review to encourage upskilling before their skills become obsolete. These practices recognise that career development is a continuous process – not a one-time choice made in youth – and that guidance should be available throughout a person's working life.

By helping people make better-informed educational and job choices, career guidance improves the efficiency of skills utilisation in the economy, reducing mismatches, and contributes to fairer outcomes by ensuring that talent is not lost due to lack of information or connections. For policymakers, this means treating career guidance as an integral part of the skills development ecosystem, investing in its reach and quality, and embedding it at multiple life stages.

1.4.7. Developing robust skills monitoring for diverse adult populations

The way adult skills are assessed can significantly influence the observed gaps between different socio-demographic groups. Different assessment tools may portray proficiency levels differently across heterogeneous populations, meaning that what appears as a "gap" between groups can widen or narrow depending on how and what is measured. For example, standard literacy tests (conducted in the host-country language) may exaggerate skills gaps for immigrants by not fully accounting for language barriers. Whereas in the past language barriers were hard to dismantle, technology can now limit their impact on

people's possibility to effectively participate in certain jobs and, increasingly, certain labour markets that operate in English rather than other official languages (Marconi, Vergolini and Borgonovi, 2023[136]). Similarly, assessments not designed to cater to diverse participants can misrepresent group differences. For example, adults with disabilities and impairments often score lower on traditional literacy and numeracy tests than the general population, which partly reflects test formats that fail to accommodate their needs. If universal design features are lacking (e.g. accessible interfaces or adapted time limits), testing environments can prevent certain groups from demonstrating their true competencies, thereby skewing the measured gaps. Even gender differences in skills may fluctuate with the choice of assessment framework: research finds that men perform better on certain types of literacy items (e.g. texts that are short, non-continuous or contain numerical content), whereas women do as well as men on other item types (Borgonovi, 2022[137]).

Failing to consider the full diversity of learners can mask the reasons behind low achievement in certain segments of the population, limiting policymakers' capacity to respond. Who and how we assess matters: robust monitoring tools must be sensitive to gender, socio-economic, cultural and age differences so that measured skills gaps reflect reality rather than artefacts of the test (Borgonovi and Suarez-Alvarez, 2025[138]).

In OECD labour markets today, populations are more diverse than ever in terms of gender and migration, socio-economic and educational backgrounds. However, many adult skills assessments were not originally designed with such heterogeneity in mind. This mismatch has tangible consequences. Standardised surveys that ignore diversity risk presenting an overly narrow picture of the skills individuals have and miss opportunities to inform policy with meaningful data. Developing more inclusive and flexible assessment tools would yield a more accurate and complete skills profile of the entire adult population.

Modernising adult skills monitoring systems to better capture the full spectrum of abilities across diverse groups of learners involves both widening coverage (ensuring under-represented groups participate) and refining measurement approaches. Reflecting diverse life experiences and skills applications can be achieved by tailoring assessments to adults with different experiences. In practice, this could mean offering test items that better mirror real-world tasks in various cultural settings, or, in the context of international assessments, allowing nationally relevant modules alongside an international core to acknowledge country-specific differences in skill sets. Advancing the flexibility and accessibility of assessments can help to better represent the strengths and vulnerabilities of different population groups. Technological innovations provide promising avenues: computer-based adaptive testing can adjust question difficulty to an individual's skills level, producing more precise results for both low and high performers. Using large item banks that include easier items and practical scenarios can improve measurement at the lower end of proficiency, where many disadvantaged adults are found. Multimedia and interactive problem solving tasks may also engage adults with different learning styles or language profiles, thereby capturing skills that traditional text-heavy tests miss. Importantly, embedding universal design and accommodations (such as assistive technologies or extra time) can enable people with disabilities or low digital literacy to fully participate, making the assessment far more representative. These improvements would help ensure that observed skills gaps truly signal areas in need of intervention, rather than reflecting biases of the instrument.

Assessment systems that embrace heterogeneity yield more precise data for decision making and better serve broader social goals. By designing tools that consider the heterogeneity in the characteristics of target populations, policymakers can identify the needs of entire communities and thus formulate effective, inclusive skills policies (Borgonovi and Suarez-Alvarez, 2025[138]). Building more adequate adult skills monitoring tools is not an end in itself but a means to drive both personalised learning pathways and smarter public policy. High-quality skills data, disaggregated by gender, socio-economic status, age, immigrant status or region, provide invaluable insights for guiding interventions. At the individual level, improved assessments can support tailored guidance and training. When adults receive detailed feedback

on their skills strengths and weaknesses, they and their instructors can pinpoint what upskilling or retraining is needed. For instance, assessments used in learning settings help educators identify each learner's gaps in real time so that they can adjust instruction accordingly. Even large-scale surveys primarily intended for monitoring could be made more useful to participants. Incorporating feedback mechanisms into surveys such as the OECD Survey of Adult Skills – for example, by giving test-takers an indication of their results and areas to improve – would make the experience more rewarding for adults and increase their engagement. This in turn yields more reliable data for policymakers, creating a virtuous circle: adults are motivated to participate and improve, and policymakers get better information on which to act. Ultimately, an accurate skills assessment can empower individuals to make informed decisions about further training, career moves or skills certification. It becomes a diagnostic tool guiding adults to the opportunities that match their needs – whether a numeracy refresher course for someone with low basic skills or an advanced ICT workshop for an older worker adapting to technological change. For example, the Slovakian "Digital Seniors" project initiative provides digital training to over 100 000 seniors and people with disabilities by providing training and tools to incentivise ongoing learning, highlighting the need for a multi-faceted approach to supporting sustained learning (see Chapter 3, Box 3.10).

At the system level, comprehensive and granular skills data enable more effective policy design, evaluation and resource allocation. When monitoring tools capture which groups are falling behind and in what areas, governments can target investments to where they will have the greatest impact. For example, if assessments reveal that adults in certain rural regions have particularly low digital skills, training funds and programmes can be directed there. Likewise, persistent gender or socio-economic skills gaps in the data can trigger the design of specialised outreach and support (such as literacy programmes for low-educated adults or mentoring for women in STEM fields). Robust measurement also helps in tracking progress and accountability: policymakers can set baselines and objectives (e.g. closing the urban–rural gap in basic skills or improving immigrant language proficiency over time) and use periodic assessment results to evaluate whether policies are working. System-level assessments are crucial for identifying equity gaps and guiding strategic planning towards national skills goals. Moreover, linking assessment outcomes with administrative data (on employment, earnings, training uptake, etc.) allows for the rigorous evaluation of which skill investments yield returns. This evidence-based approach supports allocating public funding efficiently – bolstering programmes that demonstrably raise skills levels in target groups and redesigning or discontinuing those that do not. In addition, transparent results from skills monitoring can strengthen accountability for institutions and training providers, ensuring the responsible use of public funds and quality assurance in adult learning.

1.4.8. Aligning skills with labour market needs: Improving matching and inclusive hiring through a skills-first approach

As countries work to build skills through education and training, they must also improve the matching of skills to jobs and remove barriers that prevent individuals from securing employment. Labour market institutions and employer practices can have a profound influence on whether skills disparities translate into opportunity gaps in the labour market. Policies in this domain aim to ensure that 1) employers can find and recognise the skills they need (addressing skill shortages); 2) workers can signal and use their skills effectively (addressing skills underutilisation and mismatch); and 3) progress is made against discriminatory or inefficient hiring practices so that everyone with the requisite skills can secure employment. Better matching can promote productivity and growth as firms get the talent they need and workers are more productive in roles that match their abilities. It can also promote inclusion by tackling biased hiring practices.

PES play a crucial role in matching jobseekers to jobs and in facilitating upskilling for those who are unemployed. Active labour market policies (ALMPs) such as job placement assistance, targeted training programmes and hiring subsidies can help those with skills gaps or other disadvantages find employment.

For example, jobseekers who lack certain in-demand skills can be directed to short training courses (in co-ordination with local employers who have vacancies). Hiring subsidies or apprenticeship incentives encourage employers to not overlook candidates with disadvantaged socio-economic backgrounds or disrupted learning trajectories, such as youth without experience, the long-term unemployed or persons with disabilities, and to instead focus on training them on-the-job. It is important that these programmes are well-targeted and coupled with counselling so that participants are matched to opportunities suited to their aptitudes. Many OECD countries are modernising their PES by using digital tools to profile jobseekers and predict who might need more intensive support, while simplifying access to services online. Public employment specialists and career counsellors should be trained to address biases, take into account individuals' needs and aspirations, and understand local labour market needs to improve outcomes. Governments may outsource this work to community-based, non-profit, private and other mission-driven organisations, which can help bridge the gap between policies and the practicalities of helping those they are intended to serve (see Chapter 3, Box 3.9) (OECD, 2025[113]).

ALMPs also need to keep pace with changing skill demands, which involves close co-ordination with education providers and employers. Fostering collaboration between PES providers, training providers and industry representatives can help address skills shortages (for example, when a new local investment creates demand for certain skills, the local workforce system can respond with a targeted training and placement programme). The ultimate goal is to prevent unfilled vacancies while skilled workers remain unemployed or underemployed due to shortcomings in the recruitment process. By continuously upgrading the skills of jobseekers and connecting them with opportunities, ALMPs contribute to both lowering unemployment and creating a more inclusive labour market.

Traditional hiring practices often rely heavily on formal credentials, such as degrees, certifications and prior job titles as proxies for skill, which can inadvertently exclude talented candidates who have followed non-formal learning pathways. For example, a seasoned IT professional may have a breadth and depth of self-taught coding skills but no relevant academic credential, and as a result may be filtered out of the recruitment process if a vacancy requires a university diploma.

A skills-first approach (see Chapter 4, Box 4.1) emphasises individuals' skills rather than how they were acquired. In practice, it means enhancing the transparency of skills information, making it easier for employers to identify the competencies they seek and for workers to showcase their skills, thereby improving labour market matching. A skills-first approach has implications for all stakeholders in the labour market: for employers, it means rethinking their recruitment and human resource management strategies; education providers may need to re-evaluate their curricula, teaching practices and means of certifying skills; and individuals may need to consider how best to demonstrate their existing skills and identify new skills required to succeed in the labour market.

Existing forms of hiring bias such as prejudiced decision making or disregarding non-traditional skills signals have created undue barriers for individuals striving for occupational mobility. A skills-first approach can promote occupational mobility by opening pathways to opportunities for individuals who have the skills required for a particular job but who have been historically under-represented in a given occupation or industry as a result of their inherent characteristics or occupational experiences. For example, even though more women hold higher education degrees, they are less likely to signal the full range of skills and experiences associated with the qualification. A skills-first approach to hiring and human resource management that emphasises clear and direct communication about individuals' skills could help address these gaps in communication.

Policymakers can encourage the skills-first approach by working with employers and industry bodies to develop better skills assessment tools and frameworks. For instance, creating occupational skills profiles and encouraging the use of skills tests or portfolios in recruitment can allow candidates to demonstrate ability regardless of socio-demographic characteristics. Governments themselves, as major employers, can lead by example by removing unnecessary degree requirements in public sector hiring and

implementing skills assessments. Robust credentials and skills recognition, particularly for migrants and older workers, can enable their qualifications and skills to be recognised by employers in the host country. Similarly, mid-career workers who acquire new skills through short courses or online learning need those skills to be visible to employers. Expanding digital credential platforms (for verified micro-credentials and RPL) and the use of e-portfolios and professional networking tools are other potential avenues of promoting skills-first practices in the labour market.

Policymakers should also focus on addressing occupational segregation and promoting diversity in high-demand fields. For example, women and socio-economically disadvantaged workers are often clustered in lower-paying roles or sectors. This is not purely a pipeline issue but reflects workplace environments and societal norms. Policymakers can support initiatives that improve diversity and inclusion in high-growth fields traditionally dominated by men or those with advantages socio-economic backgrounds, such as engineering and finance. For example, enforcing strong anti-discrimination laws and pay transparency can diminish gender pay gaps and hiring biases. For instance, France introduced a Gender Equality Index in 2019, requiring companies with more than 50 employees, and later public institutions, to publish annual scores based on pay gaps, promotions, and representation indicators. This policy aims to foster transparency and accountability, putting measurable pressure on organisations to reduce gender inequalities. Some countries require larger companies to report on gender pay differences or diversity statistics, creating pressure for organisations to improve. Supporting returnship programmes (short-term programmes to help professionals return to careers after a break, often used to reintegrate women after having children) can help reclaim lost skills and reduce attrition from the labour force. In tech sectors, programmes that retrain women or minority workers from other fields into coding or data analytics roles have shown success when coupled with hiring commitments from industry. Governments can fund or co-sponsor such conversion programmes as part of their skills strategy.

While the onus to upskill often rests with the individual, is it up to employers to make the best use of employees' skills. Many employees have more or different skills than their job requires, which can lead to disengagement and lower productivity (Adalet McGowan and Andrews, 2015[139]). Governments and employer associations can promote workplace practices that fully use and further develop workers' skills, such as the Belgian Federal Public Administration Talent Exchange (OECD, 2025[113]), or similar programmes that enable employees to gain experience across different parts of an organisation. Supporting SMEs to adopt such practices (e.g. via consulting or benchmarking initiatives) could yield productivity gains.

Dialogue between employers and education providers can ensure that skills taught (especially soft skills such as communication and collaboration) are leveraged in the workplace. New graduates being underutilised would be an inefficiency to address through job design or improved graduate recruitment practices. The increasingly sophisticated capabilities of AI and its encroachment on previously untouched research-intensive jobs has created unemployment and underemployment for many recent graduates. For example, in the United States, research and consulting roles, many of which are held by recent graduates and early-career professionals, are declining quickly and at a higher rate than overall postings (Stahle, 2025[140]).

In conclusion, aligning skills with labour market needs requires interventions on both the demand side (employer practices, job design, anti-discrimination) and the supply side (employment services, mobility and training incentives). By reducing mismatches and biases, countries can reap a "double dividend": a more efficient allocation of human capital – which research shows could boost productivity significantly (Adalet McGowan and Andrews, 2017[141]) – and a more inclusive labour market, where an individual's background is less determinative of their job prospects. Many disparities, especially those related to socio-economic background, would diminish if skills were equalised; for those gaps that remain, such as the gender gap, labour market-focused solutions are needed on top of skills policies. Several countries have launched national initiatives for employers to commit to skills-based hiring and some are using

"diversity charters" to encourage firms to implement inclusive recruitment and progression policies. Sharing and scaling up such best practices will be crucial. Ultimately, the effectiveness of a nation's skills investments will be undermined if those skills are not properly used. Therefore, skills policy and labour market policy must work hand in hand, ensuring that improving the skillset of the population translates into real gains in economic prosperity and social inclusion.

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Notes

[1] The Gini coefficient measures the extent to which distribution (for example of income) among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

[2] Green driven occupations comprise all jobs that are likely to be positively affected by the net-zero transition, even those that are not green in themselves. In particular, this includes the following categories: 1) green new and emerging occupations: new occupations (entirely novel or "spinoffs" from an existing occupation) with unique tasks and worker requirements (e.g. biomass plant engineers; carbon trading analysts; solar photovoltaic installers); 2) green-enhanced skills occupations: existing occupations whose tasks, skills, knowledge, and external elements, such as credentials, tend to be altered because of the net-zero transition (e.g. arbitrators, mediators, and conciliators; architects; automotive specialty technicians; farmers and ranchers). However, even if the net-zero transition alters the characteristics of these jobs, in non-green sectors of the economy (e.g. certain GHG-intensive industries, such as chemicals, fossil fuel power generation), these occupations may still be associated with the old (non-green) list of tasks, skills, knowledge and credentials, and their demand may therefore not necessarily grow in the short term; 3) green increased demand occupations: existing occupations in increased demand due to the net-zero transition but with no significant changes in tasks or worker requirements. Some occupations in this group can be considered as directly contributing to low emissions and clearly involve green tasks (e.g. environmental scientists and specialists; forest and conservation workers) but most are not and should rather be seen as in support of green economic activities (e.g. construction workers; drivers; chemists and materials scientists) (OECD, 2024[16]).

[3] The social and emotional skills used in the *OECD Skills Outlook 2025* are based on the BFI-2-XS Extra Short Big Five Inventory. This is the instrument administered across most of the countries that took part in the OECD Survey of Adult Skills.

[4] This report uses parental education, parental occupation, immigrant background and childhood residential context to distinguish groups. Parental occupation (at respondents' age 14) is based on the International Classification of Occupations (ISCO) and grouped into high-status: managers, professionals, and technicians and associate professionals (ISCO 1-3); and low-status: clerical support workers; service and sales workers; skilled agricultural, forestry and fishery workers; craft and related trades workers; plant and machine operators, and assemblers; and elementary occupations (ISCO 4-9). Parental education (at respondents' age 14) is based on the International Standard Classification of Education (ISCED) 2011 and grouped into tertiary-educated (having at least one parent who had attained tertiary education [ISCED 5, 6, 7 and 8]) and non-tertiary-educated parents. Childhood residential context (at respondents' age 14) refers to whether the respondent grew up in a village, town or city. Groups by immigrant background distinguish between children of immigrants, immigrants and non-immigrants. Children of immigrants were born in the country in which they reside, but their parents were not, or they were born in a different country and moved to their current country of residence before the age of 18. Immigrants are defined as those who migrated to their country of residence at age 18 or older. Non-immigrants were born in their country of residence, as were their parents.

[5] In cases where information is available for only one parent/guardian, the occupation of that parent/guardian is used for the analysis.

[6] For a definition of population subgroups by immigrant background please refer to section 1.3.1.

2 How background shapes 21st-century skills

Results from international large-scale assessments of adults' skills show that individuals with certain socio-demographic characteristics are more likely to have high levels of 21st-century skills than their peers. Young adults, adults with tertiary-educated parents, adults with parents who worked in high-status occupations and adults raised in cities consistently outperform their peers in literacy, numeracy and adaptive problem-solving. Gender disparities are domain-specific: women have higher proficiency in literacy whereas men have higher proficiency in numeracy and adaptive problem solving. Skills differences are widest at the tails of the distribution, suggesting "sticky floors" for disadvantaged groups and "glass ceilings" for high-achieving women. Breaking the analysis of skills disparities down by socio-demographic characteristics reveals that the nature of disadvantage is multi-layered. International comparisons show that inequalities related to gender and income are linked to skills disparities within countries. These disparities are already present among school-aged children, suggesting that future generations may face similar challenges to today's adults.

In Brief

This chapter reviews evidence on skills disparities in OECD countries across five dimensions: gender, socio-economic background (through indicators of parental education and occupation), age, immigrant background and childhood residential context. It draws on international large-scale educational assessments to identify disparities among adults and young people across achievement levels, countries and time. Disparities exist not only in the core 21st-century skills of literacy, numeracy and adaptive problem solving, but also in ancillary social and emotional skills and willingness to delay gratification. Socio-economic background is the most consistent driver of disparities, with advantages compounding over time. Context matters, with societal level inequality, place of residence and family resources shaping outcomes. Immigrant background gaps often narrow once language and family factors are considered, while gender gaps are domain-specific, favouring women in literacy and men in numeracy and adaptive problem solving. Patterns observed among adults are already present among school-aged children, suggesting that today's disparities are likely to persist without intervention. Many forms of disadvantage compound, with certain forms of disadvantage amplifying the effects of other disadvantages. Understanding these patterns is essential for designing targeted policies to narrow skills gaps. The key findings explored in this chapter include:

Disparities by socio-economic background (parental education and occupation):

- **Family socio-economic background is the strongest and most pervasive predictor of adult skills disparities**. For example, in every country, adults with tertiary-educated parents have higher skills than those whose parents are not tertiary educated: differences correspond to 0.55 standard deviation (SD) difference in literacy, 0.53 SD in numeracy and 0.55 SD in problem solving.
- **Socio-economic disparities in core 21st-century skills are wider at the bottom of the skills distribution**. The advantage in literacy for adults with at least one tertiary-educated parent corresponds to 0.44 SD among the highest achievers but 0.73 SD among the lowest achievers.
- **Socio-economic disparities in core 21st-century skills are wider in countries with greater income inequality.** For example, in Chile, total income disparities are relatively large (0.45 for Gini[1]), and skills differences related to parental occupation are also wide (0.7 SD for literacy). In contrast, in Poland, incomes are more equally distributed (Gini 0.27), and skills differences related to parental occupation are relatively contained (0.4 SD for literacy).
- **Among 15-year-olds, socio-economic disparities remain substantial, although narrowed in the first quarter of the 21st century**. For example, the difference in mathematics between students with and without tertiary-educated parents shrank from 0.47 SD to 0.37 SD between 2003 and 2022.

Disparities between men and women:

- **Gender gaps in 21st-century skills are domain specific.** On average, adult women outperform men in literacy (0.04 SD), but men outperform women in numeracy (0.17 SD) and adaptive problem solving (0.06 SD). In 30 out of 31 countries, men outperform women in numeracy.
- **Gender gaps vary by achievement level.** Men's advantage in numeracy is especially strong among top performers.

- **Between-country differences in gender gaps in numeracy reflect the level of gender inequality present in a society.** More inequality is associated with smaller numeracy gender gaps in favour of men.
- **The magnitude of gender gaps differs depending on other characteristics.** For example, the gender gap in numeracy favouring men is larger among adults with tertiary-educated parents (0.20 SD) than among adults with non-tertiary educated parents (0.16 SD).
- **Among teenagers, boys and girls have different strengths**. Boys have higher achievement than girls in creative problem solving (0.08 SD), financial literacy (0.05 SD), computational thinking (0.04 SD) and mathematics (0.10 SD). Girls have higher achievement than boys in collaborative problem solving (0.29 SD), global competence (0.26 SD), creative thinking (0.25 SD), civic knowledge (0.22 SD), computer and information literacy (0.20 SD), and reading (0.24 SD).

Age:

- **Information-processing skills peak in young adulthood and generally decline with age.** This pattern is widespread among OECD countries – with the exception of Sweden and New Zealand. On average, 16-29 year-olds outperform 50-65 year-olds by about 0.48 SD in literacy, 0.36 SD in numeracy and 0.57 SD in adaptive problem solving.
- **Age disparities are widest at the bottom tail of the achievement distribution**. For example, the difference in literacy between 16-29 year-olds and 50-65 year-olds corresponds to 0.56 SD at the 10th percentile but 0.41 SD at the 90th percentile.

Immigrant background:

- **On average, the children of immigrants have lower skills than individuals with similar background characteristics but without an immigrant background**. Differences correspond to 0.14 SD in literacy, 0.14 SD in numeracy and 0.11 SD in adaptive problem solving. However, these differences vary greatly across countries.

Childhood residential context:

- **Disparities in core 21st-century skills by childhood residential context are significantly in favour of city dwellers.** Whether individuals grew up in a village, town or city shapes the opportunities they have to develop and maintain their skills over the life course**.** On average, adults who grew up in cities have higher literacy (0.20 SD), numeracy (0.18 SD) and adaptive problem solving (0.17 SD) than those who grew up in villages.
- **The urban–rural gap in 21st-century skills is largely driven by differences in the socio-economic background of individuals across different residential contexts.** When comparing individuals with similar parental circumstances, the city–village gaps shrink to 0.08 SD in literacy, 0.06 SD in numeracy and 0.05 SD in adaptive problem solving.
- **Among 15-year-olds, disparities related to school location have slightly increased over time.** The difference in mathematics achievement between young people who attended school in a city and those who attended school in a village grew from 0.22 SD in 2003 to 0.26 SD in 2022.

1. The Gini coefficient measures the extent to which distribution (for example of income) among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

2.1. Evidence of socio-demographic disparities in 21st-century skills

Crises and megatrends have intensified the importance of individuals possessing the necessary skills to adapt, innovate and thrive in rapidly changing work and social environments, with core 21st-century skills – literacy, numeracy and adaptive problem solving – becoming increasingly important for current and emerging job roles (see Chapter 1, Section 1.1). However, evidence suggests that these skills are unevenly distributed across populations, reflecting broader inequality in which constraints and outcomes reinforce each other over time, allowing gaps to become entrenched across the life course. This unequal distribution limits the ability of certain groups to fully participate in and benefit from modern economic and civic life.

This chapter reviews existing evidence on how 21st-century skills vary by a range of socio-demographic characteristics: gender, parental education, parental occupation, immigrant background, childhood residential context and age. Drawing on data from the 2023 Survey of Adult Skills, the Programme for International Student Assessment (PISA), the International Computer and Information Literacy Study (ICILS), and the International Civic and Citizenship Education Study (ICCS), it offers a detailed assessment of the magnitude and nature of these skill gaps among adults and youth. Together, the findings shed light on both persistent and emerging patterns in the distribution of 21st-century skills, and explores how these gaps can be narrowed through targeted efforts within and beyond the education system.

Individual chances of skills formation are strongly influenced by socio-demographic characteristics (Hanushek and Woessmann, 2011[1]; Van de Werfhorst and Mijs, 2010[2]); however, the strength of these associations varies across countries, indicating that national characteristics and policy choices can shape the extent to which individuals' inherited circumstances shape their opportunities to develop their skills.

2.1.1. Disparities by parental education and occupation

Research suggests that parents influence their children's cognitive and social and emotional development (Cunha and Heckman, 2007[3]; Demange et al., 2022[4]; England-Mason and Gonzalez, 2020[5]; Grusec and Davidov, 2019[6]; Guhin, Calarco and Miller-Idriss, 2021[7]; Leerkes, Bailes and Augustine, 2020[8]). Social and emotional skills can be transmitted across generations (Attanasio, de Paula and Toppeta, 2024[9]), reinforcing social stratification, i.e. how societies categorise individuals into groups based on socio-demographic characteristics (Farkas, 2003[10]; Gruijters, Raabe and Hübner, 2023[11]). Children of parents with higher educational qualifications or who work in high-status occupations (defined in this chapter as managers, professionals, technicians and associated professionals) typically exhibit higher levels of information-processing skills and different behavioural tendencies. These disparities emerge early and persist through adolescence into adulthood, although the evolution varies by country context (Borgonovi and Pokropek, 2021[12]; Dickson, Gregg and Robinson, 2016[13]). At the same time, countries differ with respect to whether initial differences grow or shrink as individuals leave school and enter highly differentiated learning opportunities in further education, training or the labour market (OECD, 2021[14]).

Parental socio-economic status shapes both objective resources and young people's educational and career expectations (Breen and Goldthorpe, 1997[15]; Bodovski, 2013[16]; Lareau, 2011[17]). Stimulating home environments, characterised by the presence of educational resources and activities, promote early advantages in cognitive development, creating cumulative advantages that grow over time (Lareau, 2011[17]). High parental expectations, strategic residential choices and social networks further reinforce these advantages among families with socio-economically advantaged backgrounds (Chetty et al., 2022[18]; Owens, Reardon and Jencks, 2016[19]; OECD, 2024[20]).

Adolescents have been shown to evaluate educational decisions in light of perceived risks and benefits. Those from disadvantaged backgrounds perceive higher risks and often lower their expectations despite good academic performance, whereas advantaged youth maintain high aspirations regardless of

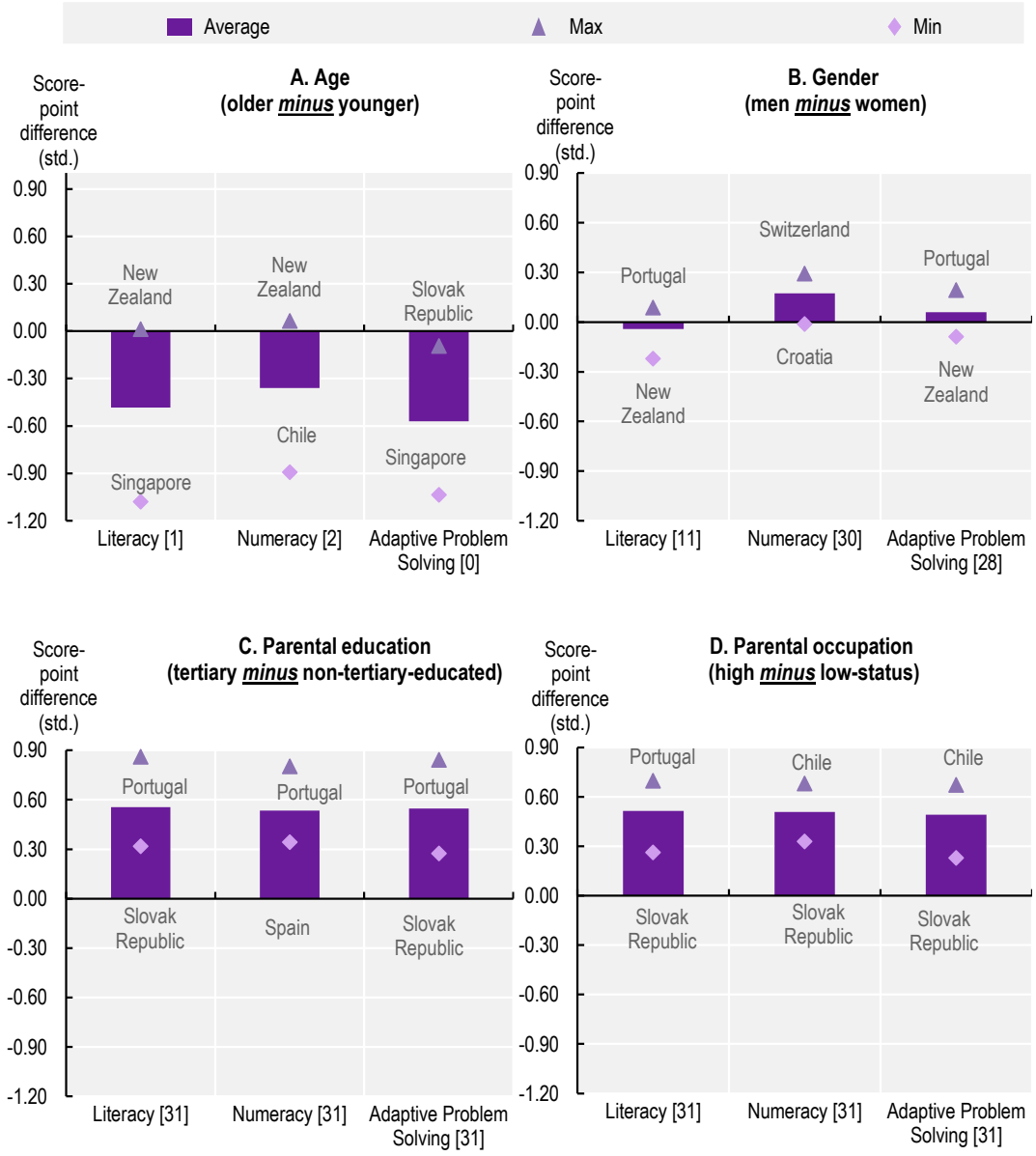
performance (Bernardi and Valdés, 2021[21]). As a result, disadvantaged students respond more strongly to signals about their likelihood of academic success, frequently opting for lower-risk educational tracks (Holm, Hjorth-Trolle and Jæger, 2019[22]). All these factors contribute to the widening of initial disadvantage over time, as small differences in circumstances in childhood, in the absence of compensatory factors, tend to compound over time.

Adults from families with socio-economically advantaged backgrounds display higher levels of information-processing skills in all countries (Figure 2.1, Panels C and D). Differences are medium-sized: the difference between adults with and without tertiary-educated parents corresponds to 0.55 SD in literacy, 0.53 SD in numeracy and 0.55 SD in adaptive problem solving. Differences related to parental occupation are similar: the difference between adults with and without parents in high-status occupations corresponds to 0.51 SD in both literacy and numeracy, and 0.49 SD in adaptive problem solving. Differences related to parental education and parental occupation are widespread: adults with a more advantaged background have higher levels of information-processing skills than their peers with a less advantaged background in all countries. Differences by parental education are widest in Portugal for literacy (0.86 SD), numeracy (0.80 SD) and adaptive problem solving (0.84 SD), and differences by parental occupation are widest in Portugal for literacy (0.7 SD), and in Chile for numeracy (0.68 SD) and adaptive problem solving (0.67 SD).

Over the past century, the make-up of families has changed significantly. Box 2.1 looks at how parental education and occupation have changed across generations and the impact this has had on the distribution of family resources in OECD countries.

Figure 2.1. Disparities in core 21st-century skills, by age, gender, parental education and parental occupation

Average, country min., country max., and number of countries with positive score-point difference, OECD average



Note: Adults aged 16-65. All average score-point differences in Panels A–D are statistically significant at the 5% level. The triangle marks the country with the largest score-point difference between the respective groups. The diamond marks the country with the smallest score-point differences between the respective groups. Numbers in square brackets next to skills indicate the number of countries with positive score-point differences. Parental education (at respondents' age 14) is based on the International Standard Classification of Education (ISCED) 2011 and distinguishes between adults with at least one tertiary-educated parent (ISCED 2011 5, 6, 7 and 8) and those with no tertiary-educated parent. Parental occupation (at respondents' age 14) is based on the International Classification of Occupations (ISCO) and grouped into high-status: managers, professionals, and technicians and associate professionals (ISCO 1-3); and low-status: clerical support workers; service and sales workers; skilled agricultural, forestry and fishery workers; craft and related trades workers; plant and machine operators, and assemblers; and elementary occupations (ISCO 4-9). Country-specific results are provided in Tables 2.A.2.1, 2.A.2.2, 2.A.2.3, and 2.A.2.4 in Annex 2.A.
Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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Box 2.1. Changes in parental education and occupation across generations

In this report, a family's socio-economic background is measured through indicators of the highest educational attainment and occupational status of parents, comparing adults with and without at least one parent with a tertiary-education degree and adults with and without at least one parent working as a professional or manager. However, considering only the educational qualification and occupational status of the most advantaged parent fails to distinguish between individuals with and without the added advantage of having both parents with tertiary qualifications or working in high-status occupations.

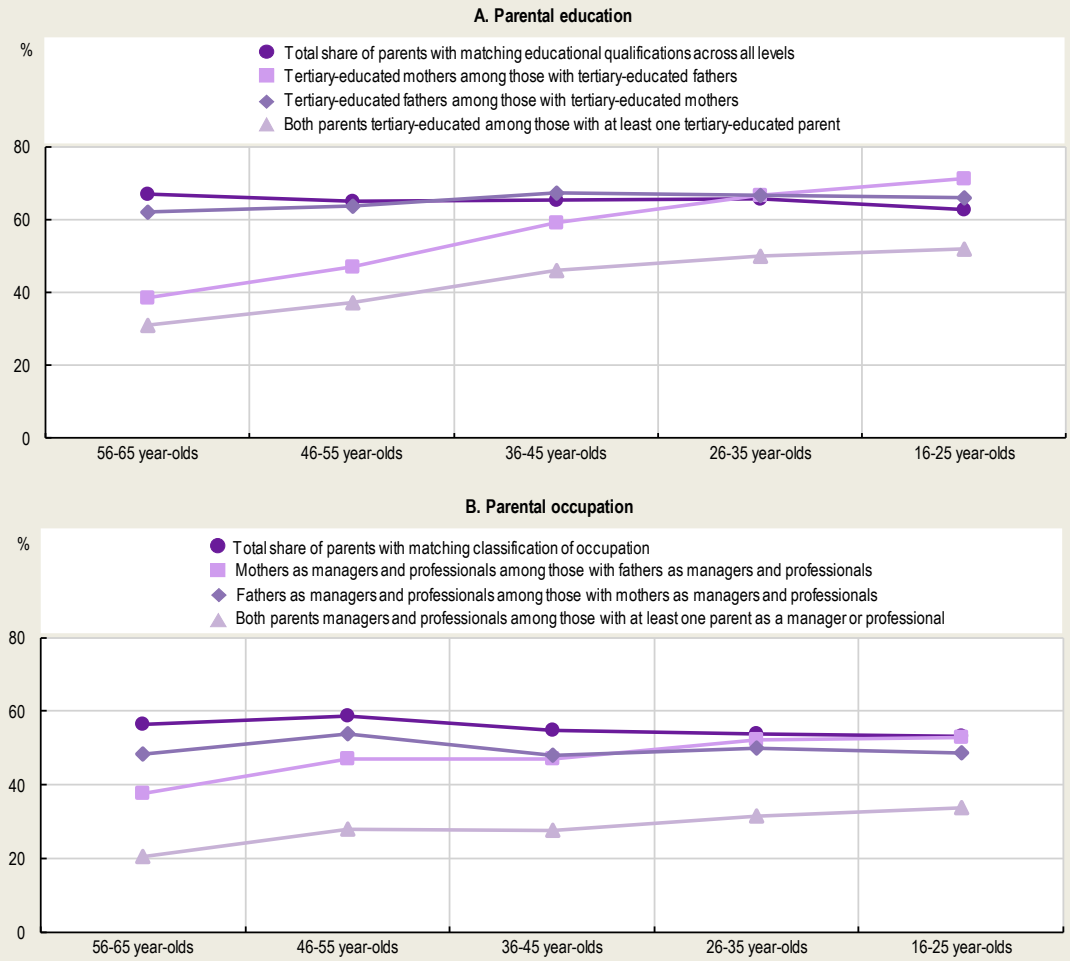
Over the past century, the make-up of families has changed significantly. Only 7% of adults aged between 56 and 65 in 2023 (those born between 1958 and 1967) have both parents educated at the tertiary level, whereas this share is 29% among those aged between 16 and 25 (those born between 1998 and 2007) (Table 2.A.1.1 in Annex 2.A). Conversely, the share of adults with both parents who achieved, at most, a lower-secondary qualification is 40% among 56-65 year-olds but only 9% among 16-25 year-olds. Among the oldest birth cohort, only 31% of individuals with at least one tertiary-educated parent also have a second parent educated at the tertiary level, compared to 52% in the youngest birth cohort.

Changes in educational attainment over time are mirrored by changes in occupational status: women's increased participation in education has been accompanied by increased participation in the labour market, with many employed in higher-status occupations such as managers and professionals (International Classification of Occupations [ISCO 1-2]). The share of adults with both parents in ISCO 1-2 occupations increases across younger age cohorts, with 7% of 56-65 year-olds having both parents in this occupational category compared to 16% of 16-25 year-olds (Table 2.A.1.2 in Annex 2.A). Among the oldest birth cohort, only 20% of individuals with at least one parent working in high-status occupations also have a second parent working in a high-status occupation compared to 34% in the youngest birth cohort.

The significant changes in educational attainment and occupation detailed in Tables 2.A.1.1 and 2.A.1.2 in Annex 2.A are largely driven by increases in the participation of women in tertiary education and their increased employment prospects, rather than by changing preferences in terms of the characteristics men and women look for in a spouse. The share of individuals with parents who obtained similar levels of educational qualifications and the share of individuals whose parents worked in a similar type of occupation remain relatively stable across birth cohorts. The biggest changes are visible for adults who have tertiary-educated mothers among those whose fathers are also tertiary educated. This share corresponds to 38% of 56-65 year-olds and increases to 71% of 16-25 year-olds (Panel A in Figure 2.2). Similarly, the share of adults with mothers who worked as managers and professionals among those whose fathers also worked as managers and professionals increased from 38% among 56-65 year-olds to 53% among 16-25 year-olds (Panel B in Figure 2.2). Meanwhile, few changes are visible among adults with tertiary-educated fathers whose mothers are also tertiary educated, and among adults with fathers working as managers and professionals whose mothers are also managers and professionals.

Figure 2.2. Trends in parental education and occupation

Total students in OECD countries, with countries weighted by population, OECD average



Note: Panel A: The category "Total share of parents with matching educational qualifications across all levels" denotes the share of respondents with cumulative share of parents with the same educational qualification across all educational levels. The category "Tertiary-educated mothers among those with tertiary-educated fathers" denotes the share of respondents with tertiary-educated mothers and fathers among respondents with tertiary-educated fathers. The category "Tertiary-educated fathers among those with tertiary-educated mothers" denotes the share of respondents with tertiary-educated fathers and mothers among respondents with tertiary-educated mothers. The category "Both parents tertiary-educated among those with at least one tertiary-educated parent" denotes the share of respondents with tertiary-educated mothers and fathers among those with tertiary-educated mothers or tertiary-educated fathers.
Panel B: The category "Total share of parents with matching classification of occupation" denotes the share of respondents with cumulative share of parents with the same classification of occupation. The category "Mothers as managers and professionals among those with fathers as managers and professionals" denotes the share of respondents with mothers and fathers as managers and professionals among respondents with fathers as managers and professionals. The category "Fathers as managers and professionals among those with mothers as managers and professionals" denotes the share of respondents with fathers and mothers as managers and professionals among respondents with mothers as managers and professionals. The category "Both parents managers and professionals among those with at least one parent as a manager or professional" denotes the share of respondents with mothers and fathers as managers and professionals among those with mothers as managers and professionals or fathers as managers and professionals.
Source: Calculations based on OECD (2024[23]), *PIAAC 2nd cycle database*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

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These changes, due to assortative mating and increases in female educational attainment, have profound implications for education systems and skills acquisition. Resources available in households where both parents are tertiary educated and earn incomes from higher-status occupations are very different from the resources available in families where neither is the case. There are also challenges to evaluating trends over time, as whereas historically, many individuals with at least one tertiary-education parent had only one such parent, now most have two. This creates difficulties for direct comparisons of skills levels by parental education. However, it also suggests that the depth of advantage potentially experienced by children with socio-economically disadvantaged backgrounds relative to that of more advantaged households has deepened over time, and resource differences are likely to have grown. Therefore, compensatory measures that might have been sufficient and effective in the past may no longer be equally effective today or in the future.

Findings also indicate that the composition of households according to parental education between adults who grew up in cities and those who grew up in villages has become more pronounced over time. For example, among 56-65 year-olds in 2023 (born between 1958 and 1967), 11% of those who grew up in cities had both parents educated at the tertiary level compared to only 4% of those who grew up in villages, a difference of 7 percentage points (Table 2.A.1.3 in Annex 2.A). This difference was as large as 15 percentage points among adults born between 1998 and 2007. Hence, findings suggest that long-term trends in the concentration of individuals with tertiary-level qualifications in urban centres have exacerbated disadvantage in rural communities.

2.1.2. Disparities by gender

Skills disparities between men and women are generally modest (Hyde, 2014[24]) but can still be consequential to the extent that they shape educational paths and career choices. Girls tend to outperform boys in verbal/language-related tasks, leading to better reading achievement, while boys often have a small edge in spatial and mathematical tasks. Gender differences evolve with age, reflecting educational and occupational trajectories (Rebollo-Sanz and de la Rica, 2020[25]; Borgonovi, 2022[26]; OECD, 2019[27]). The advantage of girls and women in literacy peaks in adolescence and diminishes by adulthood, while the advantage of boys and men in numeracy steadily increases (Borgonovi, Choi and Paccagnella, 2021[28]; Solheim and Lundetræ, 2016[29]; Lundetræ et al., 2014[30]; Rosdahl, 2014[31]; OECD/Statistics Canada, 2005[32]). Men and boys are more likely to report being willing to choose larger delayed rewards over smaller immediate ones than women and girls (Falk and Hermle, 2018[33]), but in practice they are less likely to actually choose the larger delayed rewards over the smaller immediate rewards (Silverman, 2003[34]).

Starting from an early age, boys and girls are often socialised into different skill-building experiences, reinforcing gender stereotypes and influencing skill development trajectories: girls are often encouraged to read and express emotions, whereas boys may receive toys that promote the development of the prerequisites of mathematics skills (OECD, 2015[35]). Gender stereotypes can also undermine young people's confidence in counter-stereotypical domains. Adolescent girls, for instance, often underestimate their mathematical ability despite high performance, affecting their further skill development (Huang, 2012[36]). School environments and broader social structures can magnify or reduce gaps (OECD, 2015[35]).

Differences between men and women in core 21st-century skills vary depending on the skill considered (Figure 2.1, Panel B). For example, while on average women outperform men in literacy by 0.04 SD, men score higher than woman in numeracy and adaptive problem solving (0.17 SD and 0.06 SD, respectively). Across countries, women outperform men in 9 out of 31 countries in literacy. In numeracy, men outperform women in all countries except Croatia, and the gender gap in numeracy is largest in Switzerland at 0.29 SD. In adaptive problem solving, men outperform women in 12 out of 31 countries.

2.1.3. Disparities by age

Skills disparities evolve over the life course, influenced by formal, non-formal and informal learning, life experiences, and cohort-specific socio-economic contexts. Age also moderates the effects of gender, family background and migration (Borgonovi et al., 2017[37]; Rebollo-Sanz and De la Rica, 2020[38]). Information-processing skills peak in early adulthood and typically decline thereafter, and more sharply for lower-educated individuals. Longitudinal studies indicate that skills use at work and home mitigates age-related decline, particularly among highly educated individuals (Hanushek et al., 2025[39]).

On average, 16-29 year-olds have higher levels of core 21st-century skills than 50-65 year-olds. Differences are small- to medium-sized when using "Cohen's d benchmarks"[1] but large when considering the standardised difference in achievement over the course of a school year among PISA participants (around 0.20 SD) (Avvisati and Givord, 2023[40]), or the range of effects on achievement of educational interventions (Kraft, 2020[41]): the difference corresponds to 0.48 SD for literacy, 0.36 SD for numeracy and 0.57 SD for adaptive problem solving (Cohen, 2013[42]). Younger groups also report being more willing to give up something beneficial today in order to benefit more from it in the future (0.35 SD difference) (Figure 2.1, Panel A). Differences in information-processing skills related to age favour young adults in virtually all countries. The only exceptions are New Zealand, where older adults score higher in literacy, and New Zealand and Sweden, where they score higher in numeracy, although these differences were not statistically significant.

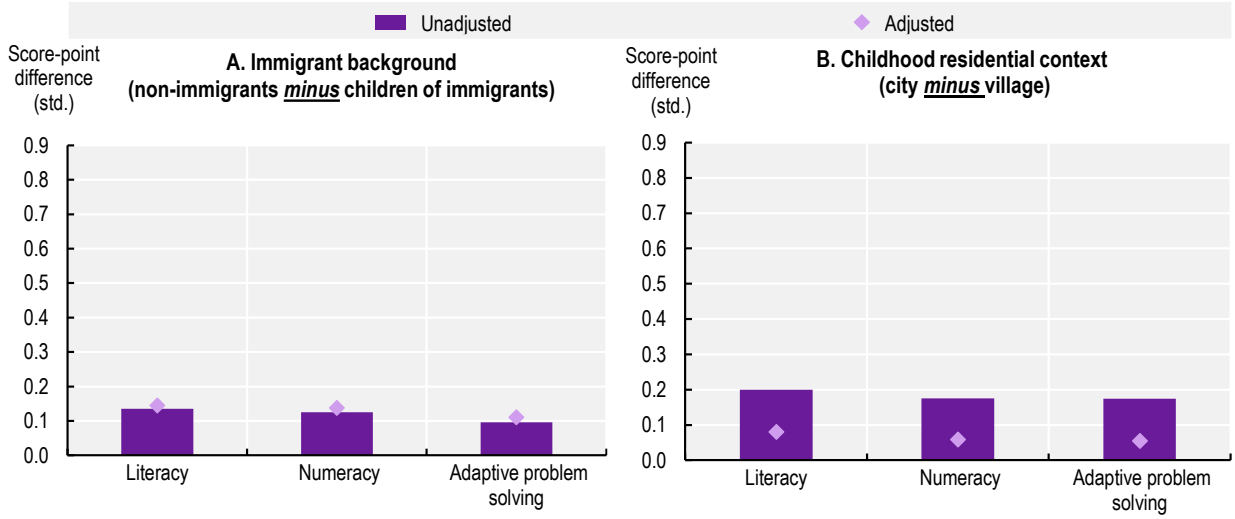
2.1.4. Disparities by immigrant background

Evidence on adult populations suggests that in most countries, immigrants or the children of immigrants, i.e. those born in a country to migrant parents or who migrated when under 18, have lower levels of information-processing skills than individuals without an immigrant background (OECD, 2016[43]). The unadjusted difference related to immigrant background is 0.14 SD for literacy, 0.13 SD for numeracy and 0.10 SD for adaptive problem solving (Figure 2.3, Panel A). After accounting for parental education and parental occupation, the differences are 0.14 SD for literacy and numeracy and 0.11 SD for adaptive problem solving.

In OECD countries, the educational attainment of migrants has significantly increased over recent decades, reflecting global increases in educational attainment (Barro and Lee, 2013[44]) and selective immigration policies (OECD, 2024[45]). Attracting, selecting and retaining migrants with skills adapted to the host-country labour market has become a key policy objective in many OECD countries, and differences in migrant composition explain a large part of between-country differences in the set of information-processing skills of migrant populations (OECD, 2018[46]). Language barriers, particularly for those migrating as adults, significantly impact their ability to express their information-processing skills' potential, with proficiency declining notably for those who migrated after the age of 12 (Cathles et al., 2021[47]; OECD, 2018[46]). Box 2.2 details the role of linguistic distance in people's skills.

Figure 2.3. Disparities in core 21st-century skills, by immigrant background and childhood residential context

Adjusted and unadjusted difference in literacy, numeracy and adaptive problem solving, by immigrant background and childhood residential context, OECD average



Note: Adults aged 16-65. 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 parental education and parental occupation. All adjusted and unadjusted differences are statistically significant at the 5% level. Childhood residential context (at respondents' age 14) refers to whether the respondent grew up in villages, towns or cities. Groups by immigrant background distinguish between children of immigrants and non-immigrants. Children of immigrants were born in the country in which they currently reside, but their parents were not, or they were born in a different country and moved to their current country of residence before the age of 18. Non-immigrants were born in their current country of residence, as were their parents. Country-specific results are provided in Tables 2.A.2.5 and 2.A.2.6 in Annex 2.A.
Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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Box 2.2. Differences in how personal characteristics affect different skills: The case of linguistic distance

Chapter 1 details how in the 21st century, individuals must possess a broad skillset that includes social and emotional skills and the capacity to delay gratification, alongside information-processing skills. By examining a range of skills, it is possible to consider how a certain personal characteristic may act as a barrier to skills proficiency in one domain (e.g. literacy) but a potential advantage in another (e.g. numeracy or adaptive problem solving). Recognising these interconnections highlights the multifaceted nature of human potential and reveals pathways for more inclusive learning and employment practices.

A holistic perspective on skills development also encourages the recognition of the strengths of populations that are usually disadvantaged in labour markets and societies. For instance, factors such as linguistic distance – the degree of dissimilarity between an individual's native language (L1) and second language (L2) – might hinder proficiency in acquiring a new language that is very different from the language an individual already knows, but it could also spur cognitive adaptations that foster greater flexibility in other areas (Isphording, 2014[48]; Paradis, 2011[49]). Linguistic distance influences not only the direct acquisition of linguistic skills but also amplifies cognitive challenges during L2 usage, often referred to as the "foreign language effect" (Takano and Noda, 1995[50]). Appreciating such compensatory mechanisms can help policymakers, educators and employers better tap into underutilised talents across society. Ultimately, understanding a broader range of skills enables the design of interventions and opportunities that nurture and showcase the full spectrum of human capabilities, benefiting not only the individuals involved but also the communities and organisations they belong to.

Language proficiency in a consciously acquired second language can be significantly affected by how dissimilar the new language is compared to the language an individual already knows in terms of pronunciation, grammar, script and vocabularies. Greater dissimilarity between L1 and L2 generally leads to increased difficulty in linguistic processing (understanding L2 as it is being heard/read). This leads to cognitive fatigue, because greater cognitive resources are needed for linguistic processing. Therefore, cognitive resources are less likely to be mobilised for non-linguistic information processing (Isphording, 2014[48]; Takano and Noda, 1995[50]). Consequently, individuals facing greater L1 to L2 dissimilarity may experience compounded difficulties in both using L2 and performing cognitively demanding tasks in L2 (Norman and Bobrow, 1975[51]). As such, linguistic distance emerges as a significant factor influencing both linguistic and broader information-processing skills (Borgonovi and Ferrara, 2020[52]; Isphording, 2014[48]; Kuperman, 2022[53]).

Although linguistic distance is associated with poorer literacy outcomes (Borgonovi and Ferrara, 2020[52]; Isphording, 2014[48]; Kuperman, 2022[53]), its effects on other competencies can be more nuanced. For instance, Kuperman (2022[53]) examined the impact of linguistic distance on the outcomes of Canadian immigrants. While greater linguistic distance was associated with lower literacy scores, numeracy skills were unaffected. One explanation for this is that numeracy tends to be more "language independent" than literacy, with existing numeracy skills more readily transferred to a new linguistic environment, whereas proficiency in literacy is more closely tied to the specific language in which they were originally developed (Kuperman, 2022[53]).

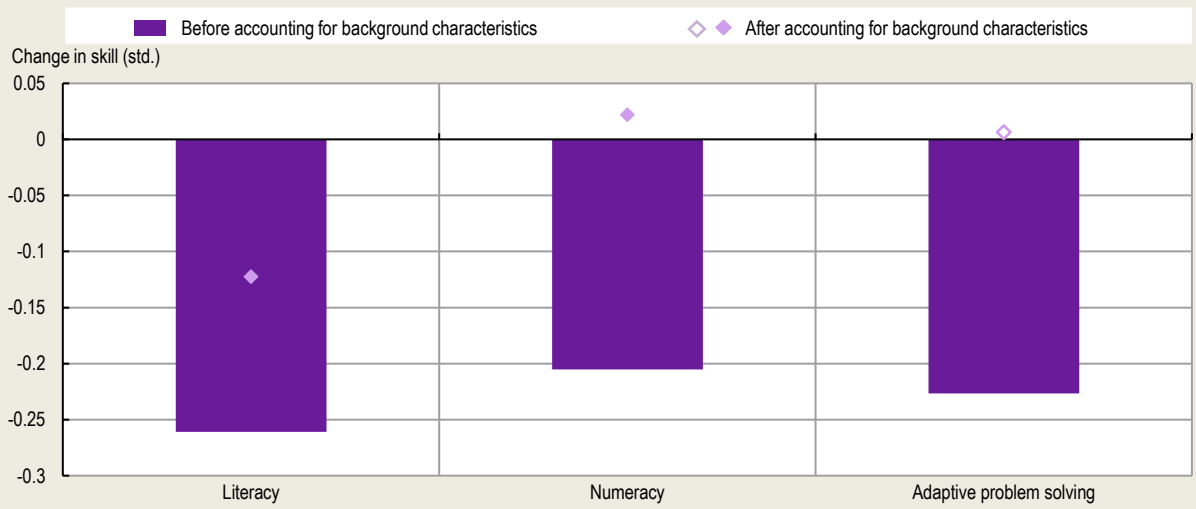
Learning a second language has been linked to structural anatomical changes in the brain (Li, Legault and Litcofsky, 2014[54]). For example, bilingual experiences can produce cross-domain effects, enhancing both linguistic abilities and general cognitive functions (Lehtonen et al., 2018[55]; Li, Legault and Litcofsky, 2014[54]). Even among older adults, learning a second language has been linked to improvements in attentional switching, inhibition, working memory and increased functional connectivity

(Ware et al., 2021[56]). A meta-analysis by Nucette et al. (2024[57]) explored the correlation between foreign language instruction and mathematical skills in young adolescents, highlighting that language learning could positively influence proficiency in numeracy. Therefore, although individuals with larger linguistic distance may lag in literacy, they may cultivate compensatory skills that benefit them in numeracy and other domains.

The results presented in Figure 2.4 support prior evidence on linguistic distance having compensatory effects on skills other than literacy. Linguistic distance, as measured by Levenshtein Distance Normalised by Divergence,[2] shows a significant negative correlation with literacy both before and after accounting for socio-demographic characteristics (-0.26 SD and -0.12 SD, respectively). However, when literacy is held constant, linguistic distance is positively correlated with numeracy after controlling for socio-demographic characteristics (0.02 SD). Moreover, the initially negative relationship between linguistic distance and adaptive problem solving (-0.23 SD) disappears almost entirely (0.01 SD, not significant) once accounting for literacy and background factors. These patterns suggest that while linguistic distance presents initial barriers to literacy acquisition, it may foster other skills, particularly in numeracy, through compensatory mechanisms.

Figure 2.4. Linguistic distance and skills proficiency

Effect of a one-standard-deviation increase in linguistic distance on core 21st-century skills, OECD average



Note: All coefficients before accounting for socio-demographic characteristics are statistically significant at the 5% level. Filled diamonds indicate that coefficients after adjusting for background characteristics are statistically significant at the 5% level. Socio-demographic characteristics include gender, age, respondents' educational attainment, educational attainment of parents, place of living at the age of 14, years in country of assessment, whether two languages were learned at home in childhood and still understood, type of immigration pattern, and literacy score (in the models for numeracy and adaptive problem solving). All models include country fixed effects.
Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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2.1.5. Disparities by childhood residential context

Where individuals live plays an important role in shaping their labour market and social opportunities (Chetty et al., 2014[58]; 2018[59]; OECD, 2025[60]). While cities have historically promoted economic equality, recent decades have seen increasing inequality and diminished opportunities for social mobility in cities (Connor et al., 2025[61]). Place of birth impacts skill development opportunities due to financial, occupational, social and caregiving constraints on mobility, with many adults remaining close to their hometowns despite limited opportunities (Artamonova and Syse, 2021[62]; Ferreira, Gyourko and Tracy, 2011[63]; Ganong and Shoag, 2017[64]; Gobillon and Seold, 2021[65]; Spring, Gillespie and Mulder, 2023[66]).

Regional contexts affect social and emotional skills and academic achievement, independent of parental background. Urban areas typically offer better educational infrastructure and resources, whereas rural areas experience constraints in educational choices and quality (Atherton et al., 2023[67]; OECD, 2017[68]; Rentfrow, Gosling and Potter, 2008[69]; Echazarra and Radinger, 2019[70]). Rural areas also face challenges in early childhood education and care (ECEC), including higher child-to-staff ratios, fewer pro-social teaching practices and limited availability. Urban centres attract more funding, better-qualified staff and more comprehensive resources (OECD, 2019[71]; Echazarra and Radinger, 2019[70]).

In around three out of four countries, adults who grew up in cities have higher proficiency in literacy, numeracy and adaptive problem solving than adults who grew up in villages or rural areas, as indicated in Panel B in Figure 2.3. On average, the unadjusted differences correspond to 0.20 SD in literacy, 0.18 SD in numeracy and 0.17 SD in adaptive problem solving. Differences are smaller when comparing the two groups after controlling for parental education and occupation: 0.08 SD for literacy, 0.06 SD for numeracy and 0.05 SD for adaptive problem solving.

Disparities in social and emotional skills and willingness to delay gratification can be observed across different socio-demographic groups (Box 2.3).

Box 2.3. Disparities in social and emotional skills and willingness to delay gratification

In a world where success increasingly hinges on collaboration, adaptability and self-regulation, social and emotional skills and a willingness to delay gratification complement the core 21st-century skills of literacy, numeracy and adaptive problem solving. Mapping how these skills vary by age, gender, socio-economic background, immigrant background and childhood residential context can highlight disparities that a reliance on traditional achievement metrics miss and equip policymakers with more complete information for the design of interventions. These measures are descriptive and context-dependent and therefore should not be interpreted as fixed traits or value judgements about individuals or groups (see the Reader's Guide).

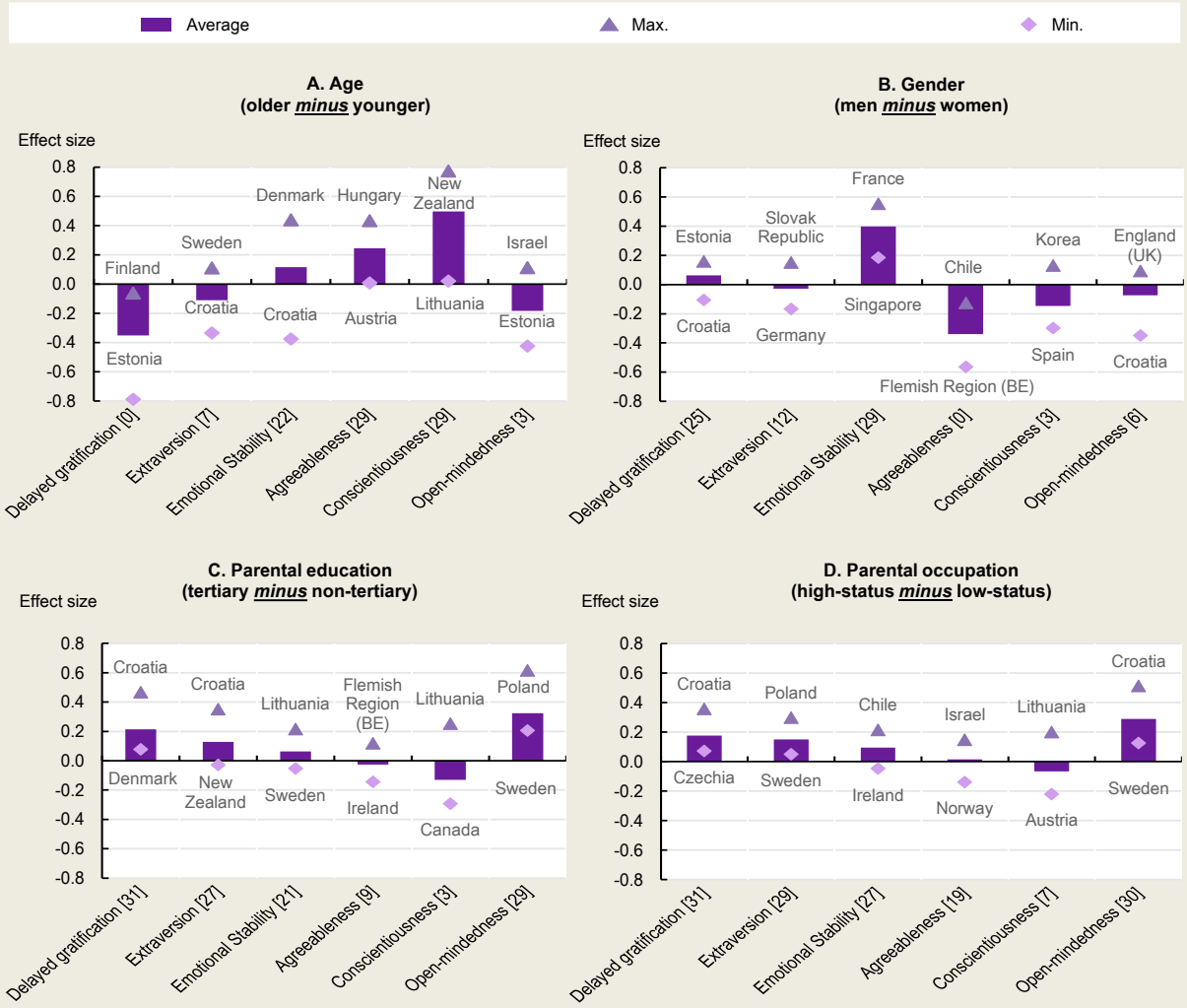
Disparities by age: Older adults are more likely to report being emotionally stable and not easily upset (i.e. scoring high on emotional stability) than younger adults (0.12 SD) on average across OECD countries. They are also more likely to be compassionate and assume the best in people (with a difference in agreeableness of 0.24 SD) and are more likely to be reliable (with a difference in conscientiousness of 0.50 SD) (Figure 2.5, Panel A). Younger adults are more likely to be full of energy and to come up with new ideas (with a difference in extraversion of 0.11 SD and a difference in open-mindedness of 0.18 SD).

Disparities by gender: Men score higher than women in emotional stability in all countries (0.40 SD), but women score higher than men in agreeableness (0.34 SD) and conscientiousness (0.15 SD). Gender differences are less pronounced for extraversion and open-mindedness (Figure 2.5, Panel B). Men also report being more willing to delay gratification than women (0.06 SD), with significant differences observed in 15 out of 31 countries (see Table 2.A.2.2 in Annex 2.A).

Disparities by socio-economic background: In all countries, adults with socio-economically advantaged backgrounds score higher on open-mindedness than adults with a socio-economically disadvantaged background (0.32 SD difference on average between individuals with and without tertiary-educated parents, and 0.29 SD difference on average between individuals with parents who worked in high-status rather than low-status occupations). Adults with a socio-economically advantaged background are also more likely to score higher than individuals with a disadvantaged background on extraversion and emotional stability, although differences are less pronounced (Figure 2.5, Panels C and D). Adults with socio-economically disadvantaged backgrounds score higher on conscientiousness than individuals with more advantaged backgrounds. For example, in 13 out of 29 countries, adults with parents who worked in low-status occupations score higher on conscientiousness than adults whose parents worked in high-status occupations (0.07 SD difference on average), and in 20 out of 29 countries, individuals with no tertiary-educated parents score higher on conscientiousness than individuals with tertiary-educated parents (0.13 SD difference on average). Socio-economic differences in agreeableness are small on average (slightly favouring adults with non-tertiary-educated parents by 0.03 SD and favouring adults whose parents worked in high-status occupations by 0.02 SD) and vary across countries. Differences in willingness to delay gratification related to socio-economic background are quantitatively small but pervasive in all participating countries. Adults whose parents obtained tertiary education report a higher willingness to delay gratification than adults whose parents did not (0.21 SD difference). Similarly, adults whose parents worked in a high-status occupation when they were children report a higher willingness to delay gratification than adults whose parents did not (0.18 SD difference).

Figure 2.5. Disparities in delayed gratification and social and emotional skills, by age, gender, parental education and parental occupation

Average, country min., country max., and number of countries with negative effect sizes, OECD average



Note: All average score-point differences in Panels A–D are statistically significant at the 5% level. The triangle marks the country with the largest effect size between the respective groups and the diamond marks the country with the smallest effect size between the respective groups. The share next to each element considered indicates the percentage of countries with negative effect sizes. See the note for Figure 2.1 for the definitions of groups based on parental education and parental occupation. Country-specific results are provided in Tables 2.A.2.1, 2.A.2.2, 2.A.2.3 and 2.A.2.4 in Annex 2.A.

Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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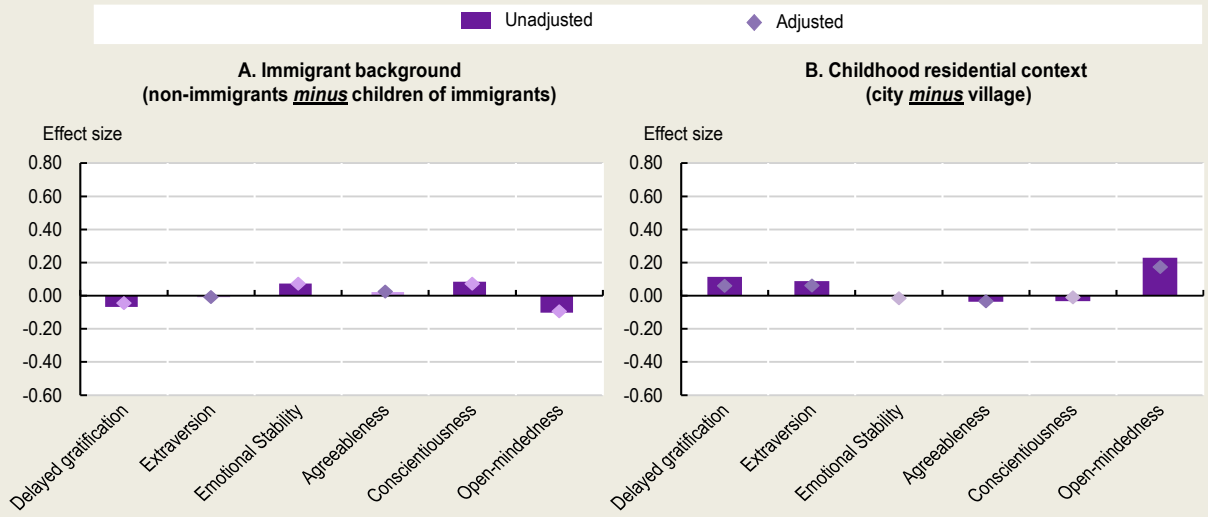
Disparities by immigrant background: Differences in social and emotional skills between individuals with and without an immigrant background are small, but largest when considering open-mindedness. On average, children of immigrants score higher on open-mindedness than individuals without an immigrant background (0.09 SD on average, Figure 2.6, Panel A) – even after controlling for socio-economic background (i.e. parental education and occupation). Empirical evidence suggests that higher levels of open-mindedness correspond with a heightening of the intention to migrate (Canache

et al., 2013[72]), with studies on intergenerational transmission of skills, attitudes and behaviours suggesting that children behave similarly to their parents (Dohmen et al., 2011[73]; Liefbroer and Elzinga, 2012[74]; Grönqvist, Öckert and Vlachos, 2016[75]). Therefore, children of immigrants may develop behavioural tendencies associated with higher levels of open-mindedness, which may involve the ability to discern whether challenges could be beneficial (Tucker, 2023[76]). Moreover, growing up in a household of immigrants means that children are likely to be exposed to a range of languages, norms, values, literary texts and worldviews, which may broaden their ability to understand and reflect different perspectives.

Figure 2.6. Disparities in delayed gratification and social and emotional skills, by immigrant background and childhood residential context

Adjusted and unadjusted difference in delayed gratification and social and emotional skills, by immigrant background and childhood residential context, OECD average



Note: 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 parental education and parental occupation. Darker colours denote differences that are statistically significant at the 5% level. See the note for Figure 2.3 for the definitions of groups based on immigrant background and childhood residential context. Country-specific results are provided in Tables 2.A.2.5 and 2.A.2.6 in Annex 2.A.
Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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Disparities by childhood residential context: Differences in social and emotional skills related to childhood residential context are small, except for open-mindedness, extraversion and delayed gratification (Figure 2.6, Panel B). Adults who grew up in cities score higher in open-mindedness than adults who grew up in villages (0.17 SD difference, after controlling for parental education and occupation), which is in line with findings from the literature (Militaru et al., 2023[77]). They also score higher on extraversion and delayed gratification (0.06 SD difference each, after controlling for parental education and occupation). These differences do not reflect different socio-economic background but may be due to the fact that cities are characterised by greater population density and higher diversity than villages, meaning that children living in cities are more likely to be exposed to individuals differing from them and from each other culturally, socially and economically (Lee et al., 2025[78]). Furthermore, the higher concentration of institutions such as museums, libraries and availability of cultural events in

cities may encourage curiosity and engagement with new ideas among children who grew up in cities rather than villages. Finally, urban environments typically offer more varied educational and extracurricular opportunities (Echazarra and Radinger, 2019[70]), which may foster adaptability and open-mindedness. In 9 out of 10 countries, adults who grew up in cities also report a greater willingness to delay gratification than adults who grew up in villages or rural areas, but this difference is small (0.06 SD after controlling for parental education and occupation).

2.2. The multi-layered nature of skill disparities

2.2.1. Disparities in core 21st-century skills: From basic to advanced skills

Average gaps in skills disparities between different groups mask large differences at the extremes of the proficiency distribution in literacy, numeracy and adaptive problem solving. Examining skills disparities among the highest achievers helps to identify the extent to which individuals from different backgrounds who share the talent needed to steer innovations such as artificial intelligence (AI) development of green technologies have been adequately supported in their skills development trajectory. Similarly, examining between-group differences in skills disparities among those with the lowest levels of achievement helps to identify the need for investments in lifelong learning to ensure that all adults, irrespective of their backgrounds, have the basic levels of proficiency needed to perform the core economic and social activities needed for informed participation in society and labour markets. Disparities among the highest achievers point to the success or failure of, for example, tertiary-education institutions and countries' innovation hubs to ensure equal opportunities for men and women and for individuals from advantaged and disadvantaged backgrounds. By contrast, disparities among the lowest achievers point to the success or failure of, for example, compulsory schooling in motivating and engaging young people with a lower interest and aptitude for processing information. Looking beyond the mean therefore provides a clearer, more detailed basis for policy design and resource allocation than relying on averages. In concrete terms, the analysis compares gaps in skills not only for the "average" adult but also for those at the very top (90th percentile) and very bottom (10th percentile) of the skills distribution. This allows us to see whether disparities are larger/smaller among high and low achievers, and which groups are most affected. This section complements the analyses above by detailing differences for average adults in OECD populations and disparities at the 10th (bottom 10% scoring adults) and 90th (top 10% scoring adults) percentiles of the distribution of literacy, numeracy and adaptive problems solving skills.

Among the highest achievers, gender disparities favour men in all domains, as indicated in Figure 2.7, Panel B. In numeracy, the average advantage of men is 0.17 SD; however, at the 90th percentile it is 0.28 SD and at the 10th percentile it is only 0.05 SD. In literacy, men outperform women by 0.05 SD among the highest achievers, whereas women outperform men by 0.15 SD among the lowest achievers. Similarly, the advantage of men in adaptive problem solving corresponds to 0.15 SD among the highest achievers, but women outperform men by 0.04 SD among the lowest achievers. These differences are discussed in Section 2.2.2, which considers the intersectional nature of disadvantage and reflects on the interplay between gender and socio-economic background.

Age disparities favour young adults and are widest among the lowest achievers in literacy, numeracy and adaptive problem solving. Panel A in Figure 2.7 reveals that the difference in numeracy in favour of 16-29 year-olds relative to 50-65 year-olds corresponds to 0.28 SD at the 90th percentile but 0.46 SD at the 10th percentile. In literacy, 16-29 year-olds outperform 50-65 year-olds by 0.41 SD among the highest achievers and by 0.56 SD among the lowest achievers. Similarly, the advantage of young adults in adaptive problem solving corresponds to 0.53 SD among the highest achievers and 0.62 SD among the lowest achievers. These findings could reflect age-related skills depreciation (Paccagnella, 2016[79]) and restricted opportunities for adult learning (Hanushek et al., 2025[39]) disproportionately

affecting older adults, who already possess limited human capital. By contrast, younger cohorts who have just completed a more broadly uniform schooling may benefit from a de facto minimum proficiency floor that leads to a relatively compressed lower tail of the achievement distributions. Over the life course, older workers with low information-processing skills are less likely to access further training, have technology-rich jobs or engage in cognitively stimulating activities; however, older adults with high levels of information-processing skills can offset natural decline through continuous professional practice and by mobilising experience. The result is a more polarised distribution among older individuals due to a sizeable share of this group sliding further behind, while the lower tail of the youth distribution remains comparatively compact, accentuating age-related disparities precisely where achievement is weakest.

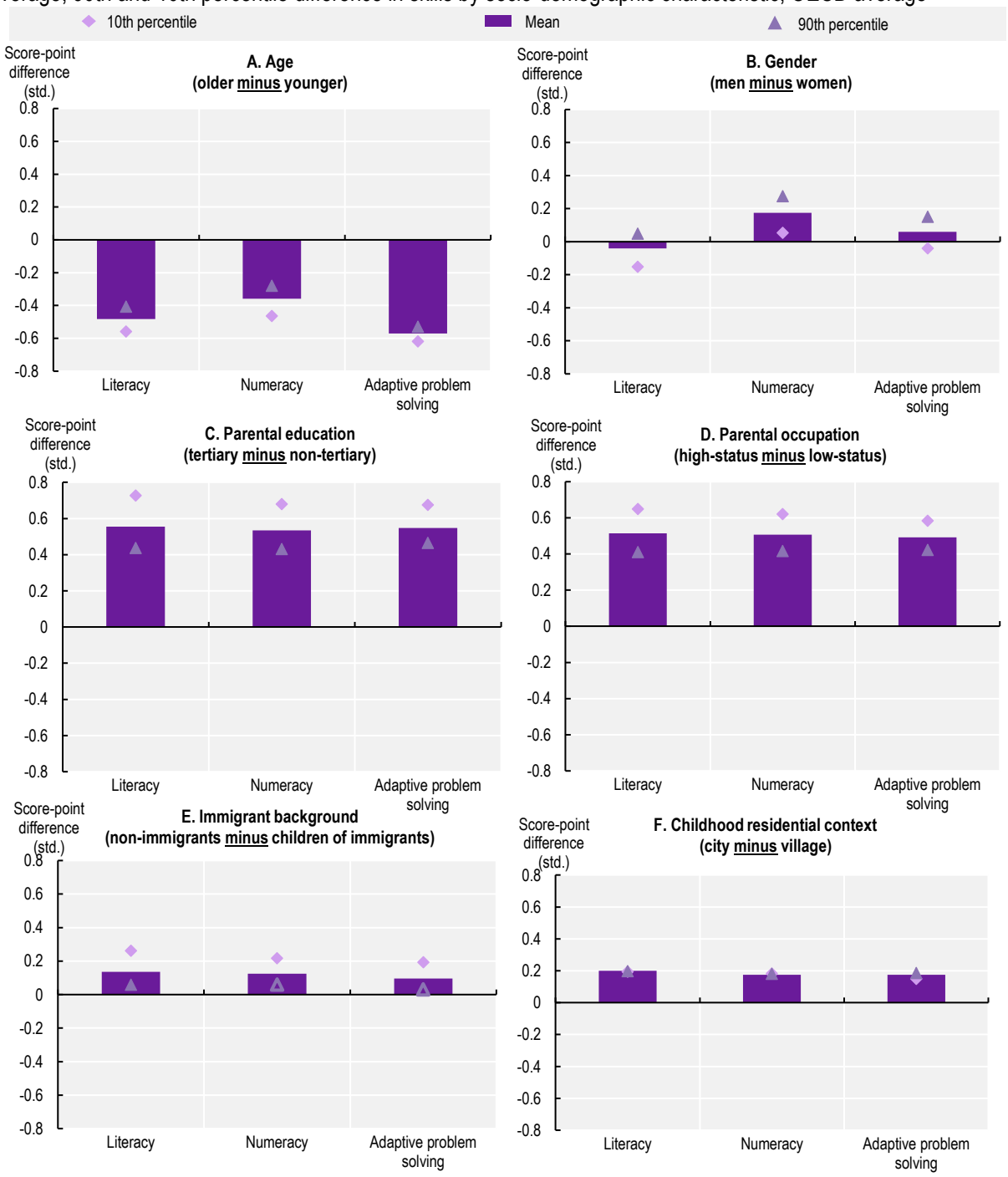
Disparities related to socio-economic background favour adults with advantaged backgrounds and are widest among the lowest achievers. For example, Panels C and D in Figure 2.7 indicate that the advantage in literacy skills of adults with at least one tertiary-educated parent corresponds to 0.44 SD among the highest achievers and 0.73 SD among the lowest achievers. The advantage in literacy skills of adults with at least one parent who worked in a high-status occupation corresponds to 0.41 SD among the highest achievers and 0.65 SD among the lowest achievers. Similarly, the advantage in numeracy of adults with at least one tertiary-educated parent corresponds to 0.43 SD among the highest achievers and 0.68 SD among the lowest achievers. For adults with at least one parent who worked in a high-status occupation, the advantage in numeracy skills corresponds to 0.42 SD among the highest achievers and 0.62 SD among the lowest achievers.

Disparities related to immigrant background favour non-immigrants and are widest among the lowest achievers. Differences in information-processing skills between individuals with and without an immigrant background are especially wide among the lowest achievers, whereas disparities are lowest among the highest achievers (Figure 2.7, Panel E). For instance, while the mean literacy difference between non-immigrants and immigrants is 0.14 SD, the difference among the lowest achievers is 0.26 SD and among the highest achievers 0.06 SD.

Disparities related to childhood residential context favour those who grew up in cities and are widest among the highest achievers in adaptive problem solving but do not differ significantly between the highest and lowest achievers in literacy and numeracy. The mean difference between adults who grew up in cities and those who grew up in villages is 0.2 SD in literacy, 0.18 in numeracy and 0.17 in adaptive problem solving (Figure 2.7, Panel F). In adaptive problem solving, the difference among lowest achievers is 0.15 SD, while it is 0.19 SD among the highest achievers.

Figure 2.7. Disparities in the distribution of core 21st-century skills among the highest and lowest achievers, by socio-demographic characteristic

Average, 90th and 10th percentile difference in skills by socio-demographic characteristic, OECD average



Note: Adults aged 16-65. All mean score-point differences in Panels A–F are statistically significant at the 5% level. Filled diamonds indicate that differences at the 10th or 90th percentile are statistically significant at the 5% level. The pale colour diamond marks the score-point difference at the 10th percentile between the respective groups. The darker colour diamond marks the score-point differences at the 90th percentile between the respective groups. See the note for Figure 2.1 for the definitions of groups based on parental education and parental occupation. See the note for Figure 2.3 for the definitions of groups based on immigrant background and childhood residential context. Country-specific results are provided in Tables 2.A.2.7, 2.A.2.8, 2.A.2.9, 2.A.2.10, 2.A.2.11 and 2.A.2.12 in Annex 2.A.

Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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The findings shown in the figures above suggest that "who you are" matters differently at different levels of achievement, reflecting within-group differences between individuals with a higher and lower propensity to excel in core 21st-century skills. The wide gap associated with socio-economic background among low achievers could reflect compensatory advantage processes, i.e. the fact that families with a socio-economically privileged background can mobilise financial, cultural and social capital to ensure that if their children have low levels of academic potential they nonetheless gain valuable skills (Bernardi, 2014[80]; Bernardi and Valdés, 2021[21]). It could also reflect the fact that such parents are more able to engage in intensive and strategically structured parenting to support their children (Lareau, 2011[17]).

2.2.2. The intersectional nature of skills disparities

Disparities in skills arise from the interplay of multiple characteristics such as gender, socio-economic background and geographical context. Intersectionality underscores the importance of examining these factors simultaneously, as each dimension can compound or mitigate inequalities in complex ways (Crenshaw, 1991[81]). Individuals sharing one characteristic, like parental education, may experience different outcomes due to their gender or childhood location. An intersectional approach allows for the more accurate identification of subgroups facing compounded disadvantages, providing insights that could be used to provide targeted support and promote skills development over the life course. This perspective allows policymakers to create flexible, targeted interventions that address specific vulnerabilities (Christoffersen, 2021[82]). This section adopts an intersectional approach to illustrate the added vulnerability that arises from the combination of sources of childhood disadvantage.

Differences between groups in core 21st-century skills vary systematically by gender, parental education and childhood residential context. Detailed differences for specific core 21st-century skills and population groups are available in Annex Table 2.A.3. This section presents illustrative examples to highlight the importance of policy making taking into account the multiplicative nature of disadvantage to provide adequate and tailored support.

Gender disparities

Among school-aged populations, evidence suggests that young people's socio-economic background is especially impactful for boys, and that boys from disadvantaged backgrounds and/or attending schools with disadvantaged peers are especially likely to suffer from low levels of academic achievement (Autor et al., 2023[83]; Legewie and DiPrete, 2012[84]). These findings reflect the fact that gender gaps in numeracy are especially pronounced among individuals with high levels of numeracy skills (Ellison and Swanson, 2010[85]; Fryer and Levitt, 2010[86]), who tend to have a socio-economically advantaged background and live in urban rather than rural settings.

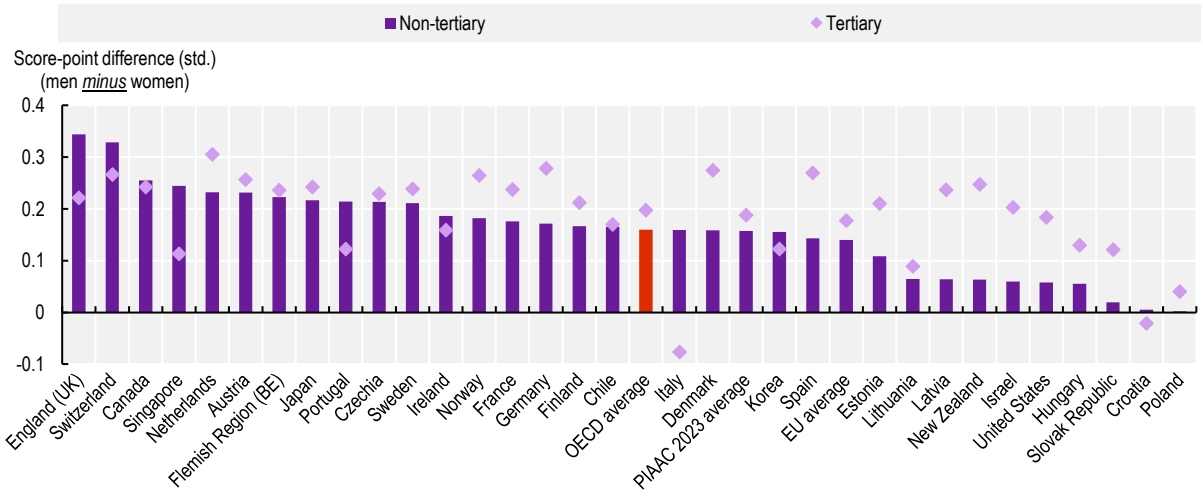
The disadvantage of women with socio-economically advantaged backgrounds could reflect the specific barriers they may face among high achievers, such as women's attitudes towards risk taking and competition (Eckel and Füllbrunn, 2015[87]; Niederle and Vesterlund, 2007[88]), as well as stereotypes and discrimination regarding women's lower potential to be "brilliant" (Leslie et al., 2015[89]; Storage et al., 2020[90]). The wider gender gaps among high achievers could also underscore how context-specific social norms and stereotypes may influence boys and girls differentially depending on their family background and where they grew up. Social norms in more advantaged urban environments may reinforce or elevate boys' engagement with academic pursuits, amplifying their lead in domains such as numeracy, which are prized in the labour market.

Gender disparities in numeracy are wider – favouring men – among those with at least one tertiary-educated parent (0.20 SD), and slightly narrower among those without (0.16 SD) (Figure 2.8). The figure also illustrates how the gender gap in numeracy proficiency between men and women differs depending on parental educational attainment in different countries. Among adults without any tertiary-educated

parent, the gender gap in favour of men is widest in England (United Kingdom) (0.34 SD) and Switzerland (0.33 SD), whereas in Croatia, Hungary, Israel, Latvia, Lithuania, New Zealand, Poland, the Slovak Republic and the United States it is less than 0.1 SD. Among those with at least one tertiary-educated parent, the gender gap in favour of men in numeracy is widest in the Netherlands (0.31 SD) and is smaller than 0.1 SD in Croatia, Italy, Lithuania and Poland. The difference in the gender gap in numeracy in favour of men between individuals with and without a tertiary-educated parent is largest in favour of those without a tertiary-educated parent in Italy – where it is as large as 0.24 SD; it is largest in favour of those with a tertiary-educated parent in New Zealand, where it is as large as 0.18 SD.

Figure 2.8. Gender disparities in numeracy proficiency, by parental education and country

Difference in numeracy proficiency between men and women, by parental education



Note: Adults aged 16-65. The figure shows the gender gap in numeracy among adults where no parent is tertiary-educated and among parents where at least one parent is tertiary-educated. See the note for Figure 2.1 for the definitions of groups based on parental education.
Countries are ranked in descending order of the score-point difference between men and women among those without tertiary-educated parents.
Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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Childhood residential context

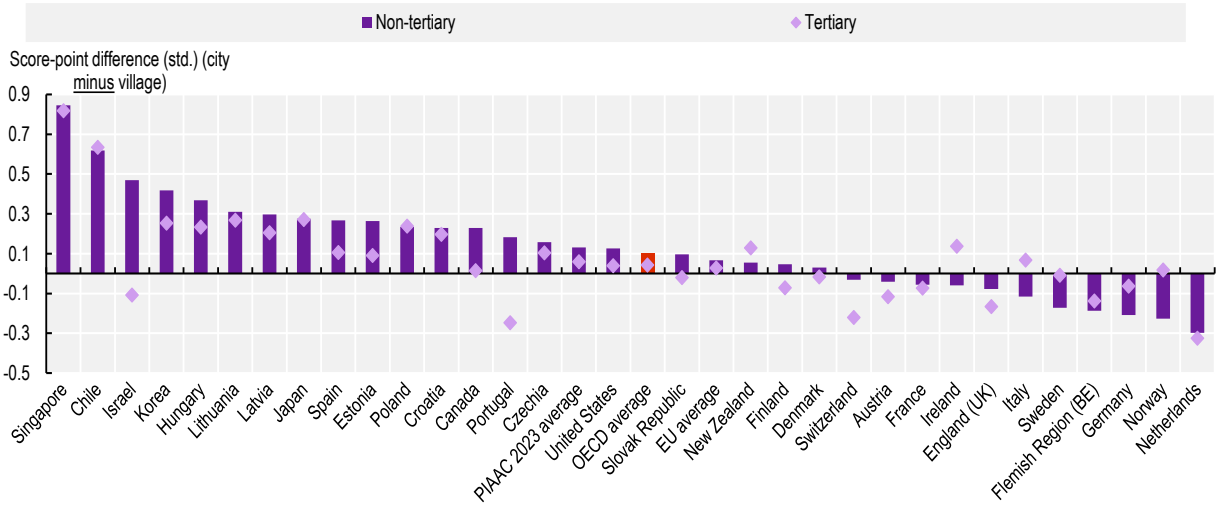
Disparities in information-processing skills between adults with and without tertiary-educated parents are especially wide among those who grew up in villages rather than cities. For example, the difference in literacy between individuals with and without a tertiary-educated parent is 0.61 SD among individuals who grew up in villages but 0.52 SD among those who grew up in cities Annex Table 2.A.3. Similarly, the differences in numeracy and adaptive problem solving skills between individuals with and without a tertiary-educated parent are 0.57 SD for numeracy and 0.6 SD for adaptive problem solving among individuals who grew up in villages compared to 0.51 SD, and 0.52 SD among those who grew up in cities.

These findings suggest that a family's cultural, economic and social resources exert a stronger influence on long-term outcomes in settings with limited opportunities for skills development. For example, in rural areas, lower population density often reduces choice in terms of school educational programmes or high-quality training programmes (Echazarra and Radinger, 2019[70]). Similarly, amid generalised teacher shortages in many OECD countries (OECD, 2024[91]), rural areas face especially strong barriers to attracting and retaining teachers (Echazarra and Radinger, 2019[70]), with highly educated individuals typically preferring to live and work in urban centres with rich cultural amenities and greater labour market opportunities for their partner (Bacolod, Blum and Strange, 2009[92]; Berry and Glaeser, 2005[93]). Moreover, economic activities in rural settings – such as energy extraction, agriculture, forestry and fishing, food production and processing, and logistics – often do not support the cultivation of advanced information-processing skills to the same extent as activities in urban settings. Consequently, individuals with socio-economically disadvantaged backgrounds from rural areas may be particularly constrained by limited resources within the home and in their environment, hindering their ability to develop and maintain robust skills over time.

Figure 2.9 shows that the "city advantage" in numeracy is not the same for all adults but depends on the education level of a person's parents. For example, in Israel, adults without tertiary-educated parents gain the most from having grown up in a city rather than a village: those raised in cities score around half a standard deviation higher in numeracy than similar adults who grew up in villages. By contrast, adults with tertiary-educated parents gain the most from having grown up in a village rather than a city: those raised in cities score one-tenth of a standard deviation lower in numeracy than similar adults who grew up in villages. In Norway the pattern is reversed: whereas there is no difference in numeracy between adults who grew up in urban and rural settings for adults with tertiary-educated parents, among adults without tertiary-educated parents, numeracy proficiency is lower among those who grew up in cities rather than a village. These differences reflect between-country differences in how economic opportunities and the availability of high-quality skills development possibilities differ across urban and rural settings.

Figure 2.9. Disparities in numeracy proficiency related to childhood residential context, by parental education and country

Average difference in numeracy proficiency between adults who grew up in cities and villages, by parental education



Note: Adults aged 16-65. The figure shows the gender gap in numeracy among adults who grew up in cities and among adults who grew up in villages. See the note of Figure 2.3 for the definition of groups by childhood residential context.
Countries are ranked in descending order of the score-point difference between those who grew up in cities and villages among those without tertiary-educated parents.
Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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2.3. Between-country differences in 21st-century skills disparities

Disparities in information-processing skills, alongside social and emotional skills, can influence economic productivity, social mobility and individuals' well-being. Examining differences in the size of disparities across countries can shed light on whether contextual factors may strengthen or weaken skills differentials across specific population groups. This section considers whether differences between countries in the size of skills disparities between men and women and between individuals with socio-economically advantaged and disadvantaged backgrounds reflect the degree of inequality present in different countries. Figure 2.10 summarises results regarding the associations between country-level characteristics and the size of disparities in skills.

2.3.1. How differences across countries in skills disparities between men and women relate to country-level characteristics

Across OECD countries, reducing gender disparities in education and the labour market is a common policy goal, and empirical evidence based on data from PISA has revealed that in countries with greater gender equality – as measured by the Gender Inequality Index (GII) – the gender gap in mathematics among adolescents in favour of boys is smaller, whereas the gender gap in reading in favour of girls is wider (Guiso et al., 2008[94]). Although this pattern was expected to hold among adults, further empirical evidence has since indicated that in countries with higher levels of gender equality (as measured by the GII), differences between men and women in numeracy proficiency are wider, in favour of men, as is the

gender gap in participation in science, technology, engineering and mathematics (STEM) fields of study (Balducci et al., 2024[95]; Borgonovi, Choi and Paccagnella, 2018[96]; Herlitz et al., 2024[97]; Stoet and Geary, 2018[98]). This is sometimes referred to as the "gender equality paradox" (Stoet and Geary, 2018[98]). Understanding why these patterns emerge is crucial for designing policies that effectively address the root causes of persistent differences in outcomes between men and women, and can help to refine theories on how social environments interact with individual choices and potential.

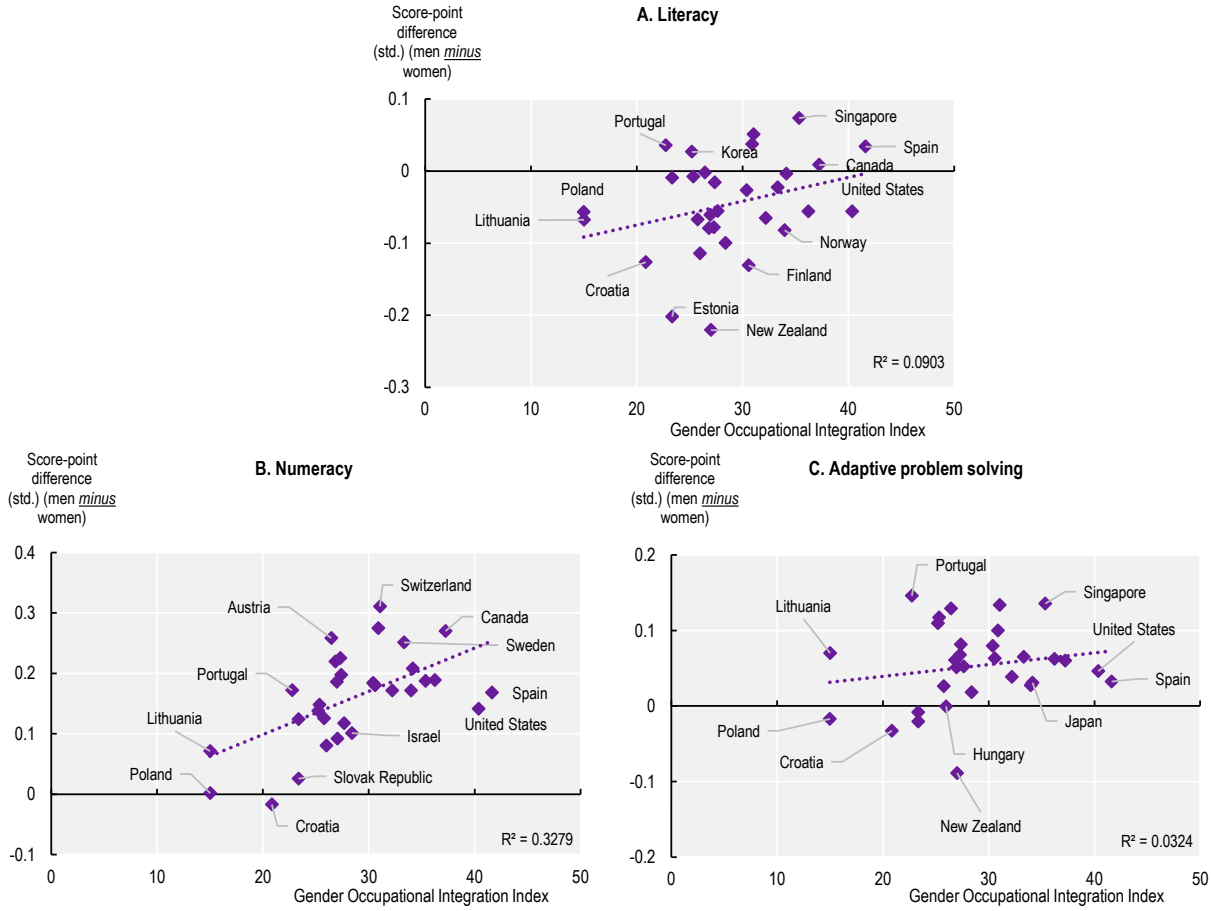
Most empirical analyses of the association between the size of gender skills differentials in a country and that country's norms towards gender equality rely on measures of societal-level gender inequality that reflect women's under-representation in the economic, political and social life of a country. Such metrics quantify women's access to labour markets and political representation but fail to portray qualitative differences in the opportunities men and women have available. For example, in a particular society, men and women could have similar levels of employment but work in very different occupations, with women being considerably more likely to work as teachers and nurses, and men being more likely to work as engineers and welders.

This section characterises societal-level gender disparities through the newly constructed Gender Occupational Integration Index (GOII). The GOII measures how equally women are represented in men-majority occupations and how equally men are represented in women-majority occupations (see Box 2.4 for a detailed description of the two indices). Associations derived from the GOII are similar to those obtained when considering GII, which is the widely used measure of societal inequality (Annex Table 2.A.4). Figure 2.10 illustrates country-level associations between the indicator of societal-level gender equality, using the GOII, and country-level indicators of gender disparities in skills, providing evidence that can be used to assess how social norms shape the relative performance of men and women across various skills domains. Societal-level gender equality is not systematically associated with the size of gender disparities in core 21st-century skills. Most country-level associations are quantitatively small or medium size, except for numeracy (Figure 2.10, Panel B). This means, for example, that gender disparities in literacy (a skills domain with a relatively large variation in the size of gender gaps across countries) tend to be just as large in countries in which occupational segregation between men and women is low and in countries in which it is high.

Figure 2.10 shows that gender gaps in numeracy in favour of men tend to be wider in countries with higher levels of gender equality. For example, in Canada the gender gap in numeracy is large (0.27 SD), and on average women and men are less likely than in other countries to work in occupations with a majority of workers of the same sex (GOII=37).

These findings indicate that among adults, the gender equality paradox applies only to proficiency in numeracy and not to other domains. Furthermore, the results suggest that the paradox is not due to measurement: estimates are aligned regardless of whether measures of gender equality that characterise qualitative differences in the participation of men and women in the labour market (likelihood of employment in counter-stereotypical occupations, i.e. the GOII) or measures that characterise quantitative differences (employment rates) are used (i.e. the GII) (see Annex Table 2.A.4).

Figure 2.10. Country-level association between gender gaps in core 21st-century skills and societal-level gender occupational integration



Note: To maintain readability, a selection of countries and economies is labelled. For more information on the Gender Occupational Integration Index (GOII), refer to Box 2.4 and Chapter 4.
Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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These findings suggest that societal norms and stereotypes may persist even in highly egalitarian contexts. Although structural barriers may be lower, gendered expectations about suitable roles and interests may still influence individuals' decisions. The gender equality paradox may reflect differences in the relative achievement of boys and girls in different academic domains and, in turn, the extent to which relative achievement shapes educational and career choices. In more equal societies, girls achieve at a level that is closer to that of boys than in less equal societies, but they generally continue to be especially proficient in domains not typically associated with enrolling in STEM subjects or pursuing STEM careers (OECD, 2015[35]). As a result, they tend to choose pathways of further education and training that do not strengthen their numeracy skills (Jansen, Becker and Neumann, 2021[99]). While these observed relationships can inform policy discussions, a more definitive understanding will require longitudinal or multilevel designs that control for shared cultural, linguistic and historical factors (Richardson et al., 2020[100]).

Box 2.4. Occupational concentration and gender inequality

Indicators of societal-level gender inequality each have advantages and disadvantages, depending on the intended use (Permanyer, 2009[101]). One of the most commonly used indicators is the Gender Inequality Index (GII), which is a composite measure of inequality between men and women that captures three dimensions: 1) reproductive health; 2) political empowerment; and 3) labour market participation (UNDP, 2025[102]). A low GII value indicates small differences in outcomes on the three dimensions between men and women, and a high GII value indicates large differences in outcomes between men and women (Permanyer, 2009[101]).

Although the GII offers broad country coverage and covers labour market disparities, its approach is relatively limited in this area as it only considers labour force participation rates. Its composite structure also makes it difficult to conduct more focused analyses of specific labour market outcomes. In particular, the GII cannot determine gender differences in labour market participation by sector and whether observed differences arise from women's under-representation in some sectors, men's under-representation in other sectors or both, which is an important distinction given that these patterns can vary considerably by country and sector (see Chapter 4).

To address these limitations, the Gender Occupational Integration Index (GOII) was developed to examine labour market occupational integration for men and women separately, with results combined into a single indicator to reflect how societal-level social norms shape the concentration of men and women in different economic activities. Put simply, whereas the GII captures how many women work, the GOII indicates the extent to which men work as, for example, teachers or nurses and women as truck drivers or engineers.

The GOII is calculated as the sum of the percentage of women working in men-majority occupations and of men working in women-majority occupations. Men-majority occupations are those where the weighted proportion of men's employment across all countries and economies in pooled 2023 Survey of Adult Skills first and second cycles exceed 75%. Women-majority occupations are those where the weighted proportion of women's employment across all countries and economies in pooled 2023 Survey of Adult Skills first and second cycles exceed 75%. This percentage is broadly aligned with other literature that defines gender-dominated occupations as those with female (or male) percentages between 60% and 80% (Bächmann, 2022[103]; Keane, Russell and Smyth, 2017[104]; McCaughey, 2023[105]; Torre, 2018[106]). The proportions were calculated at the three-digit ISCO level. Ten occupation categories (less than 0.5% of the sample) were excluded due to an insufficient number of observations. Armed forces occupations were also excluded from the analysis. This classification thus categorises occupations as men- and women-majority among all 2023 Survey of Adult Skills participating countries and economies together, disregarding local contexts. This ensures that, in the next step, the same men- and women-majority occupations are compared among countries.

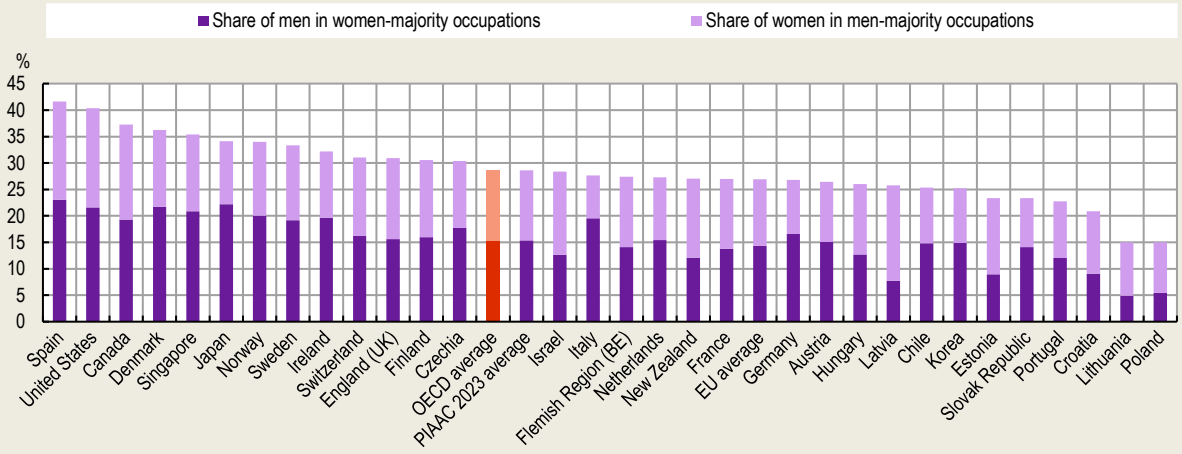
Once each occupation has been classified as men-majority, women-majority or neither, shares of women in men-majority and men in women-majority workers were calculated in each country and economy participating in the 2023 Survey of Adult Skills. These shares have been summed to produce the GOII value, expressed in percentages. Its theoretical minimum is 0% (no equality), indicating that no women work in men-majority occupations and no men work in women-majority occupations. If 50% of women in a country were to work in men-majority occupations and 50% of men work in women-majority occupations (perfect equality), its value is 100%.

The top three men-majority occupations are building frame and related trades workers (men-employment share of 97.8%), electrical equipment installers and repairers (97.6%), and building finishers and related trades workers (97.5%). The top three women-majority occupations are secretaries (women-employment share of 93.6%), nursing and midwifery professionals (91.7%), and childcare workers and teachers' aides (90.7%).

On average across the OECD, only 29% of workers are employed in jobs where their own sex accounts for less than one-quarter of the workforce; however, there is considerable cross-national variation in occupational gender integration (Figure 2.11). At one end of the spectrum, Poland and Lithuania have the lowest integration, with only about 15% of workers employed in jobs where their own sex accounts for less than one-quarter of the workforce (determined as all countries participating in the pooled first and second cycles of the Survey of Adult Skills). Similarly, in Croatia, Portugal, the Slovak Republic and Estonia, less than 25% of workers are employed in jobs where their own sex accounts for less than one-quarter of the workforce. The United States and Spain are the only countries in which over 40% of workers are employed in jobs in which their own sex accounts for less than a quarter of the workforce.

Figure 2.11. Gender occupational integration, by country

Sum of the percentage of women working in men-majority occupations and of men working in women-majority occupations



Note: Gender Occupational Integration Index measures the sum of the percentage of women working in men-majority occupations and men in women-majority occupations. Its theoretical minimum is 0% (no equality), indicating that no women work in men-majority occupations and no men work in women-majority occupations. Men-majority occupations are those where the weighted proportion of men's employment across all countries and economies in the pooled first and second cycles of the Survey of Adult Skills exceed 75%. Women-majority occupations are those where the weighted proportion of women's employment across all countries and economies in pooled 2023 Survey of Adult Skills first and second cycles exceed 75%. The proportions were calculated using occupations at the three-digit ISCO level.
Countries are ranked in descending order of the Gender Occupational Integration Index.
Source: Calculations based on OECD (2017[107]), *PIAAC 1st cycle database*, www.oecd.org/en/data/datasets/PIAAC-1st-Cycle-Database.html and OECD (2024[23]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

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Table 2.1 indicates, in detail, differences in the shares of workers in women-majority and men-majority occupations, of men and of women in occupations where their sex is a minority, alongside gender-specific rates of labour force participation or employment.

Table 2.1. Share of men in women-majority occupations, share of women in men-majority occupations and other labour market characteristics, by country

	Share of workers in women-majority occupations	Share of men in women-majority occupations	Male labour force partici-pation rate	Male employ-ment rate	Share of workers in men-majority occupations	Share of women in men-majority occupations	Female labour force partici-pation rate	Female employ-ment rate
Austria	18.0	15.1	81.0	77.2	29.6	11.4	74.4	70.5
Canada	15.0	19.3	84.0	79.4	29.5	17.9	78.3	73.9
Chile	16.3	14.8	83.7	79.3	32.3	10.5	71.1	64.8
Croatia	17.2	9.1	71.1	67.4	30.5	11.8	67.0	63.7
Czechia	13.9	17.7	85.4	82.2	33.8	12.7	70.7	66.3
Denmark	18.4	21.8	87.0	83.1	25.5	14.5	82.1	78.3
England (UK)	16.7	15.6	84.3	78.8	24.4	15.3	75.6	72.0
Estonia	14.0	9.0	86.1	81.2	33.4	14.4	83.3	78.5
Finland	17.9	16.0	81.7	75.9	29.6	14.6	78.7	75.3
Flemish Region (BE)	16.8	14.1	78.2	75.7	24.8	13.3	76.2	74.2
France	20.2	13.8	77.1	72.6	28.3	13.2	70.1	65.6
Germany	16.2	16.6	82.2	79.7	27.4	10.3	75.3	72.9
Hungary	11.8	12.7	85.9	82.4	35.7	13.3	76.5	73.5
Ireland	16.5	19.7	84.3	81.3	24.7	12.5	74.3	70.7
Israel	16.8	12.6	77.3	74.6	27.6	15.8	73.1	69.7
Italy	14.3	19.5	74.4	69.9	27.2	8.1	57.1	50.9
Japan	15.8	22.2	85.1	83.3	24.7	11.9	73.3	71.2
Korea	13.0	14.9	82.2	80.2	24.6	10.3	65.4	63.1
Latvia	10.8	7.7	79.9	73.7	32.5	18.1	76.4	71.4
Lithuania	13.4	4.9	76.9	71.1	31.1	10.1	73.5	67.8
Netherlands	13.9	15.4	85.3	83.3	23.4	11.9	80.9	78.5
New Zealand	12.5	12.1	85.9	82.4	29.4	14.9	79.9	76.0
Norway	20.9	20.0	87.0	83.1	24.9	14.0	81.4	78.1
Poland	12.2	5.4	79.4	76.7	38.2	9.6	67.0	65.0
Portugal	19.4	12.1	79.0	73.8	26.2	10.7	74.9	68.9
Singapore	12.3	20.9	83.3	81.7	28.9	14.5	73.0	71.6
Slovak Republic	15.1	14.1	81.0	77.2	30.2	9.3	73.8	71.4
Spain	15.1	23.0	78.6	71.3	24.8	18.6	72.6	62.8
Sweden	21.8	19.2	86.9	80.5	28.9	14.2	80.3	75.1
Switzerland	15.3	16.2	88.0	85.4	22.5	14.9	82.7	79.5
United States	12.3	21.6	80.0	75.8	27.1	18.8	73.5	67.5
PIAAC 2023 average	15.6	15.4	82.0	78.1	28.4	13.3	74.6	70.6
OECD average	15.7	15.4	82.3	78.3	28.3	13.3	74.9	70.8
EU average	15.8	14.3	81.1	76.8	29.3	12.6	74.3	70.1

Note: Includes 16-65 year-olds. Men-majority occupations are those where the weighted proportion of men's employment across all countries and economies in pooled 2023 Survey of Adult Skills first and second cycles exceed 75%. Women-majority occupations are those where the weighted proportion of women's employment across all countries and economies in pooled 2023 Survey of Adult Skills first and second cycles exceed 75%. The proportions were calculated at three-digit ISCO level. Potentially employed individuals are adults who were not students or retired, and were either unemployed; actively looked for paid work; or did not look for work due to looking after the family or home, due to being temporarily sick or injured, due to not believing any jobs were available, or due to not getting around to looking yet; and those who stopped working involuntarily in their last job due to a temporary job coming to an end, the job not matching skills, reorganisation, mass lay-offs or plant closure, or family reasons. It is expressed as a percentage of all employed workers.

Source: Calculations based on OECD (2017[107]), *PIAAC 1st cycle database*, www.oecd.org/en/data/datasets/PIAAC-1st-Cycle-Database.html and OECD (2024[23]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

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2.3.2. How differences across countries in skills disparities linked to socio-economic background relate to country-level characteristics

Evidence indicates that countries with greater income inequality also have lower social mobility, which Alan Kruger referred to as the Great Gatsby Curve (Corak, 2013[108]). Historically, worsening inequality has been shown to go hand in hand with declining social mobility. In contexts where incomes are spread out very unevenly, the children of disadvantaged families may find it more difficult to improve their position in adulthood by developing their skills. If socio-economic disparities shape opportunities for skills development among different groups, whether through access to family resources, access to high-quality education or broader community support, differential skills development could be one of the key channels through which inequality reduces social mobility.

A critique of the Great Gatsby Curve is that, in its original formulation, it fails to distinguish different forms of inequality (Bukodi and Goldthorpe, 2018[109]). Inequality arising from the willingness and ability of a society to reward talent and achievement is, in fact, qualitatively different from inequality that reflects innate privilege (OECD, 2025[60]). Therefore, this section considers two indicators of inequality: total income inequality, as measured using the Gini coefficient, and inequality of opportunity, as measured by the OECD's absolute inequality of opportunity indicator, which reflects how much income varies between people with different backgrounds (OECD, 2025[60]). The OECD absolute inequality of opportunity indicator reflects how much the household market income of two people who put similar effort to succeed but came from different family circumstances can be expected to differ.

Investigating whether cross-country differences in skills gaps between individuals with socio-economically advantaged and disadvantaged backgrounds reflect country differences in inequality can reveal the extent to which broader inequalities filter through into skills formation. Societies that exhibit both high income inequality and large disparities in key skills may be at particular risk of sustaining low levels of social mobility, as predicted by the Great Gatsby Curve. Conversely, those that manage to cultivate more inclusive skills development may mitigate some of the long-term harms associated with high inequality.

This section explores these issues by examining the country-level associations between total income inequality and inequality of opportunity on the one hand, and disparities in information-processing skills across adults with different socio-economic backgrounds on the other. The findings presented in Table 2.2 show that associations between socio-economic disparities in information-processing skills and total income inequality are strong or medium size, with skills disparities more pronounced in countries with greater inequality. By contrast, associations with inequality of opportunity are weaker[3]. For example, around 18% of the between-country variation in differences in numeracy between individuals with and without tertiary-educated parents can be explained by differences across countries in income inequality. Similarly, around 21% of the between-country variation in differences in numeracy between individuals who grew up in cities and those who grew up in villages can be explained by differences across countries in income inequality.

Table 2.2. Association between country-level characteristics and socio-economic disparities in information-processing skills

Variation explained and sign of relationship

	Absolute inequality of opportunity		Total income inequality (Gini coefficient)	
	Strength (R^2) and sign of association	With increasing index, respective disparity is: Increasing (↑)	Strength (R^2) and sign of association	With increasing index, respective disparity is: Increasing (↑)
A. Disparities between adults with and without tertiary-educated parents				
Literacy	0.04		0.13	↑
Numeracy	0.12	↑	0.18	↑
Adaptive problem solving	0.04		0.12	↑
B. Disparities between adults with parents who worked in high-status occupations and those whose parents worked in low-status occupations				
Literacy	0.00		0.17	↑
Numeracy	0.03		0.23	↑
Adaptive problem solving	0.00		0.21	↑
C. Disparities between adults who grew up in cities and those who grew up in villages				
Literacy	0.13	↑	0.22	↑
Numeracy	0.15	↑	0.21	↑
Adaptive problem solving	0.13	↑	0.19	↑

Note: For the definition of the absolute inequality of opportunity index see OECD (2025[60]). The strength of the association is assessed by R-squared (R^2) values, which are categorised based on Cohen's (2013[42]) benchmarks. Specifically, an R^2 above 0.13 reflects a medium or substantial effect. The Gini coefficient is based on household disposable income, i.e. income after taxes and transfers adjusted for household size. The Gini coefficient takes values between 0 (where every person has the same income), and 1 (where all income goes to one person). See the note for Figure 2.1 for the definitions of groups based on parental education and parental occupation. See the note for Figure 2.3 for the definitions of groups based on childhood residential context.

Source: Calculations based on OECD (2025[60]), *To Have and Have Not – How to Bridge the Gap in Opportunities*, https://doi.org/10.1787/dec143ad-en; OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html; and OECD (2024[110]), *Income Distribution Database*, (database), Data Explorer, http://data-explorer.oecd.org/s/17a.

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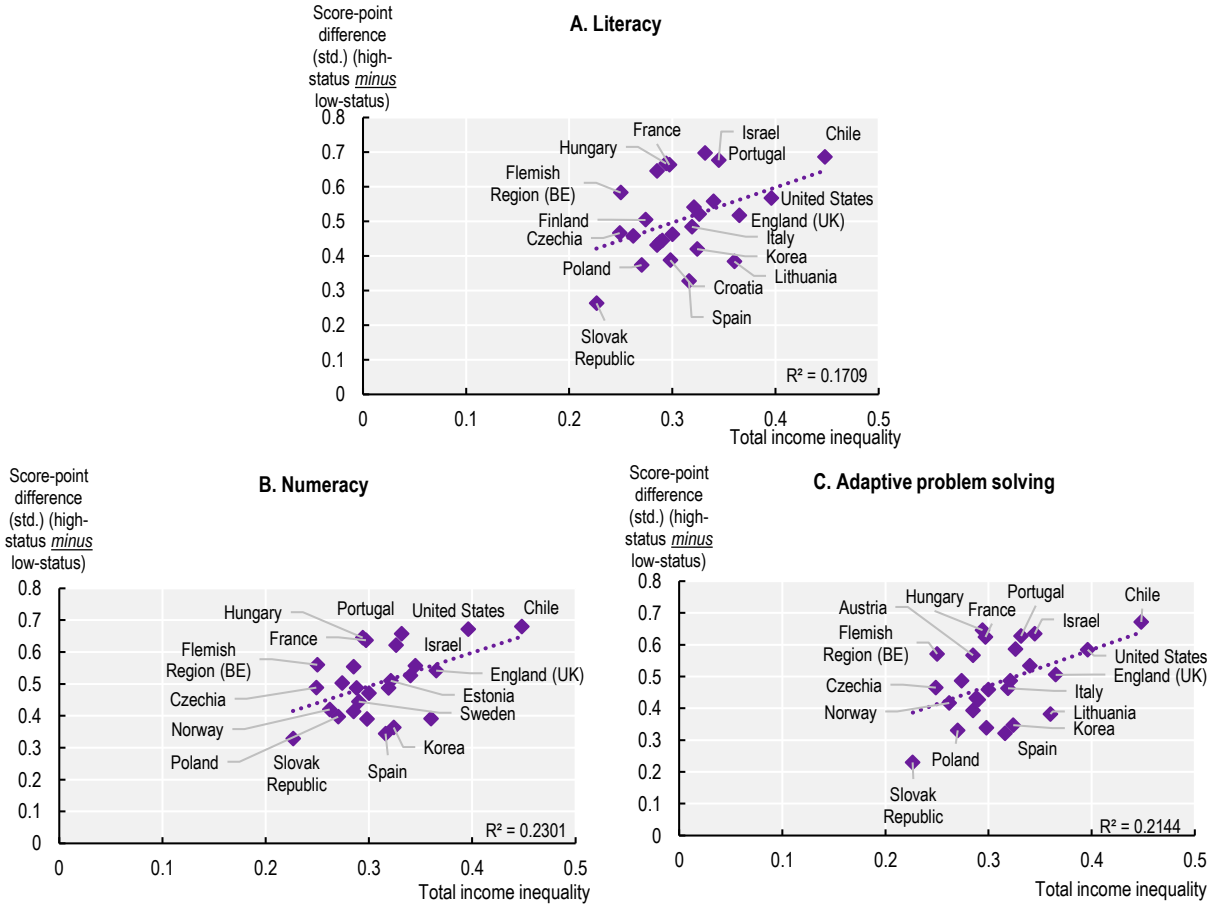
Analyses suggest that within-country disparities in information-processing skills reflect how economic resources are distributed: in societies with more unequal distributions of economic resources, the skills gap between individuals with different socio-economic backgrounds is wider. The results also indicate that, as observed for gender disparities, numeracy is more closely linked to a society's level of inequality than either literacy or adaptive problem solving skills.

For example, Figure 2.12 shows how in Chile and Israel, total income inequalities are relatively large (Gini = 0.45 and 0.34, respectively) and skills disparities between individuals related to parental occupation are also wide (0.7 SD difference in numeracy and 0.6 SD difference in adaptive problem solving, and 0.7 SD difference for both countries in literacy). In contrast, in Poland and the Slovak Republic, incomes are more equally distributed (Gini = 0.27 and 0.23, respectively, Figure 2.12), and skills disparities between individuals based on parental occupation are relatively narrow (0.4 SD and 0.3 SD difference in numeracy, 0.3 SD and 0.2 SD difference in adaptive problem solving and 0.4 SD and 0.3 SD difference in literacy, Figure 2.12).

Figure 2.12. Country-level association between parental occupation gaps in core 21st-century skills and total income inequality



Note: To maintain readability, a selection of countries and economies is labelled. Total income inequality is based on the Gini coefficient. The Gini coefficient is based on household disposable income, i.e. income after taxes and transfers adjusted for household size. The Gini coefficient takes values between 0 (where every person has the same income), and 1 (where all income goes to one person). Data for total income inequality for the Flemish Region (Belgium) refer to Belgium and for England (United Kingdom) to the United Kingdom. See the note for Figure 2.1 for the definitions of groups based on parental occupation.

Source: Calculations based on OECD (2024[110]); *Income Distribution Database*, (database), Data Explorer, http://data-explorer.oecd.org/s/17a and OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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2.4. A glimpse into the future: Disparities in the skills of young people in school

Adolescence marks a critical juncture in educational trajectories and future labour market choices. Research consistently shows that adolescents' proficiency in reading and mathematics is a strong predictor of later academic success, influencing decisions about upper secondary specialisations, university enrolment and eventual career pathways (Hakkarainen, Holopainen and Savolainen, 2013[111]; Wang, 2013[112]). Changes over the first quarter of the 21st century in adolescent reading and mathematics skills can shed light on whether gaps across different population groups, such as gender, immigrant background, childhood residential context and socio-economic background, are narrowing or widening. Such information can help policymakers evaluate the evolving quality of initial education and target interventions to reduce disparities that emerge at an early age.

By analysing recent trends in the achievement of adolescents, policymakers can better anticipate whether new cohorts have key prerequisites for successful participation in further education and training. Information on the skills levels of young people is also needed to design interventions that mitigate longer-term disparities by reshaping the provision of further education and training to align with what young people know and can do. Conversely, evidence of narrowing divides might signal that existing policies are helping to equalise opportunities, although sustained commitment may still be required to maintain progress.

Ultimately, tracking shifts in skills disparities during adolescence offers a more forward-looking perspective than relying solely on cross-sectional data from adult populations. It allows policymakers to identify emerging trends before they fully manifest in the workforce, thereby guiding the design of proactive strategies to ensure that future adults, regardless of gender, parental background, immigration status or childhood residential context, can develop the skills demanded by rapidly evolving labour markets. This section compares trends in achievement in reading and mathematics between 2003 and 2022, the period for which comparable evidence on both domains can be tracked among adolescents in a large number of OECD countries.

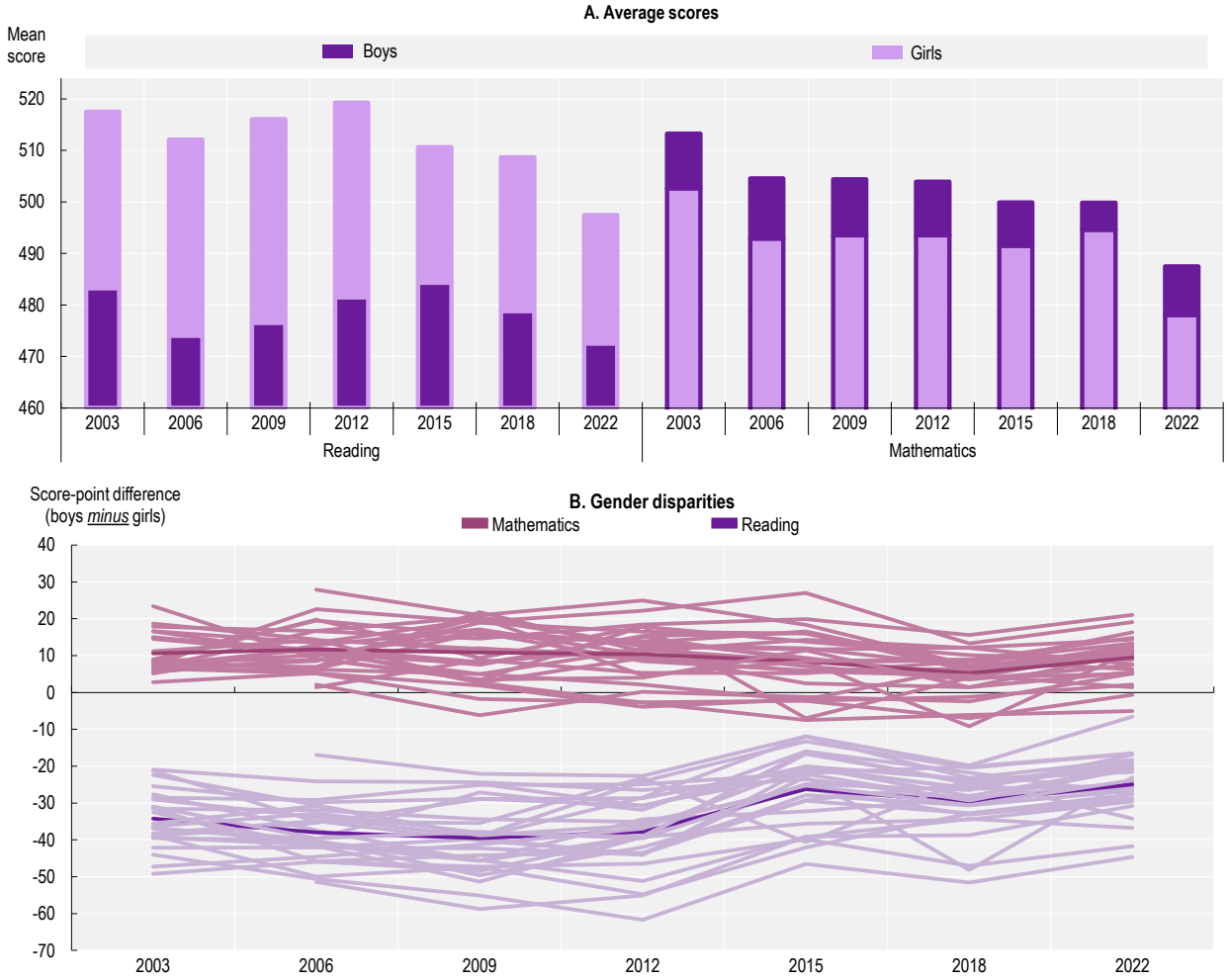
2.4.1. Trends in achievement disparities among 15-year-old students

Between 2003 and 2022, the gender gap in reading and mathematics proficiency fluctuated. Figure 2.13 presents the average proficiency by gender in reading and mathematics among 15-year-old students (Panel A) and the evolution of the gender gap over the 2003 to 2022 period (Panel B). In reading, the gender gap in favour of girls increased by six PISA score points between 2003 and 2009 (from 34 to 40 points, corresponding to an increase from 0.34 SD to 0.40 SD difference[4]). However, starting in 2012, the gender gap steadily narrowed, and by 2022, it was 25 PISA score points (corresponding to 0.25 SD difference). In mathematics, the gap favouring boys decreased between 2003 and 2018, from 11 PISA score points to 5 score points (corresponding to a decline of the gap from 0.11 SD to 0.05 SD), but widened again from 5 score points to 9 score points between 2018 and 2022 (corresponding to an increase in the gap from 0.05 SD to 0.09 SD).

Figure 2.13 suggests that changes in gender gaps over the period were due to diverging trends in achievement, which declined among both boys and girls. Between 2012 and 2018, the reduction in the gender reading gap in reading, which favoured girls, was driven by improvements in boys' achievement, whereas girls' achievement remained stable. In contrast, between 2018 and 2022, the period corresponding to the COVID-19 pandemic, reading achievement decline was more pronounced among girls than boys. The increase in the gender gap in mathematics between 2018 and 2022 was due to the fact that both boys' and girls' mathematics achievement declined over the period, but the decline was steeper for girls than for boys.

Figure 2.13. Gender disparities in mathematics and reading among 15-year-old students

Panel A: Mathematics and reading scores for boys and girls, OECD average. Panel B: Differences in average mathematics and reading scores between boys and girls (boys *minus* girls)



Note: Panel B: Lines in lighter colours represent gender disparities in specific countries between 2003 and 2022. Lines in dark colours represent the OECD average.

Source: Calculations based on OECD (2003[113]), *PISA 2003 Database*, www.oecd.org/en/data/datasets/pisa-2003-database.html; OECD (2006[114]), *PISA 2006 Database*, www.oecd.org/en/data/datasets/pisa-2006-database.html; OECD (2012[115]), *PISA 2012 Database*, www.oecd.org/en/data/datasets/pisa-2012-database.html; OECD (2015[116]), *PISA 2015 Database*, www.oecd.org/en/data/datasets/pisa-2015-database.html; OECD (2018[117]), *PISA 2018 Database*, www.oecd.org/en/data/datasets/pisa-2018-database.html; and OECD (2022[118]), *PISA 2022 Database*, www.oecd.org/en/data/datasets/pisa-2022-database.html.

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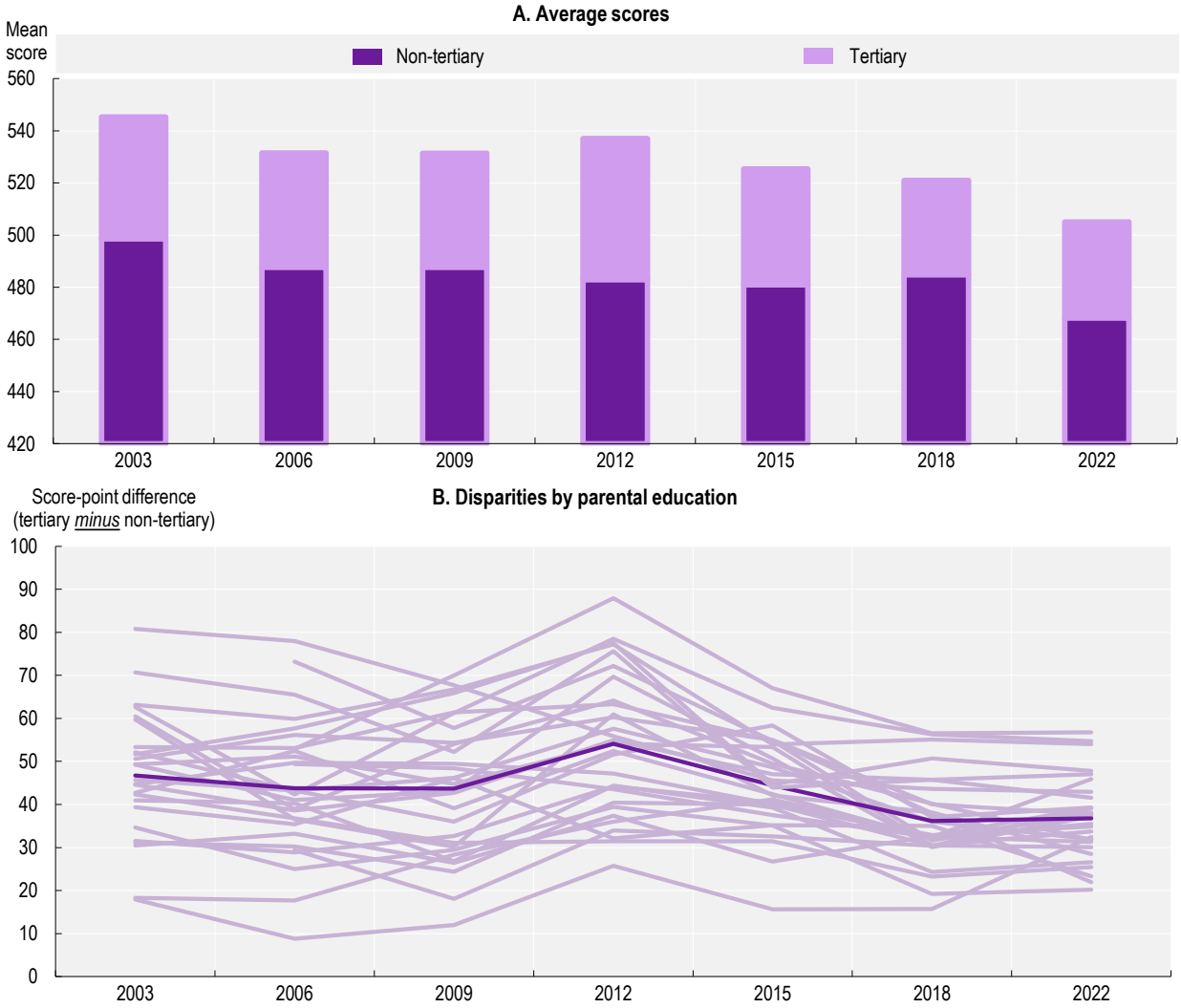
Whereas gender disparities differ markedly depending on the skill considered, disparities in reading and mathematics between 15-year-old students with and without tertiary-educated parents are closely aligned. Similarly, results remain consistent when parental occupational status is used as an indicator of socio-economic background. Figure 2.14 therefore reports only the evolution of disparities in mathematics achievement between 15-year-old students with and without tertiary-educated parents from 2003 to 2022. Disparities by parental educational attainment narrowed during this period but remained large: in 2022, the score-point difference in mathematics achievement between young people with and without a tertiary-educated parent was 37 score points (corresponding to 0.37 SD difference), whereas in 2003 it was

47 score points (corresponding to 0.47 SD difference). The narrowing of disparities between 2003 and 2012 was primarily due to the fact that mathematics skills declined over the period among all young people, but the decline was steeper among young people with tertiary-educated parents.

Figure 2.14. Disparities in mathematics among 15-year-old students, by parental education

Panel A: Mathematics scores for students with tertiary and non-tertiary educated parents, OECD average. Panel B: Differences in average mathematics scores between students with tertiary and non-tertiary educated parents



Note: Panel B: Lines in lighter colours represent disparities between students with and without tertiary educated parents in specific countries between 2003 and 2022, and the darker line represents the OECD average. Parental education is based on students' responses. Information on their mothers' and fathers' education. were used to derive the index of highest education level of parents. The index is equal to the highest ISCED level of either parent.

Source: Calculations based on OECD (2003[113]), *PISA 2003 Database*, www.oecd.org/en/data/datasets/pisa-2003-database.html; OECD (2006[114]), *PISA 2006 Database*, www.oecd.org/en/data/datasets/pisa-2006-database.html; OECD (2012[115]), *PISA 2012 Database*, www.oecd.org/en/data/datasets/pisa-2012-database.html; OECD (2015[116]), *PISA 2015 Database*, www.oecd.org/en/data/datasets/pisa-2015-database.html; OECD (2018[117]), *PISA 2018 Database*, www.oecd.org/en/data/datasets/pisa-2018-database.html; and OECD (2022[118]), *PISA 2022 Database*, www.oecd.org/en/data/datasets/pisa-2022-database.html.

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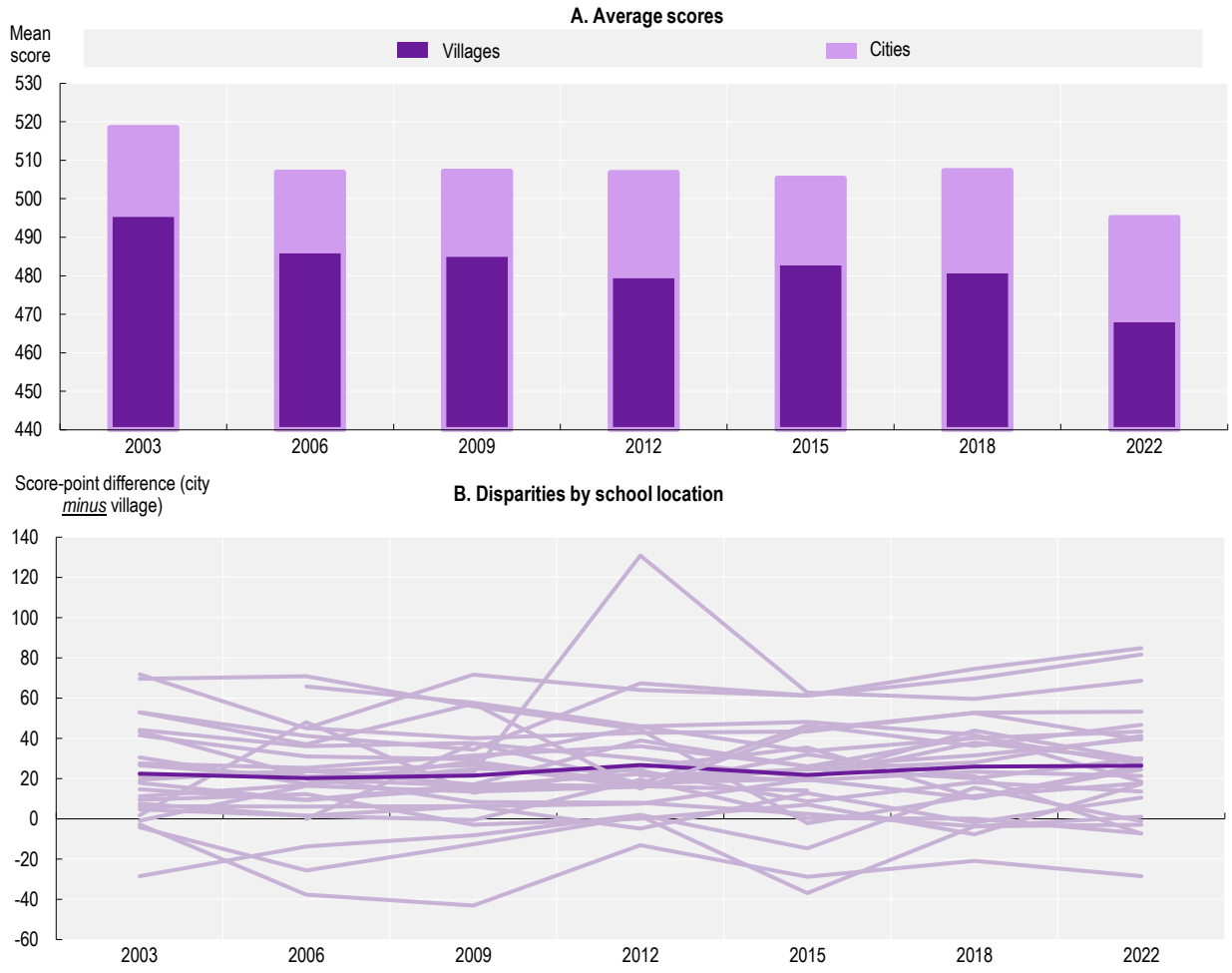
There are notable mathematics skills disparities among students who attended schools in cities compared to villages, with the skills gap fluctuating between 2003 and 2022. Figure 2.15 illustrates trends from 2003 to 2012 in the average mathematics achievement of 15-year-old students who attended schools in cities compared to those in villages. Disparities in reading are similar. On average, students who attend school in cities have higher mathematics skills than those who attend schools in villages (Figure 2.15, Panel A), and the disparity between the two groups widened from 22 score points in 2003 (corresponding to 0.22 SD difference) to 26 score points in 2022 (corresponding to 0.26 SD difference).

Figure 2.15. Disparities in mathematics among 15-year-old students, by school location

Panel A: Mathematics scores for students who attended school in villages and cities, OECD average. Panel B: Differences in average mathematics scores between students who attended school in villages and cities (city *minus* villages)



Note: Panel B: Lines in lighter colours represent disparities between students who attended in schools in cities and villages in specific countries between 2003 and 2022, and the darker line represents the OECD average. The figure reports the mathematics achievement and the mathematics achievement gap depending on whether students attended school in a village or a city. Villages are defined as communities (villages or towns) with up to 15 000 people, cities are defined as communities (cities or megacities) with 1 million and more people.

Source: Calculations based on OECD (2003[113]), *PISA 2003 Database*, www.oecd.org/en/data/datasets/pisa-2003-database.html; OECD (2006[114]), *PISA 2006 Database*, www.oecd.org/en/data/datasets/pisa-2006-database.html; OECD (2012[115]), *PISA 2012 Database*, www.oecd.org/en/data/datasets/pisa-2012-database.html; OECD (2015[116]), *PISA 2015 Database*, www.oecd.org/en/data/datasets/pisa-2015-database.html; OECD (2018[117]), *PISA 2018 Database*, www.oecd.org/en/data/datasets/pisa-2018-database.html; and OECD (2022[118]), *PISA 2022 Database*, www.oecd.org/en/data/datasets/pisa-2022-database.html.

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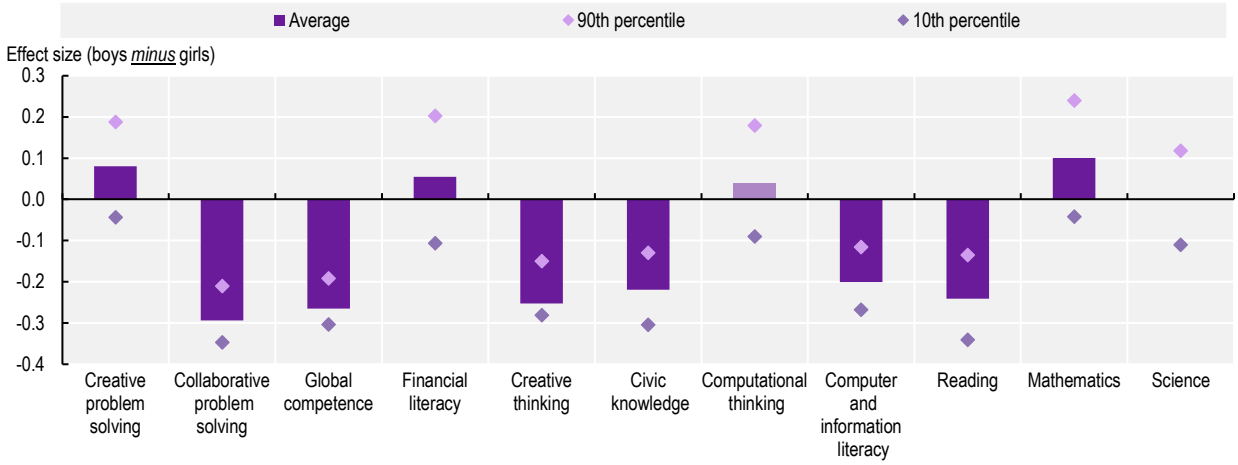
2.4.2. Extending the analysis: Skills disparities in ancillary 21st-century skills related to gender, childhood residential context and parental education

The range of skills analysed in this report is limited by the availability of cross-country comparable data on adult populations in OECD countries. However, analyses can be considerably extended when assessing disparities in ancillary 21st-century skills among young people. This is because a wider range of assessment instruments has been developed and administered to schooled populations. These include measures for creative problem solving (OECD, 2014[119]), collaborative problem solving (OECD, 2017[120]), global competence (OECD, 2020[121]), financial literacy (OECD, 2023[122]), creative thinking tasks (OECD, 2024[123]), civic knowledge (IEA, 2022[124]), computational thinking (IEA, 2023[125]), and computer and information literacy (IEA, 2023[125]).

Results from this further analysis show that there are variations in these ancillary skills related to gender, childhood residential context and parental education. Figure 2.16, Figure 2.17 and Figure 2.18 summarise disparities between boys and girls, between young people who attended schools in rural and urban settings, and between those with and without tertiary-educated parents in each of these ancillary skills, while additionally showing average disparities in reading, mathematics and science for the latest available data from 2022. Figure 2.16 displays standardised scores in the assessments as well as differences at the 90th percentile and 10th percentile. On average across OECD countries, boys outperform girls in creative problem solving (0.08 SD), financial literacy (0.05 SD), computational thinking (0.04 SD) and mathematics (0.10 SD). Girls outperform boys in collaborative problem solving (0.29 SD), global competence (0.26 SD), creative thinking (0.25 SD), civic knowledge (0.22 SD), computer and information literacy (0.20 SD), and reading (0.24 SD). In domains where boys outperform girls on average, differences are larger among top-scoring students. In contrast, in domains where girls outperform boys, differences are smaller among top-scoring students, with differences larger among the 10% of bottom-scoring students.

Figure 2.16. Gender disparities in ancillary 21st-century skills among young populations, OECD average



Note: Estimates are standardised to a total OECD mean of zero and a standard deviation of one in the respective databases. Darker bars denote mean differences that are statistically significant at the 5% level. All differences at the 90th and 10th percentile are statistically significant at the 5% level. OECD averages exclude the following OECD countries due to unavailable data: In PISA 2012: Costa Rica, Greece, Iceland, Latvia, Lithuania, Luxembourg, Mexico, New Zealand and Switzerland; in PISA 2015: Ireland, Poland and Switzerland; in PISA 2018: Australia, Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovenia, Sweden, Switzerland, Türkiye and the United States; in PISA 2022 for "creative thinking": Austria, Ireland, Japan, Norway, Sweden, Switzerland, Türkiye, the United Kingdom and the United States. OECD averages include the following OECD countries: PISA 2022 "financial literacy": Austria, the Flemish Community of Belgium, Canadian provinces (Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario and Prince Edward Island), Costa Rica, Czechia, Denmark, Hungary, Italy, the Netherlands, Norway, Poland, Portugal, Spain and the United States; ICCS 2022: Colombia, Denmark, Estonia, France, Italy, Latvia, Lithuania, Netherlands, North Rhine-Westphalia (Germany), Norway, Poland, Schleswig-Holstein (Germany), the Slovak Republic, Slovenia, Spain and Sweden; ICILS 2023: Austria, Chile, Czechia, Denmark, Finland, the Flemish Community of Belgium, France, Germany, Greece, Hungary, Italy, Korea, Latvia, Luxembourg, the Netherlands, Norway, Portugal, the Slovak Republic, Slovenia, Spain, Sweden and the United States.

Source: Calculations based on IEA (2022[124]), *ICCS 2022 Database*, https://doi.org/10.58150/ICCS_2022_data_edition_2_including_process_data; IEA (2023[125]), *ICILS 2023 Database*, https://doi.org/10.58150/ICILS_2023_data; OECD (2012[115]), *PISA 2012 Database*, www.oecd.org/en/data/datasets/pisa-2012-database.html; OECD (2015[116]), *PISA 2015 Database*, www.oecd.org/en/data/datasets/pisa-2015-database.html; OECD (2018[117]), *PISA 2018 Database*, www.oecd.org/en/data/datasets/pisa-2018-database.html; and OECD (2022[118]), *PISA 2022 Database*, www.oecd.org/en/data/datasets/pisa-2022-database.html.

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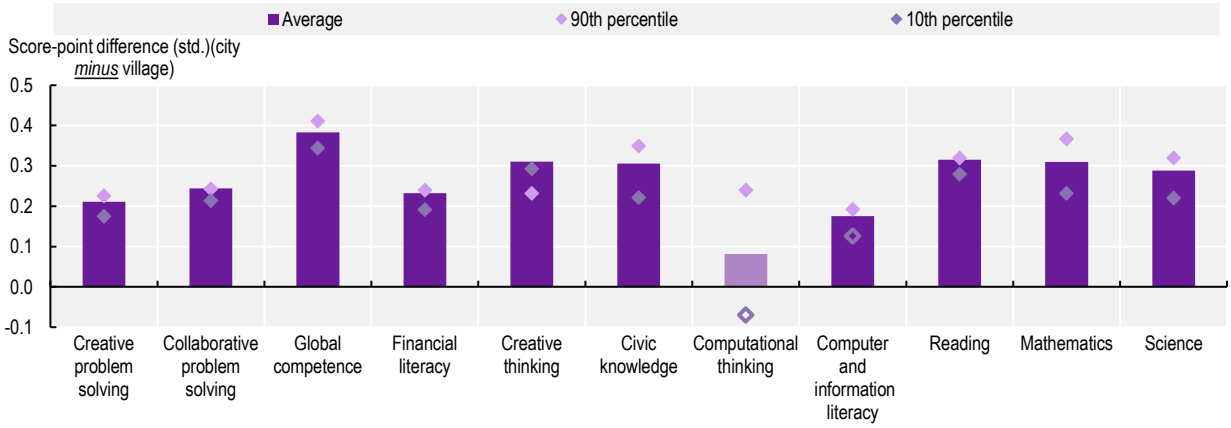
Students who attended schools in cities (with over 100 000 inhabitants) outperform their peers who attended schools in villages in all domains, with differences ranging between 0.1 SD for computational thinking to 0.4 SD for global competence, as indicated in Figure 2.17. In creative problem solving, global competence, financial literacy, civic knowledge, computational thinking, and computer and information literacy, differences related to school location are larger among top-scoring students. In contrast, in creative thinking, differences related to school location are larger among bottom-scoring students.

Students with tertiary-educated parent(s) outperform their peers without tertiary-educated parents across all assessments and domains (Figure 2.18). The socio-economic gap is larger among top-scoring students in all assessments except for creative thinking and computer and information literacy.

Figure 2.17. Disparities in ancillary 21st-century skills among young populations, by school location, OECD average

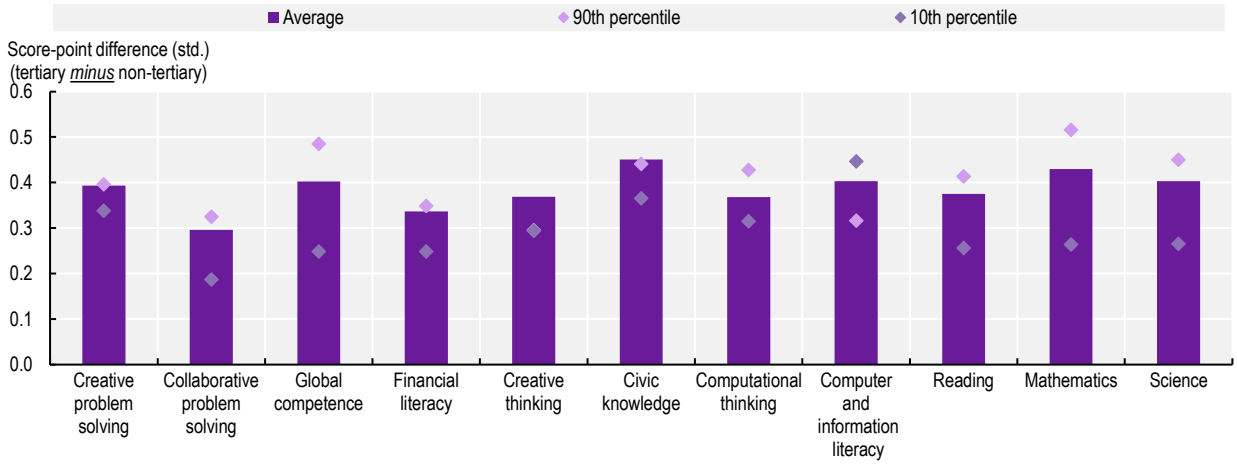


Note: Estimates are standardised to a total OECD mean of zero and a standard deviation of one in the respective databases. Darker bars denote mean differences that are statistically significant at the 5% level. Filled markers denote differences at the 90th and 10th percentile that are statistically significant at the 5% level. OECD averages exclude the following OECD countries due to unavailable data. In PISA 2012: Costa Rica, Greece, Iceland, Latvia, Lithuania, Luxembourg, Mexico, New Zealand and Switzerland; in PISA 2015: Ireland, Poland and Switzerland; in PISA 2018: Australia, Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovenia, Sweden, Switzerland, Türkiye and the United States; in PISA 2022 for "creative thinking": Austria, Ireland, Japan, Norway, Sweden, Switzerland, Türkiye, the United Kingdom and the United States. OECD averages include the following OECD countries: PISA 2022 "financial literacy": Austria, the Flemish Community of Belgium, Canadian provinces (Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario and Prince Edward Island), Costa Rica, Czechia, Denmark, Hungary, Italy, the Netherlands, Norway, Poland, Portugal, Spain and the United States; ICCS 2022: Colombia, Denmark, Estonia, France, Italy, Latvia, Lithuania, Netherlands, North Rhine-Westphalia (Germany), Norway, Poland, Schleswig-Holstein (Germany), the Slovak Republic, Slovenia, Spain and Sweden; ICILS 2023: Austria, Chile, Czechia, Denmark, Finland, the Flemish Community of Belgium, France, Germany, Greece, Hungary, Italy, Korea, Latvia, Luxembourg, the Netherlands, Norway, Portugal, the Slovak Republic, Slovenia, Spain, Sweden and the United States.

Source: Calculations based on IEA (2022[124]), *ICCS 2022 Database*, https://doi.org/10.58150/ICCS_2022_data_edition_2_including_process_data; IEA (2023[125]), *ICILS 2023 Database*, https://doi.org/10.58150/ICILS_2023_data; OECD (2012[115]), *PISA 2012 Database*, www.oecd.org/en/data/datasets/pisa-2012-database.html; OECD (2015[116]), *PISA 2015 Database*, www.oecd.org/en/data/datasets/pisa-2015-database.html; OECD (2018[117]), *PISA 2018 Database*, www.oecd.org/en/data/datasets/pisa-2018-database.html; and OECD (2022[118]), *PISA 2022 Database*, www.oecd.org/en/data/datasets/pisa-2022-database.html.

StatLink https://stat.link/iczyvw

Figure 2.18. Disparities in ancillary 21st-century skills among young populations, by parental education, OECD average



Note: Estimates are standardised to a total OECD mean of zero and a standard deviation of one in the respective databases. All mean differences and differences at the 90th and 10th percentile are statistically significant at the 5% level. Parental education is based on students' responses. Information on their mothers' and fathers' education was used to derive the index of highest education level of parents. The index is equal to the highest ISCED level of either parent. OECD averages exclude the following OECD countries due to unavailable data. In PISA 2012: Costa Rica, Greece, Iceland, Latvia, Lithuania, Luxembourg, Mexico, New Zealand and Switzerland; in PISA 2015: Ireland, Poland and Switzerland; in PISA 2018: Australia, Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovenia, Sweden, Switzerland, Türkiye and the United States; in PISA 2022 for "creative thinking": Austria, Ireland, Japan, Norway, Sweden, Switzerland, Türkiye, the United Kingdom and the United States. OECD averages include the following OECD countries: PISA 2022 "financial literacy": Austria, the Flemish Community of Belgium, Canadian provinces (Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario and Prince Edward Island), Costa Rica, Czechia, Denmark, Hungary, Italy, the Netherlands, Norway, Poland, Portugal, Spain and the United States; ICCS 2022: Colombia, Denmark, Estonia, France, Italy, Latvia, Lithuania, Netherlands, North Rhine-Westphalia (Germany), Norway, Poland, Schleswig-Holstein (Germany), the Slovak Republic, Slovenia, Spain and Sweden; ICILS 2023: Austria, Chile, Czechia, Denmark, Finland, the Flemish Community of Belgium, France, Germany, Greece, Hungary, Italy, Korea, Latvia, Luxembourg, the Netherlands, Norway, Portugal, the Slovak Republic, Slovenia, Spain, Sweden and the United States.

Source: Calculations based on IEA (2022[124]), *ICCS 2022 Database*, https://doi.org/10.58150/ICCS_2022_data_edition_2_including_process_data; IEA (2023[125]), *ICILS 2023 Database*, https://doi.org/10.58150/ICILS_2023_data; OECD (2012[115]), *PISA 2012 Database*, www.oecd.org/en/data/datasets/pisa-2012-database.html; OECD (2015[116]), *PISA 2015 Database*, www.oecd.org/en/data/datasets/pisa-2015-database.html; OECD (2018[117]), *PISA 2018 Database*, www.oecd.org/en/data/datasets/pisa-2018-database.html; and OECD (2022[118]), *PISA 2022 Database*, www.oecd.org/en/data/datasets/pisa-2022-database.html.

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Annex 2.A. Supplementary online results

Annex Table 2.A.1. Changes in parental educational attainment, parental occupation across generations

Table 2.A.1.1	Parental educational attainment, by age
Table 2.A.1.2	Parental occupation, by age
Table 2.A.1.3	Parental educational attainment, by residential context and age

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Annex Table 2.A.2. Disparities in core 21st-century skills, by country and socio-demographic characteristic

Table 2.A.2.1	Core 21st-century and ancillary skills, by age
Table 2.A.2.2	Core 21st-century and ancillary skills, by gender
Table 2.A.2.3	Core 21st-century and ancillary skills, by parental education
Table 2.A.2.4	Core 21st-century and ancillary skills, by parental occupation
Table 2.A.2.5	Core 21st-century and ancillary skills, by immigrant background
Table 2.A.2.6	Core 21st-century and ancillary skills, by childhood residential context
Table 2.A.2.7	Distribution of core 21st-century skills (90th and 10th percentiles), by age
Table 2.A.2.8	Distribution of core 21st-century skills (90th and 10th percentiles), by gender
Table 2.A.2.9	Distribution of core 21st-century skills (90th and 10th percentiles), by parental education
Table 2.A.2.10	Distribution of core 21st-century skills (90th and 10th percentiles), by parental occupation
Table 2.A.2.11	Distribution of core 21st-century skills (90th and 10th percentiles), by immigrant background
Table 2.A.2.12	Distribution of core 21st-century skills (90th and 10th percentiles), by childhood residential context

StatLink https://stat.link/kqnbed

Annex Table 2.A.3. Intersectional nature of disparities

Table 2.A.3.1	Gender disparities in core 21st-century skills, by age
Table 2.A.3.2	Gender disparities in core 21st-century skills, by parental education
Table 2.A.3.3	Gender disparities in core 21st-century skills, by parental occupation
Table 2.A.3.4	Gender disparities in core 21st-century skills, by immigrant background
Table 2.A.3.5	Gender disparities in core 21st-century skills, by childhood residential context
Table 2.A.3.6	Disparities in core 21st-century skills between adults with tertiary and non-tertiary educated parents, by age
Table 2.A.3.7	Disparities in core 21st-century skills between adults with tertiary and non-tertiary educated parents, by gender
Table 2.A.3.8	Disparities in core 21st-century skills between adults with tertiary and non-tertiary educated parents, by parental occupation
Table 2.A.3.9	Disparities in core 21st-century skills between adults with tertiary and non-tertiary educated parents, by immigrant background
Table 2.A.3.10	Disparities in core 21st-century skills between adults with tertiary and non-tertiary educated parents, by childhood residential context
Table 2.A.3.11	Disparities in core 21st-century skills between adults who grew up in villages and cities, by age
Table 2.A.3.12	Disparities in core 21st-century skills between adults who grew up in villages and cities, by gender
Table 2.A.3.13	Disparities in core 21st-century skills between adults who grew up in villages and cities, by parental education
Table 2.A.3.14	Disparities in core 21st-century skills between adults who grew up in villages and cities, by parental occupation
Table 2.A.3.15	Disparities in core 21st-century skills between adults who grew up in villages and cities, by immigrant background

StatLink https://stat.link/mqpo01

Annex Table 2.A.4. Country-level associations

Table 2.A.4.1	Country-level association between gender gaps in core 21st-century skills and societal-level gender inequality
Table 2.A.4.2	Gaps in core 21st-century skills related to absolute inequality of opportunity and parental education
Table 2.A.4.3	Gaps in core 21st-century skills related to total income inequality and parental education
Table 2.A.4.4	Gaps in core 21st-century skills related to absolute inequality of opportunity and parental occupation
Table 2.A.4.5	Gaps in core 21st-century skills related to total income inequality and parental occupation
Table 2.A.4.6	Gaps in core 21st-century skills related to absolute inequality of opportunity and childhood residential context
Table 2.A.4.7	Gaps in core 21st-century skills related to total income inequality and childhood residential context

StatLink https://stat.link/xeo7bf

Notes

[1] Differences in the standardised effect size "Cohen's d" benchmarks are interpreted as small effects if Cohen's d is below 0.2, as medium for values between 0.2 and 0.5, and as large for valued of 0.5 and greater.

[2] The Levenshtein Distance Normalised by Divergence (LDND) is a measure of linguistic distance developed by the Cross-Linguistic Linked Data project hosted by the Max Planck Institute for the Science of Human History. It provides a systematic approach to quantifying the similarity between languages (Wichmann et al., 2010[127]). The LDND metric is based on the Automated Similarity Judgment Program, which compares the phonetic and lexical features of different languages using the Swadesh list – a standardised set of words with shared meanings among languages. Phonetic transcriptions of the words are analysed using a composite Levenshtein distance, calculated as the minimum number of single character edits needed to transform one language's transcription into another's (Bakker et al., 2009[126]). The average distance across all words is then adjusted to produce the final LDND score, which is a continuous measure ranging from 0 to just above 100, where lower scores indicate greater similarity. This approach provides a standardised and empirically validated framework for cross-language comparison that is applicable in various research contexts.

[3] The Inequality of Opportunity measure is calculated using market income whereas total income inequality is calculated using disposable income, a difference that may explain discrepancies between estimates.

[4] PISA scores have a standard deviation of around 100 score points (OECD, 2023[128]).

3 How learning evolves across the life course

This chapter uses OECD cross-country evidence to examine how differences in educational attainment, field of study and participation in adult education impact skills development over the life course across demographic groups. Gaps in core 21st-century skills, initially shaped by family background and educational settings, frequently become larger after compulsory education ends. Gender and socio-economic background determine not only for how long individuals study but also what they study and whether they have the chance to continue learning over the life course. Barriers to participation in non-formal adult learning differ depending on adults' prior education and socio-economic background. While increased educational spending can reduce skills disparities, it alone is insufficient to compensate for initial disadvantage related to parental circumstances. Effective lifelong learning policies are critical for reducing inequalities. The analysis in this chapter underscores the importance of educational quality, accessibility and tailored interventions.

In Brief

Disparities in access to learning opportunities and educational trajectories explain a large share of existing gaps in core 21st-century skills between adults with a different socio-economic background, childhood residential context and immigrant background. However, they do not explain gender skills gaps. Socio-economic gaps in skills narrow during compulsory schooling but widen markedly once students leave school, as more advantaged individuals accumulate higher-quality qualifications and access more adult learning.

Gender differences in learning and skills development follow a distinct trajectory: numeracy gaps in favour of men increase from childhood into early adulthood, whereas women's advantage in literacy peaks in adolescence. Women are more likely than men to attain tertiary qualifications, yet remain under-represented in mathematics-intensive, science, technology, engineering and mathematics (STEM) courses in both vocational and academically oriented programmes. Key findings include:

Formal education and training:

- **In most countries, schooling provides equalising opportunities for individuals from different socio-economic backgrounds.** For example, the difference in literacy proficiency between individuals born around 1990 with and without tertiary-educated parents was 0.57 standard deviations (SD) at age 10, followed by 0.34 SD in adolescence, 0.47 SD in young adulthood and 0.45 SD in adulthood.
- **Disparities in numeracy in favour of men grow larger over the life course, whereas literacy gender gaps in favour of women are widest during adolescence and narrower in primary school and adulthood.** For example, the gender gap in numeracy between men and women born in 1984 was 0.06 SD at age 10, followed by 0.08 SD in adolescence, 0.22 SD in young adulthood and 0.24 SD in mature adulthood.
- **Individuals with advantaged socio-economic backgrounds are more likely to obtain advanced educational qualifications.** Among adults whose parents worked in high-status occupations, 53% attain a bachelor's degree or higher qualification compared to only 23% of those whose parents worked in low-status occupations. Some 40% of adults who grow up in cities earn a bachelor's degree or higher qualification compared to only 26% of those who grow up in villages.
- **Whereas disparities related to socio-economic background lie primarily in how long people study for, disparities related to gender differences also lie in what men and women study.** Women are more likely to obtain tertiary educational qualifications but are considerably less likely than men to attend courses with a strong mathematics orientation.
- **Field-of-study choices during formal education explain around a quarter of gender differences in numeracy skills between men and women, and around half of gender differences in adaptive problem solving.** However, gender differences in numeracy in favour of men remain pronounced (0.18 SD) even when comparing men and women with similar levels of educational attainment and fields of study.
- **Disparities in educational attainment are a key factor in determining socio-economic disparities in skills**. For example, around half of disparities in core 21st-century skills between individuals with and without tertiary-educated parents can be explained by differences in educational qualifications between the two groups.

Non-formal education and training:

- **The very adults who most require upskilling and reskilling to improve their labour market prospects generally participate the least in adult learning.** For example, around 61% of tertiary-educated individuals participate in adult learning opportunities compared to only 19% of those without an upper secondary qualification.
- **Early disparities in skills and educational opportunities shape the likelihood of individuals being able to continue engaging in skills development as adults.** Socio-economic disparities in participation in adult learning are not inherent to socio-economic background, but largely arise because of differences in the educational and occupational trajectories of individuals with advantaged and disadvantaged backgrounds.
- **Disparities pertain not just to the rates of participation of different groups but also to the types of training they engage in.** Rather than promote mobility, training may reproduce the intergenerational transmission of disadvantage. Adults from disadvantaged backgrounds are over-represented among those who engage in training that is focused on learning how to operate machinery and equipment or following and maintaining security protocols. By contrast, individuals from advantaged backgrounds are over-represented among those who participate in learning aimed at developing project management or organisational skills, acquiring foreign languages, and developing skills involving numbers and calculations.
- **Barriers to participation differ across groups.** Family obligations are more prominent among younger workers and women. Scarcity of suitable courses, last minute impediments or inconvenient scheduling are especially cited by adults living in rural areas. Women are also especially likely to cite unexpected events as a reason for lack of participation, an indication of the lack of support women have and the fine balance of their time budgets.

Informal learning – volunteering:

- **Participation in volunteering activities is associated with higher core 21st-century skills**. Those who participate in volunteering have 0.11 SD higher literacy and numeracy and 0.10 SD higher proficiency in adaptive problem solving.
- **On average, 32% of adults reported engaging in some form of volunteering in the previous year, but participation rates vary greatly across countries**. Disparities by socio-economic background are large: 38% of adults with tertiary-educated parents engage in volunteering compared to 30% of adults without tertiary-educated parents.

3.1. Introduction: The importance of addressing lifelong learning gaps

Skills are developed, enhanced and accumulated throughout an individual's life via the formal educational and training opportunities they participate in and the informal learning that occurs outside these settings. At any given time, the range of skills adults possess – spanning information-processing skills (literacy, numeracy and adaptive problem solving), social and emotional skills (agreeableness, openness to experience, conscientiousness, extraversion and emotional stability), and willingness to delay gratification – is shaped by their access to learning opportunities, the value they assign to life choices and their willingness to engage in skills development opportunities. This developmental trajectory begins in early childhood, progresses through formal schooling and continues into adulthood via formal, non-formal and informal learning contexts including work, leisure and home environments (Cunha and Heckman, 2007[1]).

Formal education has a key role to play in reducing initial disparities arising from circumstances over which individuals have little to no control (such as the educational attainment or the occupational status of their parents, if they are men or women, if they were raised in a city or village, or if their parents decided to leave their country and migrate). Compulsory schooling legislation aims to guarantee a level playing field in skills and educational participation, and support growth. At the same time, there is evidence that the quality of educational opportunities in childhood differs greatly depending on the background of individuals. For example, children with socio-economically advantaged and disadvantaged backgrounds access schools of varying quality, are not equally likely to participate in early learning settings, and, even when they have similar academic results early on, have different rates of participation in further education and training.

Schools offer an environment that is conducive to the development of the information-processing skills critical to thrive in the 21st century (OECD, 2024[2]); however, education systems differ in their capacity to ensure that education standards are of high quality and available to all students, irrespective of their family circumstances. Institutional factors such as tracking and streaming policies, teacher allocation, and curriculum standards are associated with differences in the skills development trajectory of individuals from different backgrounds (Brunello and Checchi, 2007[3]) and gender (van Hek, Buchmann and Kraaykamp, 2019[4]), resulting in disparities in adult skills proficiency.

Students with socio-economically disadvantaged backgrounds, from rural areas or with immigrant backgrounds are frequently channelled into educational paths of comparatively lower quality, limiting their opportunities for skills enhancement (Green and Pensiero, 2016[5]; Silva et al., 2020[6]). Furthermore, parental educational attainment and occupational status profoundly impact children's skill acquisition trajectories by shaping home learning environments, setting expectations and influencing aspirations (Cunha and Heckman, 2007[1]; Ermisch and Francesconi, 2001[7]). Adult learning opportunities, particularly continuous professional development and informal learning, further amplify existing disparities due to variations in individuals' employment contexts, residential areas and resources available for ongoing education (Desjardins, 2003[8]). Adults with higher levels of education are often more intrinsically motivated to continue learning as part of their daily lives and to attract support for this from their employers. As a result, disparities in initial educational opportunities can shape lifelong learning trajectories and, potentially, contribute to widening skills disparities over the life course.

Effective lifelong learning systems can promote economic competitiveness by equipping individuals with the foundational knowledge and skills needed to navigate an increasingly dynamic labour market (see Chapter 1). They can also ensure that individuals possess the skills needed to participate effectively in democratic processes, thereby fostering civic engagement and social cohesion. There is a long-standing debate about whether schools function primarily as mechanisms of social mobility or as institutions that reinforce existing disparities, and whether the socio-economic gaps in skills observable in the early years are narrowed or widened through education and training (Cheadle, 2008[9]; Skopek and Passaretta, 2020[10]; Passaretta, Skopek and van Huizen, 2022[11]), with students often sorted into different education programmes along pre-existing class, gender and cultural lines.

This chapter first maps how disparities in core 21st-century skills have evolved over recent decades from childhood into adulthood. It then illustrates disparities in participation in education and training, and the extent to which disparities in learning opportunities exacerbate or alleviate skills disparities between socio-demographic groups. Finally, the chapter considers engagement in adult learning and informal learning, and explores the implications of participation patterns for disparities in core 21st-century skills, offering policy insights on how to broaden access to lifelong learning and mitigate persistent skills disparities. Taken together, the analysis pinpoints whether the key driver of inequality is *how long* people study for, *what* they study or factors that lie beyond formal education altogether – which are essential distinctions for designing effective, targeted policy responses.

3.2. Expenditure on education and skills gaps

Public investment in schooling is a key lever for raising average achievement and narrowing the learning gaps between young people with socio-economically advantaged and disadvantaged backgrounds (Jackson, Wigger and Xiong, 2021[12]). Higher per-pupil spending is associated with smaller class sizes, better-qualified teachers and richer instructional materials in school, which are factors associated with stronger outcomes and smaller skills gaps. Expenditure can also be directed towards compensatory programmes, such as early childhood education, instructional support, tutoring and needs-based scholarships that aim to reduce skills disparities and that benefit students from low-income families.

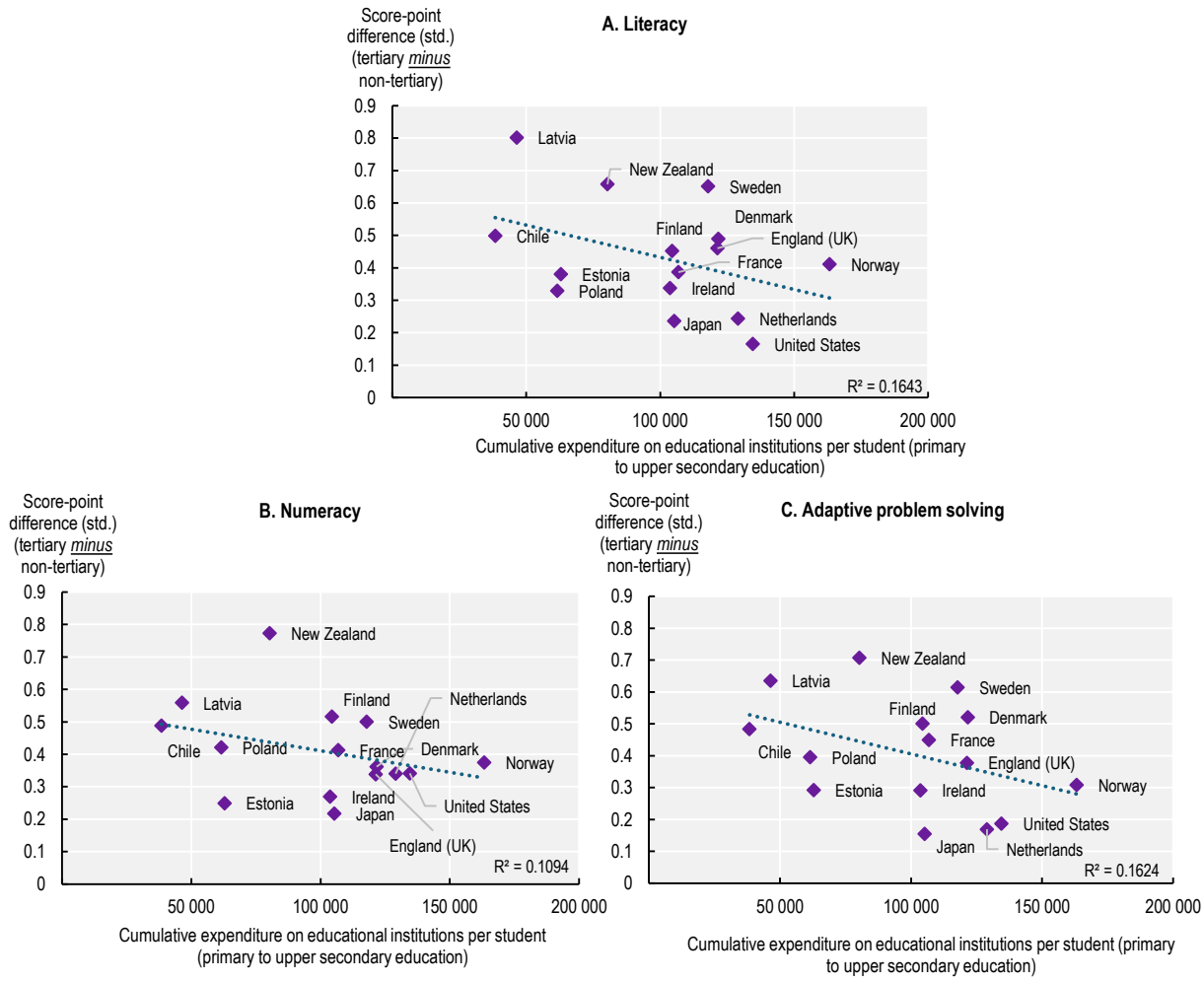
However, greater resources do not automatically translate into smaller disparities between individuals with different socio-economic backgrounds. More advantaged families generally have more resources to navigate school choice options, lobby for their children to take part in higher quality programmes or supplement public provision with private tutoring. As a result, additional funds may widen, rather than narrow, socio-economic gaps. Empirical studies of “resource–advantage” interactions show that rises in spending deliver larger skills gains for young people in better-off neighbourhoods unless the allocation formula is explicitly progressive (Lafortune, Rothstein and Schanzenbach, 2018[13]). Against this backdrop, the analysis in this chapter examines whether cross-national differences in cumulative public expenditure per pupil are reflected in disparities in young adults’ core 21st-century skills.

Socio-economic disparities arise from a combination of individual and social factors. At the individual level, unequal access to economic, cultural and social resources during childhood shapes educational pathways and skills formation. At the national level, broadening access to high-quality schooling generally entails higher costs, and countries differ markedly in how much they spend. Figure 3.1 illustrates the association between cumulative public expenditure per pupil (from primary to upper secondary level) and gaps in core 21st-century skills among 22-26 year-olds with and without tertiary-educated parents. In countries that invest more, socio-economic gaps in literacy and numeracy tend to be narrower. The association, however, is weak: similar spending levels are consistent with very different gaps. Chile and Latvia each spend roughly USD 35 000 to 45 000 per pupil, yet Chile’s literacy gap is about 0.5 standard deviations (SD) while Latvia’s approaches 0.8 SD. Denmark, England (United Kingdom) and the Netherlands spend USD 120 000 to 130 000 per pupil, but their literacy gaps range from 0.2 SD in the Netherlands to 0.5 SD in Denmark.

This cross-section evidence suggests that, on average, higher cumulative investment is accompanied by smaller socio-economic disparities in core 21st-century skills. However, the large dispersion around the trend line indicates that funding alone is not a sufficient condition to guarantee lower skills disparities. In fact, higher expenditure per student is generally only positively correlated with overall levels of information-processing skills up to a certain threshold: additional investments beyond the cumulative USD 100 000 figure per student do not appear to be associated with higher skills at the country level (OECD, 2024[14]). Structural features such as how resources are targeted, how schools are governed and how families can supplement public provision determine the degree to which additional spending equalises (or not) opportunities (OECD, 2023[15]). Given that how money is spent is at least as important as how much is spent, this chapter details policies and initiatives adopted in OECD countries to reduce disparities in 21st-century skills.

Figure 3.1. Association between educational expenditure and disparities, by parental education in core 21st-century skills

Direct expenditure within educational institutions in equivalent USD converted using purchasing power parity (PPPs) for gross domestic product (GDP)



Note: Adults aged 22-26, restricted to adults whose highest completed level of formal education is upper secondary education. Cumulative expenditure on educational institutions per student (primary to upper secondary) refers to the years 2005-2016. Expenditure data are only available for a limited number of countries that participated in the 2023 Survey of Adult Skills. Data for expenditure for England (United Kingdom) refer to the entire United Kingdom. The dashed line represents the fitted regression line. Parental education (at respondents' age 14) is based on the International Standard Classification of Education (ISCED) 2011 and distinguishes between adults with at least one tertiary-educated parent (ISCED 2011 5, 6, 7 and 8) and those with no tertiary-educated parent.

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html and OECD (2025[17]), *Expenditure on educational institutions per full-time equivalent student,* (database), Data Explorer, http://data-explorer.oecd.org/s/1cs.

StatLink https://stat.link/jz1dt4

Box 3.1 provides insights into how policymakers can manage budget constraints related to the particular policy challenge of reducing disparities among students with an immigrant background.

Box 3.1. Reducing disparities among students with an immigrant background: The use of artificial intelligence (AI)

Across the OECD, the integration of students with an immigrant background into school systems stands as an increasingly pressing policy challenge. Young people with an immigrant background have lower results in the Programme for International Student Assessment (PISA) than their counterparts without an immigrant background. Similarly, students with an immigrant background report a weaker sense of belonging, with girls who were not born in the country in which they reside as teenagers especially likely to report a low sense of belonging at school.

Language acquisition and inclusive teaching and learning practices can promote positive educational outcomes among students with an immigrant background. Across the OECD, governments have invested in AI infrastructures, programmes and tools that can assist teachers and other stakeholders in their efforts to integrate students with an immigrant background, and their families, into the school community and society more broadly. Table 3.1 provides an overview of AI-powered tools rolled out on a systemic basis in OECD and partner countries to support language teaching in schools.

Table 3.1. AI-powered tools to assist language teaching

Government funded – or otherwise supported – AI-powered tools rolled out on a systemic basis in OECD and partner countries

Country	Initiative
Canada	Digital language learning platform, "Voila Learning". Planned roll-out out across 35 school boards (Government of Canada, 2023[18]).
Germany	Language assessment through Natural Language Processing: supporting academic research and development of a digital learning platform powered by natural language generation technology (Hector Institute for Empirical Educational Research, 2024[19]; Tübingen Center for Digital Education, 2024[20]; Tübingen Center for Digital Education, 2024[21]).
Netherlands	Precise and personalised language feedback: supporting academic research and development of automatic speech recognition technology (Radboud University, 2025[22]).
Iceland	Speech recognition and feedback: a computer-assisted pronunciation training tool, so far implemented in the Icelandic-as-a-second-language programme at the University of Iceland (Richter et al., 2022[23]; Language and Voice Laboratory, n.d.[24]).
Singapore	Marking system for English language assessment embedded within the National AI Strategy (Smart Nation Singapore, 2019[25]).
Thailand	Language learning platform, "Winner English": a system used for English language instruction in select public schools (Vathanalaoha, 2022[26]; Khonthai Foundation, 2021[27]).

Note: See (Borgonovi et al., 2025[28]) for additional details about the initiatives listed.

Several OECD countries are also funding or otherwise supporting infrastructure for the development of AI tools for public use across low-resource languages (i.e. languages for which a comparatively low number of written texts are available to train AI systems), with the aim of spurring the development of AI-powered educational technology (ed-tech) for language learning. For example, the Lithuanian Ministry of the Economy and Innovation recently announced an investment of EUR 12 million across six projects, including the development or updating of monolingual and multilingual text databases across ten languages, to enable the creation of multilingual chatbots or other tools that incorporate learners' first languages into the language teaching process (Ministry of the Economy and Innovation of Lithuania, 2024[29]). In Iceland, the government has invested ISK 2.2 billion (Icelandic kronur, ~ EUR 13.6 million) in the "Language Technology for Icelandic" initiative, which includes the development of automatic speech recognition technology for Icelandic. Such technology infrastructure will enable those designing and developing voice-based user interfaces to add Icelandic to machine-translation technology (Language and Voice Laboratory, n.d.[24]; Nikulásdóttir, Guðnason and Steingrímsson, n.d.[30]; Ministry of Culture and Business Affairs, 2024[31]).

3.3. Disparities in achievement growth: Exploring how gaps develop over time

Comparative evaluations of skills disparities based on evidence from international large-scale assessments rarely capture how achievement gaps develop over time. Because most of these studies are cross-sectional, they reveal disparities at discrete grades or ages, but not trajectories. A growing body of work has addressed this limitation by constructing synthetic cohorts[1] to trace changes in information-processing skills across individuals with different socio-economic backgrounds and between men and women (Borgonovi, Choi and Paccagnella, 2018[32]; Dämmrich and Triventi, 2018[33]; Jerrim and Choi, 2013[34]).

Existing research on the evolution of socio-economic disparities focuses mainly on the period from early childhood to the end of compulsory schooling. Findings from Australia, Canada, Germany, the United Kingdom and the United States – countries that differ markedly in income inequality and school organisation – indicate that socio-economic gaps are largely established prior to school entry and widen little, if at all, during the school years (Duncan and Magnuson, 2013[35]; Skopek and Passaretta, 2020[10]). In other words, schools appear to have an equalising effect.

Far less is known about what happens after compulsory schooling, when learning pathways diversify and achievement tests are seldom administered (Schulenberg, Sameroff and Cicchetti, 2004[36]; Schulenberg and Schoon, 2012[37]). Achievement gaps may widen between late adolescence and early adulthood because of initial inequalities and the cumulative nature of advantage (DiPrete and Eirich, 2006[38]). Entry into post-secondary education depends heavily on success in upper secondary schooling and, unlike earlier stages, participation is voluntary and the quality of provision is more varied (Breen and Jonsson, 2005[39]). Achievement disparities may therefore become more pronounced during this phase.

The literature consistently links socio-economic gaps in attainment to differences in the resources families invest in their children (Conger and Donnellan, 2007[40]). Individuals with socio-economically advantaged backgrounds are able to provide more material, cultural and social capital; greater involvement in educational decision making; access to better formal learning environments; and richer out-of-school experiences (Domina, 2005[41]).

Skills, attitudes and dispositions accumulate throughout life and are transmitted between generations. The effectiveness of new learning depends critically on prior learning, which is in turn influenced by family background and earlier educational experiences. As individuals progress through the life course, past learning increasingly shapes future opportunities. To describe how achievement gaps evolve over time, this section draws on multiple cross-sectional surveys that sampled individuals from broadly the same birth cohorts at successive ages to construct synthetic cohorts. While this approach does not produce a true longitudinal dataset, it does allow gender and socio-economic disparities to be compared at key stages of the educational trajectory.

3.3.1. The evolution of gender gaps

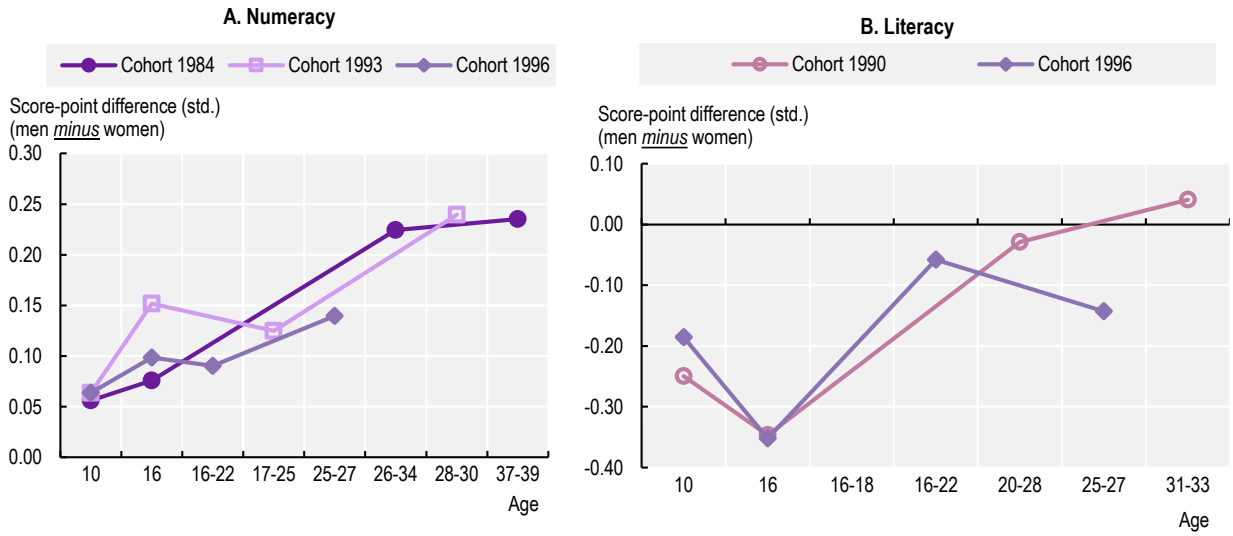
Gender gaps in mathematics and numeracy, favouring boys and men, are smallest at age 10 and widen with age, as shown in Figure 3.2. By contrast, gender gaps in reading and literacy, favouring girls and women, peak in mid-adolescence and then narrow. These patterns appear stable across seven OECD countries for which data are available – Canada, England (United Kingdom), Hungary, the Netherlands, New Zealand, Norway and the United States – and across cohorts born in 1984, 1993 and 1996. For the 1984 cohort, the mathematics gap increased from 0.06 SD at age 10 to 0.08 SD at 16, followed by 0.22 SD at ages 26-34 and 0.24 SD at ages 37-39. The 1993 and 1996 cohorts exhibit similar trends, although the gap does not increase further between age 16 and young adulthood.

Gender gaps in reading and literacy follow a U-shape: they are largest at age 16 and smaller in primary school and adulthood. This pattern is consistent across the 1990 and 1996 cohorts. Notably, for the 1996

cohort, the relative performance of women improves between age 16 and young adulthood, in contrast to earlier cohorts. These findings corroborate earlier work – e.g. (Borgonovi et al., 2017[42]) and (Borgonovi, Choi and Paccagnella, 2018[32]) – although the magnitude of the gaps varies by country, age and cohort – likely reflecting differences in participation in formal, non-formal and informal learning.

Figure 3.2. Gender disparities in numeracy and literacy, by age

Difference in standardised mathematics/numeracy and reading/literacy scores between men and women (men *minus* women), OECD average



Note: Estimates are standardised to an OECD mean of zero and a standard deviation of one in the respective databases. OECD averages include the following countries: Canada, England (United Kingdom), Hungary, the Netherlands, New Zealand, Norway and the United States. Country-specific results in addition to detailed information on data availability are provided in Annex Table 3.A.5.

Source: Calculations based on IEA (1995[43]), *TIMSS 1995 Grade 4 Database*, https://doi.org/10.58150/IEA_TIMSS_1995_G4; IEA (2001[44]), *PIRLS 2001 Database*, https://doi.org/10.58150/PIRLS_2001_data; IEA (2003[45]), *TIMSS 2003 Grade 4 Database*, https://doi.org/10.58150/IEA_TIMSS_2003_G4; IEA (2007[46]), *TIMSS 2007 Grade 4 Database*, https://doi.org/10.58150/IEA_TIMSS_2007_G4; IEA (2006[47]), *PIRLS 2006 Database*, https://doi.org/10.58150/PIRLS_2006_data; OECD (2017[48]), *PIAAC 1st Cycle Database*, www.oecd.org/en/data/datasets/PIAAC-1st-Cycle-Database.html; OECD (2000[49]), *PISA 2000 Database*, www.oecd.org/en/data/datasets/pisa-2000-database.html; OECD (2009[50]), *PISA 2009 Database*, www.oecd.org/en/data/datasets/pisa-2009-database.html; OECD (2012[51]), *PISA 2012 Database*, www.oecd.org/en/data/datasets/pisa-2012-database.html; OECD (2022[52]), *PISA 2022 Database*, www.oecd.org/en/data/datasets/pisa-2022-database.html; and OECD (2024[53]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

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Gender gaps evolve in part because early comparative strengths influence subsequent educational choices. Girls who perform well in mathematics often excel even more in reading; when encouraged to pursue their strongest subjects, they are channelled into humanities-oriented programmes and receive less exposure to advanced mathematics, reducing the likelihood of progressing into STEM pathways. Boys, by contrast, seldom enjoy a relative advantage in reading. During compulsory schooling they must engage with set texts that may hold little personal interest (OECD, 2015[54]), but outside school they are free to explore an array of reading materials that align with their preferences. This voluntary reading can narrow the literacy gap after adolescence, while their sustained engagement with mathematics maintains or enlarges the numeracy advantage. Gendered expectations, differential guidance and a paucity of visible female role models in STEM further reinforce these trajectories. In adulthood, women are more likely than

men to engage in unpaid care activities, which may limit their ability to engage in activities that promote strengthened literacy and numeracy skills. Box 3.2 illustrates between-country differences in how gender disparities in reading and mathematics evolve between primary and secondary school, and Box 3.3 provides examples of policies and initiatives aimed at reducing gender disparities over the life course.

Box 3.2. The role of schooling in narrowing gender disparities in mathematics and reading proficiency

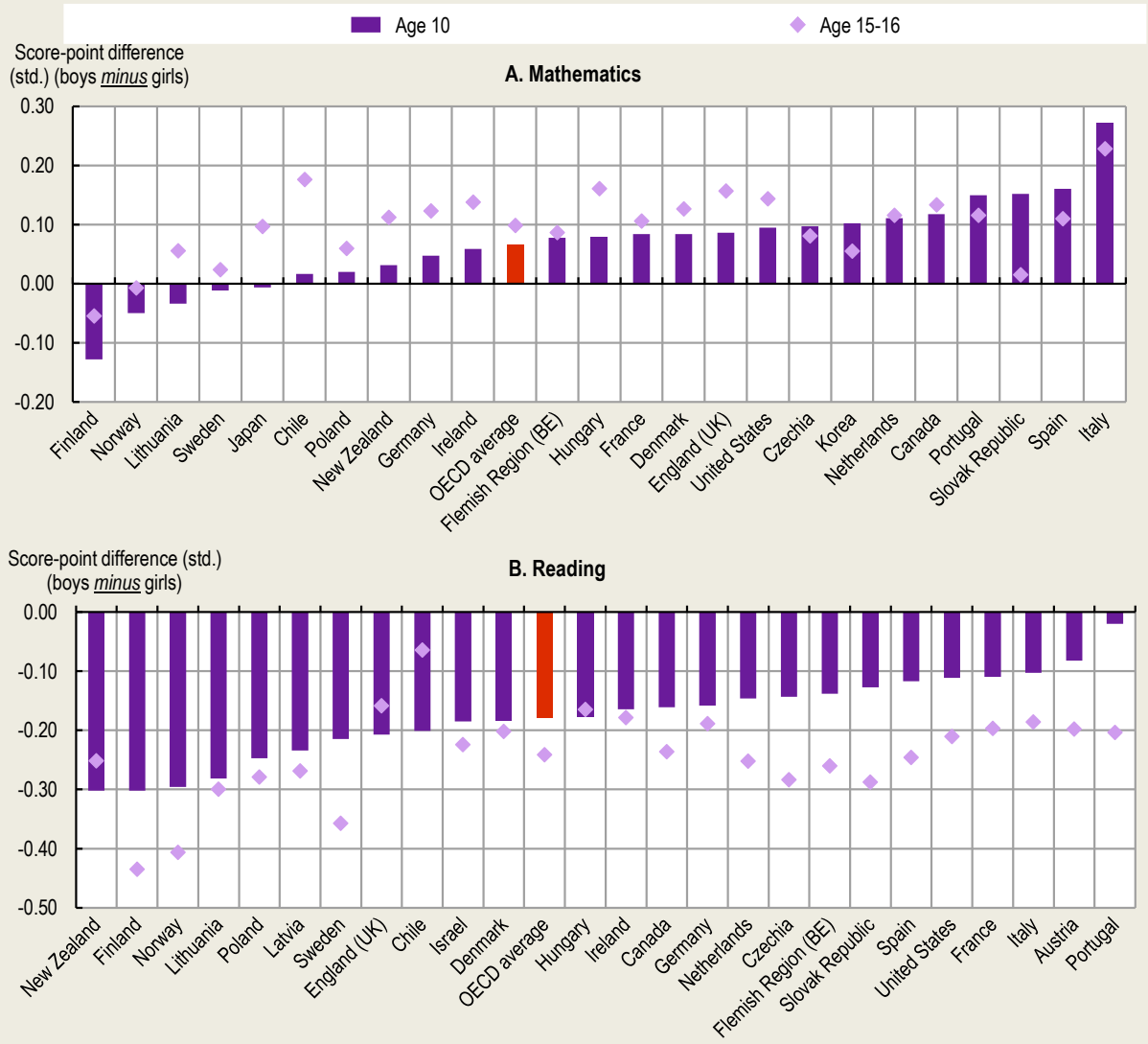
Figure 3.2 suggests that for cohorts of children born between 1984 and 1996, gender gaps in favour of girls and gender gaps in favour of boys grew wider between age 10 and age 15-16.

Figure 3.3 complements this evidence with estimates of gender gaps in mathematics and reading for cohorts of children born in 2004-05 across a wider set of OECD countries to highlight the evolution of gender gaps during compulsory schooling. Estimates are aligned with those illustrated in Figure 3.2: during primary and secondary school gender gaps become more pronounced, although countries differ with respect to the size of gender gaps at age 10, as well as the evolution of such gaps as young people age. For example, the gender gap in favour of boys in mathematics at age 10 is widest in Italy (0.27 SD), whereas in Finland, girls outperform boys in mathematics at age 10 by 0.13 SD. Although in Italy the gender gap in favour of boys is reduced between age 10 and age 15-16 (it is 0.23 SD at age 15-16), it remains the largest among countries with available data. Boys' disadvantage in Finland narrows, and by age 15-16 the gender gap in favour of girls in mathematics is 0.05 SD. The gender gap in favour of boys in mathematics grows the most in Chile where it is 0.02 SD at age 10 and 0.18 SD at age 15-16.

Similarly, the gender gap in favour of girls in reading is large at age 10 and in most countries, it grows larger by age 15-16. For example, in Finland, girls outperform boys in reading by 0.3 SD at age 10, a gap that grows as large as 0.44 SD by age 15-16. In Portugal, the gender gap in favour of girls in reading is only 0.02 SD at age 10 but grows to 0.20 SD by age 15-16. Comparing the evolution of gender gaps in mathematics and reading in

Figure 3.3 suggests that gaps in mathematics in favour of boys tend to be smaller in countries in which gender gaps in favour of girls are wider and, conversely, gender gaps in mathematics in favour of boys are widest in countries in which gender gaps in reading in favour of girls are smaller. Furthermore, countries in which gender gaps in mathematics in favour of boys grow the most between age 10 and age 15-16 tend to be those in which gender gaps in reading in favour of girls grow the least.

Figure 3.3. Disparities in mathematics and reading proficiency among school-aged children, by gender



Note: Estimates are standardised to an OECD mean of zero and a standard deviation of one in the respective databases. Norway assessed its fifth grade at the age of 10 to obtain better comparisons with other northern European countries.

Countries are ranked in ascending order based on the score-point difference of boys and girls in mathematics (Panel A) and reading (Panel B).

Source: Calculations based on IEA (2015[55]), *TIMSS 2015 Grade 4 Database*, https://doi.org/10.58150/IEA_TIMSS_2015_G4; IEA (2016[56]), *Progress in International Reading Literacy Study (PIRLS) 2016 Database*, https://doi.org/10.58150/PIRLS_2016_data; and OECD (2022[52]), *PISA 2022 Database*, www.oecd.org/en/data/datasets/pisa-2022-database.html.

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Box 3.3. Reducing gender disparities in skills throughout the life course

Addressing gender disparities in skills requires a comprehensive, life-course approach – from early childhood education to adulthood – with targeted policies and initiatives that challenge stereotypes, broaden opportunities and support the participation of men and women in all sectors. Beginning in early childhood education and care (ECEC), interventions can address how children are socialised and extend all the way to industry-specific programmes that lower barriers for women accessing labour market opportunities in men-majority fields.

Early childhood education and care

Gender equality initiatives in Sweden's preschools aim to eliminate gender stereotypes in early childhood education by fostering inclusive environments that challenge traditional gender roles. These schools use gender-neutral language, avoid gendered expectations and offer diverse learning activities – from creative arts to problem solving – ensuring all children engage equally. Classrooms are structured to avoid gender-based divisions, promoting equal participation in all areas of play and learning. A key component is teacher training, equipping educators with strategies to recognise and counteract unconscious bias. The approach aligns with Sweden's broader commitment to gender equality, embedding values of fairness and inclusion from an early age (Shutts et al., 2017[57]; Brussino and McBrien, 2022[58]).

Schooling and young adulthood

Ireland's Facts, Faces, Futures campaign, launched in 2023 by the National Apprenticeship Office, promotes the participation of women in apprenticeships. Featuring female role models and distributed to over 130 all-girls schools, it has received positive feedback, with visits continuing into 2024. By the end of 2023, over 100 schools had received apprenticeship information. In 2024, the campaign focused more on craft apprenticeship opportunities and collected feedback to enhance impact (Education Magazine, 2023[59]). The campaign is central to the Action Plan for Apprenticeship 2021-2025; the Minister for Further and Higher Education, Research, Innovation and Science credited Facts, Faces, Futures for promoting women's participation in apprenticeships in Ireland and for the increase in the share of apprentices who are women (approximately 9% of the overall apprentice population are women, a 70% increase between the end of 2021 and February 2025) (House of the Oireachtas, 2025[60]).

In the Slovak Republic the You too in IT (*Aj Ty v IT*) initiative encourages and supports girls and women to pursue careers in information and communication technology (ICT). It offers coding workshops for secondary school girls, upskilling for career changers and teacher training. Activities are often delivered in all-girl groups to create a supportive environment, enhancing engagement and confidence. The programme links participants to tech employers, supporting diversity and ensuring technology benefits from a broader range of perspectives (Aj Ty v IT, 2025[61]).

In France, the government has launched **the Girls and Maths** (*Filles et Maths*) plan, introducing measures to encourage girls to choose more mathematics-intensive study pathways throughout their formal schooling, and ultimately enrol in mathematics-related higher education pathways. The gap between boys' and girls' mathematics achievement and enrolment begins in primary school and widens with age – the plan therefore aims to tackle the persistent gender stereotypes in society and the classroom which lead to girls opting out of studying mathematics. The plan includes additional training for national education staff, setting higher targets for girls' enrolment in specialised mathematics courses throughout secondary school, and fostering networks and promoting role models to inspire young girls to choose mathematics-related career paths. Beyond mathematics, the plan ultimately aims to guide more girls towards scientific and technological careers, areas often referred to as future-

oriented and offering greater economic opportunities (French Ministry of National Education, 2025[62]; 2025[63]).

Adulthood

Women continue to face barriers in entering and progressing within men-majority fields such as construction and technology, which are sectors crucial to the green and digital transition and that are experiencing acute labour shortages. **In Denmark**, **the Boss Ladies** project (Boss Ladies, 2025[64]) seeks to shift perceptions and attract more women into construction, where they currently represent just 9% of the workforce. The project also works to reshape narratives through media outreach and social media campaigns featuring female role models. The initiative includes:

- Boss ladies ambassadors: Over 300 female builders visiting schools as role models.
- Learning labs: Collaboration with vocational schools and counsellors to recruit more women.
- Talent development: Camps, workshops and mentoring focused on communication and career planning.
- Girl boss garage: Providing practical building experiences for girls without industry connections.
- Apprenticeship match: One-on-one support to help women secure apprenticeships.

3.3.2. The evolution of gaps related to parental education

At every age, people from tertiary-educated families outperform their peers with no tertiary-educated parent, with the gap widening between age 16 and early adulthood in all cohorts. Panel A in Figure 3.4 presents the average standardised difference in mathematics and numeracy between students with at least one tertiary-educated parent and those with no tertiary-educated parent. As shown, the gap for the 1993 cohort widens from 0.45 SD at age 16 to 0.52 SD at the age of 17-25. The disparity flattens for the 1984 cohort between age 27-34 and 37-39, increases for the 1993 cohort (from 0.52 SD at age 17-25 to 0.63 SD at age 28-30) and drops slightly for the 1996 cohort (from 0.41 SD at age 16 to 0.53 SD at age 25-27). Although country-specific patterns diverge, the broad tendency across the seven OECD countries used for this analysis is one of increasing socio-economic disparity.

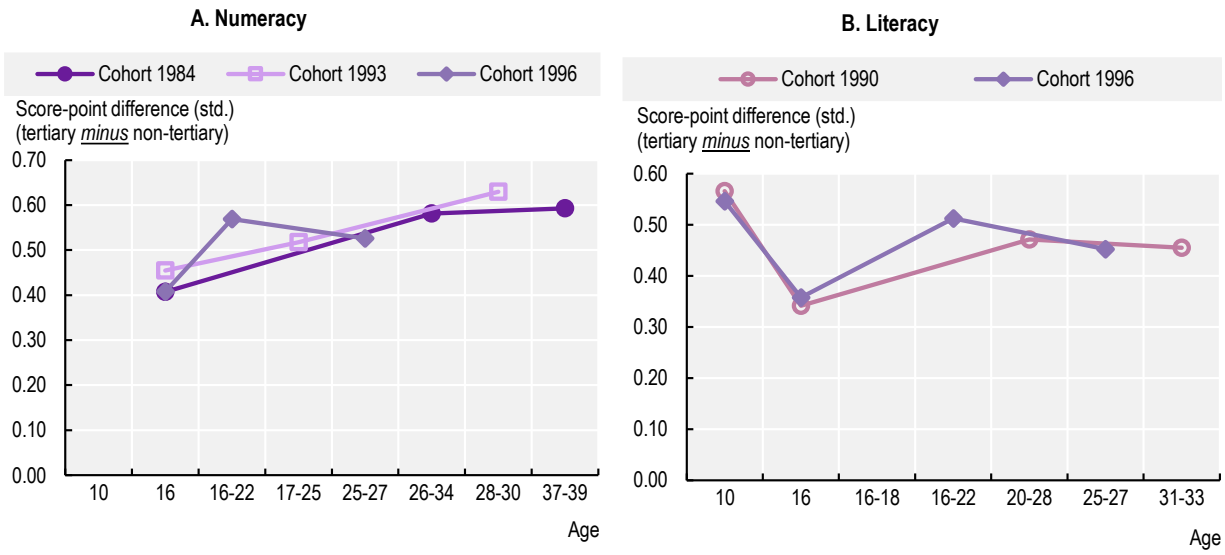
In reading and literacy (Figure 3.4, Panel B), the parental education gap is likewise present at every age. It contracts between primary and lower-secondary schooling, then expands and plateaus through early adulthood. For instance, the disparity for the 1990 cohort starts at 0.57 SD at age 10, drops to 0.34 SD at age 16, increases back to 0.47 SD at age 20-28 and then drops slightly to 0.46 SD at age 31-33. Overall, socio-economic gaps are wider than those linked to gender, but national trajectories vary.

These results highlight that socio-economic disparities in literacy and numeracy observed at a young age not only persist but often widen into young adulthood in most countries. Previous work attributes this widening to unequal access to post-secondary education and training, higher dropout rates among students with socio-economically disadvantaged backgrounds, and their increased likelihood of unemployment or employment in occupations that do not foster skills development. Compulsory schooling appears to act as an equalising force, but afterwards divergent educational and labour market experiences frequently amplify socio-economic gaps in information-processing skills, particularly numeracy skills.

Box 3.4 presents evidence on country specific disparities in mathematics achievement at age 10 and ages 15-16 for two cohorts: one that participated in the Trends in International Mathematics and Science Study (TIMSS) in 2011 and PISA in 2018, and one that participated in TIMSS in 2015 and PISA in 2022. Box 3.5 provides examples of initiatives that promote access to compulsory schooling for children and the uptake in formal skills development opportunities throughout the life course.

Figure 3.4. Parental education disparities in numeracy and literacy, by age

Differences in standardised mathematics/numeracy and reading/literacy scores between individuals whose parents have tertiary education and those whose parents do not, OECD average



Note: Estimates are standardised to an OECD mean of zero and a standard deviation of one in the respective databases. OECD averages include the following countries: Canada, England (United Kingdom), Hungary, the Netherlands, New Zealand, Norway and the United States. See the note for Figure 3.1 for a description of parental educational attainment. Country-specific results in addition to detailed information on data availability are provided in Annex Table 3.A.5.

Source: Calculations based on IEA (1995[43]), *TIMSS 1995 Grade 4 Database*, https://doi.org/10.58150/IEA_TIMSS_1995_G4; IEA (2001[44]), *PIRLS 2001 Database*, https://doi.org/10.58150/PIRLS_2001_data; IEA (2003[45]), *TIMSS 2003 Grade 4 Database*, https://doi.org/10.58150/IEA_TIMSS_2003_G4; IEA (2007[46]), *TIMSS 2007 Grade 4 Database*, https://doi.org/10.58150/IEA_TIMSS_2007_G4; IEA (2006[47]), *PIRLS 2006 Database*, https://doi.org/10.58150/PIRLS_2006_data; OECD (2017[48]), *PIAAC 1st Cycle Database*, www.oecd.org/en/data/datasets/PIAAC-1st-Cycle-Database.html; OECD (2000[49]), *PISA 2000 Database*, www.oecd.org/en/data/datasets/pisa-2000-database.html; OECD (2009[50]), *PISA 2009 Database*, www.oecd.org/en/data/datasets/pisa-2009-database.html; OECD (2012[51]), *PISA 2012 Database*, www.oecd.org/en/data/datasets/pisa-2012-database.html; OECD (2022[52]), *PISA 2022 Database*, www.oecd.org/en/data/datasets/pisa-2022-database.html; and OECD (2024[53]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

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Box 3.4. The role of schooling in narrowing socio-economic disparities in mathematics and reading proficiency

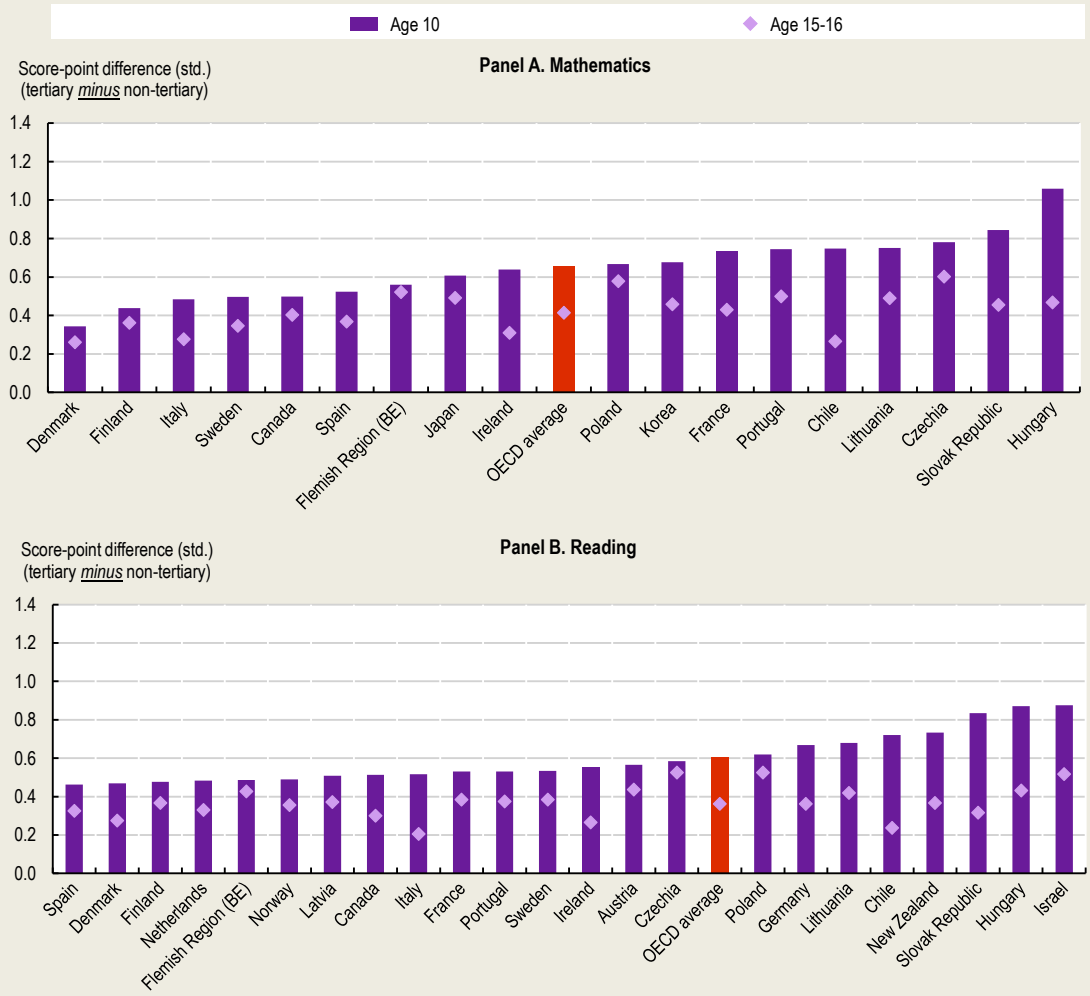
Although it is possible to map the evolution of socio-economic disparities for selected cohorts, as shown in Figure 3.4, there is a lack of data on parental education for fourth graders in early editions of the TIMSS study, which prevents examining early trajectories for numeracy. Figure 3.5 shows that disparities related to parental education are generally wider at age 10 than at ages 15-16. On average across OECD countries, the difference in mathematics achievement for the 2004/2005 cohort decreased from 0.66 SD at age 10 to 0.41 SD at ages 15-16.

Across countries with available data, score-point differences in mathematics between young people whose parents had and did not have a tertiary qualification were largest in Hungary and the Slovak Republic (1.06 SD and 0.84 SD) at age 10, and in the Czech Republic (hereafter 'Czechia'), Poland and the Flemish Region (Belgium) (0.60 SD, 0.58 SD and 0.52 SD) at age 15-16 (Figure 3.5, Panel A). Socio-economic disparities in mathematics narrowed the most between age 10 and

age 15-16 in Hungary (from 1.06 to 0.47), whereas they remained relatively stable in the Flemish Region (Belgium) (0.56 SD and 0.52 SD, respectively).

In reading, socio-economic gaps narrowed the most in the Slovak Republic (from 0.83 to 0.32) and did not widen in any country with available data between age 10 and age 15-16 (Figure 3.5, Panel B). Israel was the country with the widest socio-economic gap in reading at age 10 (0.88 SD) but by 15-16 the gap narrowed to 0.52 SD. Similarly, in Hungary, the socio-economic gap in reading at age 10 was 0.87 SD but by 15-16 the gap narrowed to 0.43 SD.

Figure 3.5. Disparities in mathematics and reading proficiency among school-aged children, by parental education



Note: Estimates are standardised to an OECD mean of zero and a standard deviation of one in the respective databases. Norway assessed its fifth grade at the age of 10 to obtain better comparisons with other northern European countries. Parental education is based on students' responses. Information on their mothers' and fathers' education was used to distinguish between young people with at least one tertiary-educated parent (ISCED 2011 levels 5, 6, 7 and 8) and those with no tertiary-educated parent.

Countries are ranked in ascending order based on the score-point difference of adults with tertiary and non-tertiary educated parents in mathematics (Panel A) and reading (Panel B).

Sources: Calculations based on IEA (2015[55]), *TIMSS 2015 Grade 4 Database*, https://doi.org/10.58150/IEA_TIMSS_2015_G4; IEA (2016[56]), *Progress in International Reading Literacy Study (PIRLS) 2016 Database*, https://doi.org/10.58150/PIRLS_2016_data; and OECD (2022[52]), *PISA 2022 Database*, www.oecd.org/en/data/datasets/pisa-2022-database.html.

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Box 3.5. Reducing socio-economic disparities in skills over the life course

Access to quality education throughout the life course can reduce disparities in the short term and prevent them from accumulating over time. Policies may range from investment in ECEC infrastructure that considers the needs of families with socio-economically disadvantaged backgrounds, programmes promoting access to higher education, and interventions in adulthood that mitigate disparities in early years and prevent the accumulation of disadvantages resulting from disrupted schooling or low levels of skills.

Early childhood education and care

Sure Start Children's Centres in the United Kingdom offer integrated support for families with children under five, particularly in disadvantaged areas. Services include health, parenting, financial advice and employment support for parents, and early education. Evaluations show positive outcomes: improved early development, physical health, home environments and early identification of special educational needs. The programme is considered cost-effective and impactful in reducing early childhood inequalities and has achieved significant educational gains for young children, with benefits lasting into secondary school (Carneiro et al., 2025[65]; UK Department of Education, 2010[66]; OECD, 2025[67]). At its peak in 2009-2010, Sure Start had around 3 600 centres operating in England. Following funding cuts, local authorities scaled back or closed most of the centres by 2018. The programme cost GPB 2.7 billion a year in 2023-24 prices, delivering a return of around GBP 2 for every GBP 1 invested (Carneiro et al., 2025[65]).

Finland's Programme for Equality and Non-Discrimination in Education and Training 2025 is a ten-point action plan covering every level of the education system and the stakeholders involved in children's educational and developmental journeys. Related to ECEC, the programme introduced new quality indicators that promote inclusivity and cultural sensitivity, giving teachers the tools to evaluate their pedagogical practices accordingly. Professional development for teachers and school staff to recognise unconscious bias, identify discriminatory behaviour and create inclusive classroom environments is also envisioned as part of this programme, including in initial teacher training. The programme builds upon the Right to Learn initiative implemented between 2020 and 2022, which gave schools additional resources and teacher training to identify and support students requiring additional help facing barriers related to socio-economic or linguistic background or learning obstacles. Both programmes in-built family and community involvement to ensure effectiveness in reducing achievement gaps, particularly among students with an immigrant background (OECD, 2022[68]; Ministry of Education and Culture, Finland, 2025[69]).

Head Start programmes across the United States promote school readiness for low-income families with children up to age five. In addition to early learning, the programmes support child health, parent engagement and access to public services. Programmes are federally funded and locally delivered through schools and non-profits, aiming to support both children's development and family well-being (Bierman et al., 2013[70]; Bierman et al., 2008[71]; OECD, 2025[67]).

Schooling and young adulthood

The Irish Higher Education Access Route (HEAR) eases entry into higher education for students from disadvantaged backgrounds. Applicants must meet financial, social and cultural criteria, with household income the most important, and can apply for HEAR at the same time as university. Each participating higher education institution has a reserved number of places to offer eligible HEAR applicants at lower or reduced Leaving Certificate (the national end of high school exam) points. Like all other applicants, HEAR prospective beneficiaries need to meet the minimum entry requirements (at

the institutional level) and any specific programme requirements before being considered for a HEAR reduced points offer (HEAR, 2025[72]). In 2022, 11% of university applicants applied through HEAR, with an average 84% acceptance rate (Irish Universities Association, n.d.[73]).

HEAR also offers support such as orientation, tutoring, mentoring, study skills help and financial advice, and participants report a strong sense of identity and belonging (Byrne et al., 2013[74]). HEAR students are more likely to transition successfully to higher education (Byrne et al., 2013[74]), achieve honours degrees and perform better academically than peers with similar backgrounds (Byrne et al., 2013[74]; Denny et al., 2014[75]). The programme is funded as a part of wider efforts by the Irish government to widen access to higher education, promote innovation in higher education and support national development.

Adulthood

Luxembourg's FutureSkills Initiative targets unemployed individuals with secondary education, offering three months of training followed by a six-month public sector internship. Training focuses on soft skills, digital competencies and office tasks. The aim is to improve employability and open access to public sector roles, which may otherwise be out of reach for individuals from disadvantaged backgrounds (Agence pour le développement de l'emploi, 2025[76]; OECD, 2023[77]).

Norway's Skills Plus Work programme provides workplace-based basic skills training for employed adults or individuals engaged in volunteering who have low formal qualifications. Training focuses on literacy, numeracy, digital and communication skills using job-relevant content. Employers or voluntary organisation collaborate with training providers to design tailored programmes. Funded by the Ministry of Education and Research, the programme targets learners unlikely to participate in formal training (OECD, 2020[78]; Directorate of Higher Education and Competence, Norway, 2025[79]).

Spain's Vives Emplea Saludable programme aims to enhance employability by integrating physical, emotional and social well-being into employment support programmes among unemployed individuals. The programme combines job-readiness training with interventions focused on mental health, physical activity, sleep and nutrition. Emotional resilience, healthy behaviours and job placement rates were the key metrics through which programme success was evaluated. The initiative is delivered through labour-market programmes led by non-governmental organisations (European Commission, 2023[80]).

3.4. The impact of educational attainment disparities on core 21st-century skills disparities

3.4.1. Disparities in educational attainment

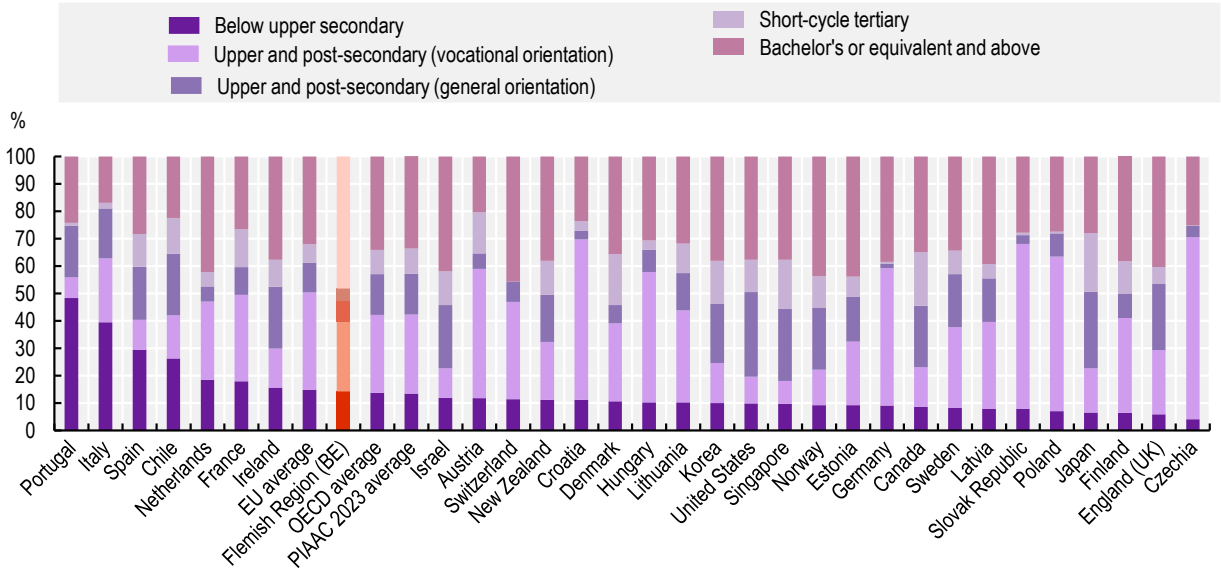
The educational attainment of 30-65 year-olds varies markedly across OECD countries and is unevenly distributed across demographic groups: younger adults (30-49 year-olds) "out-credential" their older peers; women match or exceed men in tertiary attainment; and individuals with socio-economically advantaged backgrounds or who grew up in urban settings on average have higher levels of educational qualifications than less advantaged adults or adults who grew up in rural areas. Programme orientation further stratifies opportunities, with vocational-focused upper secondary pathways typically facilitating smoother transitions into work but enabling less exposure to advanced academic content than general tracks. At the tertiary level, professionally-oriented short-cycle programmes offer a rapid route to skilled employment. Because measured proficiency reflects both the quantity and the nature of formal learning, disparities in educational attainment are a primary driver of skills gaps. This section quantifies the extent to which differences in educational attainment level and field of study between different groups of individuals explain disparities in 21st-century skills.

Figure 3.6 shows the highest educational qualification of 30-65 year-olds who participated in the OECD Survey of Adult Skills. On average across OECD countries, 14% have not completed upper secondary education, 28% hold an upper or post-secondary credential with a vocational orientation, 15% possess an upper or post-secondary certificate with an academic orientation, 9% have completed a short-cycle tertiary programme, and 34% have a bachelor's degree or higher.

National profiles vary sharply. The proportion of adults without an upper secondary credential ranges from 48% in Portugal to 4% in Czechia. Vocational upper secondary and post-secondary qualifications are the modal attainment in Czechia (66%) yet account for just 8% of attainment in Portugal. Academically oriented upper secondary programmes are most common in the United States (31%) and least common in Germany (2%). Participation in short-cycle tertiary education is 21% in Japan but remains below 1% in Czechia, Germany, Poland and the Slovak Republic. Finally, the share of adults with a bachelor's degree or above ranges between 48% in the Flemish Region (Belgium) and 17% in Italy.

Figure 3.6. Adults' educational attainment, by country

Share of 30-65 year-olds, by highest educational attainment



Note: Adults aged 30-65. Respondents' educational attainment is based on the International Standard Classification of Education (ISCED) 2011, grouped into below upper secondary (ISCED 0, 1, 2), upper secondary and post-secondary general (gen. ISCED 3 short, gen. ISCED 3 access 3, gen. ISCED 3 access 3/4, gen. ISCED 3 access 5/6/7), upper secondary and post-secondary vocational (voc. ISCED 3 short, voc. ISCED 3 access 3, voc. ISCED 3 access 3/4, voc. ISCED 3 access 5/6/7), short-cycle tertiary education (ISCED 5 nfs [not further specified], gen ISCED 5, voc ISCED 5) and bachelor's or equivalent or above (ISCED 6, 7, 8).
Countries are ranked in descending order based on the percentage of adults with below upper secondary education.
Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

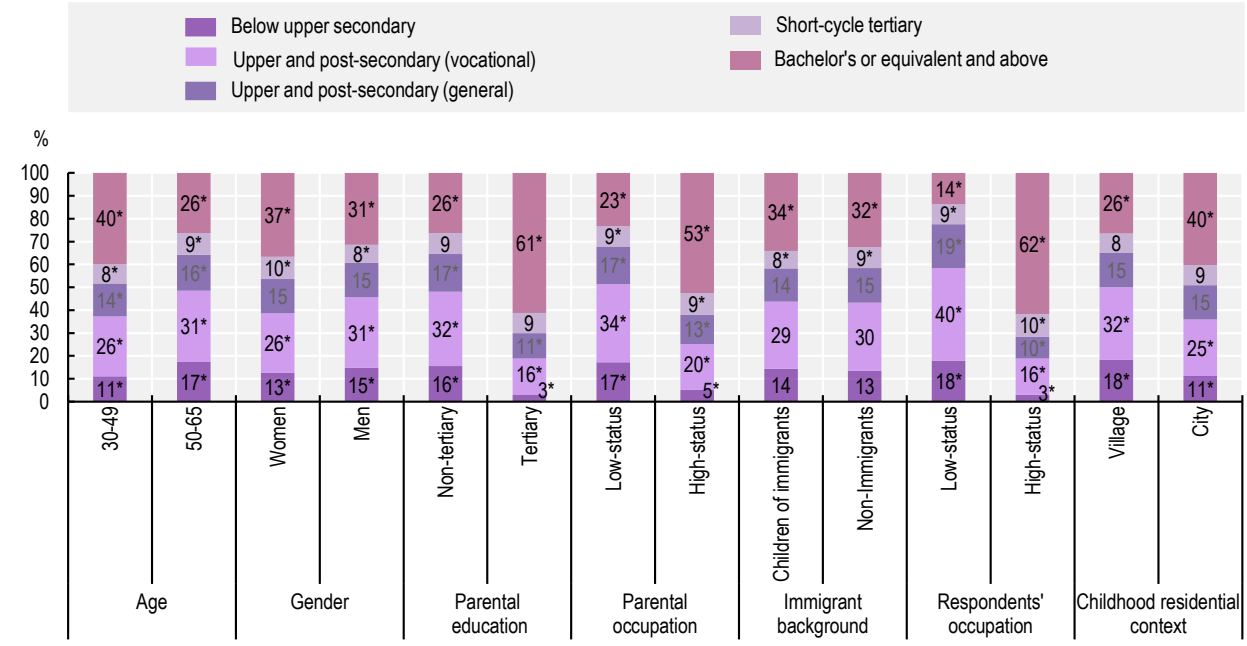
StatLink https://stat.link/r9o6bv

When disaggregating data on educational attainment by age, gender, socio-economic background, childhood residential context and own occupation, there are clear patterns and differences, as shown in Figure 3.7. Educational expansion is evident: 40% of 30-49 year-olds hold a bachelor's degree or higher, compared with 26% of 50-65 year-olds. Moreover, 16% of 50-65 year-olds have not completed an upper secondary qualification compared to only 11% of 30-49 year-olds. Women outpace men in tertiary educational attainment (37% vs. 31%, respectively) but are less likely to hold vocationally oriented upper

secondary or post-secondary degrees (26% vs. 31%, respectively). Figure 3.7 also indicates that socio-economic background is a powerful determinant of educational attainment. Among adults with tertiary-educated parents, 61% hold at least a bachelor's degree, compared with 26% of those with no tertiary-educated parent. A similar pattern emerges by parental occupation: 53% of adults from high-status occupational backgrounds hold a bachelor's degree or higher, compared to 23% of those from low-status backgrounds. As many as 40% of adults who grew up in cities earn a bachelor's degree or higher compared to 26% of those who grew up in villages. By contrast, differences by immigrant background are small.

Figure 3.7. Adults' educational attainment, by socio-demographic characteristics

Share of adults, by socio-demographic characteristic and highest educational attainment, OECD average



Note: Adults aged 30-65. Respondents' occupation and parental occupation (at respondents' age 14) is based on the International Classification of Occupations (ISCO) and grouped into high-status: managers, professionals, and technicians and associate professionals (ISCO 1-3); and low-status: clerical support workers; service and sales workers; skilled agricultural, forestry and fishery workers; craft and related trades workers; plant and machine operators, and assemblers; and elementary occupations (ISCO 4-9). Childhood residential context (at respondents' age 14) refers to whether the respondent grew up in villages or cities. Groups by immigrant background distinguish between children of immigrants, immigrants and non-immigrants. Children of immigrants were born in the country in which they currently reside, but their parents were not, or they were born in a different country and moved to their current country of residence before the age of 18. Immigrants are defined as those who migrated to their current country of residence at age 18 or older. Non-immigrants were born in their current country of residence, as were their parents. See the note for Figure 3.1 for a description of parental educational attainment. See the note for Figure 3.6 for a description of respondents' educational attainment. Numbers in the figure reflect percentages associated with each educational level for each subgroup. Country-level results are provided in Annex Table 3.A.1.

* Next to percentages in the figure indicate that disparities across groups (30-49 vs. 50-65, women vs. men, non-tertiary vs. tertiary, low-status vs. high-status, children of immigrants vs. non-immigrant, village vs. city) are significant at the 5% level.

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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3.4.2. Association between disparities in educational attainment and disparities in skills

Higher levels of educational attainment are, on average, significantly and positively associated with core 21st-century skills, with each successive step up the "qualification ladder" associated with progressively stronger skills, as shown in Table 3.2. For example, relative to those who left education before completing upper secondary education, adults who hold upper or post-secondary vocational qualifications have higher literacy (0.59 SD difference), numeracy (0.64 SD difference) and adaptive problem solving (0.51 SD difference) skills. Adults who possess an upper or post-secondary certificate with a general orientation have even higher literacy (0.73 SD difference), numeracy (0.78 SD difference) and adaptive problem solving (0.64 SD difference) skills than individuals who did not complete upper secondary qualifications. Adults who have completed a short-cycle tertiary programme have higher literacy (0.87 SD difference), numeracy (0.93 SD difference) and adaptive problem solving (0.77 SD difference) skills than individuals who did not complete upper secondary qualifications. Finally, adults who have completed a bachelor's degree or higher have higher literacy (1.22 SD difference), numeracy (1.30 SD difference) and adaptive problem solving (1.08 SD difference) skills than individuals who did not complete upper secondary qualifications.

When looking at skills differences by age, on average, around one-third of the difference in numeracy skills between 50-65 year-olds and 30-49 year-olds can be explained by differences in educational attainment between the two groups (Table 3.2). The corresponding shares are about one-quarter for literacy and one-fifth for adaptive problem solving.

Gender differences in key 21st-century skills point to possible gender-specific experiences both within and beyond formal education. As noted, women have higher literacy skills but score lower in numeracy and adaptive problem solving. These patterns persist after adjusting for other socio-demographic characteristics (age, parental education and occupation, childhood residential context) (Table 3.2). However, additionally adjusting for educational attainment widens gender gaps in numeracy (from 0.18 SD to 0.24 SD, a 33% increase) and adaptive problem solving. By contrast, literacy is similar among men and women with similar levels of educational attainment. These factors are further explored in Sections 3.5 (field of study) and 3.6 (adult education and training).

The numeracy returns of educational qualifications differ across countries (Figure 3.8). For example, in New Zealand, after taking into account differences in socio-demographic characteristics, individuals who have obtained an upper and post-secondary education with a vocational orientation have 0.97 SD higher numeracy proficiency than individuals who did not obtain an upper secondary education qualification. In Israel, the difference is considerably smaller at 0.27 SD. Similarly, in Finland, individuals who have obtained an upper and post-secondary education with a general orientation have 1.25 SD higher numeracy proficiency compared to individuals who did not obtain an upper secondary education qualification; in Israel, this difference is 0.32 SD. The numeracy returns associated with having obtained a short-cycle tertiary education rather than no upper secondary qualification range between 1.45 SD in Singapore and 0.48 SD in Italy; for those who have obtained a bachelor's degree or above, the numeracy returns range between 1.82 SD in Singapore and 0.70 SD in Croatia.

Adults with at least one tertiary-educated parent score higher on core 21st-century skills than their peers with no tertiary-educated parent (Table 3.2). For example, the difference in literacy between individuals with and without tertiary-educated parents is 0.30 SD when adjusting for other socio-demographic characteristics and 0.13 SD when additionally adjusting for differences in educational attainment between the two groups, a 57% decline. Similarly, the difference in numeracy between individuals with and without tertiary-educated parents is 0.29 SD and 0.12 SD, respectively, after adjusting for differences in educational attainment, a 59% decline. Even when comparing individuals from different backgrounds but with similar educational trajectories, differences remain, reflecting the varied quality of education experiences available to different groups and the differences in learning that occur outside of formal education settings over the life course. However, results suggest that a key reason adults with

socio-economically advantaged backgrounds have considerably higher levels of information-processing skills is their greater opportunity to obtain higher levels of educational attainment.

Table 3.2. Adults' educational attainment as a mediator of disparities in core 21st-century skills

Regression coefficients before and after adjusting for respondents' educational attainment, OECD average

	Literacy		Numeracy		Adaptive problem solving	
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Gender - Men (ref.: women)	**-0.04**	0.01	**0.18**	**0.24**	**0.06**	**0.11**
Age - 50-65 (ref.: 30-49)	**-0.33**	**-0.25**	**-0.26**	**-0.18**	**-0.37**	**-0.30**
Parental education - Tertiary (ref.: non-tertiary)	**0.30**	**0.13**	**0.29**	**0.12**	**0.29**	**0.14**
Parental occupation - High-status (ref.: low-status)	**0.30**	**0.14**	**0.30**	**0.14**	**0.26**	**0.13**
Childhood residential context (ref.: village)						
Town	**0.11**	**0.05**	**0.07**	0.01	**0.08**	**0.03**
City	**0.11**	**0.07**	**0.11**	**0.04**	**0.11**	**0.05**
Immigrant background (ref.: non-immigrants)						
Immigrants	**-0.65**	**-0.64**	**-0.48**	**-0.48**	**-0.54**	**-0.54**
Children of immigrants	**-0.14**	**-0.12**	**-0.12**	**-0.10**	**-0.11**	**-0.10**
Respondents' educational attainment (ref.: below upper secondary)						
Upper and post-secondary (vocational orientation)		**0.59**		**0.64**		**0.51**
Upper and post-secondary (general orientation)		**0.73**		**0.78**		**0.64**
Short-cycle tertiary		**0.87**		**0.93**		**0.77**
Bachelor's or equivalent and above		**1.22**		**1.30**		**1.08**

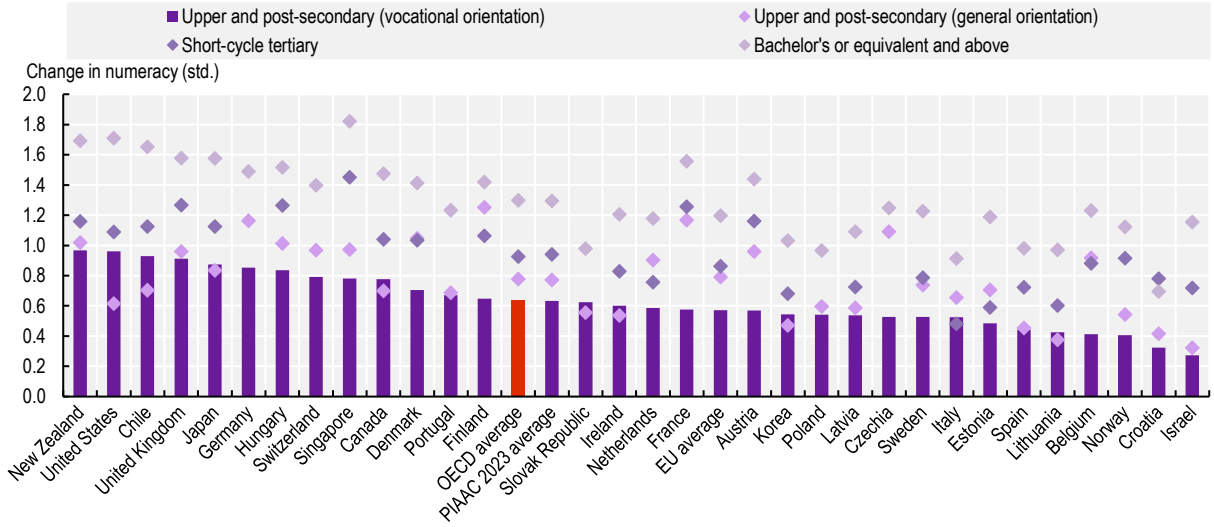
Note: Adults aged 30-65. Coefficients in bold are statistically significant at the 5% level. Results in columns (1), (3) and (5) explain the respective skill while adjusting for differences in gender, age, parental education, parental occupation, childhood residential context and immigrant background. Results in columns (2), (4) and (6) additionally adjust for differences in respondents' educational attainment. See the note for Figure 3.7 for a description of respondents' educational attainment and the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. Standard errors are provided in Annex Table 3.A.1.
Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/x269ve

Adults with parents who worked in high-status occupations score higher on core 21st-century skills than their peers whose parents worked in low-status occupations. On average, differences in educational attainment explain around half of the observed gap in numeracy between adults whose parents did or did not work in high-status occupations, but the role of differences in educational opportunities in shaping skills disparities differs across countries. Figure 3.9 illustrates the variation across countries in how differences in educational attainment relate to disparities in numeracy proficiency between individuals with and without at least one parent who worked as a manager or professional (high-status occupations) when the respondent was 14 years old. Differences between individuals with and without parents working in high-status occupations are highest in the United States (0.23 SD difference) and lowest in Korea (0.03 SD difference). Such differences can be explained, to a large extent, by differences in the educational opportunities different groups benefit from. In the United States, differences in educational attainment explain around 52% of the difference in numeracy skills between adults with and without parents who worked in high-status occupations when they were growing up, compared to 27% in Korea.

Figure 3.8. Association between educational attainment and numeracy proficiency

Change in numeracy (standardised difference) associated with respondents' educational level (ref. below upper secondary) after accounting for socio-demographic characteristics

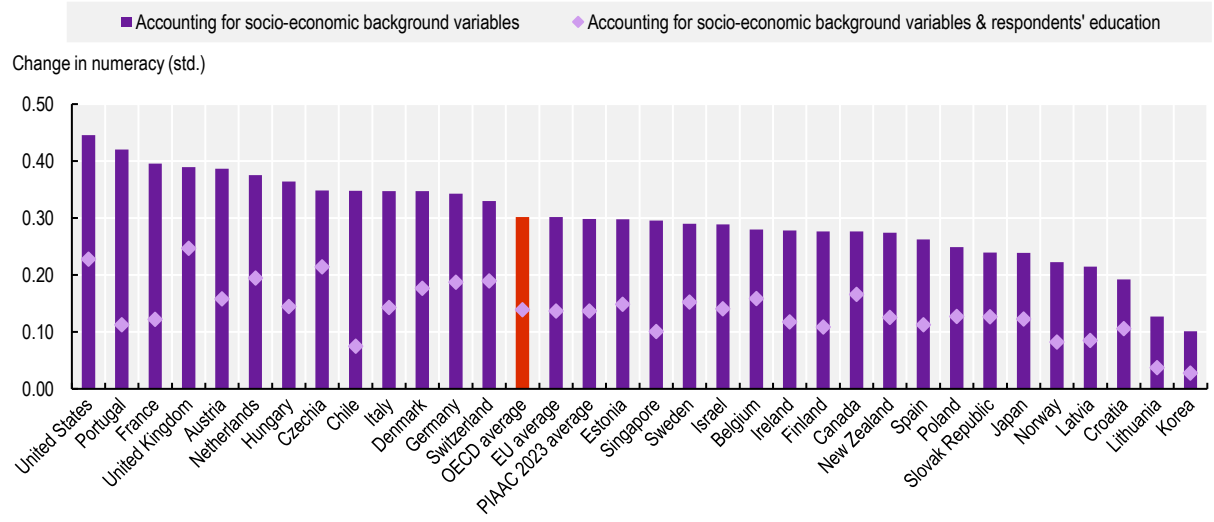


Note: Adults aged 30-65. Socio-demographic characteristics comprise gender, age, parental education, parental occupation, childhood residential context and immigrant background. See the note Figure 3.7 for a description of respondents' educational attainment.
Countries are ranked in descending order based on the effect of parents working in high-status occupations on numeracy proficiency.
Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/we38sx

Figure 3.9. The role of disparities in educational attainment in explaining parental occupation disparities in numeracy, by country

Change in numeracy (standardised difference) associated with parents working in high-status occupations (ref. low-status) before and after accounting for respondents' education



Note: Adults aged 30-65. Other socio-demographic characteristics comprise gender, age, parental education, parental occupation, childhood residential context and immigrant background.
Countries are ranked in descending order based on the effect of parents working in high-status occupations on numeracy proficiency.
Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/6s9iv7

Adults who grew up in cities outperform peers from towns and villages in core 21st-century skills, but adjusting for educational attainment narrows differences (Table 3.2). Individuals who grew up in cities may have had better access to quality education, resources and supportive learning environments, which in turn could have led to higher educational attainment and subsequently better skills. In contrast, those from villages may have faced more limited educational opportunities, contributing to lower attainment and, consequently, weaker skills outcomes. These results suggest that urban–rural disparities in the quality and breadth of educational opportunities explain part – but not all of the skills divergence between the two groups.

Adults who are the children of immigrants have lower information-processing skills than their peers without an immigrant background, even after accounting for other background factors (Table 3.2). Contrary to other characteristics, differences in educational attainment do not explain any of the observed differences in skills between the two groups, with barriers outside of formal education settings appearing to be the key drivers of the immigrant skills gap.

3.4.3. Skills returns to educational qualifications

While education is a key factor in shaping skills acquisition, its effects can vary considerably depending on age, gender, socio-economic background, childhood residential context and immigrant background. This section considers if the skills returns to education – i.e. the skills that individuals are more likely to possess after completing certain levels of education – differ across different socio-demographic groups. Table 3.3 illustrates differences in the skills returns to educational qualifications among men and women, age groups, and socio-economic background of the family of origin. The skills returns to educational qualifications are broadly homogeneous with respect to childhood residential context and immigrant background, with detailed results reported in Annex Table 3.A.1.

Educational attainment is generally less strongly associated with information-processing skills among individuals with socio-economically advantaged backgrounds, i.e. individuals whose parents worked in high-status occupations or obtained tertiary qualifications. For example, the literacy return to having obtained a bachelor's degree or more advanced qualifications rather than not having obtained an upper secondary qualification is 0.17 SD higher for adults from high-status rather than low-status households.

When family resources are scarce, formal education becomes the primary channel for developing and signalling competence. By contrast, when resources are abundant, additional credentials add relatively little. Advantaged families can provide physical and social environments for their children that foster the development of information-processing skills outside formal education settings. For disadvantaged youth, classrooms remain the main place where such skills can be cultivated. The lower skills returns among adults with socio-economically advantaged backgrounds may also reflect selection processes. Young people with socio-economically disadvantaged backgrounds are less likely to pursue advanced educational qualifications because of economic and logistical barriers, lack of role models, and lower perceived returns to education. Therefore, those who do pursue such paths are generally highly motivated and especially well-suited to acquire the set of skills that formal education is designed to promote, including literacy, numeracy and adaptive problem solving. Box 3.6 presents examples of policies and interventions aimed at addressing the risk factors for school dropout.

Gender differences in information-processing skills associated with having obtained a bachelor's degree or more advanced qualifications rather than not having completed an upper secondary qualification favour men. For example, the numeracy return to having obtained a bachelor's degree or more advanced qualifications rather than not having obtained an upper secondary qualification is 0.13 SD higher for men than women (Table 3.3). Differences in the skills returns to advanced qualifications between men and women could reflect gender differences in field of study, which is examined in the next section.

In contrast, the skills returns to education tend to be relatively homogeneous across age groups (Table 3.3). For example, the literacy returns to having obtained a bachelor's degree or more advanced qualifications are 0.1 SD higher for those aged 50-65 compared to those aged 30-50, a difference that is not statistically significant at any conventional significance level (Table 3.3).

Table 3.3. Skills returns to educational qualifications: Disparities within educational levels

Each skill is adjusted for socio-demographic characteristics, and the interaction is then shown between educational attainment and the characteristic of interest (age, gender, parental education or parental occupation), OECD average

		Literacy	Numeracy	Adaptive problem solving
	(Reference: Below upper secondary)			
Age: 50-65	Upper and post-secondary vocational	0.00	0.01	-0.04
	Upper and post-secondary	-0.02	-0.02	-0.06
	Short-cycle tertiary	0.06	0.07	0.01
	Bachelor's or equivalent and above	0.01	0.02	-0.03
Gender: Men	Upper and post-secondary vocational	-0.02	0.03	0.00
	Upper and post-secondary general	0.06	**0.08**	0.07
	Short-cycle tertiary	0.02	**0.09**	0.04
	Bachelor's or equivalent and above	**0.08**	**0.13**	**0.10**
Parental education: Tertiary	Upper and post-secondary vocational	**-0.14**	-0.12	-0.11
	Upper and post-secondary general	-0.04	-0.03	-0.03
	Short-cycle tertiary	**-0.17**	**-0.17**	**-0.16**
	Bachelor's or equivalent and above	**-0.13**	-0.11	-0.11
Parental occupation: High-status	Upper and post-secondary vocational	**-0.16**	**-0.16**	**-0.15**
	Upper and post-secondary general	**-0.14**	**-0.13**	**-0.11**
	Short-cycle tertiary	**-0.16**	**-0.17**	**-0.16**
	Bachelor's or equivalent and above	**-0.17**	**-0.17**	**-0.16**

Note: Adults aged 30-65. Coefficients in bold are statistically significant at 5% level. See the note for Figure 3.7 for a description of respondents' educational attainment. Results explain the skill while adjusting for differences in gender, age, parental education, parental occupation, childhood residential context, immigrant background, educational attainment and an interaction term between educational attainment and the characteristic of interest (i.e. depending on the row these are age, gender, parental education or parental occupation). See the note for Figure 3.7 for the definitions of groups based on parental education and parental occupation. Standard errors are provided in Annex Table 3.A.1.
Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/2lofug

Box 3.6. Addressing the risk factors for school dropout

In their Shoes (En Sus Zapatos) **is a Spanish** emotional education programme tackling bullying and promoting positive school environments. It targets students aged 4-17, as well as teachers, families and non-teaching staff, using a cascade learning model. Trained teachers pass on emotional literacy techniques to peers, parents and students, with older students mentoring younger ones. The programme is designed to build emotional literacy, empathy and conflict resolution skills to reduce bullying and foster peaceful coexistence between different students. Students learn to identify and manage emotions and resolve conflicts constructively. Evaluations by the Spanish Ministry of Education found that 92% of students could better recognise emotions, 90% of teachers reported increased empathy, and parents noted improved relationships with their children after participation. Over 120 000 individuals have been reached, with strong institutional backing and media visibility. Funding for the programme comes from partnerships with public institutions, including the Community of Madrid, which supports its widespread implementation across schools (UNESCO, 2024[81]; OECD, 2024[2]; Teatro de Conciencia, 2025[82]).

In Finland, KiVa is a research-based anti-bullying programme developed by the University of Turku and funded by the Ministry of Education and Culture. It includes three core components: prevention, intervention and monitoring. Preventive measures are embedded in the curriculum through lessons and online games; intervention strategies provide schools with structured, solution-focused tools to manage incidents; and annual surveys track progress and highlight areas for improvement. KiVa has demonstrated strong results, significantly reducing bullying and victimisation in over 200 Finnish schools within its first year. Benefits include improved school climate, student motivation and academic performance. The programme has also shown positive effects internationally, including in the Netherlands and Italy. Teachers are supported with ready-to-use resources such as lesson plans, guides and digital tools to ensure effective implementation (KiVa, 2025[83]).

In France, the Roped party of Success (Cordées de la Réussite) programme boosts academic ambition and combats self-censorship among disadvantaged secondary school students. It connects higher education institutions with secondary schools, especially in marginalised areas, offering mentorship and exposure to academic and career pathways. Support is tailored to individual needs and fosters long-term ambition – see Box 4.8 in (OECD, 2023[84]).

Australia's Be You is a national initiative supporting mental health in early learning and schools. It equips educators with tools to build mentally healthy environments through professional learning modules, covering areas such as family partnerships, resilience, early support and crisis response. Resources include action plans, tools and expert guidance. The whole-community approach promotes collaboration across schools and families and aligns with national education policy (McBrien, 2022[85]; Hoare et al., 2020[86]).

The data presented in this section are drawn from the Survey of Adult Skills, which reflects some key characteristics that shape access to education opportunities. However, within countries, other characteristics also play an important role. For example, Box 3.7 provides insights into how some OECD countries have succeeded in addressing the complex and intersectional needs of the Roma and Irish traveller population, and in promoting the uptake of tertiary education and skills development more broadly.

Box 3.7. Closing skills gaps: Education strategies for Roma and Traveller communities

Roma are the EU's largest ethnic minority, numbering around six million; they often have a socio-economically disadvantaged background and face exclusion and discrimination (EPRS, 2025[87]). Only 44% of Roma children aged 3-7 attend ECEC, compared to the EU average of 93%, and Roma employment rates remain low at 43%, compared to 70% for the EU population overall. Despite EU strategies for inclusion (e.g. the EU Roma Strategy 2020-2030), progress remains slow, especially in combating educational segregation (European Commission, 2023[88]; European Parliament, 2023[89]).

EU-led initiatives have sought to improve educational inclusion and outcomes. The Inclusive Schools: Making a Difference for Roma Children (INSCHOOL) project 2017-2021 involved 25 schools in Czechia, Hungary, Romania, the Slovak Republic and the United Kingdom, implementing teacher training, school governance reforms and community engagement. Over 4 000 stakeholders participated, and evaluations show improvements in inclusive practices and school conditions, inspiring further national policy actions (European Union/Council of Europe, 2025[90]).

In the Slovak Republic, where Roma comprise 8% of the population, there have been persistent challenges in including Roma children in the education system (EPRS, 2025[87]; Kahanec et al., 2020[91]; Council of Europe, 2012[92]). With the support of the EU, the Slovak Republic developed the Roma Equality, Inclusion and Participation Strategy 2030 (Office of the Government of the Slovak Republic, 2022[93]). Recent interventions have prioritised ECEC accessibility, notably through:

- **Schools Open to All**: Employing teaching assistants and promoting informal learning, reaching over 130 schools and benefiting 416 children and families (Koreň, 2018[94]).
- **Inclusion in Maternity Schools**: Employing Roma parental assistants and additional teaching staff and collaborating with social workers to improve kindergarten attendance among Roma children (European Commission, 2024[95]).

Hungary's Roma population, which comprises about 7% of the country and is geographically unevenly distributed, faces persistent school segregation and low educational attainment, with just 24% completing secondary education (Council of Europe, 2012[92]). The Hungarian National Social Inclusion Strategy 2020-2030 (HNSIS) recognises these challenges and prioritises inclusive ECEC initiatives and targeted support (European Commission, 2022[96]). One notable example is the Gandhi High School in Pécs – although it was opened with Roma children in mind, making it largely segregated, it provides mentoring, mental health support, family engagement and academic tutoring and is explicitly designed to mitigate educational disadvantages and promote progression to higher education, which are interventions and resources usually inaccessible to Roma students within the broader education system (Együtt fejlődünk, 2025[97]; Pályázati Portál, 2025[98]; van Driel, 2006[99]).

Ireland's Traveller and Roma communities similarly experience significant disadvantage, including barriers to education and employment. Only 31.4% of Travellers completed the Leaving Certificate in 2022 (Irish Government, 2024[100]), markedly below the national rate of 70.8% in 2020 (OECD, 2023[101]). To tackle these gaps, Ireland has implemented targeted policies and a national strategy:

- **National Traveller and Roma Inclusion Strategy 2024-2028 (NTRIS III)**: The goal of the strategy is to build a safe, fair and inclusive Ireland where Travellers and Roma are supported to lead inclusive, healthy and fulfilling lives. In its education pillar, the Strategy allocates EUR 1.25 million in 2024 to establish community link workers to support educational participation among Travellers and Roma at risk of exclusion. The Irish government is also looking towards developing a Traveller and Roma Education Strategy, incorporating targeted measures to incremental progress towards the norm in access, retention and progression (Eurydice, 2024[102]; Irish Government, 2024[100]).

- **Delivering Equality of Opportunity in Schools (DEIS)**: Targets schools within disadvantaged communities, providing resources such as additional learning support to facilitate smaller class sizes in primary schools, priority access to psychological services and free school meals in secondary schools. DEIS includes the Home School Community Liaison scheme, which provides for a teacher to be released from teaching duties in order to work intensively with and support parents or guardians through home visits, school-based classes for parents or guardians, and connecting them with other relevant resources and community initiatives (Tusla, 2025[103]). DEIS aims to raise educational attainment and school completion among Traveller and Roma students by undertaking the following: collaborating with the Child and Family Agency (Tusla) and Traveller Representative Groups on measures to improve Traveller engagement with education; re-evaluating current Traveller-specific resources in the context of outcomes and experiences; and developing best practices and innovative measures to support traveller attendance, participation and retention in a pilot context of the School Excellence Fund (Irish Government, 2017[104]). Some evaluations, even though not causal in inference, indicate narrowing achievement gaps between DEIS and non-DEIS schools. (OECD, 2024[105]).
- **Social Inclusion and Community Activation Programme 2024-2028 (SICAP)**: Delivered locally through partnerships with disadvantaged groups, SICAP specifically targets Travellers, Roma, migrants and refugees. It supports initiatives such as employment projects within the Traveller economy and language skills for Roma students, supporting their integration into education and the labour market (Pobal, 2025[106]; 2021[107]).

3.5. Differences in field of study across socio-demographic groups

Prior sections have shown that when leaving formal education, there are differences in the qualifications obtained between men and women and between adults with socio-economically advantaged and disadvantaged backgrounds. In particular, differences in educational trajectories are reflected in large disparities in information-processing skills. However, educational qualifications do not fully explain socio-economic disparities in skills.

This section considers whether differences in fields of study nurture distinct 21st-century skills and offer varying opportunities for individuals to practice them in the long term, for example by facilitating entrance into different labour-market opportunities. It also considers if people with different skills have a different propensity to choose different fields. The section first documents the field-of-study profile of adults aged 30-65 by educational programme, where differentiation is prevalent (upper and post-secondary qualification with a vocational orientation, short-cycle tertiary education, and bachelor's degree or equivalent and above). Results are also reported by gender and parental educational attainment. Results relating to field of study by parental occupation, immigrant status and childhood residential context are available in Annex Table 3.A.2. The section then considers to what extent patterns of field of study account for the disparities in skills between different socio-demographic groups, after accounting for the differences in educational attainment.

3.5.1. Field-of-study profile of adults by educational programme

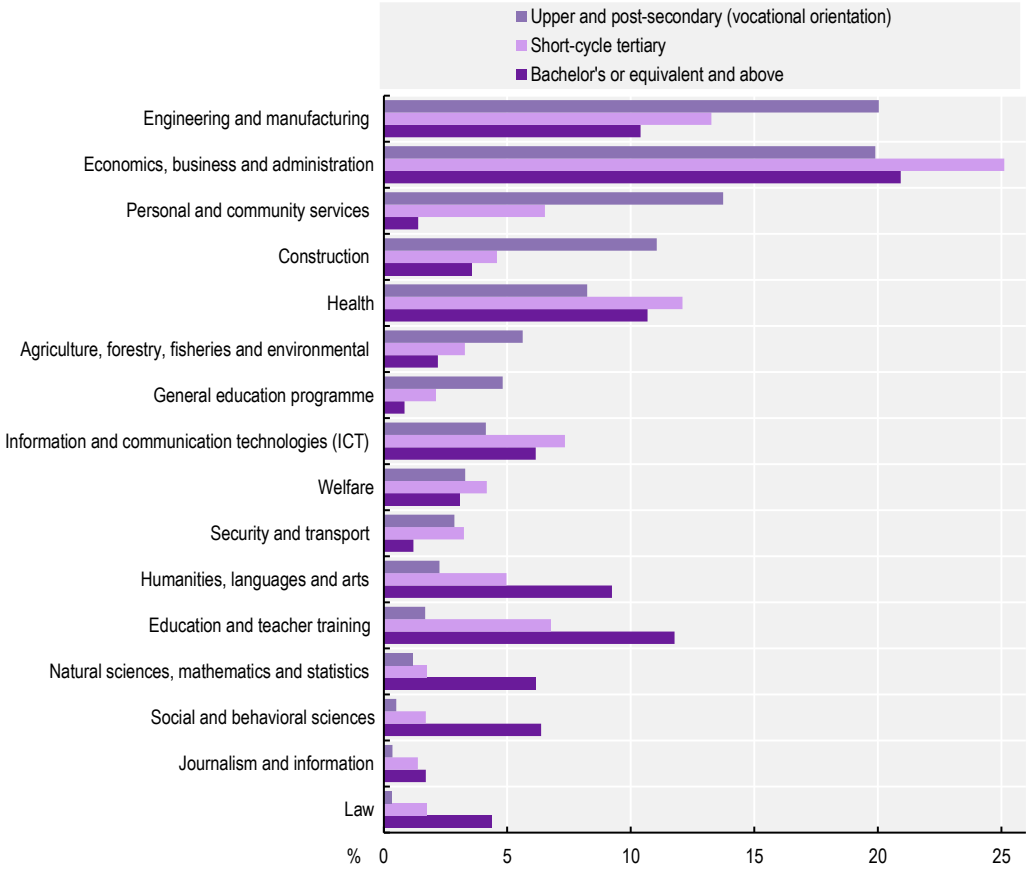
Fields of study differ for adults who have obtained an upper or post-secondary degree with vocational orientation, short-cycle tertiary education, and those with a bachelor's degree or more advanced qualifications (Figure 3.10). In particular, findings from the 2023 Survey of Adult Skills show that technical fields of study such as engineering and manufacturing; construction; agriculture, forestry, fisheries and environment; and personal and community services tend to be especially popular fields among adults who have completed vocationally oriented upper secondary qualifications. By contrast, among adults who have completed advanced academic qualifications, professional fields such as law;

social and behavioural sciences; education and teacher training; humanities, languages and arts; and natural sciences, mathematics and statistics are especially popular (OECD, 2024[16]).

Among vocational graduates, the largest shares pursued qualifications in economic, business and administration, and engineering and manufacturing (20% each), followed by personal and community services (14%), construction (11%), and health-related programmes (8%). Among those with short-cycle tertiary education, the largest shares pursue economics, business and administration (25%), engineering and manufacturing (13%) and health (12%). At the bachelor's level or equivalent and above, economics, business and administration is the single largest field of study (21%), followed by engineering and manufacturing (10%), and education and teacher training (12%), and health (11%). Up to 36% of adults with a vocational qualification pursued STEM[2] qualifications, compared to 17% of students with a short-cycle tertiary education and 26% of adults with a bachelor's degree or equivalent and above (OECD, 2024[16]).

Figure 3.10. Field-of-study, by educational attainment

Percentage of adults by field of study and highest educational attainment, OECD average



Note: Adults aged 30-65. See the note for Figure 3.7 for a description of respondents' educational attainment. Country-level results are provided in Annex Table 3.A.2.

Fields of study are ranked in descending order based on the percentage of adults with upper and post-secondary (vocational orientation).

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/97yebm

Disparities related to gender relate not only *to what level* people study, but also *what* they study. Although women are more likely to obtain tertiary educational qualifications, they are considerably less

likely than men to attend courses with a strong mathematics orientation. For example, among those who have obtained bachelor's degrees and above, women are over-represented in pursuing degrees with a focus on education (10 percentage point difference, Panel C in Figure 3.11), whereas men are over-represented in pursuing degrees with a focus on engineering (15 percentage point difference, Panel C in Figure 3.11.

Among those who have obtained an upper or post-secondary degree with a vocational orientation, women are especially likely to have completed qualifications in economics, business and administration (31%); personal and community services (22%); and health (15%) (Panel A in Figure 3.11). By contrast, men are especially likely to have completed qualifications in engineering and manufacturing (35%); construction (19%); and economics, business and administration (10%). Among those who have obtained a short-cycle tertiary education, women are especially likely to have qualifications in economics, business and administration (29%); health (19%); and education and teacher training (11%). For men, engineering and manufacturing (25%); economics, business and administration (19%); and ICT (12%) are the most common fields of study (Panel B in Figure 3.11).

Among those who have obtained bachelor's degrees and above, women are most heavily represented in economics, business and administration (20%); education and teacher training (17%); and health (15%); whereas men are especially likely to have obtained degrees in economics, business and administration (21%); engineering and manufacturing (19%); and ICT (11%) (Panel C in Figure 3.11). Box 3.8 provides insights into how some OECD countries have succeeded in promoting the participation of men and women in fields in which they are underrepresented.

Box 3.8. Policies to bring women into STEM and men into nursing, teaching and caretaking

Germany

Germany addresses stereotypes in early childhood education through teacher training and grants to men entering the field. It also supports STEM-based extracurricular activities and campaigns to raise girls' awareness of STEM. For example, Girls' Day – Girls' Future Day takes place once a year and is sponsored by the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth and the Federal Ministry of Education and Research. On this nationwide day of action, schoolgirls from fifth grade (age 10/11) onwards are given an insight into professions and courses of study in which women have thus far been under-represented. Several ministries also support *Klischeefrei*, which is a coalition of over 600 members from various sectors advocating for gender-neutral career and study choices. The coalition provide resources, networking and support through a service centre and portal. Other ministries contribute through a range of policies, such as grants to encourage women to enter trades (Ministry of Labour), investments in childcare in universities (Education and Research), grants to support later life transitions to in-demand occupations (Labour), investments in campus safety (Justice), grants to increase innovation in gender-specific safety equipment and standards (Labour), measures to increase women's representation in academic leadership positions in STEM (Education and Research), interventions with employers to ensure women have better access to STEM and innovation careers (Education and Research), and programmes to support women's networks in men-majority fields (Culture) (OECD, 2025[108]).

Spain

Universitat Politècnica de Catalunya (UPC) is a public research and higher education institution in engineering, architecture, science and technology. UPC has a low percentage of women students (less than 30% of bachelor's and master's students), with women also poorly represented across the academic career, falling to the lowest percentage in the full professor category. In 2010, UPC established a plan to reduce structural obstacles for women in the evaluation of professors qualifying

for full professorship according to National Agency for Quality Assessment and Accreditation, the public body responsible for carrying out evaluation, certification and accreditation activities of the Spanish university system.

In 2016, women accounted for only 8.6% of full professors. In response, UPC approved an affirmative measure to correct the inequalities and structural obstacles driving women's under-representation. The Full Professor Programme applies a gender coefficient, which is a correction coefficient in the final scores of women candidates when applying to a professorial positions; if a female and male candidate end on the same final score, the female candidate earns the professorship. The gender coefficient is calculated on the basis of the percentage of women professors who are not full professors, and the goal is to reach the same percentage of women with full professorship.

In 2017, a coefficient of 1.15 was applied, which has since been maintained or increased, further supporting women's pathways to full professorship. In 2021, 5% of the full professor positions opened were reserved for women candidates, and the coefficient applied was 1.25. This measure has increased the numbers of women promoted to full professor, with 12.9% of women in this category in 2021. The measure also promotes a greater presence of women in decision-making positions by having more women in the higher categories. Finally, it can impact organisational culture by showcasing the effects of transformative and structural measures to promote gender equality (European Institute for Gender Equality, 2025[109]; Oxford Research AB, 2021[110]).

Norway

In Norway, men accounted for 10% of teachers in early childhood educational development and pre-primary education in 2022 (OECD, 2024[14]). While this still reflects a significant gender gap in the teaching profession, in international comparisons Norway ranks among the countries with the highest share of male teachers. In 1997, Norway began increasing efforts to raise the number of men working in childcare, for example through positive discrimination policies (Norwegian Government, 2009[111]; Nordic Information on Gender, 2018[112]). According to regulations, men may receive preferential treatment when filling positions in teaching or childcare – provided they are equally qualified as female applicants. The right for affirmative action for men was a form of special measure aimed at increasing male participation in ECEC, schools and child protection services, and to achieve gender equality in the long term. Further efforts have been made to attract young men to the childcare profession, with municipalities encouraged to invite boys in lower secondary school to gain experience working in childcare (Nordic Information on Gender, 2018[112]; Lundgaardsløkka, 2025[113]; Norsk Rikskringkasting, 2014[114]).

Germany

In Germany, the federal government supports initiatives to attract more men into the nursing profession. Between 2020 and 2023, the share of male trainees in nursing professions with newly concluded training contracts increased from 24% to 27% (Statistisches Bundesamt, 2025[115]). The nationwide "Boys' Day" is a school-based career orientation project that allows boys from fifth grade onwards to explore professions in which men are the minority during a one-day visit to companies or institutions in the social, educational and caregiving sectors (German Government, 2024[116]; Boys' Day, 2025[117]). Between 2021 and 2023, the project "Modern Men Do Care" (funded by the Federal Ministry of Health [Bundesministerium für Gesundheit]), aimed to understand the underlying reasons for the low share of men in the healthcare sector and develop practical measures for institutions to attract more men to the nursing profession (Pflege-Netzwerk Deutschland, 2023[118]; Gesundheitswirtschaft Nordwest, 2023[119]; n.d.[120]).

United Kingdom

The National Health Service (NHS) in England launched a GBP 8 million campaign in 2018 to recruit nurses (NHS England, 2018[121]). The campaign highlighted the vast range of opportunities available in the NHS for potential new recruits through advertising across TV, radio, posters, digital and social media. In addition, the NHS worked with nursing and midwifery ambassadors who helped change the perceptions of these professions to help parents, teachers and young people see nursing and midwifery as careers of choice. The research accompanying the campaign found that only four in ten parents said they would be proud of their son becoming a nurse. The year following the campaign's launch not only saw a surge in male applicants but also a reversal of the overall trend of declining nursing applications observed in recent years (NHS England, 2019[122]).

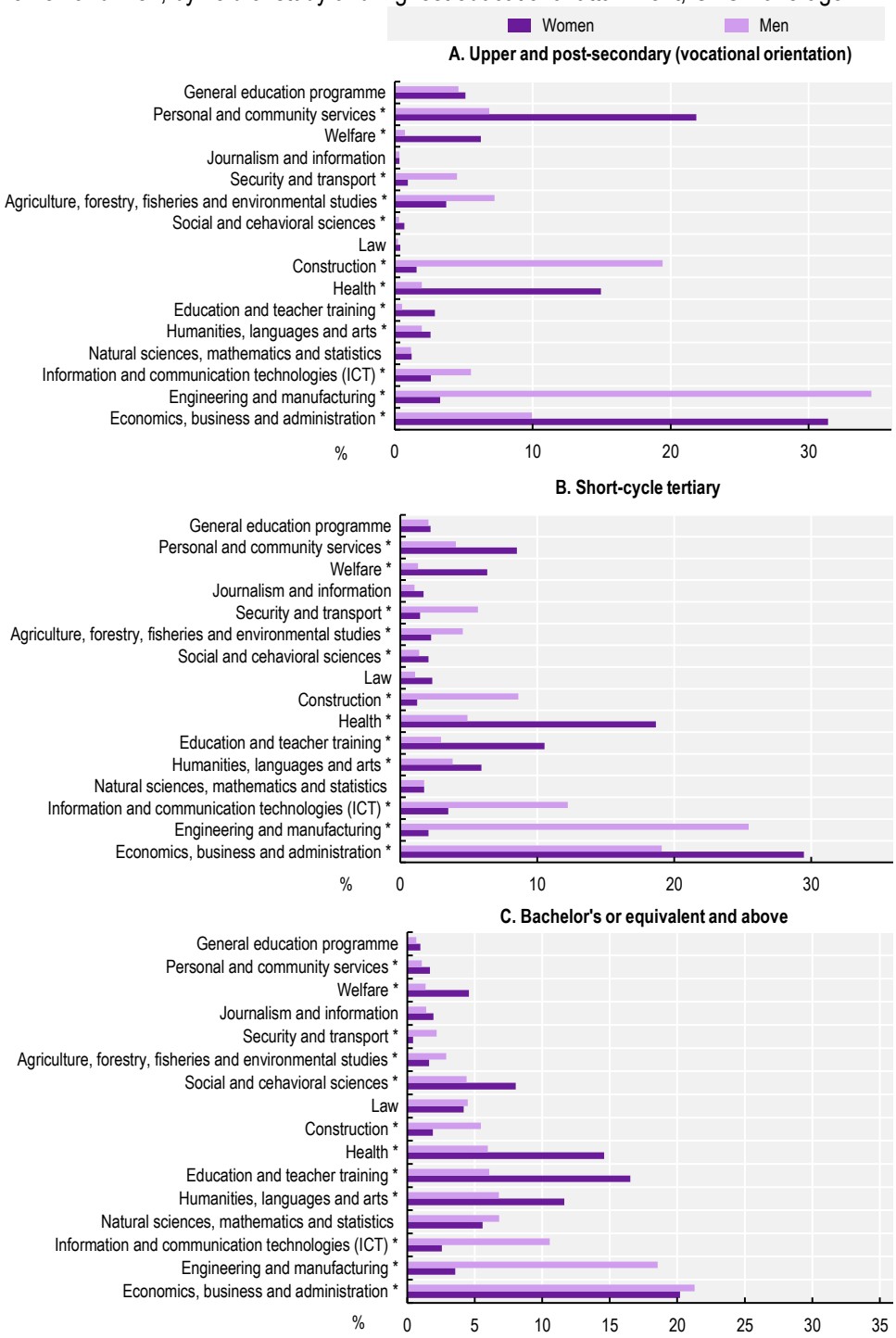
Australia

In 2020, the Australian College of Nursing (ACN) strengthened efforts to recruit and retain more men in the nursing profession. As part of their campaign, the *Men in Nursing* ebook was created, featuring a powerful collection of stories of 28 men who outline their experience in nursing (Australian College of Nursing, 2020[123]). As part of their efforts, the ACN established The Australian College of Nursing Men in Nursing Working Party, a group dedicated to improving the nursing workforce to allow for the greater retention and recruitment of men (Australian College of Nursing, 2020[123]).

Differences in field-of-study choices related to whether parents are tertiary educated are less pronounced, suggesting that disparities related to socio-economic background lie primarily in *to what level* people study, not *what* they study (Figure 3.12). For those who have obtained a short-cycle tertiary, adults without tertiary-educated parents are marginally over-represented among those who have obtained a degree in economics, business and administration, and engineering and manufacturing (around 3.6 percentage point difference in both cases), and are marginally under-represented among those who have obtained a degree oriented towards for example humanities, languages and arts (3.5 percentage point difference), personal and community services (1.8 percentage point difference), education and teacher training (1.0 percentage point difference), and ICT (0.9 percentage point difference). As will be explored in Chapter 4, there are different returns to working in STEM-oriented and humanities-education fields, meaning that these results suggest that individuals with socio-economically disadvantaged backgrounds are marginally more likely to pursue degrees with tangible individual economic returns than those from more advantaged backgrounds.

Figure 3.11. Field-of-study, by gender and educational attainment

Percentage of women and men, by field of study and highest educational attainment, OECD average



Note: Adults aged 30-65. See the note for Figure 3.7 for a description of respondents' educational attainment. * Next to field of study indicate that disparities across groups (women vs. men) are significant at the 5% level. Country-level results are provided in Annex Table 3.A.2.

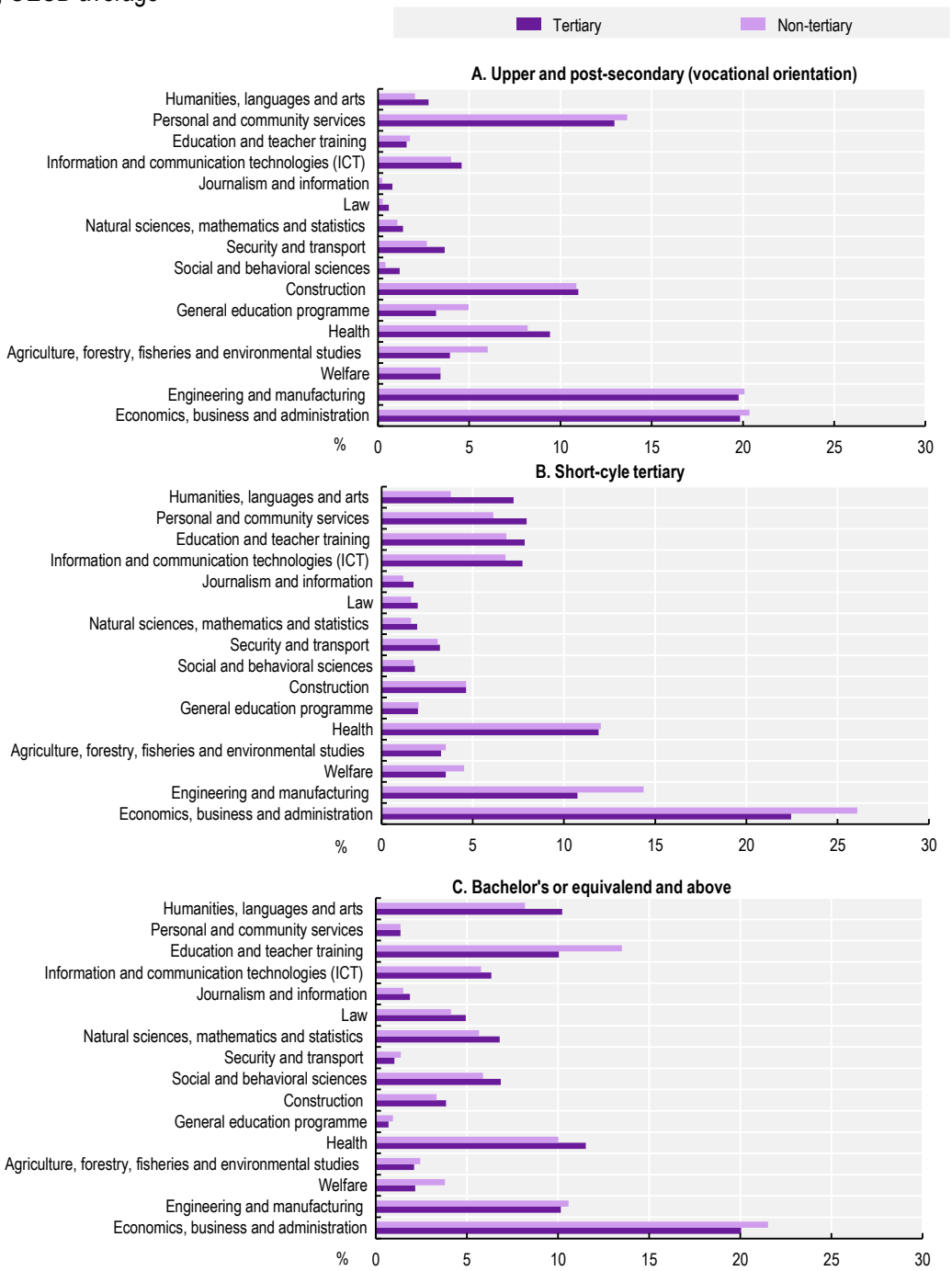
Field of study for all panels are ranked in descending order based on the percentage of women with upper and post-secondary (vocational orientation).

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/9fi523

Figure 3.12. Field-of-study, by parental education and educational attainment

Percentage of respondents with tertiary and non-tertiary educated parents, by field of study and highest educational attainment, OECD average



Note: Adults aged 30-65. See the note for Figure 3.7 for a description of respondents' educational attainment. See Note 6 in Chapter 1 for the definition of parental education groups. Country-level results are provided in Annex Table 3.A.2.

Field of study for all panels are ranked in descending order based on the percentage of respondents with non-tertiary educated parents with upper and post-secondary (vocational orientation) in Panel A.

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/pa3gb1

3.5.2. Linking field-of-study patterns with skills differences across socio-demographic groups

Field-of-study choices explain around a quarter of differences in numeracy skills between men and women and around half of gender differences in adaptive problem solving, both of which are in favour of men. At the same time, gender differences in numeracy in favour of men remain pronounced even when comparing men and women with similar levels of educational attainment and similar fields of study (Table 3.4).

By contrast, field-of-study choices explain little of the differences in 21st-century skills between different groups with similar levels of educational qualifications. This is consistent with the fact that there are few differences in field of study between young and mature adults, between adults with and without parents who obtained a tertiary educational qualification, between adults with and without parents who worked in high-status occupations, between individuals with and without an immigrant background, and between individuals who grew up in cities, towns or villages.

However, adults who have completed similar educational qualifications but in different fields do have different levels of skills proficiency (Table 3.4). Adults who have completed STEM courses have higher numeracy and higher literacy and adaptive problem solving skills than those who have completed education and teacher training courses, health courses, or courses in other fields. For example, adults who have completed STEM courses have levels of numeracy proficiency that are significantly higher than those of adults who have completed education and teacher training qualifications (0.26 SD difference) and health qualifications (0.20 SD difference) (Table 3.4). Although differences are largest for numeracy, adults who have completed STEM courses also have levels of adaptive problem-solving proficiency that are significantly higher than those of adults who have completed education and teacher training qualifications (0.21 SD difference) and health qualifications (0.16 SD difference). Similarly, they have levels of literacy proficiency that are significantly higher than those of adults who have completed education and teacher training qualifications (0.13 SD difference) and health qualifications (0.10 SD difference). These differences could reflect either the content of different field-of-study programmes, differences in the occupational trajectories of individuals who studied different fields, or differences in selection into different educational programmes. These patterns are consistent with evidence that extended exposure to mathematics and scientific training can sharpen general analytic reasoning (Attridge and Inglis, 2013[124]), and that reading technical texts or engaging in scientific reasoning can transfer beyond the narrow quantitative content of STEM courses.

Table 3.4. Field-of-study as a mediator of disparities in core 21st-century skills

Regression coefficients before and after adjusting for respondents' educational attainment and field of study, OECD average

	Literacy			Numeracy			Adaptive problem solving		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)
Gender - Men (ref.: women)	**-0.05**	0.01	-0.01	**0.18**	**0.24**	**0.18**	**0.06**	**0.11**	**0.06**
Age - 50-65 (ref.: 30-49)	**-0.33**	**-0.25**	**-0.25**	**-0.26**	**-0.18**	**-0.18**	**-0.37**	**-0.30**	**-0.30**
Parental education - Tertiary (ref.: non-tertiary)	**0.29**	**0.13**	**0.13**	**0.29**	**0.12**	**0.12**	**0.29**	**0.14**	**0.14**
Parental occupation - High-status (ref.: low-status)	**0.30**	**0.14**	**0.14**	**0.30**	**0.14**	**0.14**	**0.26**	**0.13**	**0.13**
Childhood residential context (ref.: village)									
Town	**0.11**	**0.05**	**0.05**	**0.07**	0.01	0.01	**0.08**	**0.03**	**0.03**
City	**0.14**	**0.07**	**0.07**	**0.11**	**0.04**	**0.03**	**0.11**	**0.05**	**0.05**

	Literacy			Numeracy			Adaptive problem solving		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)
Immigrant background (ref.: non-immigrants)*									
Immigrants	**-0.64**	**-0.64**	**-0.65**	**-0.48**	**-0.48**	**-0.49**	**-0.54**	**-0.54**	**-0.54**
Children of immigrants	**-0.14**	**-0.12**	**-0.12**	**-0.12**	**-0.11**	**-0.11**	**-0.12**	**-0.10**	**-0.10**
Respondents' educational attainment (ref.: upper and post-secondary (general orientation))									
Below upper secondary		**-0.73**	**-0.73**		**-0.77**	**-0.77**		**-0.63**	**-0.63**
Upper and post-secondary (vocational orientation)		**-0.15**	**-0.17**		**-0.14**	**-0.20**		**-0.13**	**-0.17**
Short-cycle tertiary		**0.14**	**0.11**		**0.17**	**0.12**		**0.12**	**0.09**
Bachelor's or equivalent and above		**0.49**	**0.47**		**0.52**	**0.48**		**0.44**	**0.42**
Field of study (ref.: STEM)									
Education and teacher training			**-0.13**			**-0.26**			**-0.21**
Health			**-0.10**			**-0.20**			**-0.16**
Other			**-0.09**			**-0.19**			**-0.14**

Note: Adults aged 30-65. The field-of-study "other" category contains the fields: economics, business and administration; law; welfare; social and behavioural sciences; journalism and information; agriculture, forestry, fisheries and environmental studies; personal and community services; security and transport; humanities, languages and arts; and no main area of study or emphasis. Coefficients in bold are statistically significant at the 5% level. Results in columns (1), (4) and (7) explain the respective skill while adjusting for differences in gender, age, parental education, parental occupation, childhood residential context and immigrant background. Results in columns (2), (5) and (8) additionally adjust for differences in respondents' educational attainment. Results in columns (3), (6) and (9) further adjust for differences in respondents' field of study. Estimation results in columns (1) to (9) are restricted to the same number of observations. See the note for Figure 3.7 for a description of respondents' educational attainment and the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. Standard errors are provided in Annex Table 3.A.2. STEM fields comprise information and communication technologies, natural sciences, mathematics and statistics, engineering and manufacturing, and construction.
*Differences by immigrant background vary greatly across countries because of differences in the size of immigrant groups as well as composition and context. Readers are therefore encouraged to consult country-specific results in Annex Table 3.A.2.
Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/ecmih7

The association between socio-demographic characteristics and numeracy skills before and after accounting for adults' educational attainment and field of study differs across countries. Figure 3.13 shows the OECD average and highlights the countries with the largest and smallest disparity in the basic model that does not control for educational attainment and field of study. For example, in Switzerland the gender gap in numeracy is large compared to the OECD average (0.32 SD), and approximately half of this gap can be explained by differences in educational attainment and field of study between men and women (after accounting for these factors the gap is 0.17 SD). By contrast, in New Zealand, the gender gap in numeracy skills is aligned with the OECD average and corresponds to 0.19 SD before and after controlling for educational attainment and field of study.

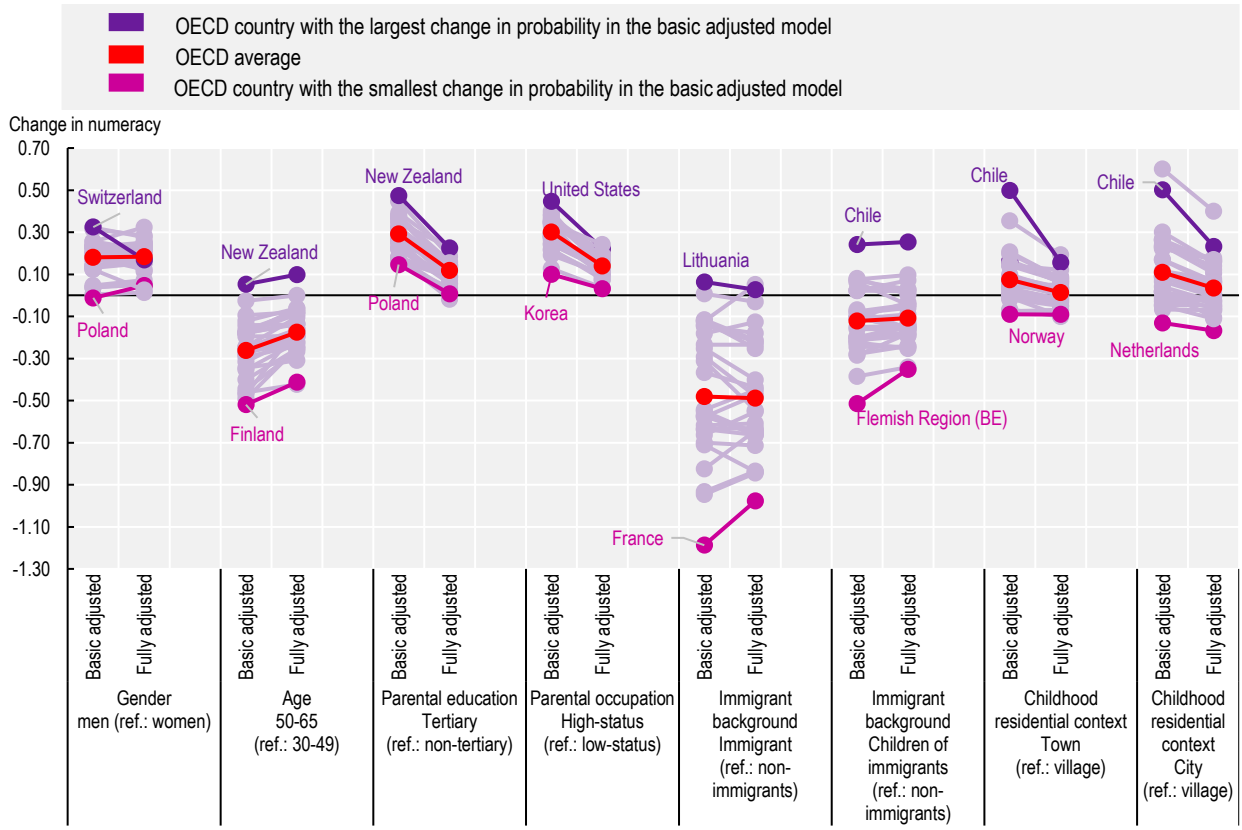
In New Zealand, the difference in numeracy skills between adults with and without tertiary-educated parents is 0.47 SD before and 0.22 SD after accounting for differences between the two groups in educational attainment and field of study, suggesting that around 53% of the parental education gap is mediated by educational attainment and field of study. Similarly, in Chile, the difference in numeracy skills between adults who grew up in cities rather than villages is 0.50 SD before and 0.23 SD after accounting for differences between the two groups in educational attainment and field of study, suggesting that around 54% of the urban–rural numeracy gap is mediated by educational attainment and field of study. By contrast, in Germany, the difference in numeracy skills between adults who grew up in cities and those who grew up in villages is -0.05 SD before and -0.05 SD after accounting for differences between the two groups in

educational attainment and field of study, suggesting that educational attainment and field of study do not mediate urban–rural skills disparities.

Results show that fields of study are associated with skills proficiency, which underpins the importance of adults' educational choices. Box 3.9 highlights differences in career guidance and counselling services between students of different socio-economic backgrounds as well as initiatives to address these shortcomings.

Figure 3.13. Field-of-study as a mediator of disparities in numeracy proficiency, by country

Change in numeracy (std.) by socio-demographic group: basic and fully adjusted country-specific regression coefficients



Note: Adults aged 30-65. The figure shows the difference in regression coefficients for numeracy between the basic adjusted model (Table 3.4 Model (4)) which accounts for differences in socio-demographic characteristics (gender, age, parental education, parental occupation, childhood residential context, immigrant background) and the fully adjusted model (Table 3.4, Model (6)), which additionally accounts for differences in respondents' educational attainment and field of study. See the note for Figure 3.7 for the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. For immigrant background, the figure only indicates a country if at least 200 adults for each group are part of the final PIAAC sample.

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/6njz59

Box 3.9. Fostering field-of-study accessibility through career guidance and counselling

Field of study may have some impact on the development of information-processing skills, such as numeracy and problem solving, throughout people's lives. Beginning at the secondary school level, the types of qualifications, teaching and learning methodologies, and extracurricular opportunities associated with different fields of study diverge. Even if students are studying within the same educational system and towards a similar qualification, their field of study may impact their entire educational experience – including the skills and proficiency levels with which they enter the labour market.

The effects of field-of-study choices add up over time, administrative barriers notwithstanding, individuals may find it difficult to choose or change field of study as a result of the skills they have, or have not, built up over time. Career guidance and counselling services throughout formal education and beyond can help individuals make decisions about their field of study and understand the skills and opportunities associated with different pathways.

Students with low socio-economic status (SES) backgrounds in the formal education system

Occupational stratification by SES backgrounds may be worsened by the availability of career guidance services in the formal education system. The 2024 OECD report *Challenging Social Inequality Through Career Guidance: Insights from International Data and Practice* (OECD, 2024[125]) highlights a range of issues related to career guidance and field-of-study selection for students with low SES backgrounds:

- Across the OECD, students in schools with a higher proportion of disadvantaged students have less access to career guidance counsellors than students in schools with higher proportions of advantaged students. However, disadvantaged students rely more on schools for career guidance than their advantaged peers.
- Students with low SES backgrounds are less likely to participate in any career development activity than their peers with high SES backgrounds, including both in and out of school.
- Students with low SES backgrounds often express misaligned career and education goals
- Higher-performing students with low SES backgrounds are less likely to expect to work in high-skilled jobs than their peers with high SES backgrounds; they are also less likely to expect to complete tertiary education.

The report highlights a range of initiatives that have been implemented across OECD countries to address these shortcomings in the provision of career guidance and counselling. These include:

- Preferential funding for schools with high concentrations of students with low SES background, such as the Delivering Equality of Opportunity in Schools in Ireland, which provides extra funding for eligible schools to provide career guidance activities.
- Leveraging the existing social capital of institutions, such as the UK's Inspiring the Future and Speakers for Schools programme that connects schools with volunteers from a range of jobs and backgrounds who go into schools to share their story with children. The programme works exclusively with public institutions to try to democratise access to hard-to-reach networks, information and, ultimately, career pathways.

Adulthood

Challenges to accessing career guidance services persist into adulthood, particularly for individuals with low SES backgrounds, as services that enable them to gain information about reskilling or career changing opportunities can be non-existent, exclusive to certain workplaces, or private and expensive.

Since 2021, the Australian state of Victoria's Jobs Victoria Career Counsellors Service (JVCCS) has been offering free, personalised career guidance to all adults, regardless of employment status. The services are delivered by the Career Education Association of Victoria (CEAV) and staffed by around 35 professionally endorsed practitioners through the Career Industry Council of Australia (CICA), including specialists for Aboriginal communities and people with disabilities. The service is accessible via face-to-face, phone or video sessions. CEAV counsellors are highly qualified and must maintain professional standards through ongoing development. They are also based in Skills and Jobs Centres within Technical and Further Education (TAFE) institutions, which offer integrated support on training, employment, welfare referrals, financial advice, skills recognition and labour-market trends, while engaging with local industries (Victoria State Government, 2025[126]).

3.6. Disparities in participation in non-formal adult education and training

Against a backdrop of rapid technological change, demographic shifts and evolving patterns of work, adult education has become a critical lever for sustaining employability and inclusive growth. The skills that adults draw upon in the labour market – information-processing skills such as literacy, numeracy and adaptive problem solving, alongside social and emotional skills – are shaped not only by initial schooling but also by individuals' life-course experiences and opportunities to learn. Skills disparities, therefore, reflect not only disparities in educational pathways but also disparities that occur in learning outside the formal education system. For example, occupational placement determines the access adults have to learning-rich environments at work and the barriers they face in engaging with learning opportunities.

For most adults, returning to formal education is constrained by tuition costs, foregone earnings and practical considerations such as childcare or shift-work schedules. As a result, non-formal learning – short, job-related courses delivered in the workplace, online or by specialised providers – often constitutes the most viable route for a person to acquire new skills or update skills needed for their current position or for a transition to a new role. Such provision is typically demand-driven, narrowly targeted and employer-sponsored, aiming to increase task-specific know-how rather than to strengthen broad foundation or social and emotional skills. The extent to which different groups engage in, benefit from or encounter barriers to this training therefore warrants close scrutiny.

This section considers non-formal learning opportunities, which include intentional, institutionalised learning of short duration that is not formally recognised by relevant authorities (e.g. short courses or workshops) but that may award "alternative credentials" such as digital badges, micro-credentials, and professional or industrial certificates[3] (OECD, 2025[127]). Drawing on data from the 2023 Survey of Adult Skills, the analysis in this section reflects the types of non-formal learning in which men and women and adults from varied backgrounds participate, identifying disparities in participation, learning goals and stated reasons for attendance. It further examines self-reported obstacles – time, cost, lack of employer support – to determine whether barriers are group-specific and whether the training undertaken genuinely equips disadvantaged adults for future labour-market requirements or merely consolidates existing roles.

By identifying who participates in training activities, what they study, why they enrol, where demand remains unmet and which obstacles prevent them from participating or from participating more, this section pinpoints the levers – such as financial incentives, targeted guidance, flexible scheduling and tailored programme design – through which policymakers can change uneven engagement in learning into more inclusive and effective skills development opportunities for adults.

3.6.1. Disparities in the uptake of non-formal education and training activities

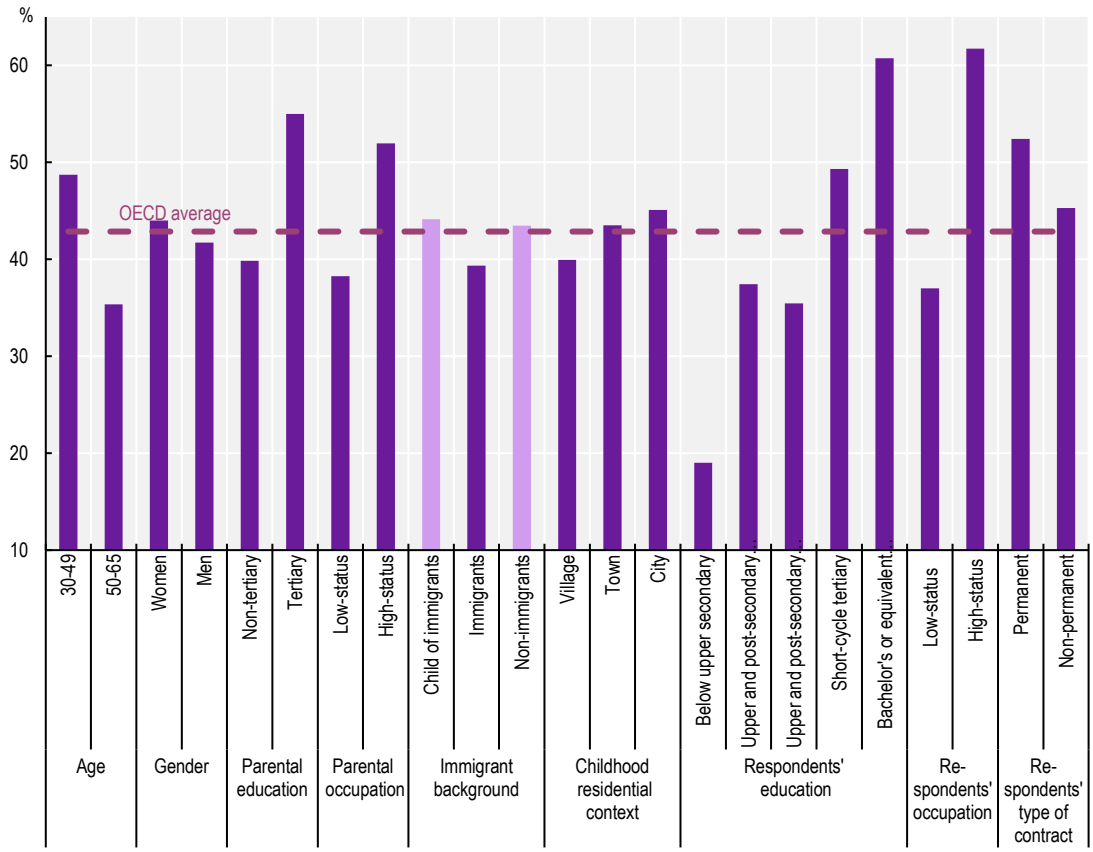
On average across OECD countries, 43% of adults report having participated in some form of non-formal education and training in the 12 months preceding the interview (including both job-related and non-job-related) (Annex Table 3.A.3). However, there are large disparities in non-formal training participation across socio-demographic groups, with non-formal learning opportunities unevenly distributed, and the very adults often considered in need of upskilling and reskilling to improve their labour-market prospects highly under-represented (Figure 3.14).

Participation in non-formal learning is higher among younger adults, those with socio-economically advantaged backgrounds, adults with higher educational attainment and individuals employed in high-status occupations and with permanent employment contracts. Participation gaps between men and women and between adults who grew up in cities and those who grew up in villages are modest, and individuals with and without an immigrant background also report similar participation levels. Adults in high-status occupations report the highest incidence of training (62%), whereas adults with below upper secondary education report the lowest (19%). Educational attainment exhibits the largest gap, with 61% of those holding a bachelor's degree or higher reporting participation in training in the past 12 months compared to 19% of those with below upper secondary education, a difference of around 42 percentage points. Adults who have an indefinite (permanent) work are also considerably more likely to participate non-formal learning compared to those with fixed term and seasonal contracts, temporary contracts with an agency, zero hour contracts, or contractor/freelance or consultant contracts (52% vs. 45%).

Participation differs by age, with 49% of adults aged 30-49 reporting to have participated in non-formal learning compared with 35% of those aged 50-65**.** More than half of adults whose parents were tertiary educated or employed in high-status occupations participate in training (55% and 52%, respectively). The corresponding shares fall to 40% and 38% among adults whose parents lacked tertiary education or had low-status jobs. Adults who grew up in cities are more likely to participate than those raised in towns and villages (45%, 44% and 40%, respectively). Gender differences are small, with a 2 percentage point advantage for women (44% vs. 42%).

Figure 3.14. Disparities in participation in non-formal adult education and training activities, by socio-demographic characteristic

Share of adults participating in non-formal adult education and training in the past 12 months, OECD average



Note: Adults aged 30-65. Survey question used to measure non-formal adult education and training participation: "During the last 12 months, that is since [Interview date], have you participated in any training activity? Include any training activity even if it lasted for only one hour. Please also include training activities that are still ongoing." Darker colours denote statistically significant differences (at the 5% level) in the percentage of non-formal adult education and training activities between groups: 30-49 vs. 50-65, men vs. women, non-tertiary vs. tertiary (parental education), low-status vs. high-status (parental occupation), children of immigrants vs. non-immigrant, village vs. city, bachelor's or equivalent and above vs. below upper secondary (respondents' education), low-status vs. high-status (respondents' occupation), permanent and non-permanent contract (only for those who are employed). See the note for Figure 3.7 for a description of respondents' educational attainment and the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. Differences by immigrant background vary greatly across countries because of differences in the size of immigrant groups as well as composition and context. Readers are therefore encouraged to consult country-specific results in Annex Table 3.A.3.

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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Box 3.10 highlights initiatives and interventions aimed at promoting engagement in different forms of learning throughout the life course, with a particular focus on opportunities and infrastructures that enable individuals to acquire and exercise their skills.

Box 3.10. Promoting engagement in lifelong learning

Lifelong learning through different modes and in different settings can promote the uptake of core 21st-century skills, as well as a range of social and emotional skills that can help individuals achieve better educational and labour market outcomes. From psychosocial support in ECEC, providing spaces and platforms for learning in young adulthood, to funding access to digital tools, policymakers can pull a range of levers to promote learning throughout the life course.

From childhood to young adulthood

In Chile, the Life Skills Program (*Programa Habilidades para la Vida*, HPV) supports students from pre-kindergarten to 12th grade by fostering emotional, social and cognitive development. Delivered in public and subsidised private schools, it targets psychosocial risks across three stages: 1) early years (pre-kindergarten to 4th grade), with a focus on emotional regulation and adaptation; 2) middle school (5th to 8th grade), with a focus on school coexistence and psychosocial well-being; and 3) upper grades (7th to 12th grade), with targeted support for students at risk of psychosocial and academic challenges. In crisis contexts, "Temporary Psychosocial Support Devices" provide tailored actions to restore school operations and create spaces that foster the socio-emotional well-being of students affected (Chile Atiende, 2025[128]).

In Spain, the Programme for Educational Guidance, Advancement and Enrichment (*Programa para la orientación, avance y enriquecimiento educativo*, PROA+) initiative aims to reduce school dropout and low performance by focusing on the digitalisation and modernisation of educational infrastructure from early childhood education to higher education, including the provision of digital tools and complementary teacher training. Schools commit to responsive service provision through agreements with educational authorities that outline the shared objectives and define specific actions and resources needed to achieve the objectives. Key goals may include strengthening personalised learning, improving educational outcomes and preventing dropout among students facing personal or social obstacles, particularly in rural areas or those with a significant number of students in a situation of educational vulnerability. The initiative is co-funded by the EU and the Spanish government; between 2021 and 2024, PROA+ was allocated EUR 360 million and covered 1 million children and young people across 3 600 schools and colleges (Spanish Government, 2025[129]; Spanish Government, 2025[130]; European Commission, 2025[131]; Comunidad de Madrid, 2025[132]; Spanish Government, 2024[133]).

Young adulthood and beyond

In France, the Personal Training Account (*compte personnel de formation,* CPF) allows individuals aged 16+ to access career training throughout their working life. Primarily accessible via a secure online platform, CPF funds a range of certified courses, including upskilling, entrepreneurship and driving licences, with support available through employers or local employment offices if needed. The programme remains valid until retirement and ensures flexibility across job changes (Perez and Vourc'h, 2020[134]).

In Mexico, The UTOPÍAS initiative in Iztapalapa, Mexico City, aims to transform neglected urban spaces into free-access centres offering educational, cultural, health and recreational services. Designed with community input, the initiative aims to foster social inclusion and youth engagement in order to tackle a range of social issues, including socio-economic disparities. With 12 sites developed in four years, the programme has the ability to reach 100 000 weekly users (Urban Sustainability Exchange, 2025[135]).

Seniors and individuals with disabilities

In the Slovak Republic, the Digital Seniors project provides digital training to over 100 000 seniors and people with disabilities. Participants learn to use IT tools and e-services, helping address digital divides worsened by the COVID-19 pandemic. Graduates receive tablets and data plans to support ongoing learning. The project is part of the Slovak Republic's Recovery and Resilience Plan (Ministry of Investments, Regional Development and Informatization of the Slovak Republic, 2025[136]; OECD, 2025[137]).

The association between participation in non-formal adult education and training and a range of socio-demographic characteristics before and after adjusting for adults' education, occupation and social and emotional skills differs across countries, as highlighted in Figure 3.15. Prior to adjustment, on average across OECD countries, men are 6 percentage points less likely than women to participate in non-formal learning. Adults aged 50-65 have a participation rate that is 8 percentage points lower than 30-49 year-olds. Children of immigrants have a participation rate that is 0.7 percentage points lower than adults with native-born parents. By contrast, adults who grew up in cities are 2 percentage points more likely to engage with non-formal learning than those raised in villages, and individuals with socio-economically advantaged backgrounds enjoy a 7 percentage point advantage in non-formal learning participation over those whose parents did not have tertiary education or who worked in low-status occupations.

Once adults' own qualifications and job status are taken into account, many of these gaps narrow markedly, with the age-related shortfall decreasing from 8 percentage points to 5 percentage points, and the socio-economic advantage shrinking to 1 percentage points for adults with tertiary-educated parents and for those from high-status occupational backgrounds. The gender difference also narrows slightly, with the participation deficit for men decreasing from 6 percentage points to 3 percentage points. There are no differences by immigrant background and childhood residential context. Further adjusting for differences in social and emotional skills leads to a small reduction in the explained disparities related to gender and socio-economic background, while the difference remains constant for age and immigrant background. The participation deficit of those who grew up in villages slightly increases from 0.3 to 0.6 percentage points.

These findings indicate that most observed disparities in adult learning participation are not inherent to socio-economic background but largely arise through the educational and occupational channels a person enters, which are in turn shaped by their background. Individuals from less advantaged families, rural areas or immigrant origins enter adulthood with lower qualification levels and are concentrated in lower-status jobs. These two factors together almost fully account for their lower subsequent engagement in non-formal training, and hence for reduced opportunities to upgrade skills and progress later in life. Conversely, once education and job status are held constant, background-related gaps shrink to negligible levels, underscoring that early disparities in attainment set in motion a cumulative process: initial credentials determine occupational placement, and, together, education and occupation shape access to further learning that could support mid-career mobility. Remaining differences in participation could reflect institutional and workplace factors that shape access to training, such as employment stability as detailed in Figure 3.14. These factors can create unequal opportunities for skill development among workers with similar educational and occupational profiles.

Figure 3.15. highlights the countries for which educational attainment and occupation mediate the most and the least in terms of disparities in participation in non-formal adult education and training activities. For example, in Lithuania the gender gap in participation is large compared to the OECD average (18 percentage points), and almost half of this gap can be explained by differences in educational attainment and field of study between men and women (after accounting for these factors the gap is 10 percentage points). By contrast, in the Israel, the gender gap in participation is aligned with the OECD average and corresponds to 6 percentage points before controlling for educational attainment and occupation.

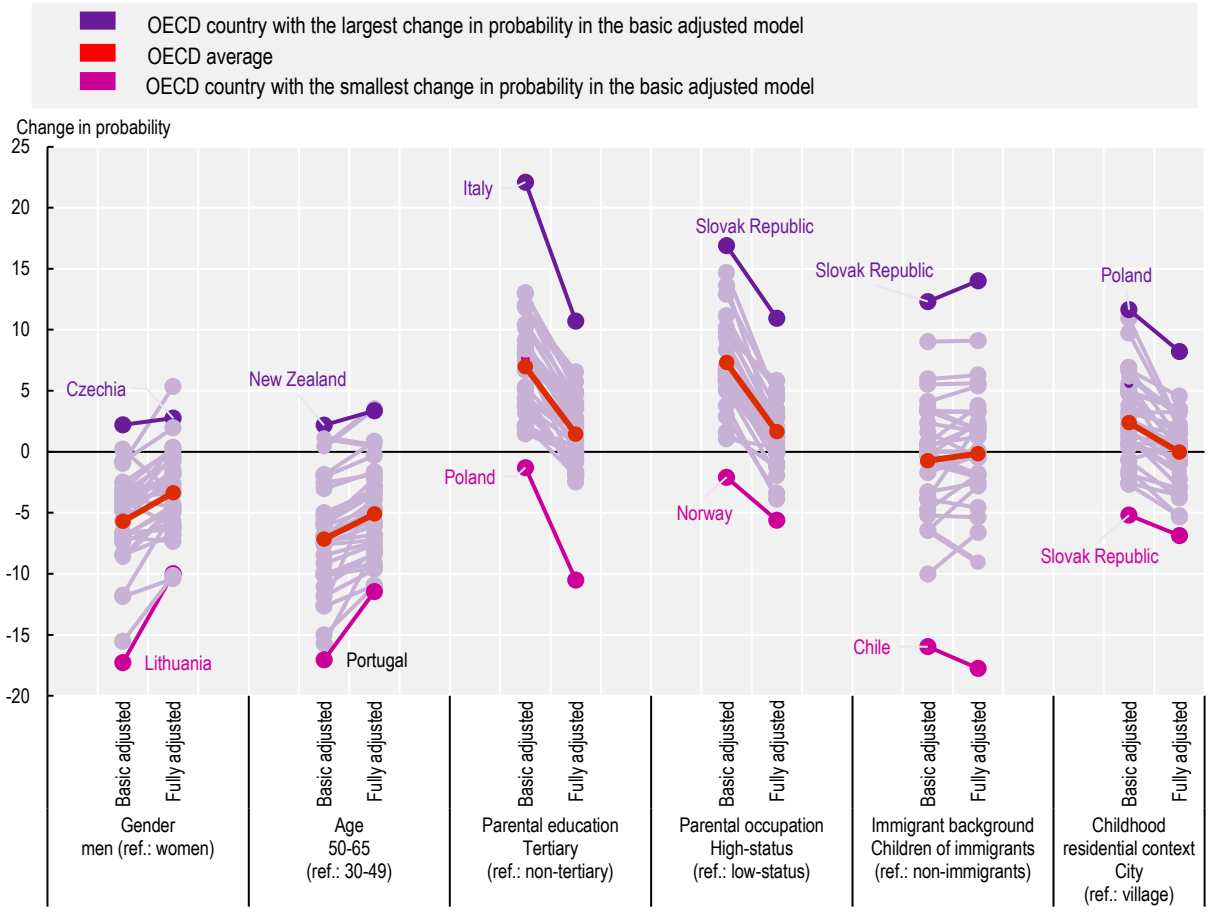
In Italy, the difference in participation between adults with and without tertiary-educated parents is 21 percentage points before and 10 percentage points after accounting for differences between the two groups in educational attainment and occupation, suggesting that around 52% of the parental education gap is mediated by educational attainment and occupation. By contrast, in Sweden, the difference in participation between adults with and without tertiary-educated parents is small and not explained by differences between the two groups in educational attainment and occupation.

In Chile, the difference in participation between adults who grew up in cities rather than villages is 11 percentage points before and 2 percentage points after accounting for differences between the two groups in educational attainment and occupation, suggesting that 82% of the urban–rural numeracy gap is mediated by educational attainment and occupation.

Participation in adult education and training is positively associated with literacy, numeracy and adaptive problem solving skills. Adults who participated in education and training have significantly higher levels of literacy than adults who have not participated in education and training (0.23 SD), with the same pattern observed for numeracy (0.21 SD) and adaptive problem solving (0.23 SD) (Table 3.5). However, participation in adult education and training does not explain differences in 21st-century skills between different groups. For example, differences in numeracy between adults who grew up in cities and villages are 0.11 SD after accounting for other socio-demographic characteristics and 0.04 SD after additionally accounting for educational attainment. However, the difference of 0.04 SD remains stable after additionally accounting for participation in adult training. This pattern is similar for the remaining socio-demographic characteristics.

Figure 3.15. Educational attainment and occupation as mediators of disparities in participation in non-formal adult education and training activities, by socio-economic characteristic and country

Change in probability of participation in non-formal adult education by socio-demographic group: basic and fully adjusted country-specific regression coefficients



Note: Adults aged 30-65. The figure shows the difference in regression coefficients for participation in non-formal adult education between the basic adjusted model, which accounts for differences in socio-demographic characteristics (gender, age, parental education, parental occupation, childhood residential context, immigrant background), and the fully adjusted model, which additionally accounts for differences in respondents' educational attainment, occupation. Survey question used to measure non-formal adult education and training participation: "During the last 12 months, that is since [Interview date], have you participated in any training activity? Include any training activity even if it lasted for only one hour. Please also include training activities that are still ongoing." See the note for Figure 3.7 for the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. For immigrant background, the figure only indicates a country if in the country at least 200 adults for each group are part of the final PIAAC sample. For immigrant background, the figure only indicates a country if at least 200 adults for each group are part of the final PIAAC sample.
Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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Table 3.5. Adult education and training as mediators of disparities in core 21st-century skills

Regression coefficients before and after adjusting for respondents' educational attainment and participation in adult education and training, OECD average

	Literacy			Numeracy			Adaptive problem solving		
	Model (1)	Model (2)	Model (3)	Model (4)	Mode l (5)	Model (6)	Model (7)	Model (8)	Mode l (9)
Gender - Men (ref.: women)	**-0.04**	0.01	**0.01**	**0.18**	**0.24**	**0.24**	**0.06**	**0.11**	**0.11**
Age - 50-65 (ref.: 30-49)	**-0.33**	**-0.25**	**-0.23**	**-0.26**	**-0.18**	**-0.16**	**-0.37**	**-0.30**	**-0.28**
Parental education - Tertiary (ref.: non-tertiary)	**0.30**	**0.13**	**0.12**	**0.29**	**0.12**	**0.11**	**0.29**	**0.14**	**0.14**
Parental occupation - High-status (ref.: low-status)	**0.30**	**0.14**	**0.13**	**0.30**	**0.14**	**0.13**	**0.26**	**0.13**	**0.12**
Childhood residential context (ref.: village)									
Town	**0.11**	**0.05**	**0.05**	**0.07**	0.01	0.02	**0.08**	**0.03**	**0.03**
City	**0.14**	**0.07**	**0.07**	**0.11**	**0.04**	**0.04**	**0.11**	**0.05**	**0.05**
Immigrant background (ref.: non-immigrants)*									
Immigrants	**-0.64**	**-0.64**	**-0.63**	**-0.48**	**-0.48**	**-0.46**	**-0.54**	**-0.54**	**-0.52**
Children of immigrants	**-0.14**	**-0.12**	**-0.12**	**-0.12**	**-0.10**	**-0.10**	**-0.11**	**-0.10**	**-0.10**
Respondents' educational attainment (ref.: upper and post-secondary (general orientation))									
Below upper secondary		**-0.73**	**-0.70**		**-0.78**	**-0.75**		**-0.64**	**-0.61**
Upper and post-secondary (vocational orientation)		**-0.15**	**-0.15**		**-0.14**	**-0.14**		**-0.13**	**-0.13**
Short-cycle tertiary		**0.14**	**0.11**		**0.17**	**0.14**		**0.12**	**0.10**
Bachelor's or equivalent and above		**0.49**	**0.44**		**0.52**	**0.47**		**0.44**	**0.39**
Non-formal adult education and training participation			**0.23**			**0.21**			**0.23**

Note: Adults aged 30-65. Coefficients in bold are statistically significant at the 5% level. Results in columns (1), (4) and (7) explain the respective skill while adjusting for differences in gender, age, parental education, parental occupation, childhood residential context and immigrant background. Results in columns (2), (5) and (8) additionally adjust for differences in respondents' educational attainment. Results in columns (3), (6) and (9) further adjust for differences in respondents' participation in adult education and training. Estimation results in columns (1) to (9) are restricted to the same number of observations. See the note for Figure 3.7 for the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. Standard errors are provided in Annex Table 3.A.3.

*Differences by immigrant background vary greatly across countries because of differences in the size of immigrant groups as well as composition and context. Readers are therefore encouraged to consult country-specific results in Annex Table 3.A.3.

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/3gt9pz

3.6.2. Disparities in the content of the training activities adults enrol in

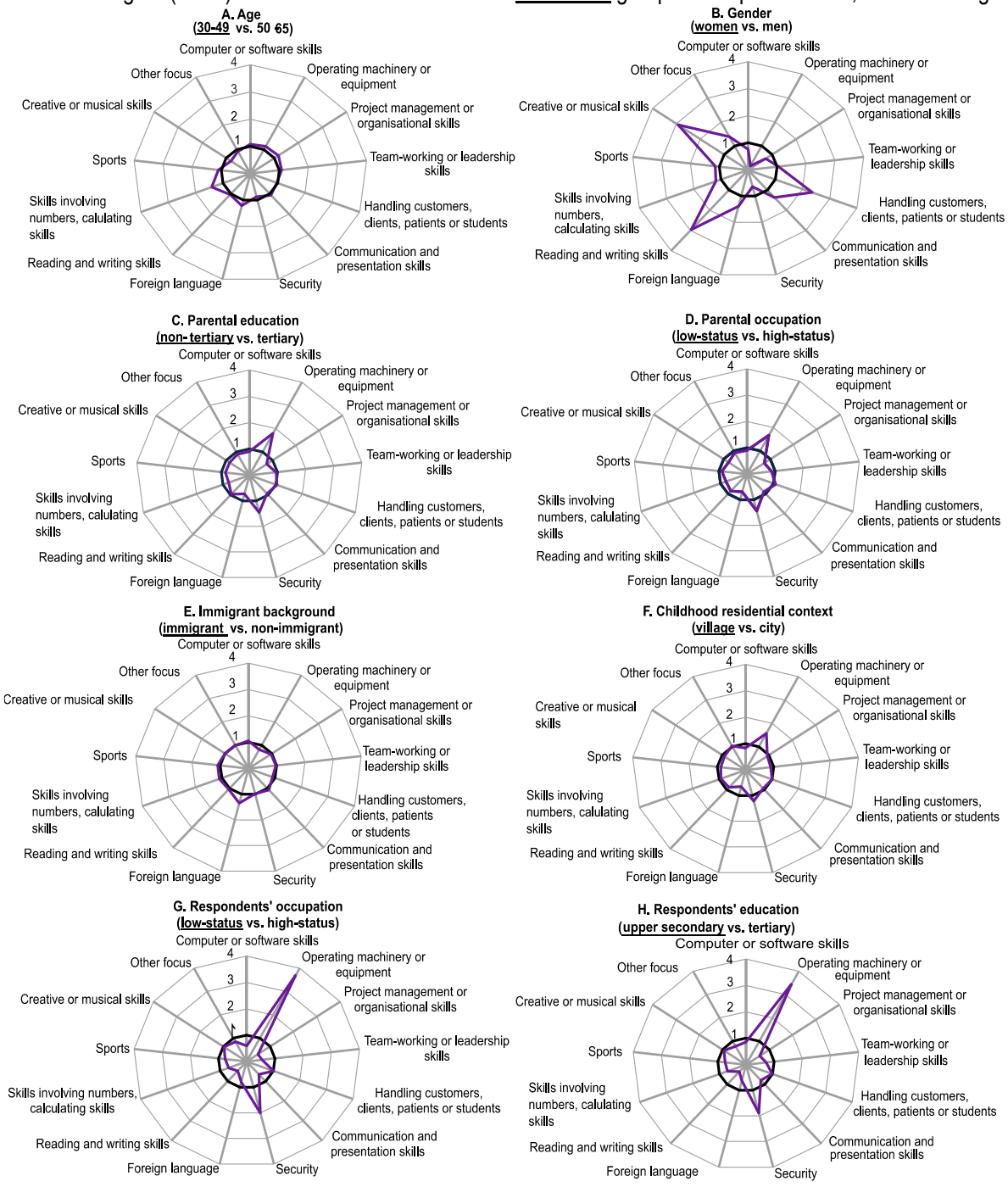
The focus of the training activities participants enrol in vary depending on socio-demographic characteristic. On average, the most frequently cited principal focus areas for participants in non-formal learning were “security” (17%); “computer or software skills” (13%); “handling customers, clients, patients or students” (9%); “team-working or leadership skills” (8%); and “operating machinery or equipment” (7%). Smaller proportions reported include “foreign language”, and “project-management or organisational skills” (6% each), “communication and presentation skills”, and “creative or musical skills” (4% each), and “sports” (3%). Training devoted to core information-processing skills – “skills involving numbers, calculating skills” (1.5%) and “reading and writing skills” (0.9%) – was rarer, while one in five adults selected “other focus” Annex Table 3.A.3.

Figure 3.16 illustrates relative representation ratios by socio-demographic characteristic, highlighting where specific groups are over- or under-represented in each training category. Age-related disparities in participation are limited, with 30-49 year-olds slightly over-represented in courses on “skills involving numbers, calculating skills” and “foreign language”; age differences are negligible for most other topics. Gender disparities are more pronounced, with women over-represented in training on “creative or musical skills”, “reading and writing skills”, “handling customers, clients, patients or students”, “communication and presentation skills” and “foreign language”. Men are over-represented in “operating machinery or equipment”, “security”, “computer or software skills” and “project-management or organisational skills”.

Adults with socio-economically disadvantaged backgrounds are over-represented among those who indicate they engaged in training focusing on “operating machinery or equipment” and “security”, whereas those with socio-economically advantaged backgrounds gravitate towards “project-management or organisational skills”, “foreign language” and “skills involving numbers, calculating skills”. Children of immigrants are over-represented in “foreign language”, and adults who grew up in villages are more likely to pursue “operating machinery or equipment” and “security”, while their urban counterparts favour “foreign language”. Adults’ own occupational status and educational attainment reinforce these tendencies, with adults in low-status occupations or who have not studied beyond upper secondary qualifications over-represented in “operating machinery or equipment” and “security”. Conversely, individuals in high-status occupations or with tertiary education are disproportionately enrolled in “project-management or organisational skills”, “team-working or leadership skills”, “communication and presentation skills”, “reading and writing skills”, “skills involving numbers, calculating skills” and “sports”.

Figure 3.16. Disparities in the main focus of training activities, by socio-demographic characteristic

For each socio-demographic characteristic, the relative representation ratio (RR) is presented. RR > 1 (< 1) indicates a higher (lower) likelihood that members of the underlined group cite a specific focus, OECD average



Note: Adults aged 30-65. The relative representation ratios refer only to participants in non-formal adult education and training activities in the past 12 months. Survey question used to measure training focus: "What was the main focus of this training activity? Please name only one." See the note for Figure 3.7 for a description of respondents' educational attainment and the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. Country-level results are provided in Annex Table 3.A.3.

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/z7dw62

Disparities in the focus of training risk entrenching existing disparities in occupational placement rather than promoting upward labour-market mobility through upskilling and reskilling. Beyond differences in participation, qualitative aspects of training (such as its relevance, content and duration) also matter, as disadvantaged groups are often offered narrowly focused on compliance-oriented learning that does little to enhance mobility. Further examining this segmentation of learning opportunities through complementary qualitative evidence would help shed light on how training quality and quantity shape disparities in skill development. Courses focused on security tasks or the operation of machinery tend to enhance task-specific know-how that is applicable to occupations dominated by men, residents of rural areas, and workers with lower educational qualifications and working in low-status occupations. These workers are often the children of low-educated parents who worked themselves in low-status occupations, reflecting the intergenerational occupational transmission of disadvantage. By contrast, training for skills that frequently serve as gateways to higher-status, technology-intensive and internationally oriented roles (for example project management, advanced digital competencies, training involving numbers and calculations, training involving writing, training to promote digital skills, or foreign language acquisition) is concentrated among adults with a socio-economically advantaged background. Without corrective action, this pattern may curtail upward mobility for disadvantaged groups and perpetuate gendered and socio-economic disparities in access to the occupations projected to expand most rapidly in light of the digital and green transitions and demographic shifts.

3.6.3. Disparities in participation in job-related non-formal education and training

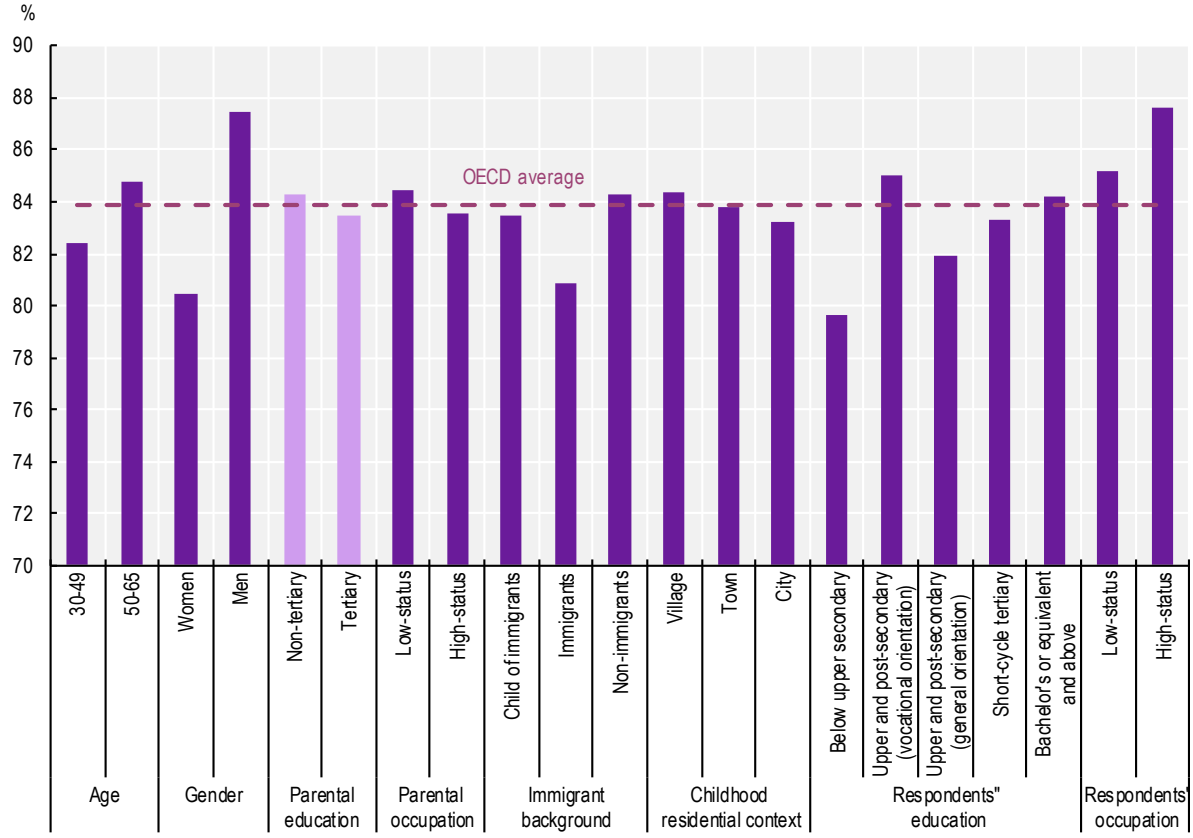
Understanding who undertakes job-related (as opposed to interest-driven) courses and why they do so is central to designing incentives that raise productivity and foster career mobility. Job-related training tends to be sponsored or required by employers and therefore exposes where firms invest. Interest-driven learning, by contrast, signals intrinsic demand that may remain untapped if finance or information are lacking.

Across OECD countries, 84% of adults who participated in non-formal education and training did so primarily for job-related reasons, while only 16% reported non-work motivations Annex Table 3.A.3. Figure 3.17 presents the distribution of work-related training across socio-demographic groups. Younger adults, men, individuals whose parents worked in low-status occupations, individuals without an immigrant background, those who grew up in villages, adults with upper secondary or post-secondary vocational qualifications, and workers in high-status occupations are marginally more likely to pursue training for job-related purposes. However, between-group differences are modest. For example, 85% of 30-49 year-olds undertook training for job-related reasons compared with 82% of 50-65 year-olds. Similarly, 84% of individuals without an immigrant background, 83% of the children of immigrants and 81% of immigrant adults reported participating in training for job-related reasons, and 84% of adults who grew up in villages or towns engaged in work-oriented learning compared to 83% of those who grew up in cities. The most pronounced gap is the difference between men and women: 87% of men cited work-related reasons for participation in training compared to 80% of women – a difference of 7 percentage points.

Adults' own educational attainment and occupational status show similarly small yet consistent disparities. Among adults with a bachelor's degree or higher and those with upper secondary or post-secondary vocational qualifications, 84% and 85%, respectively, pursued training for work-related reasons, compared with 83% of those with short-cycle tertiary credentials, 82% of adults with general upper secondary or post-secondary education, and 80% of those without an upper secondary qualification. Among workers in high-status occupations, 88% undertook job-related training compared to 85% of those in low-status roles.

Figure 3.17. Disparities in participation in job-related training, by socio-demographic characteristic

Share of adults participating in non-formal adult education and training for job-related reasons, OECD average



Note: Adults aged 30-65. Percentages presented in this figure refer only to adults who participated in non-formal adult education and training activities in the past 12 months. Survey question to measure whether or not the adult education and training was job-related: "Was this training activity mainly job-related? 'Job-related' can refer to your specific job, but also to improving career and employment chances in general." Darker colours denote that differences in the percentage of non-formal adult education and training activities between groups (16-29 vs. 50-65, men vs. women, non-tertiary vs. tertiary, low-status vs. high-status, immigrant vs. non-immigrant, village and city) are statistically significant at the 5% level. Villages, towns and cities refer to childhood residential context at the age of 14. See the note for Figure 3.7 for a description of respondents' educational attainment and the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. Country-level results are provided in Annex Table 3.A.3. Differences by immigrant background vary greatly across countries because of differences in the size of immigrant groups as well as composition and context. Readers are therefore encouraged to consult country-specific results in Annex Table 3.A.3.

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/m3snw1

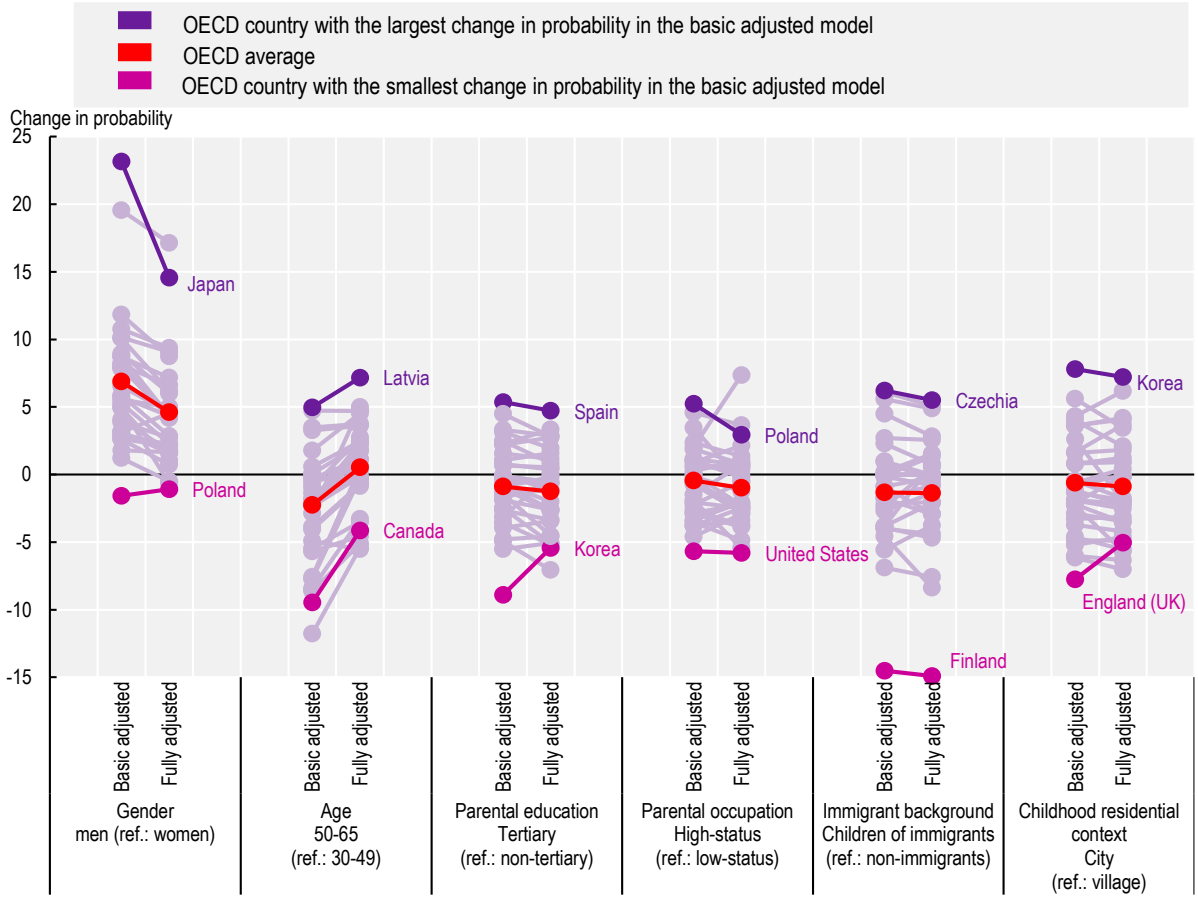
The association between participation in job-related non-formal adult education and training activities and a range of socio-demographic characteristics before and after adjusting for adults' education and occupation differs across countries. Figure 3.18 shows that men are 7 percentage points more likely than women to pursue job-related non-formal training courses, while 50-65 year-olds are 3 percentage points less likely than those aged 30-49 to engage in job-related non-formal training courses. When comparing individuals with similar levels of educational attainment and working in similar occupations, the gender gap in participation decreases to 5 percentage points, and no quantitatively relevant gaps are observed between other groups. This may be because men-majority occupations (e.g. skilled trades, security, transport) carry more mandatory or employer-financed training requirements, whereas women are concentrated in sectors where continuous learning is more often self-initiated.

Figure 3.18 shows the countries for which educational attainment and occupation mediate the most and least disparities in participation in job-related non-formal adult education and training activities. For example, in Japan, the gender gap in participation is large compared to the OECD average (23 percentage points), and approximately half of this gap can be explained by differences in educational attainment and occupation between men and women (after accounting for these factors, the gap is 15 percentage points). By contrast, in the Slovak Republic, the gender gap in participation is aligned with the OECD average and corresponds to 2 SD before and after controlling for educational attainment and occupation.

In Korea, the difference in job-related education and training participation between adults with and without tertiary-educated parents is -9 percentage points before and -5 percentage points after accounting for differences between the two groups in educational attainment and occupation, suggesting that around 44% of the parental education gap is mediated by educational attainment and field of study. By contrast, in Czechia, differences in participation between adults with and without tertiary-educated parents are negligible. In the United States, the difference in participation between adults who grew up in cities rather than villages is 3 percentage points before and -2 percentage points after accounting for differences between the two groups in educational attainment and occupation.

Figure 3.18. Disparities in participation in job-related non-formal adult education and training activities, by socio-economic characteristic and country

Change in probability of participating in job-related non-formal adult education by socio-demographic group: basic and fully adjusted country-specific regression coefficients



Note: Adults aged 30-65. The figure shows the difference in regression coefficients for participation in job-related non-formal adult education between the basic adjusted model, which accounts for differences in socio-demographic characteristics (gender, age, parental education, parental occupation, childhood residential context, immigrant background), and the fully adjusted model, which additionally accounts for differences in respondents' educational attainment and occupation. Survey question to measure whether or not the adult education and training was job-related: "Was this training activity mainly job-related? 'Job-related' can refer to your specific job, but also to improving career and employment chances in general. See the note for Figure 3.7 for a description of respondents' educational attainment and the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. For immigrant background, the figure only indicates a country if at least 200 adults for each group are part of the final PIAAC sample.

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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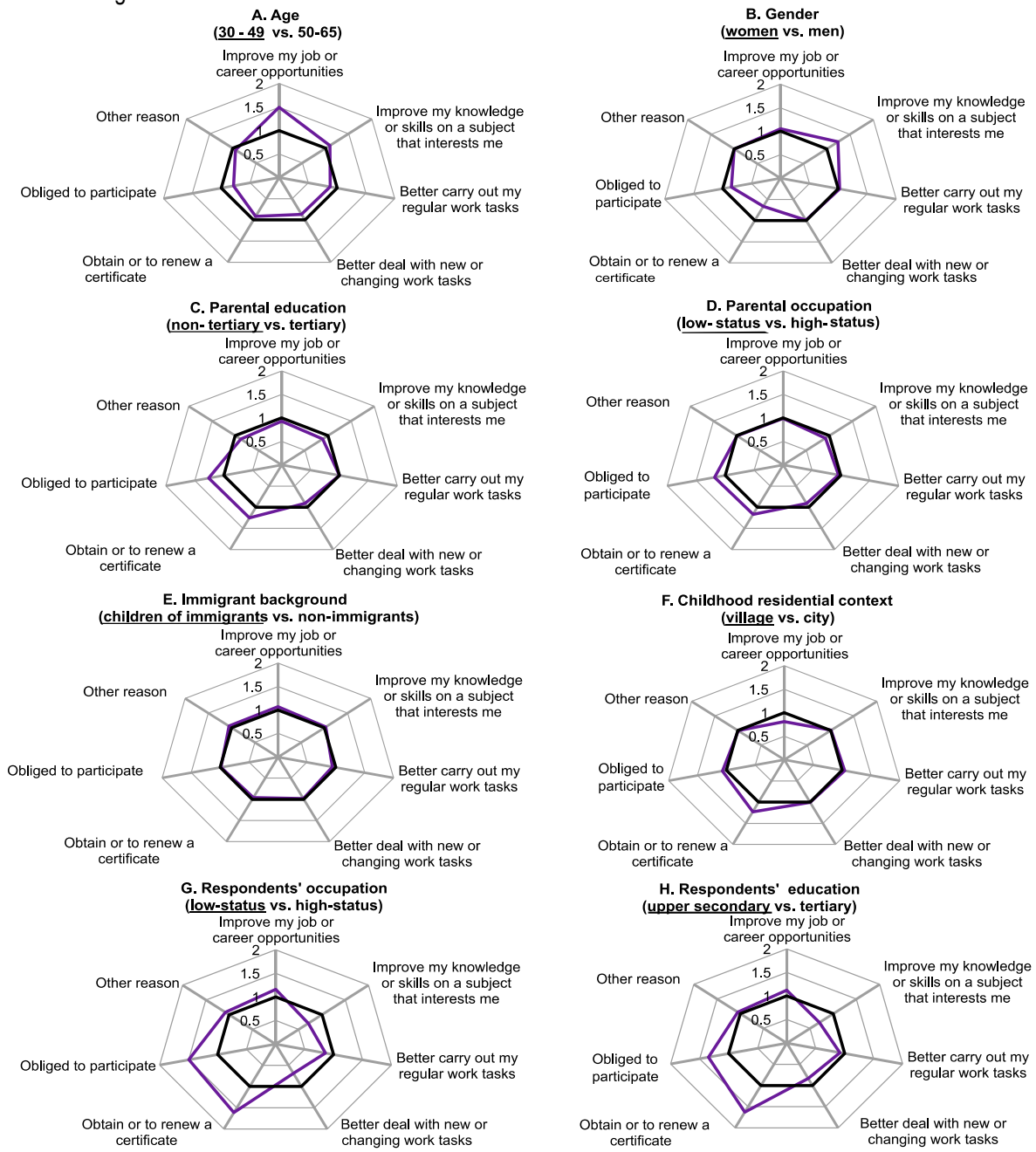
3.6.4. Group-specific motivations for engagement in job-related non-formal learning

Reasons for participating in job-related non-formal training vary depending on socio-demographic characteristic. Among all those who participated in job-related training, the most frequently mentioned reasons were: “to improve my knowledge or skills on a subject that interests me” (23%), “to improve my job or career opportunities” (19%), “to better carry out my regular work tasks” (20%), “I was obliged to participate” (17%), “to better deal with new or changing work tasks” (11%) and to “to obtain or to renew a certificate” (8%) Annex Table 3.A.3.

When breaking these down by socio-demographic group, Figure 3.19 suggests that younger adults prioritise career advancement (1.5 RR), while older adults more often say they were obliged to attend (0.8 RR) – reflecting age-biased promotion opportunities and mandatory refresher courses. Women are more likely to pursue personal-interest learning (1.2 RR), whereas men are more likely to focus on certificates (0.7 RR), which could reflect differences in the occupations men and women are employed in, and related differences in occupational licensing regimes, or men’s greater awareness of the importance of obtaining certifications to effectively navigate skills-based hiring markets (OECD, 2025[138]). Adults with socio-economically disadvantaged backgrounds are more likely to participate in job-related non-formal training because they are required to or because it will allow them to gain a certificate, although adults with socio-economically advantaged backgrounds are more likely to participate in non-formal education in general (Figure 3.14) . For example, adults with non-tertiary educated parents are more likely to participate in training to gain a certificate or because they were obliged to participate (1.3 RR each). Adults working in low-status occupations or who did not obtain tertiary education are more likely to participate in training because they were obliged to (1.5 RR and 1.33 RR, respectively) or to obtain or renew a certificate (1.6 RR each), suggesting fewer voluntary opportunities and a need to prove the skills they possess through formal qualifications among prospective employers.

Figure 3.19. Disparities in the motivations for participating in job-related non-formal training, by socio-demographic characteristic

For each socio-demographic characteristic, the relative representation ratio (RR) is presented. A RR > 1 (< 1) indicates a higher (lower) likelihood that members of the underlined group cite a specific reason for participation, OECD average



Note: Adults aged 30-65. Survey question to measure adults' main reason for participating in adult education and training: "Could you please specify your main reason for participating in this training activity?". See the note for Figure 3.7 for a description of respondents' educational attainment and the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. Country-level results are provided in Annex Table 3.A.3.

Source: Calculations based on OECD (2017[139]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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3.6.5. Satisfied and unmet demand for non-formal adult education and training: Overall prevalence and group differences

Adults participating in the 2023 Survey of Adult Skills were asked to report if there were courses they wanted to attend but did not. A “no” from a participant implies satisfied demand, whereas a “no” from a non-participant may indicate either lack of interest or a low perceived value of training given the existing supply of training opportunities. In other words, adults might have been willing to participate in training but not in the training available, hence their potential demand was unmet.

On average, 68% of participants felt their training needs were met, while 84 % of non-participants declared no interest or unmet demand, as indicated in Annex Table 3.A.3. Older adults are over-represented among participants who have a satisfied demand, with 71% of those aged 50-65 vs. 66% of those aged 30-49 who have participated in training indicating not wanting to attend other courses (Figure 3.20). Similarly, 88% of 50-65 year-olds and 80% of 30-49 year-olds who have not participated in training indicated not wanting to attend other courses. Adults with parents who worked in low-status occupations are over-represented among participants with a satisfied demand and an unmet demand. Among those who have participated in training, 71% of adults whose parents worked in low-status occupations and 64% of adults whose parents worked in high-status occupations indicated not wanting to attend other available courses. Similarly, for those who have not participated in training, 85% of adults whose parents worked in low-status occupations and 81% of adults whose parents worked in high-status occupations indicated not wanting to attend other available courses.

Overall, these numbers reflect that lack of interest in available training opportunities or unmet demand is high. Increasing enrolment in adult education and training therefore requires not only addressing potential lack of motivation to participate in non-formal learning, but also providing information about the benefits of training as well as easily accessible opportunities that meet the current training needs of adults.

The association between the extent to which individuals report lacking training activities of interest and a range of socio-demographic characteristics before and after adjusting for adults’ education and occupation differs across countries. Figure 3.21 indicates that differences in educational attainment and occupational status explain a large part of the variation in whether individuals with different socio-economic backgrounds report lacking training activities of interest; however, they do not explain much of the differences by gender and age. On average across participating OECD countries, and before accounting for adults’ educational attainment and occupation, men have an 8 percentage point higher probability of reporting no training activities of interest, and older adults (aged 50-65) have a 7 percentage point higher probability. Adults with socio-economically advantaged backgrounds have a lower probability (6 percentage points for tertiary-educated parents and 4 percentage points for parents who worked in high-status occupations), children of immigrants have a 3 percentage point lower probability, and those who grew up in cities have a 2 percentage point lower probability.

Some of these differences are explained by adults’ educational attainment and occupation. On average across participating OECD countries, the higher probability of older adults reporting no training activities slightly reduces from 7 to 5 percentage points after accounting for adults’ educational attainment and occupation. For adults with tertiary-educated parents, the lower probability changes from 6 to 3 percentage points, and for adults with parents in high-status occupations, it changes from 4 to 1 percentage point. Adjusting for adults’ educational attainment and occupation also affects differences by gender, immigrant status and childhood residential context.

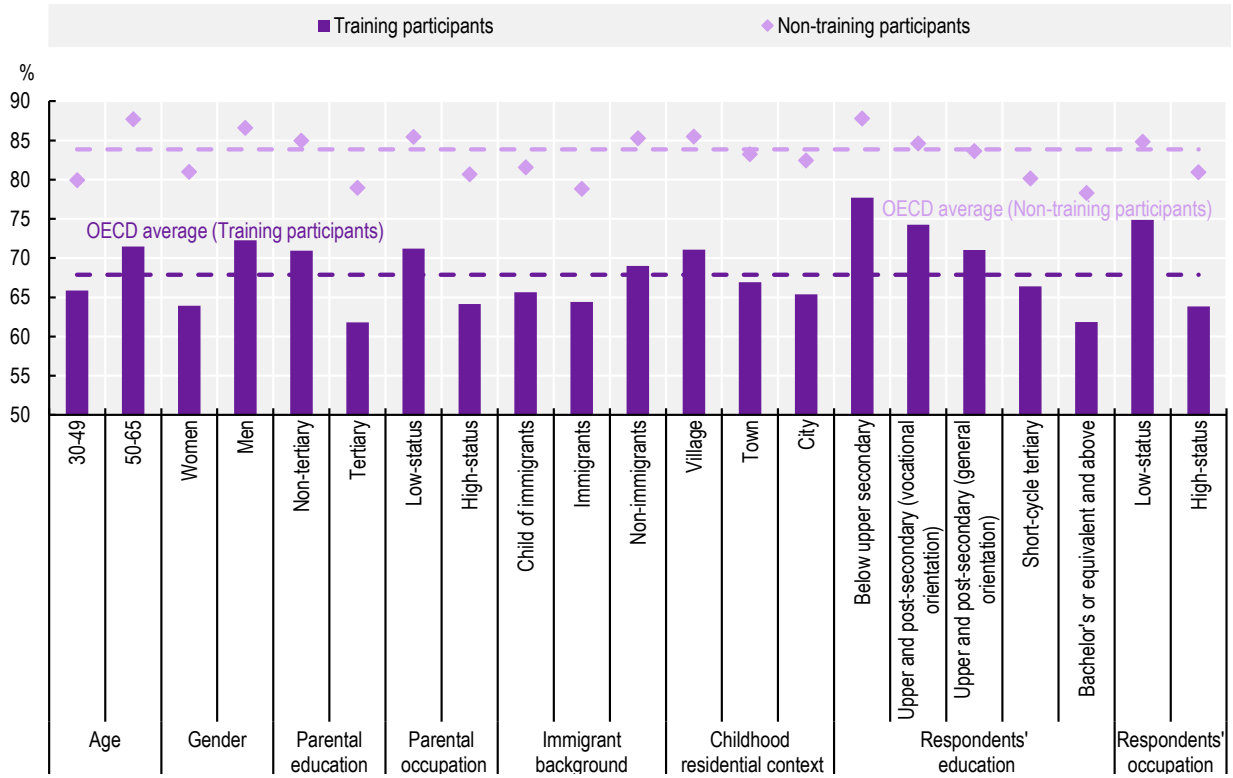
Figure 3.21 highlights the countries for which educational attainment and occupation mediate disparities in participation in job-related non-formal adult education and training activities the most and the least. For example, in Italy half of the gap in whether men and women report lacking training activities of interest can be explained by differences in educational attainment and occupation between men and women. By

contrast, in England (United Kingdom), educational attainment and occupation do not explain the small gender gap in lack of training activities of interest.

In Portugal the difference in whether adults with and without tertiary-educated parents report lacking training activities of interest is -3 percentage points before and 2 percentage points after accounting for differences between the two groups in educational attainment and occupation. By contrast, in France, this difference is -5 percentage points before and -6 percentage points after accounting for differences between the two groups in educational attainment and occupation. In Latvia, the difference in participation between adults who grew up in cities rather than villages is -1 percentage points before and 4 percentage points after accounting for differences between the two groups in educational attainment and occupation. By contrast, in the United States, the difference in participation between adults who grew up in cities and those who grew up in villages is -2 percentage points before and after accounting for differences between the two groups in educational attainment and occupation, suggesting that educational attainment and occupation do not mediate the small urban–rural disparities in lack of training activities of interest.

Figure 3.20 Satisfied and unmet demand for participation in non-formal education and training, by socio-demographic characteristic

Share of training participants (e.g. those with satisfied demand) and share of non-training participants (e.g. those with unmet demand) reporting that there were no (other) courses they wanted to participate in, OECD average



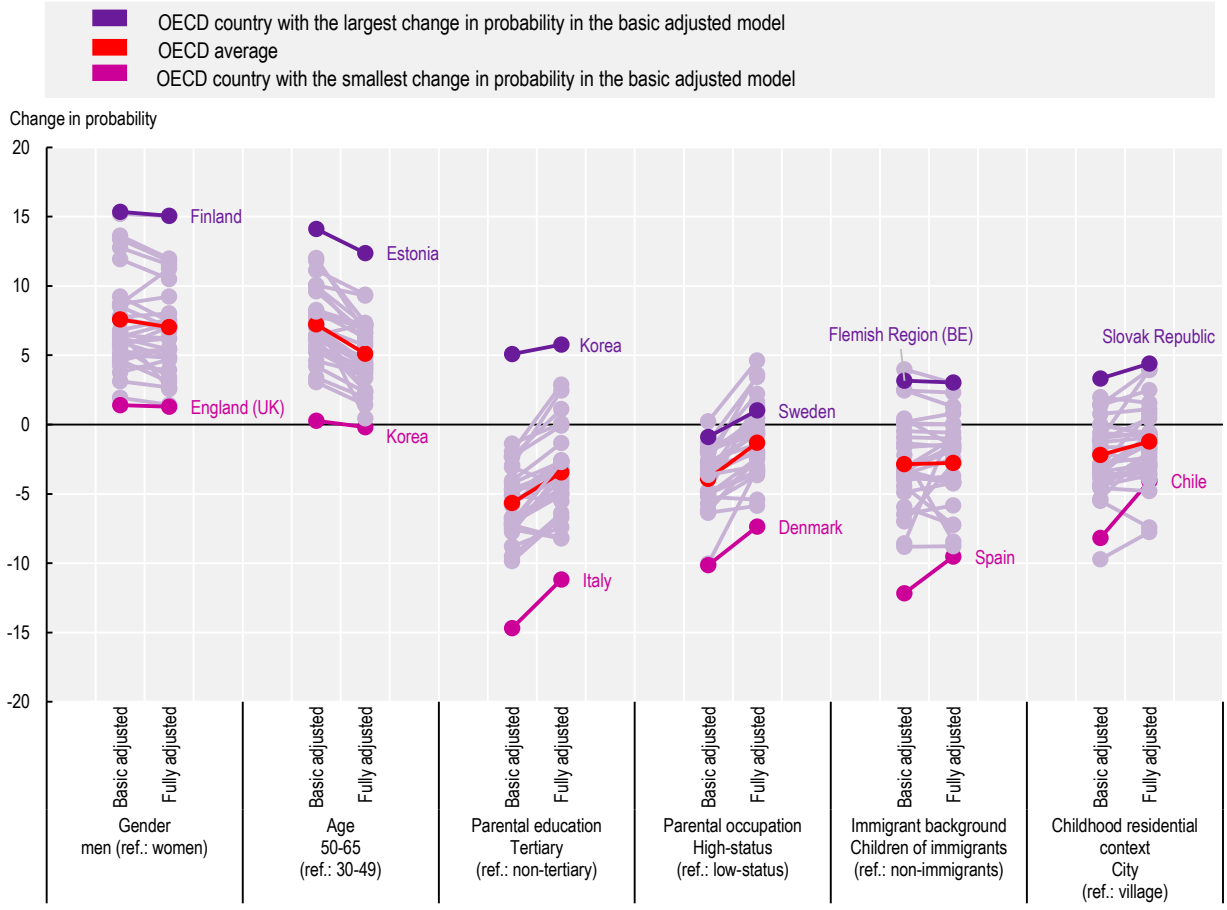
Note: Adults aged 30-65. Survey question: "In the last 12 months, were there any training activities you wanted to participate in but did not?" See the note for Figure 3.7 for a description of respondents' educational attainment and the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. Differences by immigrant background vary greatly across countries because of differences in the size of immigrant groups as well as composition and context. Readers are therefore encouraged to consult country-specific results in Annex Table 3.A.3.

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/0wr9eq

Figure 3.21. Disparities in the absence of training activities of interest, by socio-demographic characteristic and by country

Change in the probability that individuals will have "no training activities that I wanted to participate in": basic and fully adjusted country-specific regression coefficients



Note: Adults aged 30-65. The figure shows the difference in unmet demand for participation in training activities between the basic adjusted model, which accounts for differences in socio-demographic characteristics (gender, age, parental education, parental occupation, childhood residential context, immigrant background), and the fully adjusted model, which additionally accounts for differences in respondents' educational attainment and occupation. Survey question: "In the last 12 months, were there any training activities you wanted to participate in but did not?" See the note for Figure 3.7 for a description of respondents' educational attainment and the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. For immigrant background, the figure only indicates a country if at least 200 adults for each group are part of the final PIAAC sample.
Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/txb2pa

3.6.6. Disparities in barriers to participation in job-related non-formal education and training

Barriers to participating in training vary markedly by gender, age, place of residence and socio-economic background. Each barrier filters out a share of potential learners, limiting aggregate upskilling and perpetuating inequality. Failing to recognise the range of reasons that hinder participation risks misdirecting resources. By identifying precisely which hurdles deter initial participation and which constrain additional or diversified learning, policymakers can design interventions that convert latent

demand into effective engagement and progression. The design of effective skills strategies requires identifying the people facing obstacles. This is more than just those who take no training at all, but also involves those who engage in training yet would have preferred to participate more often or in different activities.

For adults participating in the 2023 Survey of Adult Skills who answered "yes" to the question "In the last 12 months, were there any training activities you wanted to participate in but did not?" – signalling interest curtailed by barriers – a follow-up question was asked about the reasons for non-participation. Figure 3.22 shows how these self-reported reasons vary across socio-demographic groups, highlighting those over-represented (relative-representation ratios > 1). The figure distinguishes between constrained participants (individuals who took at least one course but missed another) and non-participants (those who took none), allowing a direct comparison of the two forms of unmet demand.

There is a wide range of obstacles to participation in training, and the mix differs between constrained participants and non-participants and by socio-demographic characteristics. Family obligations, for example, are prominent for younger adults and women regardless of whether they were already engaged in training, whereas supply-side barriers – scarcity of suitable courses, last-minute impediments or inconvenient scheduling – feature more strongly among adults who grew up in rural areas, especially those who report not having been engaged in any training activity in the past 12 months. By contrast, both constrained participants and non-participants frequently mention the absence of appropriate courses and unmet prerequisites, pointing to gaps in provision and entry restrictions. Lack of employer support is particularly salient among non-participants but less prominent among constrained participants, suggesting that employer backing may be decisive in crossing the threshold into any training.

Obstacles to participation in training differ by age. Lack of time due to family responsibilities and the cost of training are more important barriers to participation among constrained participants and non-participant 30-49 year-olds (1.7 RR and 1.8 RR, respectively) than among constrained participants and non-participant 50-65 year-olds. By contrast, 50-65 year-olds are more likely to mention lack of suitable courses (0.7 RR for constrained participants and 0.6 RR for non-participants), unexpected events (0.7 RR and 0.6 RR) or cancellations (0.8 RR and 0.7 RR) as reasons for not participating. Several factors could explain these patterns: adults between the ages of 30 and 49 often have family responsibilities, and training must be woven around schedules constrained by childcare and sometimes elder-care. As a result, they are acutely sensitive to the *time cost* of evening or weekend courses and to direct *financial costs*. By contrast, adults aged 50-65 typically face fewer childcare demands but may confront a different hurdle: a scarcity of courses tailored to late-career upskilling or transitions towards retirement.

Furthermore, because older workers may have very specific training needs – as the heterogeneity of life experiences is wider for older workers – providers may cancel or postpone courses aimed at older workers more frequently due to low take-up or difficulty in organising relevant curricula. Finally, health fluctuations such as medical appointments can prevent participation at short notice for older adults. Taken together, these supply-side limitations and age-specific life events shift the barrier profile from time and cost among mid-career adults to course availability and unpredictability among those approaching retirement.

There are also gender differences in the obstacles to participation reported. Among constrained participants, men are over-represented in reporting that they lack prerequisites (0.7 RR), and among non-participants, men are over-represented in citing a lack of employer support (0.5 RR). By contrast, women are considerably more likely than men to emphasise family responsibilities and cost as reasons for an unfulfilled willingness to participate in training. Family responsibilities are an especially strong barrier to the participation of non-participant women (2.0 RR), and cost considerations are an especially strong barrier to additional participation among constrained participants (1.7 RR). Family responsibilities are currently not equally shared between men and women, with women's larger share of unpaid care and mid-career adults' dual pressures raising the opportunity cost of engagement among women.

Women's responses also highlight an overlooked form of vulnerability in the form of "unexpected events". In principle, such events should strike men and women at similar rates, yet women are markedly more likely to cite them as a key barrier to participation in training (1.2 RR among non-training participants). This does not suggest that women face more emergencies but indicates that they have far less spare capacity to absorb emergencies that occur. Because women still shoulder the larger share of unpaid care, a sudden illness in the family, a school closure or even a public transport strike could derail their learning plans. Whether at home or in the workplace, women are often the de facto back-up system for others (whether as mothers or partners at home or as administrative support staff in the workplace). What these results imply is that women can attend training only when nothing goes wrong, whereas men are better insulated by partner support, social expectations and workplace flexibility. That so many women report "unexpected events" as the reason for not participating reveals how finely balanced their time budgets are – and how easily the goal of upskilling is sacrificed when shocks occur.

Among adults with socio-economically disadvantaged backgrounds, training participants are over-represented in indicating that a lack of suitable courses or prerequisites constrained their participation, whereas non-participants emphasise lack of employer support and cost. For example, participants whose parents were not tertiary educated are more likely to report that they did not find suitable training activities (1.4 RR) and did not meet prerequisites (1.2 RR), and their non-participating counterparts are more likely to report a lack of employer support (1.3 RR) or cancellation or postponements of training activities (1.3 RR). Adults with socio-economically disadvantaged backgrounds may live far from their place of work or from the location of in-person courses, making it harder for them to participate. These workers are also often employed with temporary contracts, making their employers less likely to be willing to accommodate their training needs (Albert, Garcia-Serrano and Hernanz, 2005[140]). Lack of information about the benefits of participation and expectations about how training could translate into improved opportunities may lower participation among adults from disadvantaged backgrounds. They may undervalue further rounds of training, be less familiar with subsidies available to them or be deterred by unclear entry criteria. Furthermore, employers in low-productivity sectors, in which individuals with socio-economically disadvantaged backgrounds are over-represented, may doubt the payoff of helping their staff engage in training opportunities.

For the children of immigrants, both constrained participants and non-participants are over-represented in reporting that courses were too expensive (1.2 RR each), with non-participating adults also emphasising a lack of prerequisites as a key barrier to participation (2.0 RR). Among constrained participants, the children of immigrants are considerably under-represented in the group that cites lack of prerequisites as a reason for lack of participation (0.5 RR), among those who cite lack of suitable training (0.7 RR), and among constrained non-participants who cite that training takes place at an inconvenient time or location (0.6 RR).

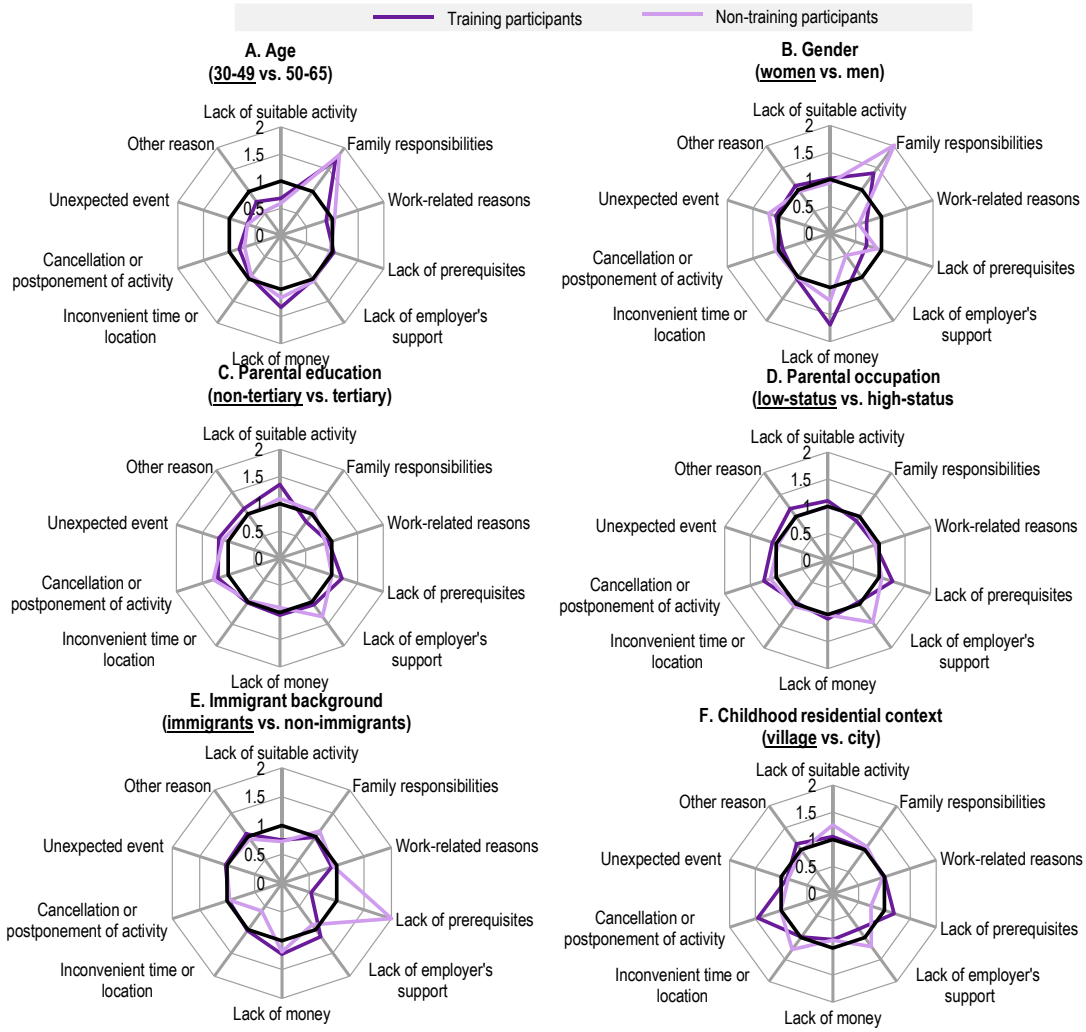
For childhood residential context, adults raised in villages report different barriers to training participation than those raised in cities. Adults raised in villages who participate in training are over-represented among those affected by cancellations (1.5 RR), with village non-participants more often citing unsuitable courses (1.3 RR), lack of employer support (1.2 RR) and inconvenient scheduling or location (1.3 RR). This may be due to structural factors such as the geographic concentration of providers, digital-connectivity gaps and sectoral training cultures, alongside differences in occupation, which may make it harder for rural residents to find suitable training.

Overall, constrained participants are more likely to report that available courses do not match their upskilling needs, whereas non-participants are more likely to emphasise cost or time barriers. Ensuring that workers have the time and financial security needed to participate, for example through paid training leave and study allowances can reduce disparities. Equally important is adapting training content and delivery to better reflect workers' needs, job contexts and personal circumstances, thereby strengthening both participation and learning outcomes. Even when practical barriers related to

cost and scheduling are removed there still needs to be investments in making curricula relevant to workers. Unless provision is aligned with workers' needs and aspirations, they will continue to under-invest in upskilling and reskilling.

Figure 3.22. Reported reasons for not participating in training, by socio-demographic characteristic

For each socio-demographic characteristic, the relative representation ratio (RR) > 1 (< 1) indicates a higher (lower) likelihood of underlined groups being represented across different reasons for non-participation, OECD average



Note: Adults aged 30-65. The figure provides responses to the survey question: "Which of the following reasons prevented you from participating in these training activities? Please indicate the most important reason." This survey question is a follow-up question to respondents answering "yes" to: "In the last 12 months, were there any training activities you wanted to participate in but did not?" See the note for Figure 3.7 for a description of respondents' educational attainment and the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. Country-level results are provided in Annex Table 3.A.3.

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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3.7. Volunteering as an informal learning pathway

International evidence suggests that informal learning is a key means through which individuals build their skills in adulthood (OECD, 2025[127]). Acquiring knowledge through everyday problem solving, peer exchange, community participation and self-directed practice allows individuals to develop transversal and technical skills in ways that formal curricula and structured workplace training rarely match. Informal learning is a particularly useful skills development path for adults who have had negative experiences in formal education settings or who may feel ill at ease with classroom-style provision.

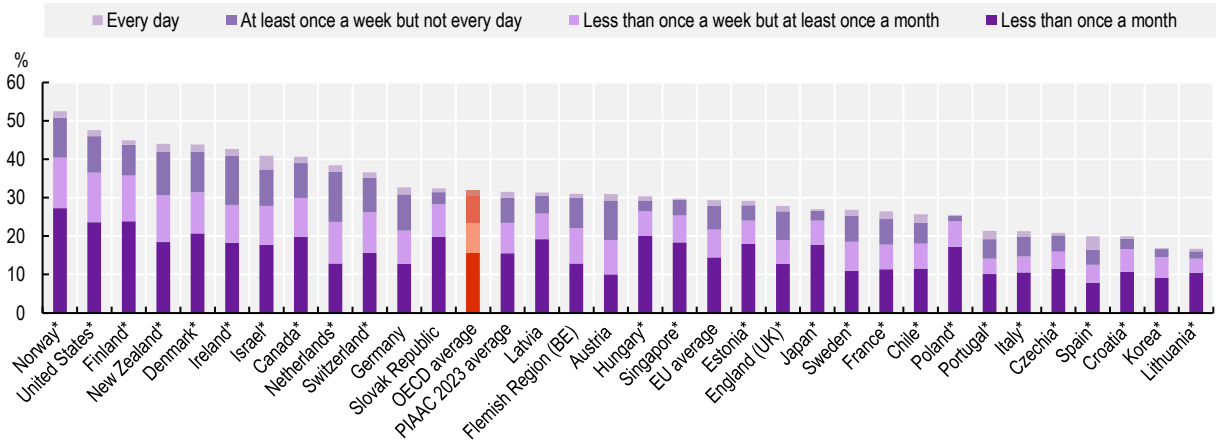
However, the very spontaneity that makes informal learning effective also renders it hard to promote through policy action. Governments can provide information alongside financial or human resources to support formal and non-formal learning, but they cannot legislate exchanges between co-workers. One exception to this is volunteering, which already sits within the reach of policy levers, with programmes to encourage civic participation, from national volunteer schemes to employer-supported volunteering leave, well established across OECD countries (see Box 3.11). Although primarily framed in terms of social cohesion and service delivery, volunteering remains an under-explored vehicle for skills development, offering a socially valued route for individuals to engage in skills development.

Voluntary work is more than civic altruism: its collaborative, problem-focused nature creates the opportunity to develop both information-processing skills and the ability to work with others, communicate effectively and self-regulate (OECD, 2015[141]). Unlike engagement in formal or non-formal learning activities, and in line with work-based learning and apprenticeships, volunteering embeds learning in real-world contexts, providing the opportunity to practice skills and receive immediate feedback – conditions that reinforce skills acquisition and promote employment prospects (Spera et al., 2015[142]). Adults with socio-economically disadvantaged backgrounds – who, as indicated in previous sections, generally hold lower formal qualifications and are less likely to participate in organised training activities – may view classrooms with scepticism, either because of earlier negative experiences or because fees, scheduling and entry requirements represent important barriers. Volunteering is therefore a potentially less stigmatising and more flexible pathway to skill development for these groups.

The share of adults who volunteer varies widely across countries. Figure 3.23 indicates that on average across OECD countries, 32% of adults reported having engaged in some form of volunteering in the previous year Annex Table 3.A.4. Around 50% of adults in Norway volunteer compared to less than 20% in Croatia, Korea, Lithuania and Spain. Frequency of participation also differs, with around 10% or slightly more of adults in Austria, Denmark, Ireland, the Netherlands, New Zealand and Norway volunteering weekly (Figure 3.23). In Canada, Denmark, Finland, Israel, the Netherlands, New Zealand, Norway, Switzerland and the United States, at least 10% of adults volunteer monthly. The shares of sporadic volunteers, i.e. adults who volunteer less than once a month, are highest in Denmark, Finland, Hungary, Norway and the United States, ranging between 20% and 27%. Disparities in volunteering by gender, age, childhood residential context and immigrant background are negligible, whereas adults with tertiary-educated or high-status occupation parents are more likely than their less advantaged counterparts to volunteer (a difference of between 7 and 9 percentage points) (as indicated in Figure 3.24).

Figure 3.23. Frequency of participation in volunteering activities, by country

Share of 16-65 year-olds engaging in volunteering activities, by country



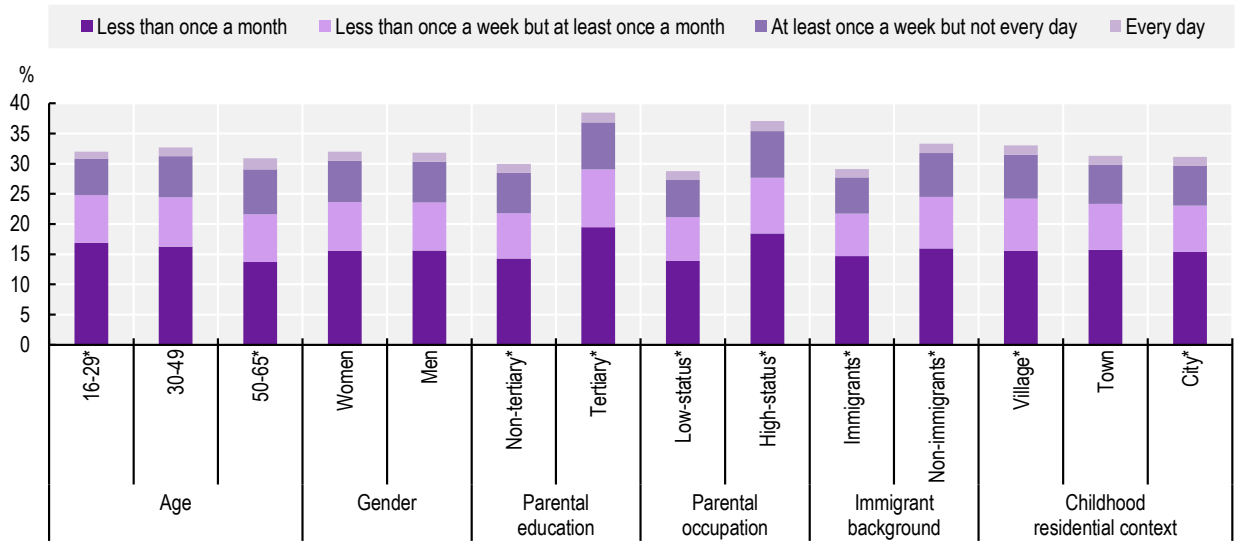
Note: Volunteering activities are measured based on the following survey question: "In the last 12 months, how often, if at all, did you do voluntary work, including unpaid work for a charity, political party, trade union or other non-profit organisation?" With answer options being: "Never", "Less than 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".
* Indicates that differences between the share of adults who volunteer in a given country and those who volunteer on average across OECD countries and economies differ statistically significant at the 5% level.
Countries are ranked in descending order based on the percentage of adults who volunteer at least once a month.
Source: Calculations based on OECD (2024[53]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

StatLink https://stat.link/isu1c4

After adjusting for adults' educational attainment level, further adjusting for volunteering contributes very little to explaining the differences in 21st-century skills between different groups. However, the results suggest that individuals who participate in volunteering activities have higher levels of proficiency in literacy and numeracy (0.11 SD each), and in adaptive problem solving (0.10 SD) (Table 3.6). These results suggest that volunteering can be an effective path for skills development. Box 3.11 provides examples of government policy measures, targeted programmes and strategic support to encourage volunteering.

Figure 3.24. Frequency of participation in volunteering activities, by socio-demographic characteristic

Share of adults, by socio-demographic characteristic and volunteering activities, OECD average



Note: Volunteering activities are measured based on the following survey question: "In the last 12 months, how often, if at all, did you do voluntary work, including unpaid work for a charity, political party, trade union or other non-profit organisation?" With answer options being: "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". See the note for Figure 3.7 for a description of respondents' educational attainment and the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context. Country-level results are provided in Annex Table 3.A.4. Differences by immigrant background vary greatly across countries because of differences in the size of immigrant groups as well as composition and context. Readers are therefore encouraged to consult country-specific results in Annex Table 3.A.4.

* Indicates that shares in volunteering across groups (16-29 vs. 50-65, women vs. men, non-tertiary vs. tertiary, low-status vs. high-status, immigrant vs. non-immigrant, village vs. city) are significant at the 5% level.

Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/meqbct

Table 3.6. Volunteering as a mediator of disparities in core 21st-century skills

Regression coefficients before and after adjusting for respondents' educational attainment and volunteering activities, OECD average

	Literacy			Numeracy			Adaptive problem solving		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)
Gender - Men (ref.: women)	**-0.04**	**0.01**	**0.01**	**0.18**	**0.24**	**0.24**	**0.06**	**0.11**	**0.11**
Age - 50-65 (ref.: 30-49)	**-0.34**	-0.25	-0.25	**-0.26**	**-0.18**	**-0.18**	**-0.37**	**-0.30**	**-0.30**
Parental education - Tertiary (ref.: non-tertiary)	**0.29**	**0.13**	**0.13**	**0.29**	**0.12**	**0.12**	**0.29**	**0.14**	**0.14**
Parental occupation - High-status (ref.: low-status)	**0.30**	**0.14**	**0.14**	**0.30**	**0.14**	**0.14**	**0.27**	**0.13**	**0.13**
Childhood residential context (ref.: village)									
Town	**0.11**	**0.05**	**0.05**	**0.07**	0.01	**0.02**	**0.08**	**0.03**	**0.03**
City	**0.14**	**0.07**	**0.07**	**0.11**	**0.04**	**0.04**	**0.11**	**0.05**	**0.05**

	Literacy			Numeracy			Adaptive problem solving		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)
Immigrant background (ref.: non-immigrants)*									
Immigrants	**-0.64**	**-0.64**	**-0.63**	**-0.48**	**-0.48**	**-0.47**	**-0.54**	**-0.54**	**-0.53**
Children of immigrants	**-0.14**	**-0.12**	**-0.12**	**-0.12**	**-0.11**	**-0.1**	**-0.12**	**-0.10**	**-0.10**
Respondents' educational attainment (ref.: upper and post-secondary (general orientation))									
Below upper secondary		**-0.73**	**-0.73**		**-0.78**	**-0.77**		**-0.64**	**-0.63**
Upper and post-secondary (vocational orientation)		**-0.15**	**-0.15**		**-0.14**	**-0.14**		**-0.13**	**-0.13**
Short-cycle tertiary		**0.13**	**0.13**		**0.16**	**0.16**		**0.12**	**0.12**
Bachelor's or equivalent and above		**0.49**	**0.48**		**0.52**	**0.51**		**0.44**	**0.43**
Volunteering			**0.11**			**0.11**			**0.10**

Note: Adults aged 30-65. For this report, any volunteering activity in the past year is categorised as a positive outcome. Coefficients in bold are statistically significant at the 5% level. Results in columns (1), (4) and (7) explain the respective skill while adjusting for differences in gender, age, parental education, parental occupation, childhood residential context and immigrant background. Results in columns (2), (5) and (8) additionally adjust for differences in respondents' educational attainment. Results in columns (3), (6) and (9) further adjust for differences in volunteering participation. Estimation results in columns (1) to (9) are restricted to the same number of observations. See the note for Figure 3.7 for a description of respondents' educational attainment and the definitions of groups based on parental education, parental occupation, immigrant background and childhood residential context.
*Differences by immigrant background vary greatly across countries because of differences in the size of immigrant groups as well as composition and context. Readers are therefore encouraged to consult country-specific results in Annex Table 3.A.4.
Standard errors are provided in Annex Table 3.A.4.
Source: Calculations based on OECD (2024[16]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/y3df2x

Box 3.11. Leveraging volunteering to bridge skills gaps

Volunteering can enhance social cohesion and community well-being at the same time as benefiting volunteers themselves (Gagliardi, Pérez-Raynaud and Robinson, 2024[143]). Governments can promote volunteering through laws and strategies, policy measures, targeted programmes and strategic support, as also highlighted by the OECD Recommendation on Creating Better Opportunities for Young People.

Encouraging volunteering from an early age

The inclination to volunteer often develops early in life, influenced by family, community and educational environments. Volunteering at a young age fosters the development of pro-social values and social and emotional skills (Wilson, 2012[144]). Governments can nurture volunteering habits among young people through:

- **Mandatory service programmes:** Some OECD countries integrate mandatory service into education. For example, Ontario, Canada, requires secondary students to complete 40 hours of community service, while Washington D.C. mandates 75 hours for graduation. National civic service programmes in Israel offer alternatives to compulsory military service. Such programmes have been shown to positively influence educational attainment and future earnings (Kim and Morgül, 2017[145]; Gagliardi, Pérez-Raynaud and Robinson, 2024[143]; Kol Zhekut, 2025[146]).
- **National youth volunteering and civic service programmes:** At least 16 OECD countries implement voluntary, national, government-led youth volunteering and civic service programmes to foster young people's civic participation and help them gain skills to enter the labour market. Most of these programmes offer training opportunities for young volunteers to promote civic engagement

as well as personal and professional skills. Some programmes provide young participants with skills certifications at the end of their volunteering placement (Gagliardi, Pérez-Raynaud and Robinson, 2024[143]).

- **Financial support:** Governments can fund volunteering directly or via organisations, thus helping to address the financial barriers reported by youth organisations (Gagliardi, Pérez-Raynaud and Robinson, 2024[143]; OECD, 2025[147]; 2020[148]). Assistance includes micro-grants, tax-breaks, stipends, language and skills training, and transport discounts.

Leveraging mass volunteering events

Governments can use large-scale events, such as Olympic Games or national disaster responses, to increase volunteering among adults. These events create widespread momentum and are often gateways to regular volunteering (Holmes et al., 2024[149]). Governments can sustain momentum by offering continuous training opportunities and support networks, ensuring volunteers develop relevant and transferrable skills (Benson et al., 2013[150]). The French government's role in the 2024 Paris Olympics exemplifies this by aligning volunteering roles with individual aspirations, promoting sustained involvement in local sports and community activities (Petit, 2024[151]). By supporting organisers and training delivered as part of volunteering, governments can ensure that training is tailored towards addressing skills shortages and labour market demands. Well-designed initiatives that are responsive to labour market needs are an avenue for adults to engage in meaningful upskilling opportunities that will enable them to gain skills in high demand; this may be particularly relevant for older adults, who have limited mobility in the job market (Lancee and Radl, 2012[152]).

Ensuring inclusive and accessible volunteering opportunities

Individuals with socio-economically backgrounds face significant barriers to volunteering, including limited access and exclusionary contexts. Governments can improve outcomes for these groups by ensuring accessible volunteering opportunities with inclusive designs and quality training (Southby, South and Bagnall, 2019[153]). Structural barriers and unnecessary eligibility criteria – such as education levels – often deter individuals who would otherwise benefit significantly. Simplified eligibility processes and clearly defined volunteering frameworks help engage marginalised groups, including migrants and refugees. For instance, the Civic Service for Youth in the Netherlands includes non-citizens through municipal databases. In France, the Civic Service assesses young applicants based on motivation, work ethic and interests, rather than specific skills or previous experiences (Gagliardi, Pérez-Raynaud and Robinson, 2024[143]). Furthermore, exploring alternative informal volunteering channels can bridge gaps for migrants typically excluded from formal opportunities (Wilson, 2012[144]). By integrating informal and formal volunteering systems, governments can widen participation, ensuring incentives and resources are accessible to all who contribute positively to their communities.

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Annex 3.A. Supplementary online results

Annex Table 3.A.1. Disparities by adults' educational attainment

Table 3.A.1.1.	Distribution of educational attainment, by gender
Table 3.A.1.2.	Distribution of educational attainment, by parental education
Table 3.A.1.3.	Distribution of educational attainment, by parental occupation
Table 3.A.1.4.	Distribution of educational attainment, by age
Table 3.A.1.5.	Distribution of educational attainment, by respondents' occupation
Table 3.A.1.6.	Distribution of educational attainment, by childhood residential context
Table 3.A.1.7.	Distribution of educational attainment, by immigrant background
Table 3.A.1.8.	Adults' educational attainment as a mediator of disparities in core 21st-century skills: Regression coefficients and standard errors
Table 3.A.1.9.	Skills returns to educational qualifications: Regression coefficients and standard errors of the interaction between educational attainment and socio-demographic characteristic

StatLink https://stat.link/pe8fyu

Annex Table 3.A.2. Disparities by adults' field of study

Table 3.A.2.1	Field of study, by educational attainment: Percentage of adults by field of study and highest educational attainment
Table 3.A.2.2	Field-of-study choices among upper and post-secondary (vocational orientation), by gender
Table 3.A.2.3	Field-of-study choices among short-cycle tertiary, by gender
Table 3.A.2.4	Field-of-study choices among bachelor's degree or equivalent and above, by gender
Table 3.A.2.5	Field-of-study choices among upper and post-secondary (vocational orientation), by parental education
Table 3.A.2.6	Field-of-study choices among short-cycle tertiary, by parental education
Table 3.A.2.7	Field-of-study choices among bachelor's degree or equivalent and above, by parental education
Table 3.A.2.8	Field of study as a mediator of disparities in core 21st-century skills: Regression coefficients before and after adjusting for adults' educational attainment and field of study

StatLink https://stat.link/jtsm63

Annex Table 3.A.3. Disparities by adults' participation in adult education and training

Table 3.A.3.1	Participation in non-formal adult education and training activities, by gender
Table 3.A.3.2	Participation in non-formal adult education and training activities, by parental education
Table 3.A.3.3	Participation in non-formal adult education and training activities, by parental occupation
Table 3.A.3.4	Participation in non-formal adult education and training activities, by immigrant background
Table 3.A.3.5	Participation in non-formal adult education and training activities, by age
Table 3.A.3.6	Participation in non-formal adult education and training activities, by childhood residential context
Table 3.A.3.7	Adult education and training as a mediator of disparities in core 21st-century skills: Regression coefficients before and after adjusting for adults' educational attainment and participation in adult education and training
Table 3.A.3.8	Main focus of non-formal adult education and training activities, by gender
Table 3.A.3.9	Main focus of non-formal adult education and training activities, by parental education
Table 3.A.3.10	Main focus of non-formal adult education and training activities, by parental occupation
Table 3.A.3.11	Main focus of non-formal adult education and training activities, by immigrant background
Table 3.A.3.12	Main focus of non-formal adult education and training activities, by age
Table 3.A.3.13	Main focus of non-formal adult education and training activities, by respondents' occupation
Table 3.A.3.14	Main focus of non-formal adult education and training activities, by childhood residential context
Table 3.A.3.15	Main focus of non-formal adult education and training activities, by respondents' education

Table 3.A.3.16	Job-related training, by gender
Table 3.A.3.17	Job-related training, by parental education
Table 3.A.3.18	Job-related training, by parental occupation
Table 3.A.3.19	Job-related training, by age
Table 3.A.3.20	Job-related training, by respondents' occupation
Table 3.A.3.21	Job-related training, by childhood residential context
Table 3.A.3.22	Job-related training, by immigrant background
Table 3.A.3.23	Job-related training, by respondents' education
Table 3.A.3.24	Motivation for participating in job-related non-formal training, by gender
Table 3.A.3.25	Motivation for participating in job-related non-formal training, by parental education
Table 3.A.3.26	Motivation for participating in job-related non-formal training, by parental occupation
Table 3.A.3.27	Motivation for participating in job-related non-formal training, by immigrant background
Table 3.A.3.28	Motivation for participating in job-related non-formal training, by age
Table 3.A.3.29	Motivation for participating in job-related non-formal training, by respondents' occupation
Table 3.A.3.30	Motivation for participating in job-related non-formal training, by childhood residential context
Table 3.A.3.31	Motivation for participating in job-related non-formal training, by respondents' education
Table 3.A.3.32	Satisfied and unmet demand of non-formal education and training, by gender
Table 3.A.3.33	Satisfied and unmet demand of non-formal education and training, by parental education
Table 3.A.3.34	Satisfied and unmet demand of non-formal education and training, by parental occupation
Table 3.A.3.35	Satisfied and unmet demand of non-formal education and training, by immigrant background
Table 3.A.3.36	Satisfied and unmet demand of non-formal education and training, by age
Table 3.A.3.37	Satisfied and unmet demand of non-formal education and training, by childhood residential context
Table 3.A.3.38	Reasons for non-participation in non-formal education and training, by gender
Table 3.A.3.39	Reasons for non-participation in non-formal education and training, by parental education
Table 3.A.3.40	Reasons for non-participation in non-formal education and training, by parental occupation
Table 3.A.3.41	Reasons for non-participation in non-formal education and training, by immigrant background
Table 3.A.3.42	Reasons for non-participation in non-formal education and training, by age
Table 3.A.3.43	Reasons for non-participation in non-formal education and training, by respondents' occupation
Table 3.A.3.44	Reasons for non-participation in non-formal education and training, by childhood residential context
Table 3.A.3.45	Reasons for non-participation in non-formal education and training, by respondents' education
Table 3.A.3.46	Participation in non-formal adult education and training activities, by country
Table 3.A.3.47	Main focus of non-formal adult education and training activities, by country
Table 3.A.3.48	Job-related training, by country
Table 3.A.3.49	Motivation for participating in job-related non-formal training, by country
Table 3.A.3.50	Satisfied and unmet demand of non-formal education and training, by country

StatLink https://stat.link/zhwuy8

Annex Table 3.A.4. Disparities by adults' engagement in informal learning

Table 3.A.4.1	Participation in informal learning (volunteering), by gender
Table 3.A.4.2	Participation in informal learning (volunteering), by parental education
Table 3.A.4.3	Participation in informal learning (volunteering), by parental occupation
Table 3.A.4.4	Participation in informal learning (volunteering), by childhood residential context
Table 3.A.4.5	Participation in informal learning (volunteering), by age
Table 3.A.4.6	Participation in informal learning (volunteering), by immigrant background
Table 3.A.4.7	Volunteering as a mediator of disparities in core 21st-century skills: Regression coefficients before and after adjusting for adults' educational attainment and volunteering activities
Table 3.A.4.8	Participation in informal learning (volunteering), by country

StatLink https://stat.link/n0jac2

Annex Table 3.A.5. Achievement growth

Table 3.A.5.1	Disparities in mathematics/numeracy scores by age, parental education and gender
Table 3.A.5.2	Disparities in reading/literacy scores by age, parental education and gender

StatLink https://stat.link/279q1w

Annex Table 3.A.6. Skills returns to educational qualifications

Table 3.A.6.1	Skills returns to educational qualifications: Disparities for childhood residential context and immigrant background within educational levels

StatLink https://stat.link/8kyvqc

Notes

[1] A synthetic cohort is a group that analysts create by combining data from different people who are at similar stages of life, rather than following the same people over time as would typically be done in longitudinal cohort studies.

[2] STEM fields comprise information and communication technologies; natural sciences, mathematics and statistics; engineering and manufacturing; or construction.

[3] The 2023 Survey of Adult Skills defines adult education and training activities as organised learning activities, namely training activities such as courses, webinars, workshops, lectures or private lessons. These activities can be job-related or for personal interest. Examples of training activities include foreign language course, computer or software course, job-related training, hobby course (e.g. drawing, swimming, guitar or lecture on a specific topic), communication training (e.g. workshop on public speaking), or health and safety training (e.g. first aid course).

4 From skills to labour market opportunities

This chapter examines how disparities in 21st-century skills contribute to disparities in labour market outcomes in OECD countries. Using data from the 2023 Survey of Adult Skills, it analyses the extent to which disparities in employment, earnings and job satisfaction between men and women, adults with different socio-economic and immigrant backgrounds, and those who grew up in cities and rural areas reflect differences in skills and educational attainment. The chapter further considers how occupational and sectoral segregation in the labour market explains disparities in outcomes. For example, workers from socio-economically disadvantaged backgrounds are less likely to work in roles with large growth prospects in the coming decade and that are experiencing rapid changes in skills demands. Finally, this chapter quantifies the transmission of educational and occupational advantage and the role of skills in promoting upward educational and occupational mobility.

In Brief

Disparities in employment and earnings linked to individuals' socio-demographic profile are widespread across OECD countries. They largely reflect disparities in lifelong learning opportunities, as well as the skills individuals gain over time and the type of jobs they are employed in. Key findings include:

Socio-economic disparities:

- **Socio-economic disparities in employment prospects are largely explained by disparities across groups in educational attainment and skills.** Adults from tertiary-educated families are 2.7 percentage points more likely to be employed than those whose parents did not complete tertiary education, despite having similar socio-demographic characteristics. Similarly, adults with parents who worked in high-status occupations, such as managerial or professional occupations, are 3.4 percentage points more likely to be employed than those whose parents worked in low-status occupations with similar socio-demographics. These differences are largely explained by differences between the groups in individuals' own educational attainment, skills and engagement in lifelong learning.
- **Close to three-quarters of socio-economic disparities in wages can be explained by disparities across groups in learning trajectories and core 21st-century skills.** Adults from tertiary-educated families or with parents who worked in high-status occupations earn 11-13% more per hour than similar individuals without tertiary-educated parents or whose parents worked in low-status occupations. When controlling for individuals' learning trajectories, skills, engagement in lifelong learning, these differences are reduced to 4% for parental occupation and disappear for parental education.
- **Over a third of working-age people have experienced absolute upward educational and occupational mobility compared to the previous generation, and among today's young people, expectations of upward educational and occupational mobility remain high.** However, whereas only 12% of working age adults have a lower level of education than their parents, as many as 36% work in an occupation with a lower social status than the occupation of their parents. Among 15-year-old students, only 20% expect to achieve a lower level of educational attainment than their parents and 32% expect to work in a lower-status occupation.
- **Adults with socio-economically advantaged backgrounds are more likely to work in jobs that are experiencing rapid skills changes and growing demand, and that are commanding high relative wages**, whereas adults with socio-economically disadvantaged backgrounds are more likely to work in jobs that are experiencing low levels of skills changes and declining demand, and commanding low relative wages.

Gender disparities:

- **Gender disparities in employment are large and remain wide even when comparing men and women who have similar educational qualifications and skills levels.** When comparing men and women with similar socio-demographic characteristics, men's employment rate exceeds women's by 7.9 percentage points. This gap remains relatively similar when comparing men and women with similar educational qualifications, skills and engagement in lifelong learning.

- **Disparities in educational qualifications and skills do not explain gender disparities in wages.** The gender gap in wages is 14% when men and women with similar socio-demographic characteristics and personal circumstances are compared. This gap is 16% when further accounting for differences in learning trajectories, skills and engagement in lifelong learning.
- **Occupations and industries with a prevalence of male workers tend to command higher wages than occupations with a prevalence of female workers**, even when occupations with similar skills requirements are compared. Women tend to work in human-centric expansion roles and routine retreat roles, whereas men are more likely to work in transformative growth roles and disrupted declining roles, as well as routine retreat roles.

Residential context:

- **Employment disparities between adults who grew up in different environments during childhood are small; however, adults who grew up in cities earn significantly more than those who grew up in villages.** This difference reflects, to a large extent, differences between the two groups in educational attainment and information-processing skills. Adults who grew up in cities have an employment rate that is 0.89 percentage points lower than those with similar socio-demographic characteristics, skills and engagement in lifelong learning who were raised in villages. Those who grew up in cities earn 7% more per hour than those from villages, when comparing adults with similar socio-demographic characteristics. This earnings gap decreases to 3% after accounting for differences in educational qualifications and core 21st-century skills.

Immigrant background:

- **Employment disparities between adults without an immigrant background and the children of immigrants are small and almost entirely explained by differences in educational attainment and skills between the two groups.** Children of immigrants – defined as those born in the country of residence to at least one foreign born parent or those who migrated before the age of 18 – have a 2.2 percentage point lower employment rate than their non-immigrant counterparts with similar socio-demographic characteristics. Accounting for differences in additional educational attainment and information-processing skills results in a difference that is not statistically significant. These differences vary greatly across countries, which is a reflection of differences in characteristics of the children of immigrants in different contexts that cannot be fully accounted for, as well as differences in policies and practices in host countries.

4.1. Introduction

In the knowledge-driven economies of the 21st century, the role of individual skills in determining labour market outcomes has become increasingly critical. As globalisation, technological change, demographic shifts and the green transition reshape the nature of work, understanding how information-processing and socio-emotional skills influence individuals' labour market trajectories is essential for ensuring individual well-being and promoting economic growth at the economy level (Heckman and Kautz, 2012[1]; OECD, 2019[2]). Research consistently indicates that information-processing skills are significantly related to higher labour market earnings, success in the job market, societal participation and overall economic growth. Estimated returns tend to be largest for numeracy and literacy skills and smaller for problem-solving skills, although the relative importance of different skills dimensions varies across countries (OECD, 2024[3]). As a result, the disparities in 21st-century skills identified in Chapters 2 and 3 could limit

opportunities for labour market integration among many socio-demographic groups, potentially increasing skills shortages and limiting opportunities for social mobility.

This chapter considers how skills and education relate to employment outcomes, and if the disparities in skills and education described in Chapter 3 contribute to disparities in employment status, earnings and job satisfaction, as well as the allocation of workers in occupations and industries with different labour market prospects and skills requirements. Specifically, it examines how these disparities interact with individual socio-demographic characteristics such as gender, parental education and occupation, immigrant background, and childhood residential context.

Research has long documented that socio-demographic characteristics such as gender, parental background and educational attainment are significant predictors of occupational trajectories (Blanden, Gregg and Machin, 2005[4]). However, recent work, made possible by the availability of direct measures of skills, has enabled analyses of the determinants of employment outcomes to incorporate the role played by skills. Literacy and numeracy, the information-processing skills measured in the first cycle of the Survey of Adult Skills, have been shown to be critical predictors of employability and wage levels (Hanushek et al., 2015[5]; OECD, 2016[6]). The Survey of Adult Skills further reveals that higher proficiency in these domains is consistently associated with greater labour force participation and higher wages across countries (OECD, 2024[3]; 2019[2]). Moreover, the ability to solve problems in technology-rich environments has gained prominence as workplaces demand more flexible, innovative thinking (Autor, 2015[7]).

Social and emotional skills, which in this report refer to the Big Five personality traits of extraversion, emotional stability, agreeableness, conscientiousness and open-mindedness, are also increasingly considered as critical determinants of labour market success. In particular, conscientiousness, emotional stability and agreeableness have been linked to higher employment probabilities and earnings (Almlund et al., 2011[8]; Heckman, Stixrud and Urzua, 2006[9]). These skills are also associated with job performance, co-operation and resilience, all of which are valued in work environments (Soto, 2019[10]). Similarly, delayed gratification, an indicator of self-regulation, has been shown to predict long-term economic outcomes (Duckworth and Seligman, 2005[11]; Mischel, Shoda and Rodriguez, 1989[12]), suggesting that time preferences and impulse control may partly mediate how initial disparities translate into disparities in long-term outcomes.

These skills are not randomly distributed across the population. For example, children with socio-economically advantaged backgrounds (i.e. those with tertiary-educated parents or parents in high-status occupations) tend to score higher on both information-processing skills (such as literacy and numeracy) and social and emotional skills, reflecting differences in early life experiences, parental investments and educational opportunities (Heckman and Mosso, 2014[13]). However, individuals with an immigrant background and those raised in rural or with socio-economically disadvantaged backgrounds face systemic barriers that may limit skills development and labour market access (Dustmann and Glitz, 2011[14]; Oded, 2011[15]). As such, skills disparities can perpetuate intergenerational inequalities and reinforce structural divides within society.

This chapter builds on and complements a growing body of OECD analysis on the drivers of disparities in labour market outcomes. It extends insights on employment and earnings differences by parental education, which highlights how family background continues to shape wages across countries, by broadening the lens to consider a wider set of socio-demographic characteristics (Causa, Forthcoming[16]). It also connects with analyses documenting the role of unequal opportunities in perpetuating income inequality (OECD, 2025[17]) and of socio-economic and gender disparities in young people's aspirations (OECD, 2025[18]). In addition, it complements the OECD's recent stocktaking on gender gaps in education, employment, leadership, health and pay across OECD and European Union (EU) countries (OECD, 2025[19]). Finally, It draws on recent OECD work on job creation and local economic development, which highlights how place-based policies and local labour market dynamics can amplify or mitigate social and demographic disparities in labour market outcomes (OECD, 2023[20]; OECD, 2024[21]).

4.2. Disparities in employment across socio-demographic groups

Educational qualifications and information-processing skills are highly predictive of employment status. Employment is highest among those with at least a bachelor's degree, who have around a 18 percentage point higher employment rate than similar adults without an upper secondary qualification (Table 4.1, Model 2). Short-cycle tertiary graduates and upper secondary graduates also have higher employment rates than adults without an upper secondary qualification. Controlling for adults' education and 21st-century skills at the same time isolates each factor's relationship with labour market outcomes while holding the other factor constant. Results are similar when controls for social and emotional skills are introduced (Table 4.1, Model 3).

Differences in adults' educational attainment and skills explain a large proportion of the differences in employment rates observed based on age, socio-economic background (parental education and parental education), and whether people grew up in cities or villages. After accounting for other socio-demographic characteristics, the gap between those with tertiary-educated and non-tertiary educated parents is 2.7 percentage points, and 3.4 percentage points between those with high-status and low-status parents (Table 4.1, Model 1). However, there is no significant gap when differences between the two groups in adults' educational attainment and both information-processing and social and emotional skills are considered (Table 4.1, Model 3), or whether other differences in individual-level characteristics (Table 4.1, Model 4) and possible non-linearities in skills are considered (Table 4.1, Model 5). Parental education, parental occupation and childhood residential context are positively associated, because tertiary-educated parents tend to work in higher-status occupations and live in urban areas. Therefore, disparities linked to socio-economic background often compound and accumulate.

There are between-country differences in disparities related to the likelihood of employment across socio-demographic groups, and in the role that adults' educational attainment, information-processing skills and social and emotional skills play in shaping such disparities. Figure 4.1 indicates that **the variation in between-country differences in employment related to socio-economic background is smaller than the variation related to age, immigrant background and gender.** In Italy, disparities by parental education are as high as 14 percentage points, reflecting that adults with tertiary-educated parents are more likely to be employed (Figure 4.1, basic adjusted model). After accounting for adults' educational attainment and skills, this difference reduces to 5 percentage points. In contrast, in Chile, employment differences increase from 3 to 5 percentage points – favouring those adults whose parents do not have tertiary education (Figure 4.1, basic and fully adjusted model).

Differences in the likelihood of employment between men and women are similar irrespective of whether differences between men and women in educational attainment and information-processing skills are considered or not, being 7.9 percentage points in both model estimates (Table 4.1, Models 1 and 2). The large difference in employment between men and women who hold similar educational qualifications and who have similar levels of skills proficiency could reflect differences in how men and women engage with and benefit from formal education, or how societal norms and gender roles shape their employment prospects (e.g. women often exit the labour market to care for young children or elderly relatives). When the broad set of social and emotional skills is added, the gender gap in employment remains relatively unaffected at 7.1 percentage points (Table 4.1, Model 3).

Table 4.1. Disparities in the likelihood of employment, by socio-demographic characteristic

Change in likelihood of being employed in percentage points, OECD average

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Gender - Men (ref.: women)	**7.91**	**7.88**	**7.13**	**7.40**	**7.62**
Age - 50-65 (ref.: 30-49)	**-4.50**	**-2.14**	**-2.13**	**-3.51**	**-3.44**
Parental education - Tertiary (ref.: non-tertiary)	**2.72**	**-0.79**	-0.62	-0.37	-0.22
Parental occupation - High-status (ref.: low-status)	**3.41**	-0.19	-0.27	-0.42	-0.31
Immigrant background (ref.: non-immigrants)*					
Immigrants	**-4.31**	-0.58	-0.21	-0.38	-0.24
Children of immigrants	**-2.21**	-0.96	-1.03	-0.95	-0.84
Childhood residential context (ref.: village)					
Town	-0.37	**-1.22**	**-1.12**	**-1.11**	**-1.14**
City	-0.08	**-1.02**	**-0.89**	**-0.87**	**-0.87**
Respondents' educational attainment (ref.: below upper secondary)					
Upper and post-secondary vocational		**13.38**	**12.24**	**11.69**	**10.74**
Upper and post-secondary general		**10.72**	**9.89**	**9.65**	**8.93**
Short-cycle tertiary		**16.24**	**14.46**	**13.93**	**13.16**
Bachelor's degree or equivalent and above		**17.59**	**15.71**	**15.11**	**14.47**
Volunteering		**2.31**	**1.35**	**0.95**	**0.99**
Skills					
Literacy		**1.08**	**1.42**	**1.27**	**1.27**
Numeracy		**3.50**	**2.68**	**2.45**	**2.08**
Adaptive problem solving		**1.07**	**1.32**	**1.36**	**1.56**
Delayed gratification			0.26	0.18	-0.07
Extraversion			**2.57**	**2.27**	**2.30**
Emotional stability			**2.70**	**2.26**	**1.91**
Agreeableness			-0.12	-0.26	-0.16
Conscientiousness			**1.50**	**1.31**	**1.22**
Open-mindedness			**-0.73**	**-0.68**	**-0.67**
Skills (squared)					
Literacy					0.08
Numeracy					**-1.05**
Adaptive problem solving					0.09
Delayed gratification					**-0.53**
Extraversion					**-0.76**
Emotional stability					**-1.31**
Agreeableness					0.01
Conscientiousness					**-0.66**
Open-mindedness					-0.21
Additional individual-level characteristics	NO	NO	NO	YES	YES

Note: Adults aged 30-65, excludes students and retired individuals. The figure reports coefficient estimates from a linear model for the probability of being employed. Coefficients in bold are statistically significant at the 5% level. Additional individual-level characteristics include: number of children, health, employment status of partner, and current residential context (urban-rural). Estimates in models (3), (4) and (5) exclude Japan and the United States because no information on social and emotional skills was collected in these countries. These countries are also excluded from the OECD average in all models presented in this table for comparability but country specific estimates for these countries are provided alongside those of other countries in Table 4.A.1.1 in Annex 4.A. Respondents' educational attainment is based on the International Standard Classification of Education (ISCED) 2011, grouped into below upper secondary (ISCED 0, 1, 2), upper secondary and post-secondary general (gen. ISCED 3 short, gen. ISCED 3 access 3, gen. ISCED 3 access 3/4, gen. ISCED 3 access 5/6/7), upper secondary and post-secondary vocational (voc. ISCED 3 short, voc. ISCED 3 access 3, voc. ISCED 3 access 3/4, voc. ISCED 3 access 5/6/7), short-cycle tertiary education (ISCED 5 nfs [not further specified], gen ISCED 5, voc. ISCED 5), and bachelor's or equivalent or above (ISCED 6, 7, 8). Parental education (at respondents' age 14) is based on the International Standard Classification of Education (ISCED) 2011 and distinguishes between adults with at least one tertiary-educated parent (ISCED 2011 5, 6, 7 and 8) and those with no tertiary-educated parent. Parental occupation (at respondents' age 14) is based on the International Classification of Occupations (ISCO) and grouped into high-status: managers, professionals, and

technicians and associate professionals (ISCO 1-3); and low-status: clerical support workers; service and sales workers; skilled agricultural, forestry and fishery workers; craft and related trades workers; plant and machine operators, and assemblers; and elementary occupations (ISCO 4-9). Childhood residential context (at respondents' age 14) refers to whether the respondent grew up in villages, towns or cities. Groups by immigrant background distinguish between children of immigrants, immigrants and non-immigrants. Children of immigrants were born in the country in which they currently reside, but their parents were not, or they were born in a different country and moved to their current country of residence before the age of 18. Immigrants are defined as those who migrated to their current country of residence at age 18 or older. Non-immigrants were born in their current country of residence, as were their parents.

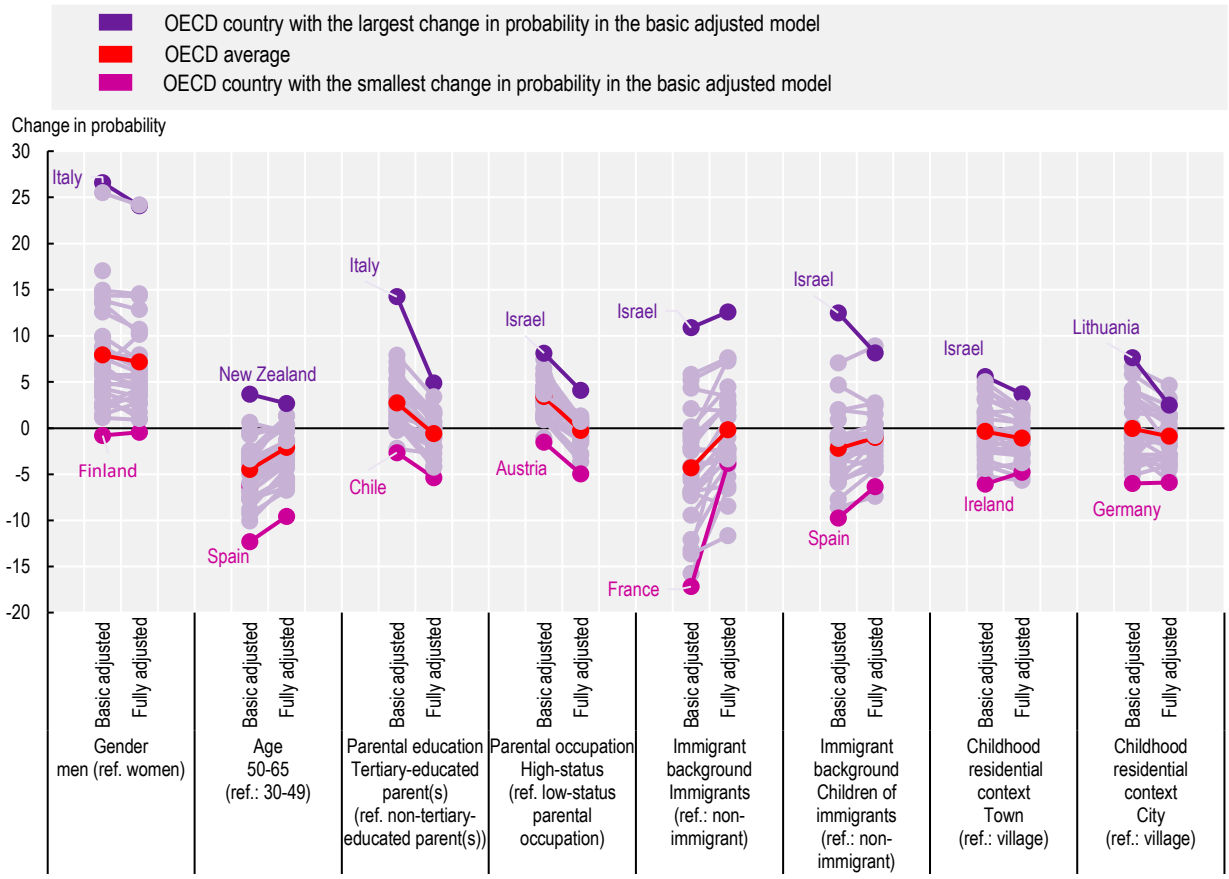
*Differences by immigrant background vary greatly across countries because of differences in the size of immigrant groups as well as composition and context. Readers are therefore encouraged to consult country-specific results in Table 4.A.1.1 in Annex 4.A.

Source: Calculations based on OECD (2024[22]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

StatLink https://stat.link/pj1w95

Figure 4.1. Disparities in the likelihood of employment, by socio-demographic characteristic and country

Change in probability of being employed by socio-demographic group: basic and fully adjusted country-specific regression coefficients



Note: Adults aged 30-65, excludes students and retired individuals. The figure reports coefficients for the following socio-demographic groups – gender, age, parental education, parental occupation, immigrant background and childhood residential context – based on separate country estimates. Coefficients from the basic adjusted model follow the specification of Model 2 in Table 4.1, while those from the fully adjusted model follow the specification of Model 5 in Table 4.1. The fully adjusted model additionally accounts for variables that may not be available for all countries, which is why for some countries, only estimates in the basic adjusted model are available. See the note for Table 4.1 for the definitions of groups based on parental occupation, parental education, immigrant background and childhood residential context. Country-specific results including standard errors are provided in Table 4.A.1.1 in Annex 4.A. For immigrant background, the figure only indicates a country if at least 200 adults for each group are part of the final PIAAC sample. Country-specific results are provided in Table 4.A.1.1 in Annex 4.A.

Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/avxr3i

Average results mask large between-country differences in the size of the gender gap in employment. For example, in Italy, the gender gap in employment is 27 percentage points, whereas in Finland the gender gap (0.8 percentage points, favouring women) is insignificant (Figure 4.1, basic adjusted model). However, country-specific gender gaps evolve differently after accounting for differences in educational attainment and skills. For example, in the Czech Republic (hereafter 'Czechia'), the gender gap decreases from 14 to 11 percentage points (Annex Table 4.A.1). By contrast, in Israel, the gender gap in employment rises from 7 to 10 percentage points when men and women with similar educational attainment and skills are compared.

Adults without an immigrant background are more likely to be employed than immigrants and the children of immigrants, although differences between groups disappear once individuals with similar educational attainment and skills are compared. The employment rate of adults without an immigrant background is 4.3 percentage points higher than that of immigrants and 2.2 percentage points higher than that of the children of immigrants (Table 4.1, Model 1). These differences reflect variations in educational attainment and information-processing skills across groups: there are no differences in the likelihood of employment between these groups when adults with similar educational attainment and information-processing skills are compared (Table 4.1, Models 2 to 5). This suggests that disparities in education and information-processing skills development opportunities are the primary reason for the lower likelihood of employment among immigrants and the children of immigrants compared to adults without an immigrant background (Table 4.1, Model 2).

Estimates suggest that there are no employment differences between adults raised in villages rather than towns or cities after taking into account other socio-demographic characteristics (Table 4.1, Model 1). In fact, when comparing individuals with a similar level of educational attainment and skills, those raised in villages have a marginally higher likelihood of being employed than those raised in cities or towns, with a difference of approximately 1 percentage point (Table 4.1, Model 3).

It is important to recognise non-linearities related to the impact of 21st-century skills when analysing the data. The empirical analyses described so far rely on the assumption of linearity: each additional standard deviation (SD) increase in 21st-century skills is assumed to raise the probability of employment by a constant amount. Relaxing these assumptions reveals diminishing marginal returns to numeracy and broadly linear returns to literacy and adaptive problem solving (Table 4.1, Model 5). The marginal effect of increases in numeracy skills falls to approximately zero once an individual is about half a SD above the population mean, after which further improvements no longer increase employment probabilities. In other words, stronger numeracy skills are associated with improved employment prospects only up to a point, beyond which further improvements do not make it easier to find work. By contrast, better literacy and the ability to problem solve keep paying off at a steady rate: the better these skills, the better the employment prospects. The association between extraversion, conscientiousness and emotional stability and the likelihood of employment is also non-linear.

Recognising non-linearities has two key implications: first, it strengthens the efficiency case for targeted skill investments, and second, it cautions against extrapolating average marginal effects to the entire population when designing policy or projecting labour market impacts. Programmes that support adults as they improve their skills from low to intermediate levels of proficiency generate larger employment dividends than those that strengthen the skills of workers who already have strong numeracy skills. If policy makers fail to account for diminishing returns, there is a risk of overstating the benefits of incremental upskilling among high-skilled groups and understating the employment payoff of basic skills remediation for adults with low levels of numeracy proficiency.

4.3. Disparities in earnings across socio-demographic groups

Educational attainment and information-processing skills are positively associated with workers' productivity, and various studies have confirmed the independent effects of information-processing skills and educational qualifications on wages (Araki, 2020[24]; OECD, 2024[3]; Hanushek et al., 2015[5]). Further evidence from the 2023 Survey of Adult Skills suggests that the effect of years of education on earnings is greater than the effect of information-processing skills (OECD, 2024[23]). This is possibly because the number of years spent in education captures a wider range of skill acquisition processes, including social and emotional skills, and may hold a signalling value for employers. Results presented in Table 4.2 allow for the identification of between-group differences in hourly wages and the extent to which such differences reflect differences between socio-demographic groups in educational attainment, 21st-century skills, and the distribution of individuals across different occupations and sectors.

The analysis presented complements Causa (Forthcoming[16]), which examines wage disparities by parental education in greater detail – explicitly accounting for differences in employment probabilities and recognising that selection into employment itself is influenced by background characteristics. By contrast, the estimates in this report reflect differences in earnings among those who are employed, offering a descriptive overview of disparities without correcting for differential labour-market participation. The two approaches are thus complementary: Causa (Forthcoming[16]) focuses on intergenerational differences in wages by parental education, whereas this report provides a broader mapping of disparities across a range of socio-demographic groups and considers whether these may stem from unequal access to lifelong learning opportunities. Taken together, the two perspectives enrich the understanding for policy makers of how family background shapes labour-market outcomes, both through access to employment and through differences in the returns to education and skills once in work.

On average across OECD countries, men earn around 14% more per hour than women (Table 4.2, Model 1). The gender gap increases to 17% after additionally accounting for differences in learning trajectories and information-processing skills (Table 4.2, Model 2). However it is 16% when also accounting for social and emotional skills (Table 4.2, Model 3) and 14% when field-of-study is additionally controlled for (Annex Table 4.A.1). Accounting for social and emotional skills and individual level characteristics, such as health, presence of children and current residential context does not change estimates (Table 4.2, Model 4), whereas differences in earnings between men and women are 13% once controls for adults' occupation and industry, experience, whether individuals work full or part-time are taken into account (Table 4.2, Model 5).

Differences in earnings between men and women vary considerably across countries. For example, they are highest in Japan, where men earn 39% more than women, and are smallest in the Flemish Region (Belgium), where the gender gap in earnings corresponds to 6% (Figure 4.2, basic adjusted model). The extent to which these gaps change after accounting for men's and women's educational trajectories, skills and participation in lifelong learning also varies across countries. For example, in Israel, the gender gap is considerably more pronounced, increasing from 18% to 26% when considering these additional factors, while in Norway, the gender gap remains constant at 11% (Annex Table 4.A.1). In Czechia, a large share of gender differences are explained by these factors, with the gender gap reducing from 21% to 17% once taking into account these additional factors (Annex Table 4.A.1).

Between-country differences suggest that even though the gender wage gap is a global phenomenon, and factors driving the gender wage gap are similar across countries, the importance of certain factors differ across countries. Therefore, certain policy responses may be more effective at translating into reductions in the gender wage gap in some countries than in others, suggesting the continued need for country- and context-specific policy responses.

Individuals with socio-economically advantaged backgrounds earn between 11-13% more per hour than individuals with socio-economically disadvantaged backgrounds, a difference that is slightly smaller compared to the disparity observed between men and women (Table 4.2, Model 1). Contrary to the gender pay gap, 70% of the difference between adults with high-status and low-status parents can be explained by additionally accounting for differences between the two groups in educational trajectories, skills and engagement in lifelong learning, reducing the earnings gap from 13% to 4% (Table 4.2, Model 3). In the case of parental education, the entire difference can be explained by the additional accounted differences between the two groups (Table 4.2, Model 3).

Socio-economic disparities in wages vary across countries. The wage difference between individuals with and without tertiary-educated parents is highest in Israel – where adults without tertiary-educated parents earn 21% less than their more advantaged counterparts – and smallest in France where it is 2% (Figure 4.2, basic adjusted model). However, in the fully adjusted model (after accounting for differences in educational trajectories, skills and participation in lifelong learning) differences in Israel are 7% and in France, adults with non-tertiary educated parents earn 5% more than those with tertiary educated parents.

Table 4.2. Disparities in hourly earnings, by socio-demographic characteristic

Percentage difference in hourly earnings in purchasing power parity (PPP)-adjusted 2022 USD, OECD average

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Gender - Men (ref.: women)	**14.48**	**16.73**	**16.05**	**16.28**	**12.79**	**12.73**
Age - 50-65 (ref.: 30-49)	**-2.87**	**3.16**	**3.19**	**2.68**	-1.10	-1.05
Parental education - Tertiary (ref.: non-tertiary)	**10.55**	0.54	0.63	0.93	**1.46**	1.33
Parental occupation - High-status (ref.: low-status)	**13.37**	**4.25**	**4.37**	**4.25**	**2.67**	**2.68**
Childhood residential context (ref.: village)						
Town	**3.46**	0.34	0.39	-0.12	-0.66	-0.56
City	**7.07**	**3.40**	**3.40**	**2.52**	0.79	0.89
Immigrant background (ref.: non-immigrants)*						
Immigrants	**-14.10**	**-8.22**	**-7.87**	**-8.36**	**-4.03**	**-4.05**
Children of immigrants	-0.46	0.99	1.31	1.49	**2.07**	**2.18**
Respondents' educational attainment (ref.: below upper secondary)						
Upper and post-secondary vocational		**7.21**	**6.46**	**6.29**	**2.50**	**2.87**
Upper and post-secondary general		**7.89**	**7.26**	**7.32**	**3.52**	**3.84**
Short-cycle tertiary		**17.57**	**16.69**	**16.40**	**7.89**	**8.28**
Bachelor's degree or equivalent and above		**35.05**	**33.88**	**33.42**	**18.57**	**18.75**
Participation in adult education and training		**11.24**	**10.79**	**10.72**	**5.75**	**5.71**
Volunteering		0.80	0.15	-0.24	-0.04	-0.13
Skills						
Literacy		1.64	**2.35**	**2.34**	1.49	**1.94**
Numeracy		**9.18**	**8.35**	**7.99**	**5.38**	**4.91**
Adaptive problem solving		-0.90	-0.64	-0.59	-0.83	-0.61
Delayed gratification			**1.14**	**0.97**	**0.84**	0.52
Extraversion			**2.55**	**2.08**	**2.02**	**2.10**
Emotional stability			**2.74**	**2.38**	**1.62**	**1.73**
Agreeableness			**-0.83**	**-1.07**	**-0.69**	**-0.75**
Conscientiousness			**2.02**	**1.81**	**0.85**	**0.96**
Open-mindedness			**-1.62**	**-1.45**	**-1.19**	**-1.21**
Skills (squared)						
Literacy						-0.21
Numeracy						**1.26**
Adaptive problem solving						-0.18
Delayed gratification						**-0.38**

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Extraversion						0.19
Emotional stability						0.15
Agreeableness						-0.23
Conscientiousness						-0.11
Open-mindedness						**-0.51**
Additional individual-level characteristics	NO	NO	NO	YES	YES	YES
Job and firm-related characteristics	NO	NO	NO	NO	YES	YES
Occupation and industry-related characteristics	NO	NO	NO	NO	YES	YES

Note: Adults aged 30-65. The table reports coefficient estimates from a linear regression with log earnings as dependent variable. Earnings below the 1st percentile and above the 99th percentile are excluded to remove outliers. Earnings include bonuses and earnings by self-employed individuals. Coefficients in bold are statistically significant at the 5% level. Additional individual-level characteristics: of children, health, employment status of partner, and current residential context. Job and firm-related characteristics include: experience, firm size, part-time, public sector. Estimates in models (4) and (5) exclude Japan and the United States, these countries are excluded from the OECD average in all models presented in this table. Korea is not included in this table. See the note for Table 4.1 for the definitions of groups based on parental occupation, parental education, immigrant background, childhood residential context and respondents' educational attainment.
Country-specific results are provided in Table 4.A.1.2 in Annex 4.A.
*Differences by immigrant background vary greatly across countries because of differences in the size of immigrant groups as well as composition and context. Readers are therefore encouraged to consult country-specific results in Table 4.A.1.2 in Annex 4.A.
Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/1famzj

Differences in earnings between individuals with and without an immigrant background are large. Immigrants – those who migrated to their country of residence at age 18 or older – earn, on average, 14% less than individuals without an immigrant background (Table 4.2, Model 1), after accounting for socio-demographic characteristics including parental education and occupation, gender, age and childhood residential context. This earnings disparity decreases to around 8% when accounting for differences between the two groups in educational trajectories, skills and engagement in lifelong learning (Table 4.2, Model 3). When differences in occupation and industry factors are also considered, the gap further narrows to 4% (Table 4.2, Model 5).

Children of immigrants – those who were either born in the country in which they reside, but their parents were not, or who moved to the country of residence before the age of 18 – do not suffer a wage penalty compared to individuals without an immigrant background, on average, after accounting for other socio-demographic characteristics, educational attainment, skills, and additional individual-level characteristics (Table 4.2, Models 1-4). However, accounting for job and firm-level and occupation and industry-related characteristics, children of immigrants, on average, enjoy a wage premium of 2% compared to individuals without an immigrant background (Table 4.2, Models 5). However, there are large differences across countries, which reflect the variations in country of birth and socio-demographic characteristics of different immigrant communities, as well as differences in integration trajectories and labour market opportunities for individuals with different linguistic and cultural backgrounds (Annex Table 4.A.1).

Individuals who grew up in cities earn 7% more than individuals who grew up in villages, on average across countries, even when accounting for other socio-demographic characteristics (Table 4.2, Model 1). However, this gap also reflects differences between the two groups in educational trajectories, skills, engagement in lifelong learning and occupational stratification, as individuals who grew up in villages and cities have a similar wage after accounting for such factors (Table 4.2, Models 5 to 6).

These disparities also vary across countries. For example, in the United States, wage disparities between individuals who grew up in cities and those who grew up in villages are smallest (-4%) – favouring those who grew up in villages. Disparities are widest in Chile (23%) – favouring those who grew up in cities (Figure 4.2, basic adjusted model). However, such variations reflect differences between the two groups in educational trajectories, skills and engagement in lifelong learning. After accounting for these factors,

the wage gap in Chile reduces from 23% – in favour of those who grew up in cities – to 3% in favour of those who grew up in villages (Figure 4.2, fully adjusted model).

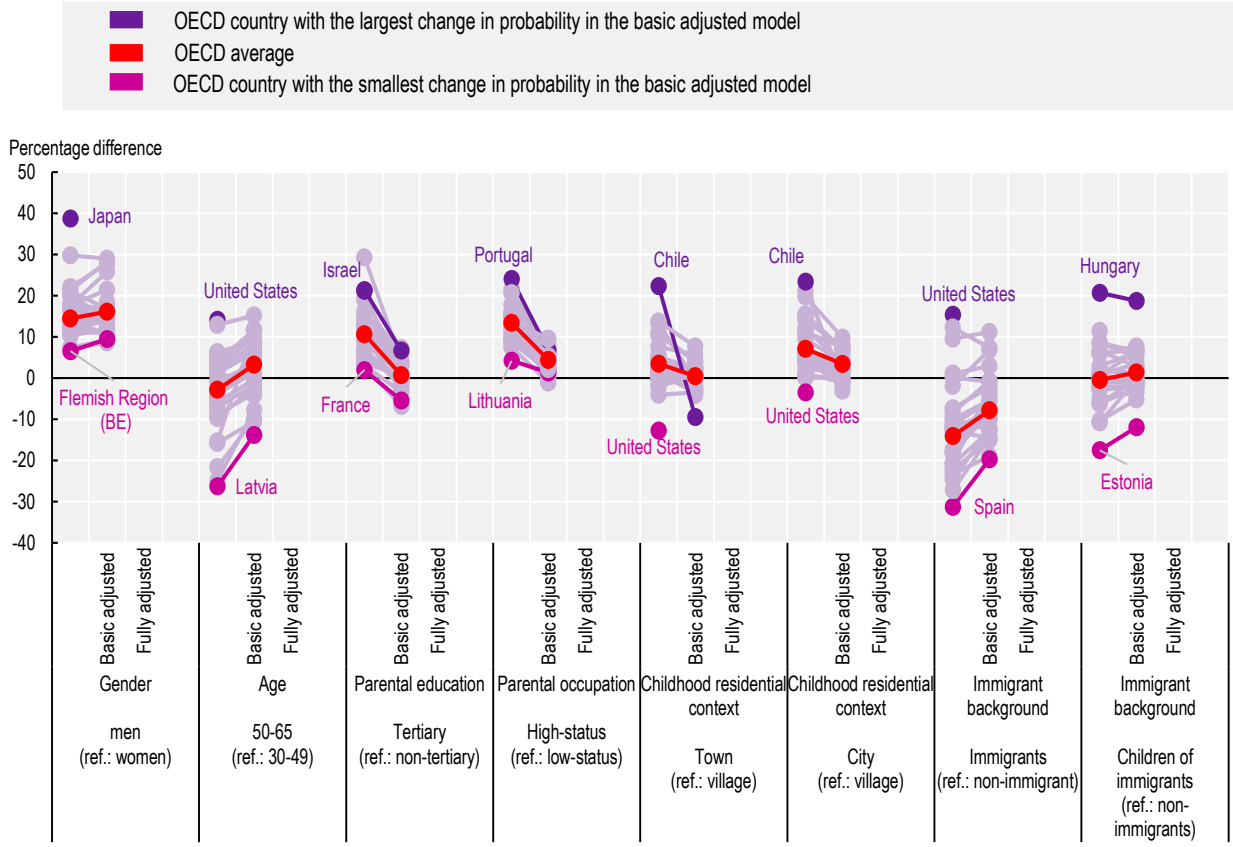
Disparities in educational attainment shape earnings disparities between different groups. As explored in detail in Chapter 3, there are large differences across socio-demographic groups in educational trajectories, particularly in relation to socio-economic background; these trajectories, in turn, shape skills development. As Table 4.2 shows, adults with an upper secondary or a post-secondary qualification (regardless of a vocational or a general orientation) earn around 7-8% more than those without such a qualification (Table 4.2, Model 2). Adults with short-cycle tertiary qualifications earn 18% more, while those with a bachelor's degree or higher earn 35% more. Most of these wage differentials reflect occupational differences, as jobs typically requiring tertiary qualifications – such as professional and associate professional occupations – tend to offer higher than average wages. For example, the earnings premium associated with having a bachelor's degree or higher, compared to not having an upper secondary qualification, decreases from 35% to 19% when accounting for differences in wages across occupations and industries (Table 4.2, Model 5). Although it is impossible with cross-sectional data to partition the relative contribution of educational attainment and skills, Table 4.2 suggests that numeracy skills in particular are valued in addition to and beyond educational qualifications. Specifically, a one SD increase in numeracy is associated with a 5%[1] increase in wages, when comparing individuals with similar socio-demographic characteristics, educational attainment, engagement in lifelong learning and working in similar occupations and industries (Table 4.2, Model 5).

Wage premiums differ by industry, occupation and across countries. For example, individuals employed in industries such as information and communications, financial and insurance activities, and those working in real estate can expect to earn around 19% more than similar individuals working in administrative and support service activities (Annex Table 4.A.1). By contrast, adults working in education can expect to earn around 5% less than otherwise similar individuals.

Workers with strong numeracy skills reap disproportionately large gains from further upskilling, with wage returns to numeracy especially high among those with the highest numeracy skills. Although the association between employment and certain 21st-century skills is non-linear, the results presented in Model 6 of Table 4.2 suggest that the wage returns to literacy and adaptive problem solving are broadly linear. These findings underline the need for policies that expand access to lifelong learning and training opportunities, particularly for individuals with low levels of proficiency in numeracy, ensuring that financial constraints, time limitations and employment insecurity do not hinder participation. Strengthening adult learning systems and targeted upskilling programmes can help make skill development more inclusive and support wage progression across the workforce.

Figure 4.2. Disparities in hourly earnings, by socio-demographic characteristic and country

Percentage difference in hourly earnings in PPP-adjusted 2022 USD by socio-demographic group basic and fully adjusted country-specific regression coefficients



Note: Adults aged 30-65. The figure reports coefficients for the certain socio-demographic groups – gender, age, parental education, parental occupation, immigrant background and childhood residential context – based on separate country estimates. Coefficients from the basic adjusted model follow the specification of Model 1 in Table 4.2, while those from the fully adjusted model follow the specification of Model 4 in Table 4.2. The fully adjusted model additionally accounts for variables that may not be available for all countries, which is why for some countries, only estimates in the basic adjusted model are available. See the note for Table 4.1 for the definitions of groups based on parental occupation, parental education, immigrant background and childhood residential context. For immigrant background, the figure only indicates a country if at least 200 adults for each group are part of the final PIAAC sample. Country-specific results are provided in Table 4.A.1.2 in Annex 4.A.
Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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A critical policy question for the design of lifelong learning strategies is whether investing in a broad mix of skills yields bigger returns than investing in specific skills, and whether the returns from developing a specific skill differ according to a learner's existing skills set. If the wage returns to skills are additive, each skill should command roughly the same wage premium no matter which other attributes a worker already has. In this context, modular training – allowing people to engage in upskilling or reskilling in their weakest area or in skills that are most in demand – can be an efficient way to organise training. However, if the returns to skills are multiplicative, the value of any skill depends on which other skills it is combined with and the broader skills set of workers. For example, increasing numeracy skills might pay off only when accompanied by a capacity to delay gratification, while the advantages linked to behavioural tendencies associated with high scores on conscientiousness may accrue primarily to workers

who already possess strong adaptive problem solving skills. In such circumstances, bundled interventions would likely be most efficient because the lack of complementary skills might sharply reduce the returns on any single skills investment.

Employers appear to value individual skills and behavioural tendencies but do not reward particular combinations of skills. In order to consider the relative merit of interventions promoting targeted standalone upskilling or comprehensive skill bundles when designing education, training and lifelong learning strategies, Table 4.3 presents the results of nine augmented wage-equation specifications of Model 4 in Table 4.2. Each equation is built around one "focal" skill (listed as rows). Diagonal entries refer to wage premiums estimated for each focal skill, whereas off-diagonal entries refer to interaction terms between the focal skill and each of the remaining eight 21st-century skills. Statistically significant coefficients are marked in bold. The findings in Table 4.3 suggest that the wage returns to skills are largely independent of a worker's broader skills profile, when comparing individuals with similar socio-demographic characteristics, educational attainment, health status, work experience, number and age of their children, and who work in similar occupations and industries. Table 4.3 points to an additive rather than a multiplicative skills model: most interaction terms are not statistically significant and are quantitatively small. Based on this evidence, it appears that employers value numeracy, literacy, adaptive problem solving and specific behavioural tendencies, but they do not appear to reward particular *combinations* of skills. Put simply, having two strengths is worth the sum of their separate contributions, not a premium above this baseline.

Table 4.3. Wage returns to skills bundles

Percentage change in hourly earnings in PPP-adjusted 2022 USD, OECD average

	Literacy	Numeracy	Adaptive problem solving	Delayed gratification	Extraversion	Emotional stability	Agreeableness	Conscientiousness	Open-mindedness
Literacy	2.28	**2.20**	-1.16	0.00	0.57	0.43	0.53	**0.86**	**-0.99**
Numeracy	0.50	**8.23**	0.66	0.17	0.46	0.42	0.37	**1.13**	-0.61
Adaptive problem solving	-1.53	**2.56**	-1.01	-0.27	0.63	0.30	0.59	**1.01**	**-0.81**
Delayed gratification	0.16	**1.65**	-1.41	**1.03**	-0.07	0.26	-0.27	0.28	**-1.03**
Extraversion	-0.01	0.03	0.60	-0.31	**2.62**	**0.85**	-0.34	-0.35	-0.32
Emotional stability	0.03	0.48	0.47	0.07	**0.76**	**2.74**	-0.35	-0.07	0.01
Agreeableness	0.44	-0.13	0.45	-0.32	-0.19	-0.26	**-0.78**	0.06	-0.40
Conscientiousness	-0.20	0.84	0.77	0.03	-0.09	-0.13	0.15	**1.84**	**-0.68**
Open-mindedness	-1.17	1.44	-0.29	**-0.91**	-0.11	0.42	-0.25	-0.55	**-1.26**

Note: Adults aged 30-65. Main effects are displayed along the diagonal from upper left to bottom right. Coefficients in bold are statistically significant at the 5% level. Estimates exclude Japan, Korea and the United States. Results are adjusted for differences in gender, age, parental education, parental occupation, childhood residential context, immigrant background, educational attainment, skills, occupation, industry and establishment (firm) size. The model also accounts for employment status of partner, subjective health status, number of children, number of years of experience, whether respondents were volunteering, whether they participated in non-formal adult education and training, part-time employment, and whether working in the public sector. Earnings include bonuses and earnings by self-employed individuals. See the note for Table 4.1 for the definitions of groups based on parental occupation.

Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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Understanding whether earnings returns to acquiring new skills vary across socio-demographic groups is critical for assessing the efficiency of investments in skills policies and the extent to which such policies should be accompanied by additional policy efforts to ensure different groups enjoy similar opportunities for personal well-being. For example, if wage returns to skills diverge for women and men, for mature and young adults, or for adults with different socio-economic backgrounds, similar training investments could yield systematically different changes in life chances, thereby perpetuating existing wage gaps even when access to training is equalised. Measuring such heterogeneities can help to identify whether wage disparities stem primarily from unequal skills acquisition, unequal valuation of those skills in the labour market, or a combination of both. Without this information, policy interventions risk treating symptoms rather than causes – either over-subsidising training that yields limited pay-offs for some groups, or neglecting complementary measures (e.g. anti-discrimination enforcement, certification standardisation) that ensure that skills translate into equivalent labour market rewards.

Earnings returns to literacy are only marginally larger among women than men whereas the earnings returns to numeracy are stronger for men than women. Similarly, the earnings returns to numeracy skills are larger for individuals whose parents worked in high- rather than low-status occupations, as shown in Table 4.4. This finding shifts the policy focus from differential valuation to differential access. As employers broadly value the skills of men and women equally, the emphasis should instead be on ensuring equitable access to learning opportunities for both men and women to acquire such skills. As outlined in Chapter 3, access to better formal learning environments is at least partially determined by an individual's socio-economic background (Domina, 2005[25]). Box 3.5 in Chapter 3 provides policy examples from across the OECD illustrating approaches to broadening access to lifelong learning opportunities to reduce socio-economic skills disparities.

Given that equivalent skills profiles command similar wage premiums, the wage and employment gaps observed appear to originate primarily from disparities in opportunities to develop, signal or deploy those skills rather than from employers' wage-setting practices. This implies that closing participation gaps in high-quality training – especially in digital and science, technology, engineering and mathematics (STEM)-related domains – could translate more directly into narrowing wage disparities. It also underscores the importance of lowering non-monetary barriers to upskilling, as identified in Chapter 3, and ensuring that credentials gained by under-represented groups are portable and transparently recognised. Examples of relevant policies include the Irish Higher Education Access Route, which facilitates entry into higher education for students from disadvantaged backgrounds by adjusting entry requirements and reserving university spots for students with socio-economically disadvantaged backgrounds (see Chapter 3, Box 3.5.). Similarly, there are initiatives promoting girls' and women's participation in STEM courses, such as France's "Girls and Maths" plan which couples targets for girls' enrolment in specialised mathematics courses with investment in different resources throughout the duration of formal education (see Chapter 3, Box 3.3).

Table 4.4. Differences in the wage returns to skills, by gender and parental occupation

Percentage change in hourly earnings in PPP-adjusted 2022 USD, OECD average

	Gender		Parental education	
	Men	Women	High-status	Low-status
	(1)	(2)	(3)	(4)
Skills				
Literacy	1.62	**3.36**	2.04	**2.46**
Numeracy	**9.51**	**6.91**	**9.87**	**7.18**
Adaptive problem solving	-0.43	-0.85	-0.36	-0.44
Delayed gratification	**1.46**	**0.79**	**1.31**	**0.79**
Extraversion	**2.72**	**2.45**	**3.65**	**1.81**
Emotional stability	**2.99**	**2.56**	**2.88**	**2.33**
Agreeableness	-0.57	**-1.14**	-0.65	-0.62
Conscientiousness	**1.90**	**2.04**	**2.77**	**1.73**
Open-mindedness	**-1.27**	**-1.87**	**-2.05**	**-1.16**
Individual-level controls	YES	YES	YES	YES
Educational attainment	YES	YES	YES	YES
Occupation fixed effects	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES

Note: Adults aged 30-65. Coefficients in bold are statistically significant at 5% level. Estimates exclude Japan, Korea and the United States. Results in column (1) display the percentage change earnings for men only, column (2) for women only, column (3) for high-status parental occupations and column (4) for low-status parental occupations. All columns adjust for differences in gender – except columns (1) and (2) – age, parental education, parental occupation – except columns (3) and (4) – childhood residential context, immigrant background, educational attainment, skills, occupation, industry and establishment (firm) size. All columns also account for employment status of partner, subjective health status, number of children, number of years of experience, part-time employment, whether working in the public sector, whether respondents were volunteering, and whether they participated in non-formal adult education and training. Earnings include bonuses and earnings by self-employed individuals. See the note for Table 4.1 for the definitions of groups based on parental education.
Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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4.4. Disparities in job satisfaction across socio-demographic groups

While wages play a crucial role in influencing employment choices, job satisfaction profoundly impacts individuals' overall happiness, health, productivity and personal growth, and expectations of satisfaction drive career decisions (Faragher, Cass and Cooper, 2005[26]; Judge et al., 2001[27]). Higher job satisfaction is correlated with improved mental health outcomes, reduced stress, enhanced self-esteem and stronger interpersonal relationships, making it integral to achieving broader societal goals related to personal and communal well-being (Helliwell and Huang, 2010[28]). Workers who are satisfied in their job are less likely to leave their job and to invest effort in what they do, increasing productivity and promoting growth. Job satisfaction is also strongly influenced by workplace characteristics such as autonomy, job security and opportunities for participation in learning opportunities, which are central components of job quality. Enhancing these aspects can simultaneously improve worker well-being and organisational performance, reinforcing the link between satisfaction and productivity. Examining disparities in job satisfaction and whether such disparities arise because of differences in skills and/or educational attainment allows for the creation of adequate support mechanisms, training and credential support if skills are the constraint, or the promotion of better workplace practices if other factors are at play. Tracking disparities in job satisfaction ensures that investments in employment and education translate into high-quality, sustainable jobs for all groups, improving the efficiency of public spending by reducing turnover and underemployment.

Educational trajectories and skills development could potentially mediate or exacerbate disparities in job satisfaction, as individuals with higher educational attainment and advanced 21st-century skills are generally more likely to secure employment offering intrinsic rewards, autonomy and opportunities for advancement, thus enhancing their job satisfaction (Autor and Handel, 2013[29]; Oreopoulos and Salvanes, 2011[30]). Investigating whether differential access to education and skills formation contributes significantly to observed disparities can support targeted policy interventions aimed at promoting inclusive workplace environments.

On average, job satisfaction differs little depending on individuals' educational attainment or engagement in lifelong learning and skills. However, exceptions exist for adults holding a bachelor's degree or higher, who, all else being equal, tend to report higher job satisfaction. The link between educational attainment, skills and job satisfaction varies notably across countries. For example, after controlling for other socio-demographic characteristics, adults in Korea with a bachelor's degree or higher are 12 percentage points more likely to report high job satisfaction compared to those who did not complete upper secondary education (Annex Table 4.A.1). Conversely, in New Zealand the opposite relationship emerges, with adults with a bachelor's degree or higher significantly less likely to report high job satisfaction (18 percentage points).

Table 4.5. Disparities in job satisfaction, by socio-demographic characteristic

Change in probability of reporting high job satisfaction (being satisfied or extremely satisfied with the job) (in percentage points), OECD average

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Gender - Men (ref.: women)	**0.68**	0.56	0.00	0.03	-0.53	-0.59
Age - 50-65 (ref.: 30-49)	0.35	0.60	0.04	-0.03	0.12	0.16
Parental education - Tertiary (ref.: non-tertiary)	0.90	0.38	0.40	0.45	0.35	0.36
Parental occupation - High-status (ref.: low-status)	**0.88**	0.46	0.20	0.17	-0.18	-0.14
Childhood residential context (ref.: village)						
Town	**-1.65**	**-1.70**	**-1.44**	**-1.37**	**-1.55**	**-1.57**
City	**-1.84**	**-1.91**	**-1.64**	**-1.44**	**-1.68**	**-1.59**
Immigrant background (ref.: non-immigrants)*						
Immigrants	**-2.42**	**-1.75**	**-1.69**	-1.62	0.48	0.16
Children of immigrants	-0.94	-0.79	-0.47	-0.15	0.52	0.46
Respondents' educational attainment (ref.: below upper secondary)						
Upper and post-secondary vocational		1.00	0.29	0.23	-1.30	-1.16
Upper and post-secondary general		0.75	-0.48	-0.51	**-2.41**	-2.11
Short-cycle tertiary		1.81	0.60	0.32	**-2.51**	-2.22
Bachelor's degree or equivalent and above		**1.81**	0.17	-0.15	**-3.63**	**-3.44**
Volunteering		**2.53**	**1.27**	**1.10**	0.80	0.77
Participated in non-formal adult education and training		**1.15**	0.68	0.58	0.75	0.75
Skills						
Literacy		**-1.41**	-0.87	-0.77	-0.94	-0.73
Numeracy		**1.41**	0.71	0.50	0.02	-0.27
Adaptive problem solving		0.47	0.77	0.69	0.72	0.55
Delayed gratification			-0.23	-0.35	-0.38	**-0.66**
Extraversion			**2.05**	**1.68**	**1.31**	**1.50**
Emotional stability			**4.79**	**4.35**	**4.17**	**4.16**
Agreeableness			**2.27**	**2.10**	**2.24**	**2.17**
Conscientiousness			**1.00**	**0.82**	**0.64**	**0.74**
Open-mindedness			-0.23	-0.12	-0.24	-0.28
Skills (squared)						
Literacy						0.25

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	
Numeracy						0.18	
Adaptive problem solving						0.13	
Delayed gratification						**-0.42**	
Extraversion						**-0.44**	
Emotional stability						**-1.01**	
Agreeableness						**-0.54**	
Conscientiousness						-0.25	
Open-mindedness						**-0.62**	
Additional individual-level characteristics	NO	NO	NO	YES	YES	YES	YES
Job and firm-related characteristics	NO	NO	NO	NO	YES	YES	YES
Occupation and industry-related characteristics	NO	NO	NO	NO	YES	YES	YES

Note: Adults aged 30-65. Coefficients in bold are statistically significant at the 5% level based on a linear probability model. Additional individual-level characteristics: of children, health, employment status of partner, experience, part-time, public sector and current residential context. Job and firm-related characteristics include: experience, firm size, part-time, public sector, permanent contract. Survey question used to measure job-satisfaction: "All things considered, how satisfied are you with your current work?". High job satisfaction comprises the answer categories "Extremely satisfied" and "Satisfied", while low job satisfaction comprises the answer categories "Neither satisfied nor dissatisfied", "Dissatisfied" and "Extremely dissatisfied". See the note for Table 4.1 for the definitions of groups based on parental occupation, parental education, immigrant background, childhood residential context and respondents' educational attainment. Country-specific results are provided in Table 4.A.1.3 in Annex 4.A.

*Differences by immigrant background vary greatly across countries because of differences in the size of immigrant groups as well as composition and context. Readers are therefore encouraged to consult country-specific results in Table 4.A.1.3 in Annex 4.A.

Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

StatLink https://stat.link/ni7p0l

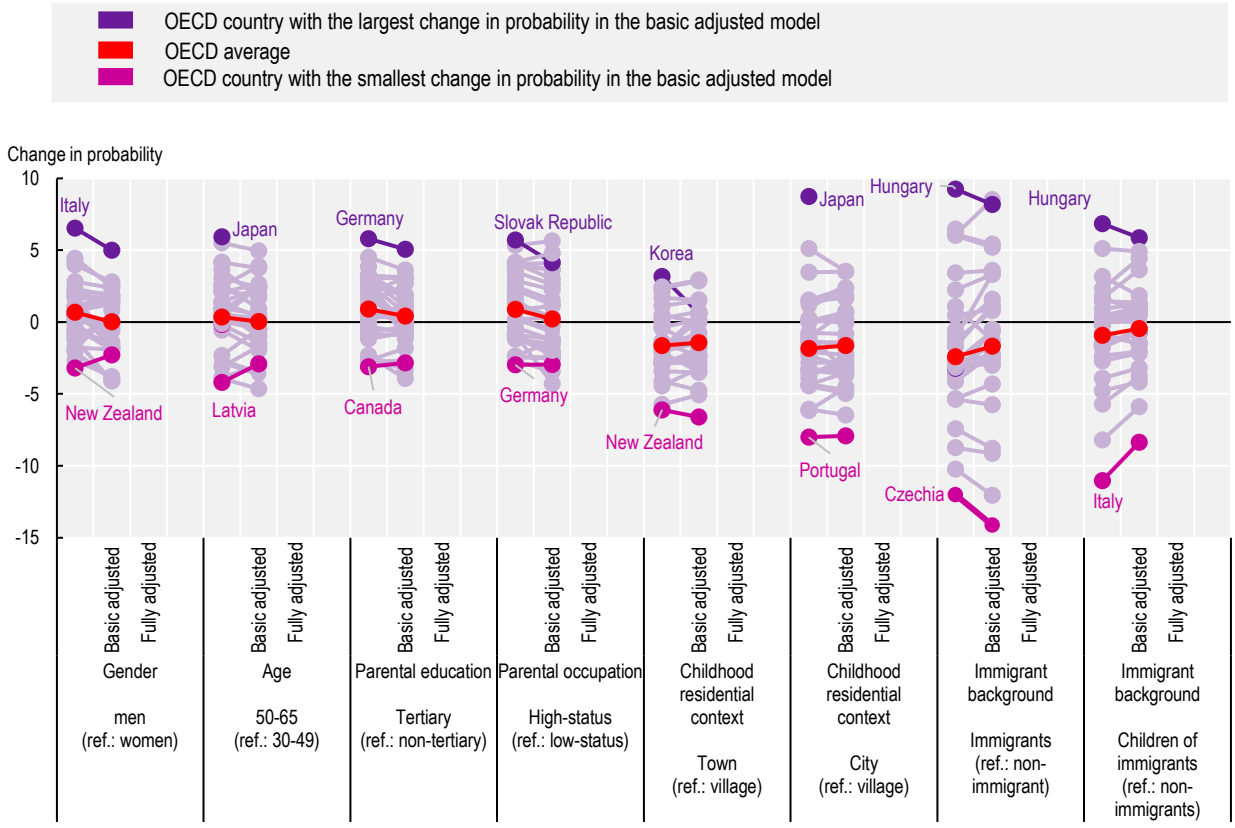
Levels of job satisfaction differ little depending on individuals' socio-demographic characteristics. Individuals from advantaged and disadvantaged backgrounds, adults with and without immigrant backgrounds, as well as younger and older adults, report similar levels of job satisfaction (Table 4.5). Differences linked to the gender, residential context during childhood are statistically significant, although quantitatively small.

Countries differ with respect to the magnitude of disparities in job satisfaction and the extent to which educational attainment, skills, lifelong learning participation and occupational sorting influence these disparities. After only accounting for other socio-economic characteristics, in Germany, men are 4.4 percentage points more likely than women to report high job satisfaction, whereas in Latvia, women are 2.6 percentage points more likely than men to report high job satisfaction (Annex Table 4.A.1). However, when comparing men and women with similar educational attainment, skills, lifelong learning participation, occupation and industry, the gender gap disappears in Germany (reducing to 0.7 percentage points) and increases in Latvia (increasing to 8.1 percentage points) (Annex Table 4.A.1).

There are also differences in job satisfaction when considering parental education. As shown in Figure 4.3 (basic adjusted model), in Germany, adults whose parents are tertiary educated are 5.8 percentage points more likely to report high job satisfaction compared to adults whose parents are not tertiary educated. Conversely, in Sweden, adults whose parents are *not* tertiary educated are almost 2.4 percentage points more likely to report high job satisfaction than adults whose parents are tertiary educated – although this difference is not significant. Accounting for differences in adults' educational attainment, skills, lifelong learning participation and occupational sorting does not reduce disparities in Germany substantially (reducing to 4.12 percentage points), but significantly accentuates them in Sweden (increasing to 3.9 percentage points).

Figure 4.3. Disparities in job satisfaction, by socio-demographic characteristic and country

Change in probability of reporting high job satisfaction (being satisfied or extremely satisfied with the job) by socio-demographic group: basic and fully adjusted country-specific regression coefficients



Note: Adults aged 30-65. The figure reports coefficients for certain socio-demographic groups – gender, age, parental education, parental occupation, immigrant background and childhood residential context – based on separate country estimates. Coefficients from the basic adjusted model follow the specification of Model 1 in Table 4.5, while those from the fully adjusted model follow the specification of Model 4 in Table 4.5. The fully adjusted model additionally accounts for variables which may not be available for all countries, which is why for some countries, only estimates in the basic adjusted model are available. Survey question used to measure job-satisfaction: "All things considered, how satisfied are you with your current work?". High job satisfaction comprises the answer categories "Extremely satisfied" and "Satisfied", while low job satisfaction comprises the answer categories "Neither satisfied nor dissatisfied", "Dissatisfied" and "Extremely dissatisfied". See the note for Table 4.1 for the definitions of groups based on parental occupation. parental education, immigrant background and childhood residential context. For immigrant background, the figure only indicates a country if at least 200 adults for each group are part of the final PIAAC sample. Country-specific results are provided in Table 4.A.1.3 in Annex 4.A.

Source: Calculations based on OECD (2024[23]), *Survey of Adult Skills (PIAAC) 2nd cycle database*, www.oecd.org/en/data/datasets/piaac-2nd-cycle-database.html.

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4.5. The role of occupational clustering in shaping disparities in labour market outcomes

The previous section highlighted substantial wage disparities across different occupations and industries which, in turn, contribute to disparities in labour market outcomes – particularly between men and women, and between adults from socio-economically advantaged and disadvantaged backgrounds – even when they possess similar levels of information-processing skills and educational attainment. Occupational and

sectoral clustering – where certain groups are disproportionately represented in particular occupations – emerges as a key driver of these disparities.

Occupations may function as meaningful skills ecosystems for three distinct reasons: 1) people with similar skills may be attracted by the same job characteristics and requirements; 2) employers may select candidates with specific skills for distinct roles, as differences in production processes require specific skill sets; and 3) jobs shape workers over time: through daily practice, individuals performing the same tasks tend to develop similar skills and behavioural traits.

While occupations are commonly perceived as requiring distinct personality traits and skills, in reality there is considerable overlap in the underlying skills needed across many roles (Anni, Vainik and Mõttus, 2024[31]); however, little evidence exists on between and within variations in skills across occupations – see (Anni, Vainik and Mõttus, 2024[31]; Wolfram, 2023[32]) for important exceptions. This suggests that prevailing beliefs and stereotypes about the suitability of specific occupations for particular demographic groups may inadvertently influence career choices and employment opportunities. Such biases can lead to the systemic clustering of different groups by occupation, limiting individuals' labour market opportunities and reinforcing wage inequalities. Understanding and addressing the drivers of this clustering is therefore essential to reducing disparities and promoting fairer and more inclusive labour market outcomes.

4.5.1. Occupational roles

As structural shifts (such as technological change, demographic shifts and the green transition) and shocks (such as geopolitical crises) reshape economies, understanding the skills requirements of different occupations is essential to identify areas at risk of labour shortages. For career orientation programmes and skills-first initiatives (OECD, 2025[33]) to be effective, it is equally important to map the skills requirements of occupations with precision.

There is limited systematic analysis of differences in skills distribution – including personality traits and social and emotional skills – across occupations, with most such studies focusing on specific occupations or small samples (Booth et al., 2015[34]; Furnham, 2017[35]; Lan, Wong and Zeng, 2021[36]). However, a few comprehensive studies have systematically examined personality traits across a wide range of occupations (Anni, Vainik and Mõttus, 2024[31]; Törnroos, Jokela and Hakulinen, 2019[37]; Wolfram, 2023[32]). Insight into how personality traits align with occupational requirements can support effective career planning, recruitment and career coaching strategies.

This section examines the skill profiles of 458 occupations – defined at the four-digit International Classification of Occupations (ISCO) level – in information-processing skills, willingness to delay gratification, and social and emotional skills. The analysis draws on pooled data from the 2023 Survey of Adult Skills, with each country and economy weighted according to its population of 16-65 year-olds.[2]

The analysis breaks down the total variance in each skill into two components: 1) a between-occupation component, which captures the extent to which individuals in different jobs have different skills; and 2) a within-occupation component, which reflects the variation in skills among workers performing the same job. For information-processing skills, the between-occupation component accounts for 26-29% of the overall variability observed across participating countries (Table 4.6, Column 1). This means that, on average, people who perform different jobs tend to differ markedly in these skills: about one-quarter of the skills gap between two randomly selected individuals in different jobs comes from the fact that their jobs tend to attract (or require) different average proficiency levels. However, the remaining three-quarters of the variation reflects random individual level differences, even among workers in the same job. The degree to which occupation explains skills gaps increases once socio-demographic characteristics are considered. When controlling for these factors, the between-occupation component accounts for 33-35% of the overall variability in information-processing skills (Table 4.6, Column 2).

For delayed gratification and social and emotional skills, the pattern is markedly different. The between-occupation component accounts for 11% of the variation in willingness to delay gratification and between 3% and 8% in social and emotional skills (Table 4.6, Column 1). When socio-demographic characteristics are taken into account, the between-occupation component accounts for 13% in willingness to delay gratification and between 5% and 9% in social and emotional skills (Table 4.6, Column 2). Thus, while occupations form distinctive skills ecosystems for literacy, numeracy and adaptive problem solving, they are far less differentiated with respect to social and emotional skills. People performing the same job tend to resemble each other to a greater extent in terms of numeracy, literacy and adaptive problem solving than social and emotional skills. Most of the dispersion in social and emotional skills and in delayed gratification occurs within rather than between jobs. This implies that workers with very different behavioural tendencies are attracted to the same job, but also that employers see the benefits of a wide range of individuals with different social and emotional skills bringing value to a job. Furthermore, whereas information-processing skills appear to be important in shaping who can successfully perform certain tasks, a wide variety of individuals with different behavioural tendencies can support the same work processes.

Table 4.6. Proportion of the variation in 21st-century skills explained by occupation

Variance proportions (adjusted R^2) of the skills accounted for by occupations

	Occupations	Occupations and socio-demographic characteristics
	(1)	(2)
	Adjusted R^2	
Literacy	0.28	0.35
Numeracy	0.29	0.34
Adaptive problem solving	0.26	0.33
Delayed gratification	0.11	0.13
Extraversion	0.04	0.05
Emotional stability	0.04	0.07
Agreeableness	0.04	0.06
Conscientiousness	0.02	0.06
Open-mindedness	0.08	0.09

Note: Occupations are coded based on the International Standard Classification of Education (ISCED) (four-digit level). Column 1: only accounts for occupations. Column 2: accounts for occupations and additional for other socio-demographic characteristics include gender, age, age squared, parental education, parental occupation, childhood residential context and immigrant background. Country fixed effects are included in all models with literacy, numeracy, adaptive problem solving and delayed gratification. They are not included in models with social and emotional skills as these are within-country centred (see *Comparison between groups and countries across different skills* in the Reader's Guide).
Source: Calculations based on OECD (2024[22]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

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These results suggest that there is a high degree of overlap in the set of occupations that require strong information-processing skills and those that do not, reflecting the high correlation between information-processing skills and the fact that certain occupations may require individuals to possess high proficiency in all such skills. Table 4.7 displays occupations with the lowest and highest mean scores in literacy, numeracy and adaptive problem solving illustrate differences for the remaining 21st-century skills analysed in this report. Occupations requiring the highest proficiency in these skills include technical occupations requiring attention to detail and strong information-processing capacity, such as mathematicians, actuaries and statisticians; town and traffic planners; and geologists and geophysicists. By contrast, occupations with the lowest mean scores in literacy, numeracy and adaptive problem solving tend to be manual

occupations that do not require workers to perform complex information-processing tasks, such as poultry producers, concrete placers, concrete finishers and related workers, and laundry machine operators.

Table 4.7. Occupations with the lowest and highest mean scores in core 21st-century skills

Literacy		Numeracy		Adaptive problem solving	
Bottom	***Top***	***Bottom***	***Top***	***Bottom***	***Top***
Poultry producers	Mathematicians, actuaries and statisticians	Concrete placers, concrete finishers and related workers	Geologists and geophysicists	Poultry producers	Biologists, botanists, zoologists and related professionals
Concrete placers, concrete finishers and related workers	Town and traffic planners	Other cleaning workers	Research and development managers	Street vendors (excluding food)	University and higher education teachers (elsewhere undefined)
Laundry machine operators	Geologists and geophysicists	Laundry machine operators	Mathematicians, actuaries and statisticians	Laundry machine operators	Database and network professionals (elsewhere undefined)
Other cleaning workers	University and higher education teachers (elsewhere undefined)	Upholsterers and related workers	Software and applications developers and analysts (elsewhere undefined)	Concrete placers, concrete finishers and related workers	Software and applications developers and analysts (elsewhere undefined)
Street vendors (excluding food)	Medical doctors (elsewhere undefined)	Street vendors (excluding food)	Electrotechnology engineers (elsewhere undefined)	Other cleaning workers	Sales, marketing and development managers (elsewhere undefined)

Note: The table shows the five occupations with the highest (top) and lowest (bottom) standardised mean scores in literacy, numeracy and adaptive problem solving. Occupations are consistently colour-coded. Tables 4.A.2.1, 4.A.2.2 and 4.A.2.3 in Annex 4.A provide detailed information on differences in occupations for literacy, numeracy and adaptive problem solving.
Source: Based on OECD (2024[22]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

Levels of willingness to delay gratification and social and emotional skills vary considerably more than information-processing skills within occupations (Tables 4.A.2.4 to 4.A.2.9 in Annex 4.A). At the same time, on average there are some differences in the social and emotional skills profile of workers in different occupations. For example, adults working as traditional and complementary medicine professionals, religious professionals, domestic housekeepers, health services managers and life science technicians report the highest willingness to delay gratification, and adults working as aircraft pilots and related associate professionals, ships' engineers, non-commissioned armed forces officers, database and network professionals, and paper products machine operators report the highest levels of emotional stability. Workers in artistic occupations report behavioural tendencies associated with the highest levels of openness to experience. These include creative and performing artists; musicians, singers and composers; visual artists; and arts and music teachers.

4.5.2. Changes in the mix of occupations and their skills requirements

Technological advances such as the rapid adoption of artificial intelligence (AI) tools and applications, demographic shifts, policies to adapt to climate change and mitigation policies to reach net-zero commitments, alongside geopolitical instability and evolving consumer preferences, are reshaping labour markets across OECD economies. These changes are significantly altering labour markets in two distinct but mutually reinforcing ways: 1) they are changing the mix of occupations that are in demand; and 2) they are changing the skills required within each occupation.

Men and women, and adults with different socio-economic backgrounds, are not equally likely to work in the same set of occupations. As a result, patterns of clustering of different groups by occupation could

significantly influence the future labour market risks and opportunities faced by different groups. A clear view of where employment is growing or shrinking, and how task content is changing, is therefore essential for designing upskilling and reskilling initiatives that cushion disruption, promote inclusive growth and narrow disparities in life chances through labour market integration.

By identifying groups most at risk of job displacement, and who thus require employment transitions, or skills obsolescence due to rapid job specific shifts, this section provides evidence that policy makers can use to direct efforts and resources more efficiently, enabling them to prioritise training initiatives that are aligned with the needs of different populations.

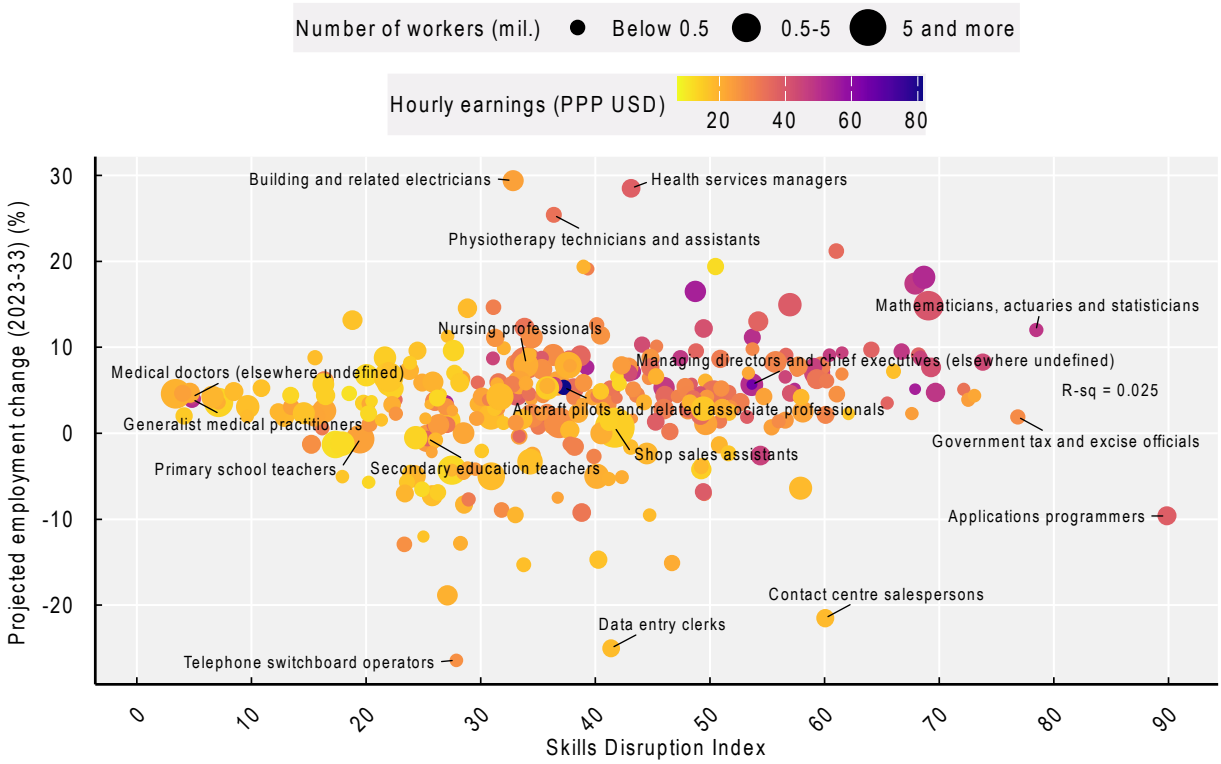
Occupations can be categorised according to four dimensions to enable the identification of the labour market vulnerabilities and opportunities faced by workers in different occupations, and to define targeted reskilling and upskilling programmes for workers who may expect to see their job disappear in the near future because of structural changes, or who may expect their existing job to undergo extensive transformations. These four dimensions are:

1. **Employment projection**: This dimension involves distinguishing between occupations projected to experience growth or contraction in total employment over the next decade, enabling the identification of job roles likely to expand or decline in the future given current expectations of labour market dynamics. This takes into account advances in AI and digital technologies, adaptation and mitigation efforts due to climate change and demographic shifts, and geopolitical uncertainty. The employment projection measure used in this section reflects projected occupational-level employment growth between 2023 and 2033 (U.S. Bureau of Labor Statistics, 2025[38]).
2. **Skills evolution**: This dimension involves differentiating occupations based on whether the skills required to perform a particular occupation have remained stable or have undergone rapid transformations. This enables the identification of roles in which adaptability and continuous learning are essential because of rapid transformation in key tasks performed by workers in such jobs. Lightcast's Skills Disruption Index (Lightcast, 2025[39]) is used in this section to reflect occupational-level skills evolution. This index was derived using information available in more than 2.5 billion online job postings on job boards, newspapers and employer websites between 2021 and 2024. The index ranges between 0 and 100, with higher scores indicating a greater degree of skills change.
3. **Earnings**: This relates to the wage level commanded by workers. Earnings information in this section reflects gross hourly wages adjusted for purchasing power parity (PPP) and is expressed in 2022 USD of workers surveyed in the 2023 Survey of Adult Skills.
4. **Size**: This relates to the number of workers and in this section reflects the number of people in specific occupations in the 2023 Survey of Adults Skills.

Figure 4.4 identifies occupations according to the degree of skills evolution they experienced between 2021 and 2024, and employment projections. Occupations in the top right quadrant combine rapid skills shifts and robust employment projections. Occupations in the bottom right quadrant combine rapid skills shifts and declining employment projections. Occupations in the top left quadrant combine relatively stable skills requirements and robust employment projections. Occupations in the bottom left quadrant combine relatively stable skills requirements and declining employment projections. For each occupation, Figure 4.4 further indicates current employment – as indicated by the size of the bubble – and earnings – as indicated by the colour of the bubble.

Figure 4.4. Projected employment growth and skills evolution by occupation

Projected employment change between 2023 and 2033 and skills disruption across countries participating in the 2023 Survey of Adult Skills, by occupation



Note: The Skills Disruption Index measures how employer skills requirements have evolved across different occupations between 2021 and 2024. It ranges from 0 to 100, where a higher score indicates a greater degree of skill change. Projected employment change was calculated after converting the occupational classification into ISCO-08 (from OES2023 via SOC2010) using the crosswalk tables provided by the U.S. Bureau of Labor Statistics.

Source: Calculations based on Lightcast (2025[39]), *The Speed of Skill Change*, https://lightcast.io/resources/research/speed-of-skill-change; OECD (2024[22]); *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html; and U.S. Bureau of Labor Statistics (2025[38]), *Table 1.2 Occupational projections, 2023-2033, and worker characteristics, 2023 (Numbers in thousands)*, www.bls.gov/emp/tables/occupational-projections-and-characteristics.htm.

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Occupations can be categorised into four groups:

1. **Transformative growth roles.** These roles combine rapid skills obsolescence with robust employment prospects. Occupations in the top right quadrant of Figure 4.4 are those undergoing intensive skill changes but that are, on average, anticipated to grow in demand in the future. Specialist professions such as mathematicians, actuaries and statisticians combine very high disruption scores and high expected expansion in overall demand. Most high-wage occupations are in this group, and workers in these occupations can expect to have to regularly update their skills to be able to continue to perform in their job. However, because the job itself is expected to increase in demand, workers can also expect their employers to have a strong incentive to support or facilitate such training either directly (by providing this in house) or indirectly (by allowing their workers to invest time and resources in upskilling and reskilling), with learning opportunities ranging from paid micro-credential courses to in-house academies. Demand for many occupations in this

group is fuelled by the increased datafication of business processes, regulatory scrutiny of risk and the diffusion of AI tools.

2. **Human-centric expansion roles.** These roles combine relatively stable task profiles with growing employment prospects; examples include the occupations in the top left quadrant of Figure 4.4. Occupations with high interpersonal or manual components – physicians, nurses, electricians and other green-infrastructure trades – face incremental technological change and rising demand driven by population ageing, the green transition and adaptation efforts to reduce the impact of climate change in infrastructure. Although on-average wage levels are markedly lower than for occupations in the transformative growth group, some occupations in this group enjoy very high wages, for example airline pilots and medical doctors. Upskilling for workers in these occupations generally focuses on deepening professional practice rather than the rapid integration of new tasks and processes.
3. **Disrupted declining role.** These roles combine rapid skills obsolescence with declining employment prospects; examples can be seen in the bottom right quadrant of Figure 4.4. Roles such as application programmers illustrate how fast-moving technological changes due to the emergence of generative AI can erode demand even while rapidly transforming task content. This is because low-code platforms and generative AI reduce the need for routine coding but raise the premium on system architecture and cyber-security.
4. **Routine retreat roles.** These roles combine relatively stable task profiles with declining employment prospects; examples include occupations in the bottom left-hand quadrant of Figure 4.4 such as telephone operators, data entry clerks and contact-centre salespersons who perform routine, codifiable tasks that are easy to automate or offshore. As firms operating in markets that employ these workers have little incentive and/or capacity to invest in employees who are operating in shrinking functions that do not require immediate upskilling, external public support is needed to support these workers' transitions paths. Given the possible geographic concentration of workers in many of these roles, training provision and other active labour market policies may have to be coupled with local regeneration efforts to create viable bridges to help workers move to in-demand occupations and prevent their long-term detachment from the labour market.

Notably, the cluster enjoying both rapid skills changes and strong employment growth includes many high-paying occupations, whereas many lower-wage roles are in quadrants where immediate change is slower. This may reduce the short-term pressure for training workers in these occupations, but it also significantly limits their exposure to new skills and dispositions that would support their mobility to higher paying and in-demand occupations. Historical evidence suggests that when disruptive change eventually reaches a broad spectrum of occupations, workers without recent learning experience suffer deeper displacement and longer spells out of work (Schmidpeter and Winter-Ebmer, 2021[40]).

What ties these four occupational groupings together is the need for a risk-weighted incentive architecture for skills investments – namely, a system that encourages workers to invest in their skills while remaining mindful of the expected returns on those investments. By tailoring incentives to the distinct trajectories revealed in Figure 4.4, policy can nudge both workers and employers towards the continuous learning that resilient labour markets demand but that, as detailed in Chapter 3, remains out of reach for many. Broadening accessibility may take many different forms, for example, programmes can target lifelong learning specifically while giving individuals agency over their reskilling trajectory, such as France's Personal Training Account (*compte personnel de formation),* which gives adults access to vetted training via a secure online platform. On the other hand, broader investments in spaces or initiatives where learning can happen, such as Mexico's UTOPÍAS initiative, which provides funding for repurposing neglected spaces into free-access centres offering educational, cultural, health and recreational services in Iztapalapa, Mexico City, can also promote lifelong learning (see Chapter 3, Box 3.10.).

How occupational transformations impact skills disparities and training investment

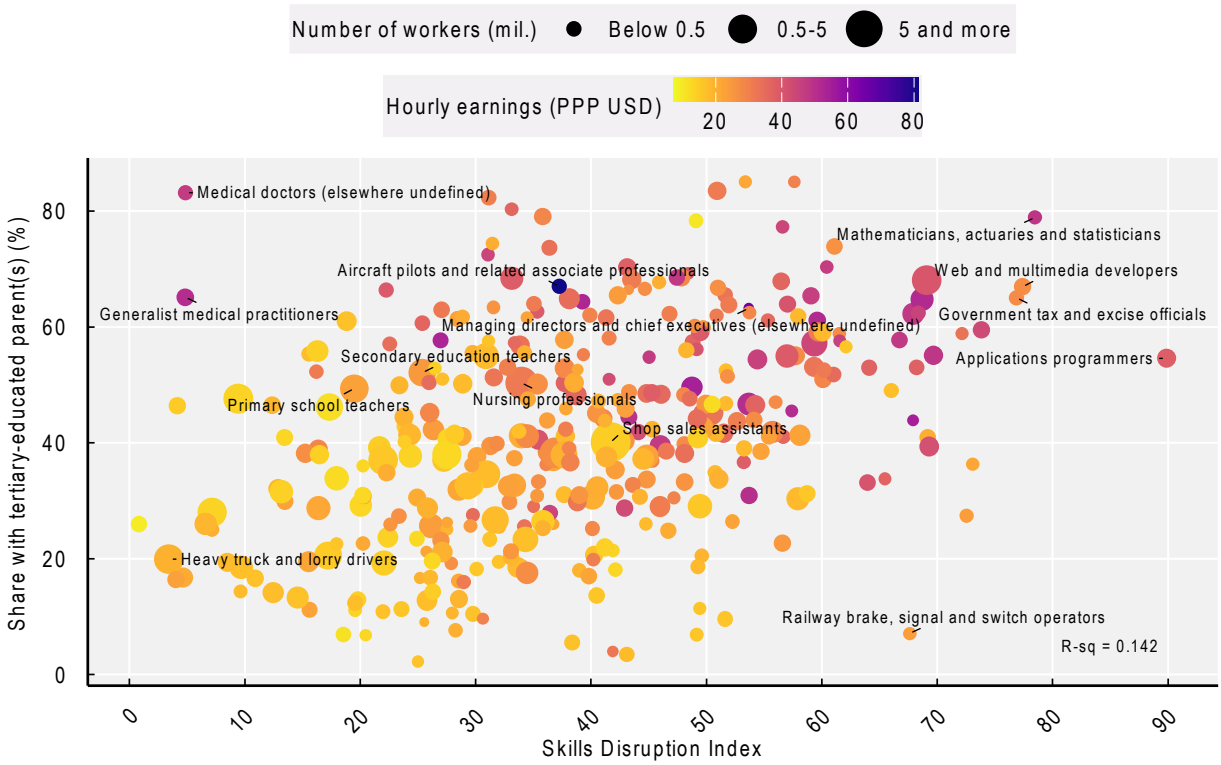
This section examines the distribution of women and adults with socio-economically disadvantaged backgrounds into occupations characterised by different occupational prospects and changing skills requirements. By understanding this distribution, it is possible to determine the different needs of certain groups to engage in lifelong learning, alongside different incentives and opportunities to train. Establishing the scale of labour market occupational clustering is necessary for assessing whether current training and career-guidance policies are aligned with the segments of the workforce most likely to require support when future adjustments occur. It can also help with understanding who can already expect to enjoy better access to employer-provided training, formal credentials and professional networks.

Socio-economic disparities

Individuals with socio-economically advantaged backgrounds are more likely to be in transformative growth roles, which are higher paying occupations that have experienced some of the largest skills changes in recent years and are projected to increase in demand in the medium term. For instance, mathematicians, actuaries and statisticians, which are among the highest-earning occupations, have a very large share of current workers who have at least one parent educated at the tertiary level (79%) (Figure 4.5). These occupations have also experienced a large degree of skills change in recent years (Disruption Index of 78) and are projected to experience robust employment prospects (employment increase of 12% by 2033). Many transformative growth roles are also technical in nature – such as software developers, electrotechnology engineers, physicists and astronomers – and current workers are predominantly individuals with tertiary-educated parents (Figure 4.6). This is because many transformative growth roles typically require tertiary educational qualifications and, as illustrated throughout this report, individuals with tertiary-educated parents are considerably more likely than those without tertiary-educated parents to pursue and complete a tertiary degree themselves.

Figure 4.5. Association between the share of socio-economically advantaged workers in an occupation and occupational-level skills change

Share of workers with tertiary-educated parents and skills disruption across countries participating in the 2023 Survey of Adult Skills, by occupation



Note: The Skills Disruption Index measures how employer skill requirements have evolved across different occupations. It ranges from 0 to 100, where a higher score indicates a greater degree of skill change. See the note for Table 4.1 for the definitions of groups based on parental education.

Source: Calculations based on Lightcast (2025[39]), *The Speed of Skill Change*, https://lightcast.io/resources/research/speed-of-skill-change and OECD (2024[22]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

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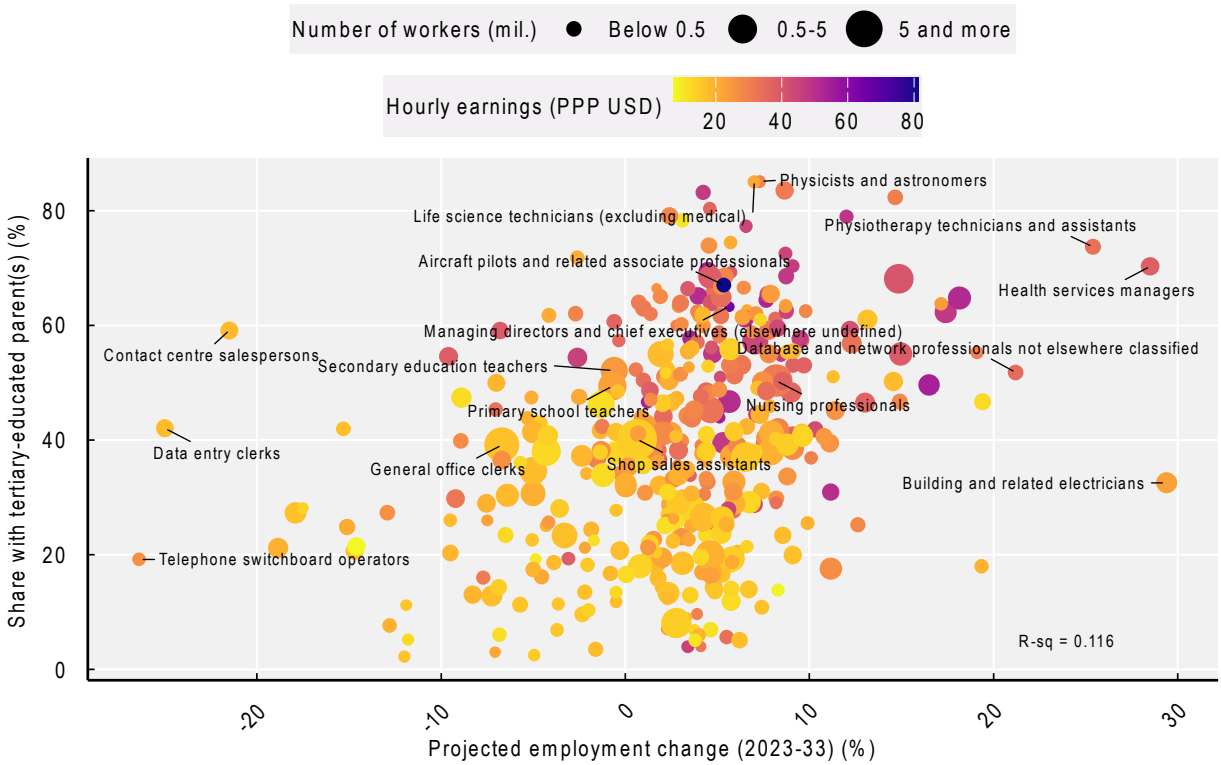
Most occupations with only a minority of current workers with advantaged socio-economic backgrounds command low wages and entail routine retreat roles, meaning that they combine relatively stable task profiles and declining employment prospects. For example, only around 2% of hand launderers and pressers have at least one tertiary-educated parent, an occupation with a projected employment decline of 12%. These workers can expect to earn below-average hourly wages, face a high risk of job displacement and will experience little to no skills change in their current occupation.

Figure 4.6. Association between the share of socio-economically advantaged workers in an occupation and occupational-level projected employment change

Share of workers with tertiary-educated parents and projected change in employment across countries participating in the 2023 OECD Survey of Adult Skills, by occupation



Note: Projected employment change was calculated after converting the occupational classification into ISCO-08 (from OES2023 via SOC2010), using the crosswalk tables provided by the U.S. Bureau of Labor Statistics. See the note for Table 4.1 for the definitions of groups based on parental education.

Source: Calculations based on OECD (2024[22]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html and U.S. Bureau of Labor Statistics (2025[38]), *Table 1.2 Occupational projections, 2023-2033, and worker characteristics, 2023 (Numbers in thousands)*, www.bls.gov/emp/tables/occupational-projections-and-characteristics.htm.

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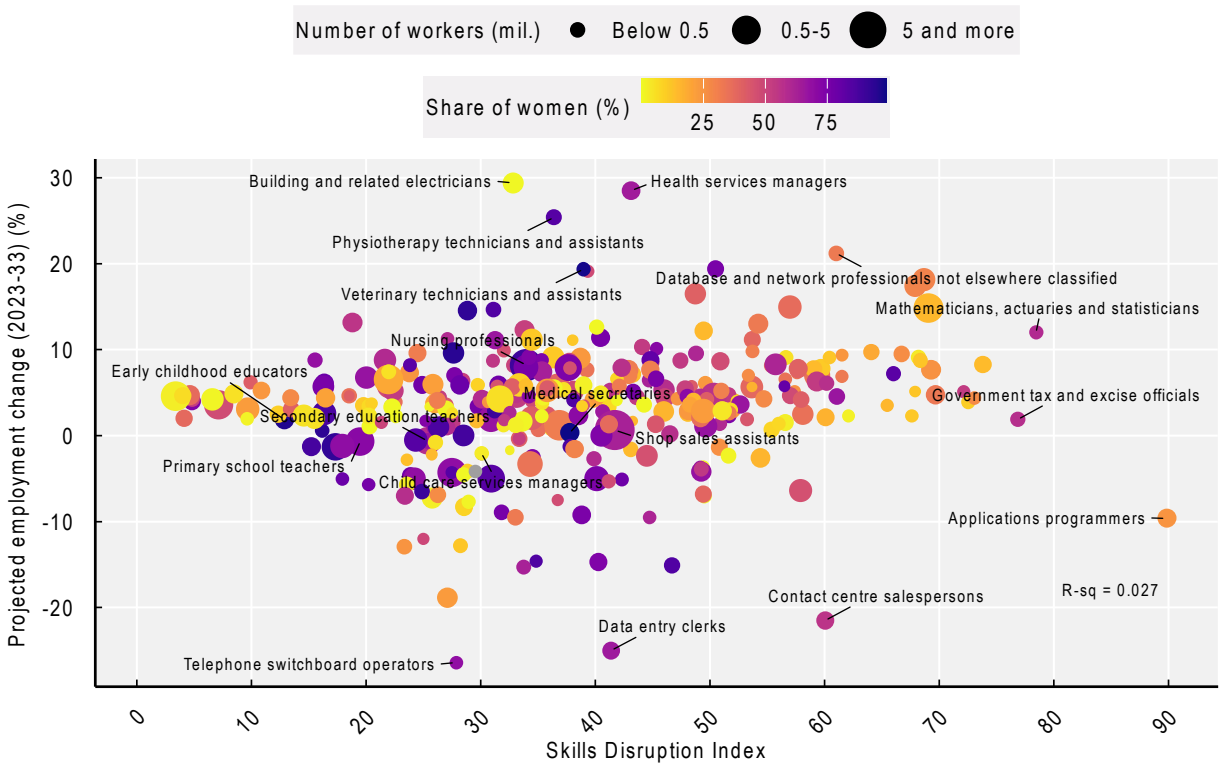
Gender disparities

Gender differences are less pronounced than differences by parental occupation; however, Figure 4.7 reveals some key differences in the types of occupations men and women work in. Women are more likely to work in occupations that are experiencing low to medium skills changes (the left part of Figure 4.7) whereas men are more likely than women to work in jobs with both very high and very low changing skills requirements. Many occupations in the left side of Figure 4.7, i.e. routine retreat roles and human-centric expansion roles, are women-majority or men-majority occupations, i.e. occupations in which the majority of workers are of the same gender. These occupations command below average wages. Data entry clerks and telephone switchboard operators are examples of women-majority routine retreat roles occupations, whereas physiotherapy technicians and assistants are examples of women-majority human-centric expansion roles. Metal working machine tool setters and operators are examples of men-majority routine retreat roles occupations, whereas building and related electricians are examples of men-majority human-centric expansion roles. By contrast, men are more likely than women to work in transformative growth

roles, occupations in the top right quadrant of Figure 4.7, although, on average, the transformative growth roles tend to have a less skewed gender composition than routine retreat roles.

Figure 4.7. Gender composition of occupations by skills disruption and employment outlook

Projected employment growth 2023-2033 and skills disruption across countries participating in the 2023 Survey of Adult Skills, by occupation



Note: The Skills Disruption Index measures how employer skill requirements have evolved across different occupations between 2021 and 2024. It ranges from 0 to 100, where a higher score indicates a greater degree of skill change. Projected employment change was calculated after converting the occupational classification into ISCO-08 (from OES2023 via SOC2010) using the crosswalk tables provided by the U.S. Bureau of Labor Statistics.

Source: Calculations based on U.S. Bureau of Labor Statistics (2025[38]), *Table 1.2 Occupational projections, 2023-2033, and worker characteristics, 2023 (Numbers in thousands)*, www.bls.gov/emp/tables/occupational-projections-and-characteristics.htm; Lightcast (2025[39]), *The Speed of Skill Change*, https://lightcast.io/resources/research/speed-of-skill-change; and OECD (2024[22]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

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The clustering of women and men into distinct occupations matters for three reasons: 1) wage premiums; 2) reskilling opportunities; and 3) labour shortages. First, wage premiums accrue disproportionately to roles where skills requirements are evolving quickly and for which demand is growing but supply is not growing at the same pace. Women appear to be under-represented in these transformative growth roles and over-represented in routine retreat roles. If women remain clustered in low-disruption jobs, the gender pay gap is liable to widen even if overall employment rates were to converge. Second, most large-scale reskilling initiatives – particularly those focused on digital, data or green competences – are designed and target transformative growth roles (Frey, Alajääskö and Thomas, 2024[41]; OECD, 2024[42]; 2021[43]). Unless such programmes explicitly reach out to women, they risk channelling public resources towards male workers and bypassing many women whose jobs face stagnation or obsolescence rather than

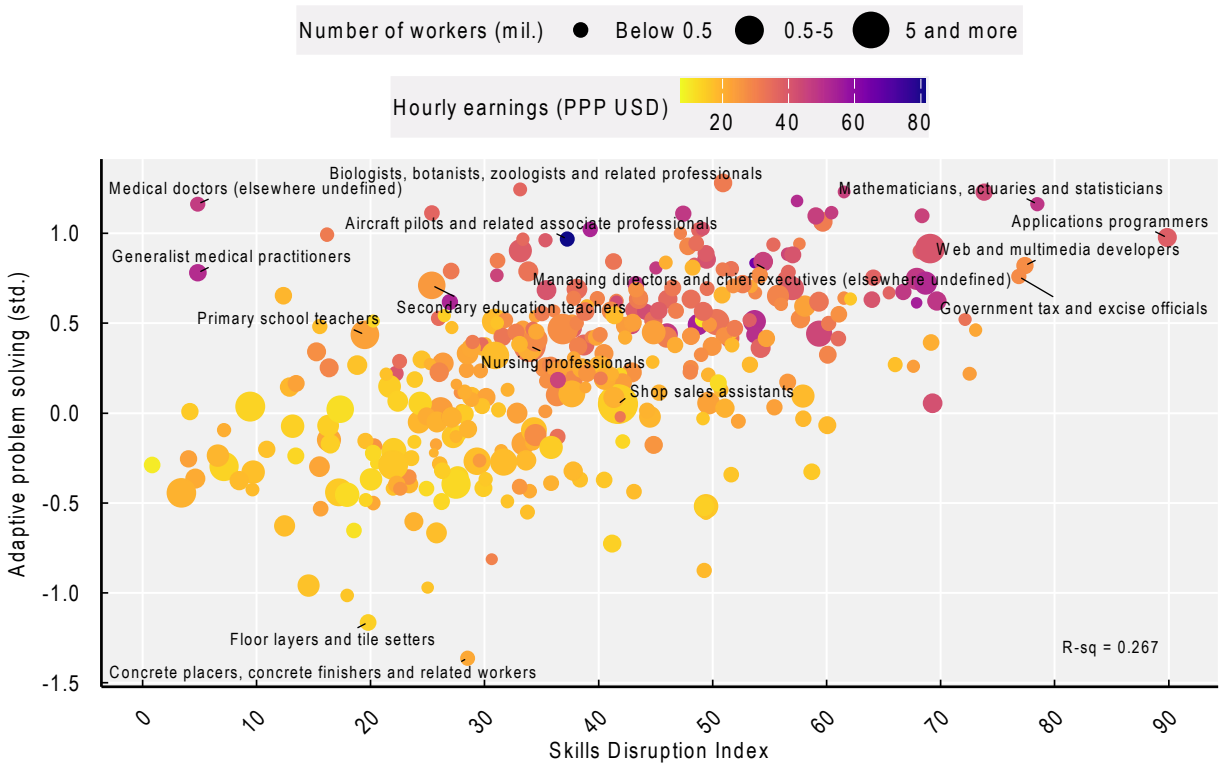
transformation. Third, labour shortages are already acute in several of the high-growth occupations where women are least represented. Persisting stratified employment patterns therefore constrain the effective supply of talent and threaten to dampen productivity gains across the OECD.

From disruption to opportunity: Pathways for workforce adaptation

Analysing the adaptive problem solving skills of individuals working in occupations experiencing rapid skills change, or who will most likely have to transition to new roles because of changing structural factors and shrinking opportunities, can provide policy makers with indications of where support and initiatives will need to be targeted. Encouragingly, Figure 4.8 suggests that adults currently working in roles with above-average changes in skills requirements have higher than average proficiency in adaptive problem solving, which means that although these individuals are likely to need to invest in significant upskilling and reskilling to be able to continue to perform tasks as their role evolves, they will have the skills to manage and adapt to the transition and thrive in a future role.

Figure 4.8. Association between occupational-level skills change and proficiency in adaptive problem solving

Mean proficiency in adaptive problem solving and Skills Disruption Index by occupation across countries participating in the 2023 OECD Survey of Adult Skills



Note: The Skills Disruption Index measures how employer skill requirements have evolved across different occupations. It ranges from 0 to 100, where a higher score indicates a greater degree of skill change.
Source: Calculations based on Lightcast (2025[39]), *The Speed of Skill Change*, https://lightcast.io/resources/research/speed-of-skill-change and OECD (2024[22]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

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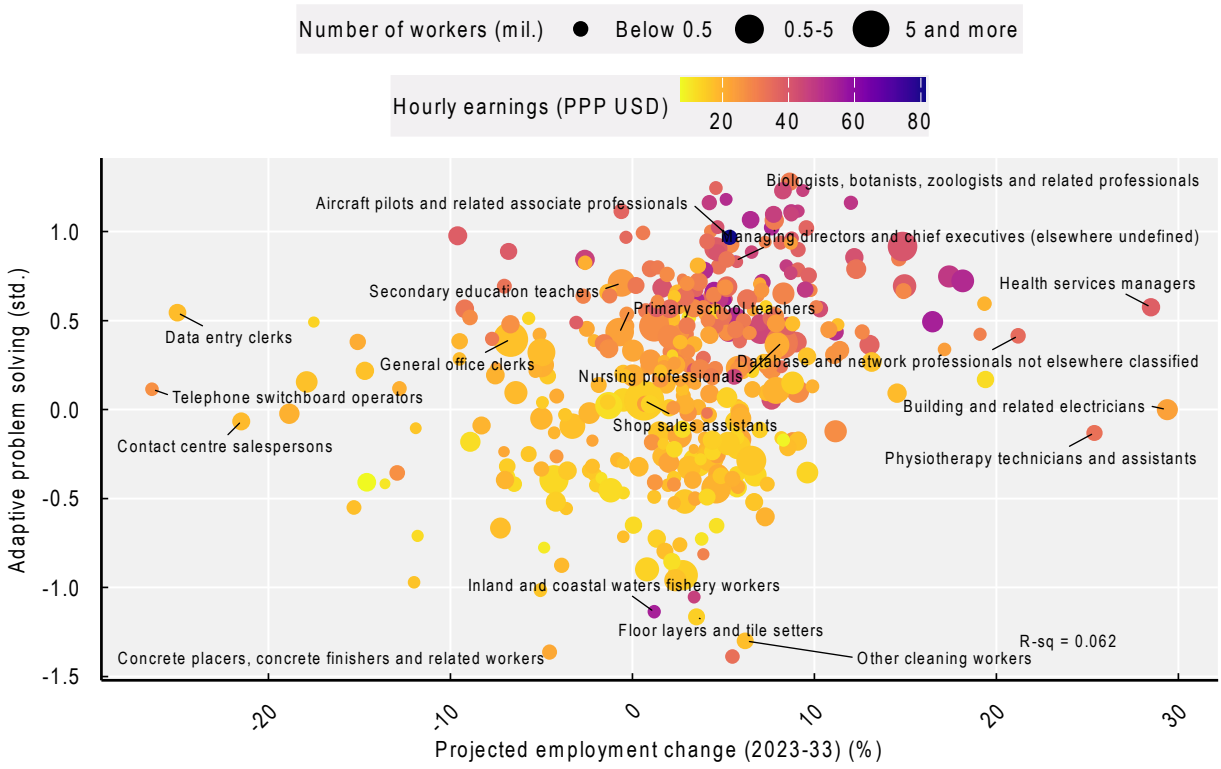
However, individuals who work in occupations with declining projected demand typically have low proficiency in adaptive problem solving, as indicated in Figure 4.9. Because structural adjustments may require some (or many) of these individuals to transition into different roles, low proficiency in adaptive problem solving skills may constrain their upskilling and reskilling efforts. Without targeted support, these adults risk a double penalty of job loss or wage erosion, combined with a steeper learning curve when trying to retrain.

Figure 4.9. Association between occupational-level projected employment change and proficiency in adaptive problem solving

Mean proficiency in adaptive problem solving and projected change in employment by occupation across countries participating in the 2023 OECD Survey of Adult Skills



Note: Projected employment change was calculated after converting the occupational classification into ISCO-08 (from OES2023 via SOC2010) using the crosswalk tables provided by the U.S. Bureau of Labor Statistics.
Source: Calculations based on OECD (2024[22]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html and U.S. Bureau of Labor Statistics (2025[38]), *Table 1.2 Occupational projections, 2023-2033, and worker characteristics, 2023 (Numbers in thousands)*, www.bls.gov/emp/tables/occupational-projections-and-characteristics.htm.

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Overall, these results indicate a stark mismatch between where labour demand is growing and where many women and adults with socio-economically disadvantaged backgrounds are currently employed. Many occupations that mostly employ adults from disadvantaged socio-economic backgrounds are in routine retreat or human-centric roles. Whereas human-centric roles are increasing in demand – because of the demographic transition and the limited impact AI so far has on these roles – routine retreat roles are shrinking – likely due to automation and structural adjustments to meet net-zero targets. These are roles that command low-to-modest wages and, because they are not directly impacted by rapid skills obsolescence, are likely to receive limited employer investment in training. Meanwhile, transformative and

disrupted declining roles – those most affected by AI – command higher pay but remain men-majority and socially selective.

Employers in industries relying on transformative roles have a direct incentive to invest in training their workforce because of rapidly changing skills requirements. At the same time, because of increased demand for such roles, they have an incentive to provide training that is as company specific as possible to reduce the likelihood that workers will move to other companies. Public policy should focus on the portability and recognition of micro-credentials so that advanced skills diffuse across firms and regions rather than remaining siloed in specific companied. Disrupted declining roles, many of which are in "white-collar" occupations, need early-warning reskilling programmes to help them transition into emerging AI-complementary occupations and become transformative roles. *Human-centric* growth roles – especially in health and care – call for expanded apprenticeship places and faster foreign-qualification recognition that attracts under-represented groups in order to ease shortages (OECD, 2023[44]). Finally, r*outine retreat* roles require a combined strategy of local regeneration and transition stipends that finance full-time retraining, as incremental upskilling will not offset looming job losses.

Low adaptive problem solving proficiency among workers in declining occupations highlights the need for scaffolded learning pathways, and could partly explain the low willingness of some workers to engage in adult learning, as identified in Chapter 3. Short, confidence-building modules on how to deal with change that blends training on basic ICT use, problem solving and peer mentoring can act as an "on-ramp" before more demanding technical courses are introduced.

4.6. Intergenerational transmission of occupation and education

This section quantifies the transmission of occupational and educational advantage across generations and maps differences across countries. It identifies countries where individuals attain educational qualifications and occupational status that are equivalent, exceed or fall short of those of their parents. Because young people's expectations reflect perceived opportunity structures and can predict future distributions of attainment, this section combines an analysis of historical patterns of observed intergenerational transmission of educational attainment and occupational status in adult populations with an analysis of patterns of expectations among school-aged children. If teenagers have expectations not aligned with available educational pathways or labour market conditions, disparities risk becoming entrenched or even widening further. The integrated examination of realised transmission and stated expectations provides policy makers with detailed evidence for targeted interventions and supports the design of measures that promote opportunities, calibrate expectations to realistic educational and labour market pathways, and promote inclusive economic growth across OECD countries.

The analysis in this section complements ongoing OECD work on social mobility and opportunity. For example, recent evidence documents sizeable earnings disparities by parental educational attainment, as well as the central role family background plays in shaping labour market outcomes (Causa, Forthcoming[16]). The section also provides a micro-to-macro bridge to new estimates of inequality of opportunity, indicating that at least one-quarter of total inequality in market income reflects circumstances beyond individuals' control, and that parental socio-economic background is often the single largest contributor to inequality of opportunity (OECD, 2025[17]). Finally, by linking adult outcomes to the formation of expectations, this section complements ongoing efforts to map the extent to which teenagers' career and educational expectations reflect their socio-economic background, frequently more so than academic results. These expectations are increasingly concentrated in a narrow set of high-status occupations, yielding misalignments with labour market demand and unequal engagement in career development activities (OECD, 2025[18]).

The opportunities individuals have to match or exceed the educational qualifications or occupational status of the previous generation are strongly influenced by the timing and scope of structural transformations.

Productivity growth and rising living standards typically lead to increases in educational attainment or the prevalence of workers in services. However, ceiling effects in tertiary enrolment and occupational structures constrain further upward movement in education and occupation. Countries that did not expand higher education or shift towards service-sector employment until the latter part of the 20th century therefore have greater opportunities to fare well on measures of intergenerational transmission of education or occupation, because adults in these countries have considerably greater chances of surpassing their lower-than-average parental educational attainment or occupational status. In countries where these changes occurred earlier, previous cohorts already occupy much of the upper distribution, thereby limiting additional advancement (OECD, 2018[45]).

Inadequate social mobility imposes an economic cost, with limited upward mobility resulting in the underutilisation of talent as individuals with the potential to excel in education or in occupations that require advanced proficiency in information-processing skills (such as professional and managerial occupations) are held back because of their background. Credit constraints, informational deficits and insufficient family resources reduce investment in education and entrepreneurship, depressing aggregate productivity. Conversely, restricted mobility at the top can entrench economic rents and facilitate opportunity hoarding, distorting resource allocation (OECD, 2018[45]).

4.6.1. Intergenerational occupational (im)mobility

Figure 4.10 illustrates the link between the social status of the occupation of adults who participated in the 2023 Survey of Adult Skills and the social status of their parents, as measured through the occupation of the parent with the higher occupational status within each household, alongside the average numeracy proficiency of those who experienced different occupational transitions. Nine occupational categories are featured, ranging from those with higher to those with lower social status: 1) managers; 2) professionals; 3) technicians and associate professionals; 4) clerical support workers; 5) service and sales workers; 6) skilled agricultural, skilled agricultural, forestry and fishery workers; 7) craft and related trades workers; 8) plant and machine operators and assemblers; and 9) elementary occupations. The width of the connectors between occupational groups in Figure 4.10 represents the size of the group, transitioning from a given parental occupational group to own occupational group, while the colour gradient – from yellow (low performance) to orange to purple (high performance) – captures variations in numeracy proficiency, which is the skill with the highest labour market returns.

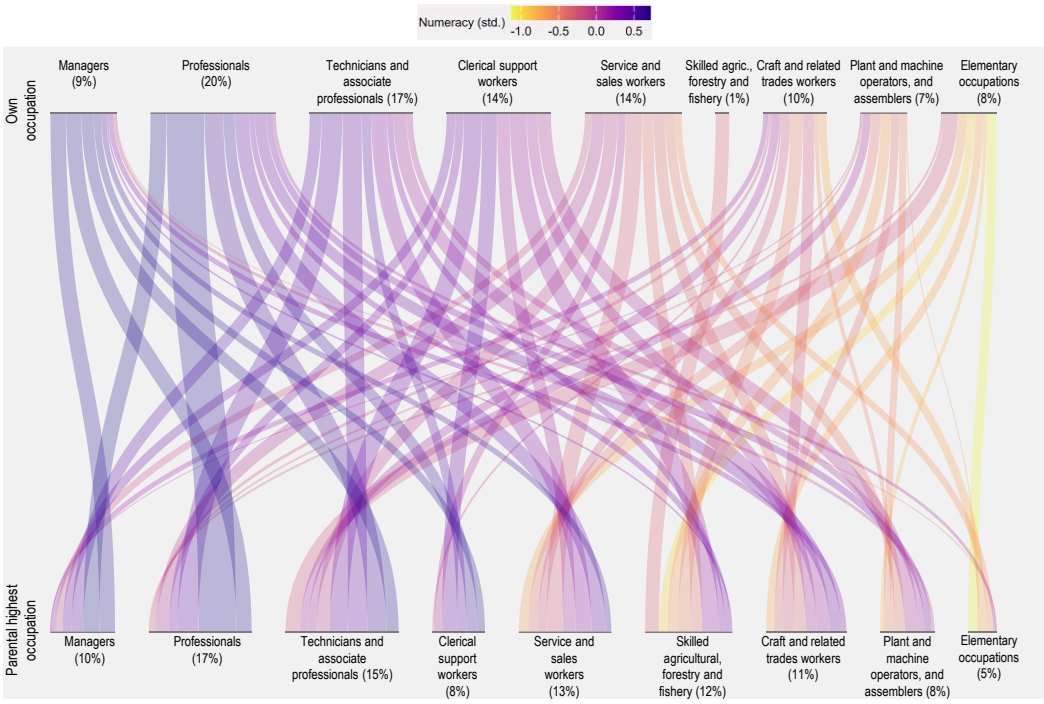
Figure 4.10 reveals marked generational shifts in the structure of the labour market, with the relative size of different occupational groups differing between the “parent generation” and the generation of 30-65 year-olds who participated in the 2023 Survey of Adult Skills. The occupation reported for the parent generation reflects the status of the occupation held by the parent with the highest social status, used as an indicator of the household’s overall social standing. This approach means that the parent generation’s occupational profile is biased towards higher-status jobs, since households with one higher-status and one lower-status parent are represented by the higher one. Seventeen per cent of households in the parent generation were headed by a parent who worked as a professional and up to 12% were headed by a skilled agricultural, forestry and fishery worker, whereas in the generation of 30-65 year-olds, 20% worked as professionals and only 1% worked as skilled agricultural, forestry, and fishery workers.

Figure 4.10 suggests a strong degree of intergenerational transmission of occupational status in OECD countries: as many as 52% of adults who had at least one parent working in a professional occupation when they were children went on to work as professionals or managers as adults. By contrast, only around 13% of adults whose parents worked in elementary occupations when they were children went on to work as professionals or managers in adulthood. Similarly, as many as 45% of professionals had parents who worked as either professionals or managers and only 16% had parents who worked as craft and related trades workers, plant and machine operators and assemblers, or in elementary occupations.

Numeracy proficiency is, on average, higher among individuals whose parents worked in high-status occupations such as managers, professionals, technicians and associate professionals and lower among individuals whose parents worked in low-status occupations, as clearly indicated in Figure 4.10. For example, the average numeracy proficiency of adults whose parents worked as professionals is 0.4 SD and the average numeracy proficiency of adults whose parents worked in elementary occupations is -0.5 SD. At the same time, on average across OECD countries, adults with higher numeracy skills are more likely than adults with lower numeracy skills to maintain the high-status occupation of their parents or to transition into higher status occupations than their parents. For example, whereas the average numeracy proficiency of adults whose parents worked as professionals and went on to become professionals themselves was 0.7 SD, the average numeracy proficiency of adults whose parents worked as professionals and went on to work as craft and related trades workers was 0.0 SD. Similarly, the average numeracy proficiency of adults whose parents worked in elementary occupations and went on to become professionals was 0.1 SD, whereas the average numeracy proficiency of adults whose parents worked in elementary occupations and went on to work as craft and related trades workers was -0.7 SD.

Figure 4.10. Occupational mobility among adults, by numeracy proficiency

Percentage of respondents' own occupation, parental occupation and numeracy proficiency, OECD average



Note: Adults aged 30-65. The width of the parental and own occupational groups (nodes) reflects respective sizes. The width of the connectors between the nodes represents the size of the occupational group flowing from parental occupation (left) to own occupation (right). Colour coding – yellow (low performance) to orange to purple (high performance) – is based on a standardised average numeracy score for each connector.
Source: Calculations based on OECD (2024[22]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

The analysis presented highlights significant occupational stability across generations in OECD countries, with higher-status occupations (managers, professionals, technicians and associate professionals) displaying strong intergenerational persistence. Individuals in these occupations often come from similar backgrounds and tend to have relatively high numeracy skills. While upward mobility from lower-status occupations to higher-status roles occurs, it is generally limited to those with strong numeracy skills. Conversely, middle- and lower-status occupations often exhibit occupational persistence, particularly

among skilled agricultural, forestry and fishery workers. However, downward mobility is present across all occupational groups, with individuals moving from higher-status occupations to lower-status roles often showing relatively lower numeracy performance. These findings suggest that although skills are a key determinant of mobility, substantial occupational inheritance persists (OECD, 2025[19]).

Taken together, the evidence presented points to a labour market hierarchy that is both persistent and selective. At the top of the social hierarchy, more than half of managers and professionals have parents who worked in the same occupations, and those who maintain such high-status positions generally have above-average numeracy proficiency. At the bottom, adults whose parents worked in elementary and routine-manual occupations rarely work in professional and managerial occupations, and those who do typically have above-average numeracy skills. These results suggest that the chances of upward mobility hinge on individuals having opportunities to develop strong information-processing skills. However, as Chapter 3 of this report details, there are large disparities in such opportunities by socio-economic background.

Contrary to what can be observed among adult workers, a large share of young people with parents working in low-status occupations expect to go on to work as managers or professionals by age 30. For example, Figure 4.11 indicates that as many as 54% of young people with parents working in craft and related trades and 53% of young people with parents working in service and sales expect to work as managers or professions by age 30. Moreover, as many as 65% of young people with professional parents and 61% whose parents are managers expect to work as managers or professionals.

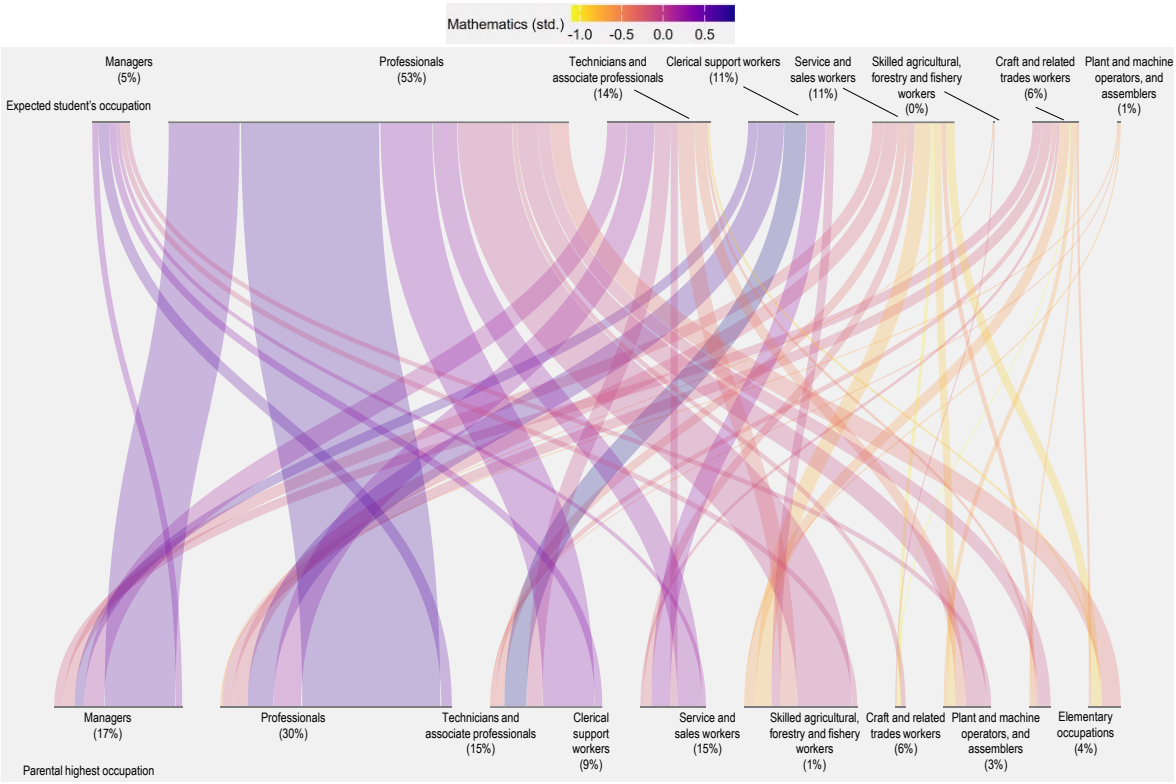
Young people who expect to be upwardly mobile generally have the highest levels of mathematics proficiency among young people with a similar parental background, as indicated in Figure 4.11. For example, the mean mathematics achievement of young people whose parents work as professionals and who expect to work as professionals by age 30 is 0.7 SD. By contrast, the mathematics achievement of young people whose parents work as professionals but who expect to work in service and sales is 0.0 SD. Similarly, the mean mathematics achievement of young people whose parents work in sales and service and who expect to work as professionals by age 30 is 0.1 SD, whereas the mathematics achievement of young people whose parents work in service and sales and who expect to work in service and sales themselves is -0.5 SD. Even among young people whose parents work in elementary occupations, those who expect to work as professionals have a higher relative achievement compared to their peers who expect to work in less prestigious occupations by age 30, such as service and sales. (-0.1 SD and -0.6 SD, respectively).

Crucially, the strong social gradient in mean levels of mathematics achievement means that the mathematics achievement of those who expect to work in high-status occupations closely maps parental circumstances. For example, among the 53% of young people who expect to work as professionals, mathematics achievement is highest among those whose parents are themselves professionals and lowest among those whose parents work in elementary occupations.

These results suggest a large gap between the expectations of many teenagers and the academic proficiency typically associated with the occupations they hope to enter. Many teenagers from lower-status households who have high levels of achievement compared to their similarly disadvantaged peers expect to work in professional or managerial roles. However, their average mathematics proficiency generally remains well below the proficiency of peers from higher-status households who hold similar expectations. Educational segregation and norm-referenced grading systems likely shape the perceptions of the opportunities young people have to thrive in roles that typically require strong information-processing skills. Nonetheless, without additional academic support and clearer information on pathways, these students may encounter difficulties meeting entry requirements for tertiary study or employment in occupations that require strong information-processing skills.

Figure 4.11. Young people's expectations of occupational mobility, by mathematics proficiency

Percentage of 15-year-olds by parental occupation and expected occupation by age 30, and mathematics proficiency, OECD average



Note: The width of the parental and student occupational groups (nodes) reflects respective sizes. The width of the connectors between the nodes represents the size of the student group flowing from parental occupation (left) to expected student occupation (right). Colour coding – yellow (low performance) to orange to purple (high performance) – is based on average mathematics score for each connector.
Source: Calculations based on OECD (2022[46]), *PISA 2022 database*, www.oecd.org/en/data/datasets/pisa-2022-database.html.

Box 4.1 explores how policy making can promote occupational mobility through a skills-first approach, demonstrating examples across OECD countries of where initiatives have been implemented to drive the development of skills.

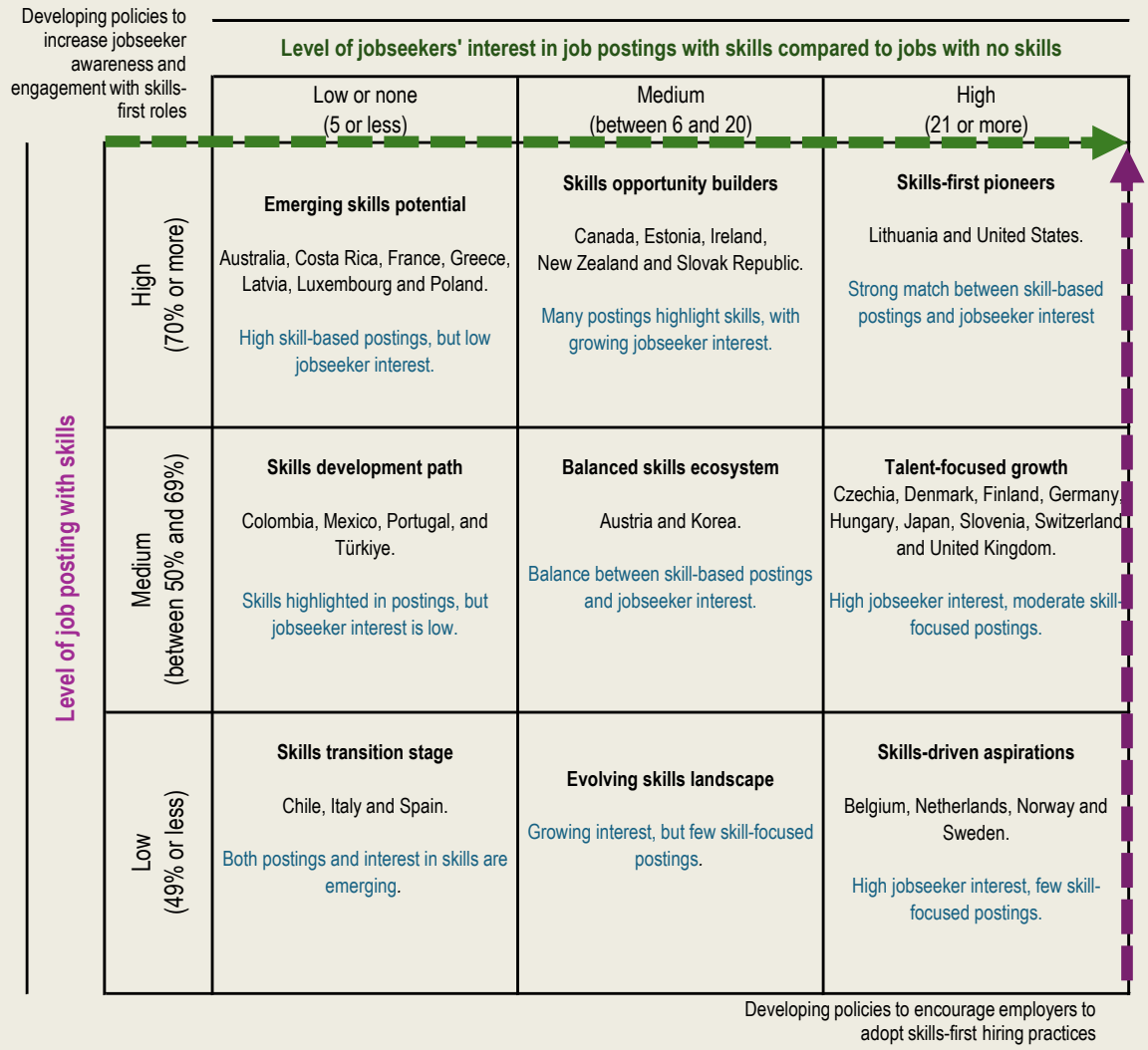
Box 4.1. The role of policy making in promoting occupational mobility through a skills-first approach

A skills-first approach to recruitment and human resource management can promote occupational mobility by reducing reliance on formal educational qualifications, which often reflect individuals' socio-demographic background more than skills. By focusing on what people can do rather than how skills were acquired, these practices can improve transparency between jobseekers and employers, helping firms identify needed competencies and enabling workers to better showcase their skills. Examples include name-blind recruitment, skills assessments and ongoing professional development, all of which broaden access to jobs that have traditionally been limited by inherited networks or institutional prestige.

Such practices have implications for all stakeholders: employers may need to rethink recruitment and HR strategies, education providers may adapt curricula and certification, and individuals must find new ways to demonstrate their skills. Addressing hiring bias and improving communication about skills is especially relevant for groups whose qualifications do not fully signal their abilities. Skills-first approaches are gaining ground across OECD countries, although uptake is uneven. In some, such as the United States and Lithuania, employer demand for skills-based hiring aligns with strong jobseeker interest. Elsewhere, mismatches persist: in Luxembourg and Greece, employers increasingly post skills-based vacancies, but jobseeker interest is low, while in the Netherlands and Sweden, interest is high but few postings emphasise skills (Figure 4.12).

Governments play a crucial role in scaling up adoption. With public employment accounting for around 20% of jobs across OECD countries, governments can lead by example. For instance, several US states have already removed degree requirements for many public roles. They can also steer a skills-first culture through strategies such as the EU's Union of Skills initiative, which invests in lifelong learning, reskilling and tools such as European Skills, Competences, Qualifications and Occupations (ESCO)[1] to support job matching. They can also strengthen HRM capacity by equipping professionals with the skills to use new tools, including AI-enabled systems piloted in France and the United Kingdom to support recruitment and workforce planning. Finally, governments can provide support structures for individuals, such as the Flemish Region's Learning and Career Account, which consolidates financial incentives and training opportunities into a single digital platform to encourage lifelong learning and smoother career transitions.

Figure 4.12. Jobseekers' engagement and employers' demands in a skills-first context



Note: The level of skills-first prevalence is on the horizontal axis. This metric refers to the extent to which individuals are inclined to apply – or consider applying – to job postings that specifically list required skills instead of those that do not mention particular skills. Categories are defined based on the standard deviation from the mean: a higher level of skills-first prevalence suggests that jobseekers respond more to postings that outline precise skills, reflecting a labour market where specific skills are prioritised over general qualifications or degrees. Conversely, a lower level indicates a continued reliance on traditional qualifications in the job application process. The percentage of online job postings with skills listed is on the vertical axis. This metric is used to rank countries in each level of skills-first prevalence.
Source: OECD (2025[33]), *Empowering the Workforce in the Context of a Skills-First Approach*, https://doi.org/10.1787/345b6528-en.
1 The European Skills, Competences, Qualifications and Occupations (ESCO) skills taxonomy acts as a "dictionary" for different stakeholders on education and training topics; describing, identifying and classifying professional occupations and skills relevant for the EU labour market and for stakeholders in the fields of education and training.
Source: OECD (2025[33]), *Empowering the Workforce in the Context of a Skills-First Approach,* https://doi.org/10.1787/345b6528-en.

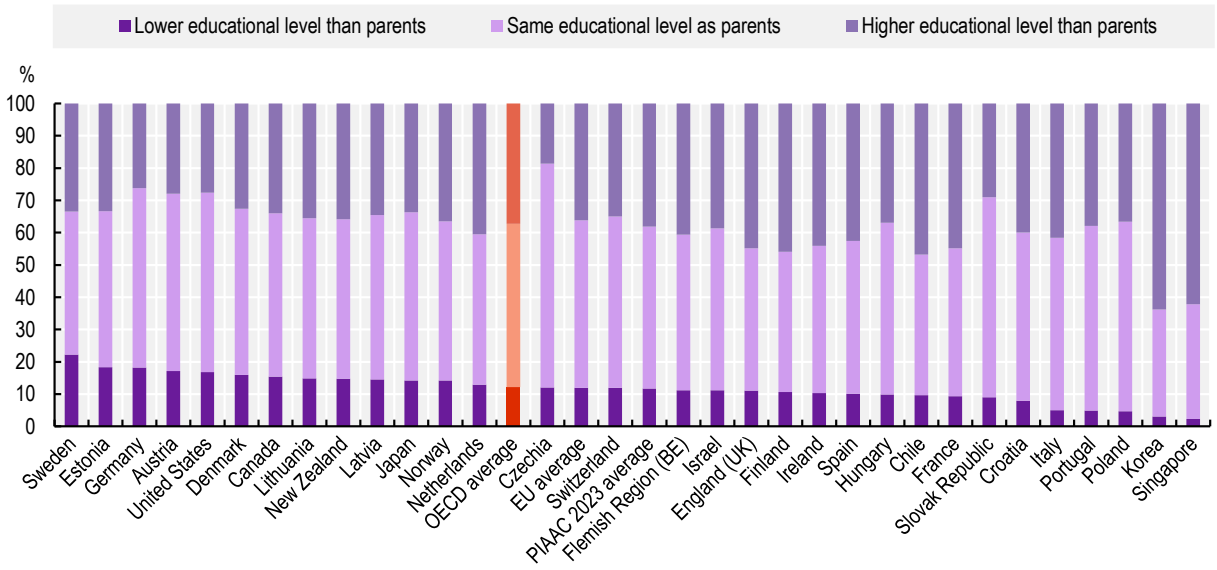
4.6.2. How intergenerational occupational and educational (im)mobility compare

In recent decades, levels of educational attainment have generally increased markedly, resulting in a large number of adults having completed a higher educational qualification compared to their parents. On

average across OECD countries, half of 30-65 year-olds have attained the same level of education as their parents, 37% have attained a higher level and 12% a lower level (Figure 4.13). Korea displays the highest level of upward educational mobility (i.e. the largest share of individuals with a higher educational level than their parents) and Czechia the lowest (64% and 19%, respectively). Conversely, Sweden exhibits the highest rate of downward intergenerational educational mobility, measured as the proportion of individuals with a lower qualification than their parents, while Singapore records the lowest (22% and 2%, respectively).

Figure 4.13. Intergenerational educational mobility, by country

Share of adults with lower, the same and higher levels of educational attainment than their parent(s)



Note: Adults aged 30-65. See the note for Table 4.1 for the definitions of groups based on parental occupation and respondents' educational attainment.
Countries are ranked in descending order based on the percentage of individuals with lower educational level than their parent(s).
Source: Calculations based on OECD (2024[22]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html.

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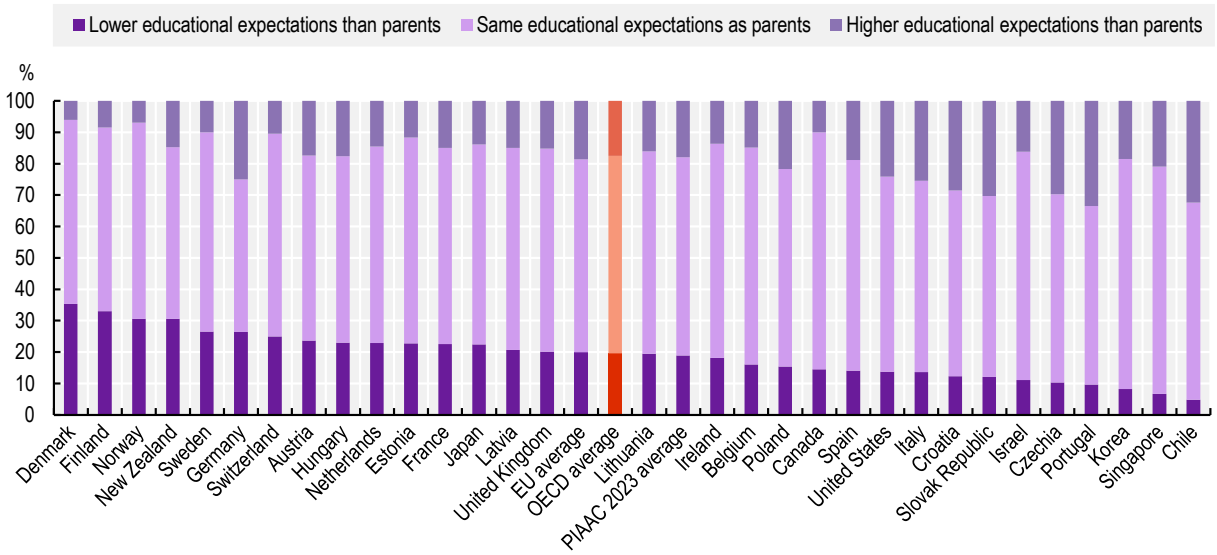
Young people's expectations of educational mobility are more conservative than actual intergenerational mobility in educational attainment observed among 30-65 year-olds, as findings from the 2022 Programme for International Student Assessment (PISA) show (Figure 4.14). On average across OECD countries, 17% of 15-year-old students expect to attain a higher level of education than their parents, almost 20% expect to attain a lower level and 63% expect to attain the same level. Portugal has the highest expected upward educational mobility (i.e. the largest share of students with higher expected educational level than their parents), while Denmark has the lowest (33% and 6%, respectively). Chile has the lowest expected downward educational mobility, and Denmark has the highest (5% and 35%, respectively).

Figure 4.14. Expected intergenerational educational mobility among 15-year-olds, by country

Share of students whose educational expectations are lower, the same or higher than the educational level of their parent(s)



Note: Students aged 15 years old. In 2022, students participating in the Programme for International Student Assessment (PISA) were asked to report their parents' educational attainment as well as the highest educational qualification they expected to obtain.
Countries are ranked in descending order based on the percentage of students with higher expected educational level than parent(s).
Source: Calculations based on OECD (2022[46]), *PISA 2022 Database*, www.oecd.org/en/data/datasets/pisa-2022-database.html.

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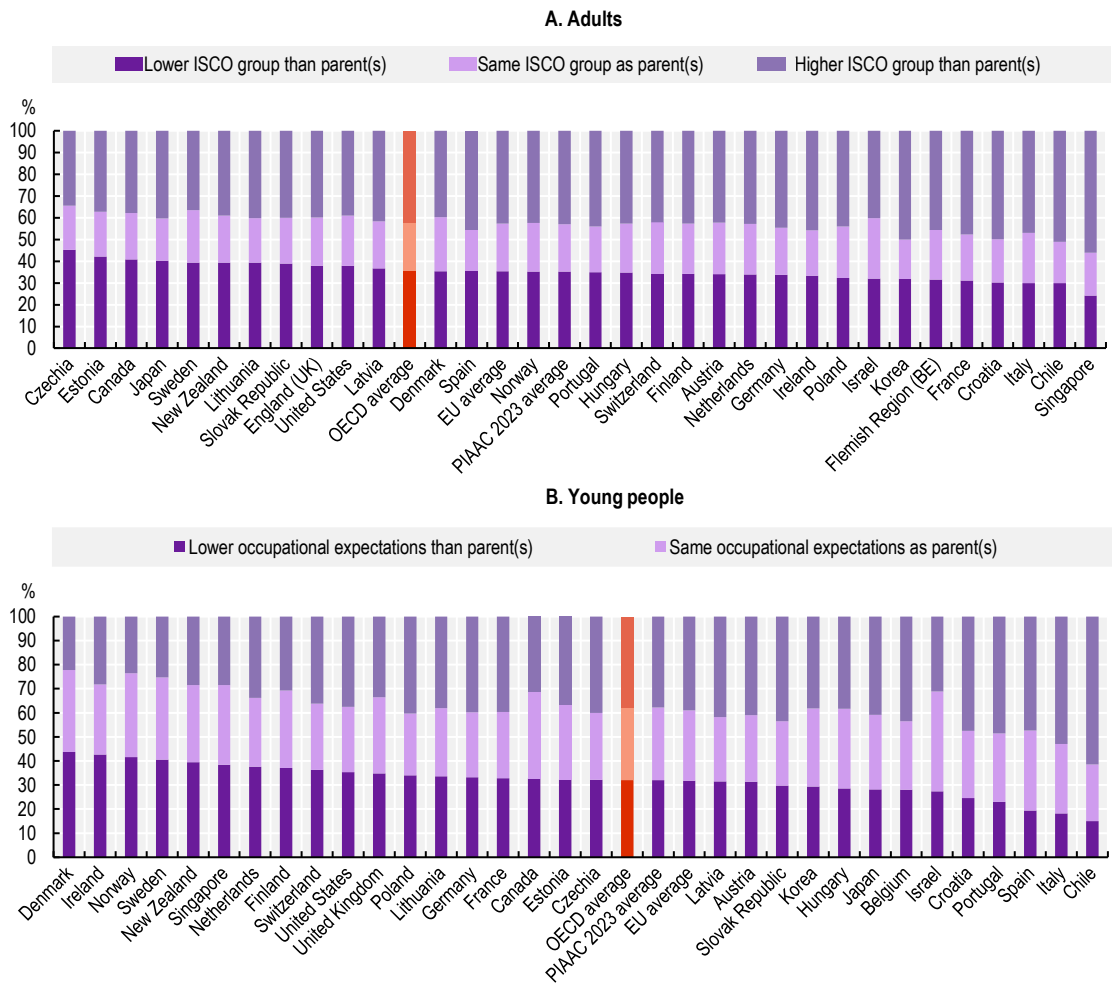
On average across participating OECD countries, 36% of adults aged 30-65 work in a lower occupational group than their parents, 22% work in the same group and 42% in a higher occupational group (Figure 4.15, Panel A). The figure highlights substantial differences across countries. For example, in Singapore, 56% of adults work in a higher occupational group than their parents, compared to only 34% in Czechia. Figure 4.15 (Panel B) also shows that, on average across participating OECD countries, 38% of 15-year-olds expect to work in a higher occupational group than their parents, 30% expect to work in the same group and 32% in a lower group. In line with the actual occupational comparisons of adults and their parents (Figure 4.15 Panel B), students in Chile report the highest expectations of upward occupational mobility, (62%), while students in Denmark report the lowest (22%).

Figure 4.15. Intergenerational occupational mobility, by country

Panel A: Share of adults with lower, same and higher ISCO group than their parents. Panel B: Share of students who report expecting to work in a lower, same and higher ISCO group than their parents



Note: Panel A: adults aged 30-65. Shows the percentage of adults with lower, same and higher ISCO group (1-digit level) than their parents. Panel B: shows the percentage of 15-year-old students who expect to work by age 30 in a lower, same and higher ISCO group (1-digit level) than their parents.

Countries are ranked in descending order of the share of adults (students) with downward occupational mobility (expectations).

Source: Calculations based on OECD (2024[22]), PIAAC data and methodology, www.oecd.org/en/about/programmes/piaac/piaac-data.html and OECD (2022[46]), *PISA 2022 database*, www.oecd.org/en/data/datasets/pisa-2022-database.html.

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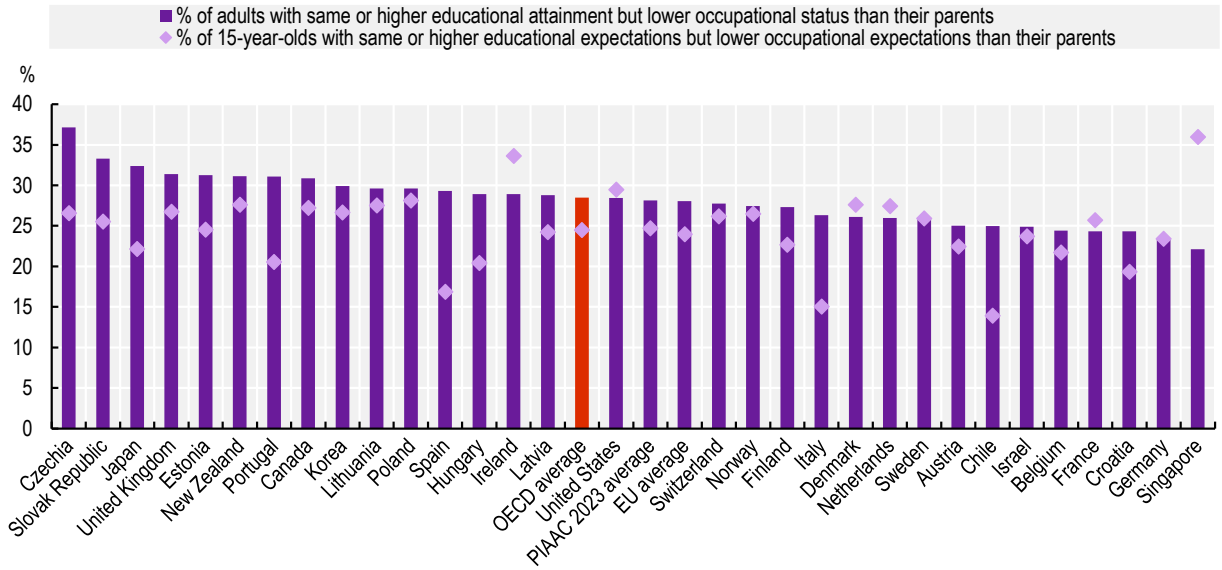
For each country, Figure 4.16 presents two indicators. The first shows the share of adults who have attained the same or a higher level of education compared to their parents but who are employed in an occupation with a lower social status than that of their parents. The second shows the share of 15-year-old students who expect to achieve the same or a higher level of education compared to their parents but, by the age of 30, anticipate working in an occupation with a lower social status than their parents. On average, 28% of adults have experienced downward occupational mobility despite experiencing stable or upward educational mobility, while 24% of young people expect to experience such downward mobility. Among adults, the divergence between educational and occupational outcomes is particularly pronounced

in Czechia, where as many as 37% have experienced downward occupational mobility despite stable or upward educational mobility. By contrast, Singapore has the lowest share at 22%. However, young people in Singapore are especially pessimistic about their future, with as many as 36% of 15-year-old students expecting to experience downward occupational mobility despite stable or upward educational mobility. In Chile, only 14% hold this expectation.

Figure 4.16. Intergenerational educational and occupational mobility among adults and young people, by country



Note: Percentage of adults aged 30-65 with same or higher educational attainment but lower occupational status (ISCO group [1-digit level]) than their parents. Percentage of 15-year old students who expect same or higher educational attainment but lower ISCO group (1-digit level) than their parents. In 2022, students participating in PISA were asked to report their parents' educational attainment, occupation as well as the highest educational qualification and occupation they expected to obtain.

Countries are ranked in descending order based on the percentage of adults with same or higher educational attainment but lower occupational status than their parents.

Source: Calculations based on OECD (2024[22]), *PIAAC data and methodology*, www.oecd.org/en/about/programmes/piaac/piaac-data.html and OECD (2022[46]), *PISA 2022 database*, www.oecd.org/en/data/datasets/pisa-2022-database.html.

StatLink https://stat.link/045g76

As educational attainment has risen over recent decades, most adults today hold qualifications that are at least as high as, and often higher than, those of their parents. However, for many, these gains in education have not translated into corresponding upward mobility in terms of occupational status. In many economies, the supply of well-qualified individuals has outpaced the creation of higher-status jobs capable of absorbing them. The result is a widening gap between educational attainment and occupational outcomes. This dynamic may help to explain growing feelings of disillusionment and frustration in many OECD countries: although families have invested heavily in education, improved qualifications do not reliably open the door to managerial or professional occupations that confer higher social status.

Looking ahead, the rapid diffusion of AI may further reshape the relationship between education and occupational mobility. On the one hand, AI could deepen existing mismatches by automating routine cognitive and technical tasks, reducing the number of mid-level professional roles traditionally accessible to well-qualified workers. On the other hand, it may create new opportunities for workers with advanced digital, analytical and creative skills, particularly in sectors that complement rather than compete with AI.

The overall impact will depend, at least in part, on how effectively education and training systems adapt to evolving skill demands and how labour market institutions support workers through these transitions.

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Annex 4.A. Supplementary online results

Annex Table 4.A.1. Country-level results for disparities in employment, earnings and job satisfaction

Table 4.A.1.1	Disparities in the likelihood of employment, by socio-demographic characteristic, by country
Table 4.A.1.2	Disparities in hourly earnings, by socio-demographic characteristic, by country
Table 4.A.1.3	Disparities in hourly earnings controlling for field-of-study, by country
Table 4.A.1.4	Disparities in job satisfaction, by socio-demographic characteristic, by country

StatLink https://stat.link/1x36e8

Annex Table 4.A.2. Occupations with lowest and highest mean scored in information-processing skills, delayed gratification and social and emotional skills

Table 4.A.2.1	Occupations with the lowest and highest mean scores in literacy
Table 4.A.2.2	Occupations with the lowest and highest mean scores in numeracy
Table 4.A.2.3	Occupations with the lowest and highest mean scores in adaptive problem solving
Table 4.A.2.4	Occupations with the lowest and highest mean scores in delayed gratification
Table 4.A.2.5	Occupations with the lowest and highest mean scores in emotional stability
Table 4.A.2.6	Occupations with the lowest and highest mean scores in conscientiousness
Table 4.A.2.7	Occupations with the lowest and highest mean scores in extraversion
Table 4.A.2.8	Occupations with the lowest and highest mean scores in agreeableness
Table 4.A.2.9	Occupations with the lowest and highest mean scores in open-mindedness

StatLink https://stat.link/0d7pzi

Notes

[1] The 2023 Survey of Adult Skills International Report (OECD, 2024[3]) noted that an increase of one standard deviation in numeracy proficiency is associated with a 9% increase in wages. This estimate accounts for years of education, age, gender, immigrant background, parental education, whether one lives with a partner or has children, and work experience. This estimate is also shown in Table 4.2, Model (2) in this chapter – as it is most similar in terms of control variables in the regression model.

[2] Whereas in other parts of the report the evidence presented reflects the average of country specific associations, in these sets of analyses the reference unit is the overall population of workers and the extent to which they are clustered in different occupations. To correctly account for differences in the probability of being sampled in different countries and population groups, weights are used when estimating a pooled model.

OECD Skills Outlook 2025

Building the Skills of the 21st Century for All

The first quarter of the 21st century has been defined by shocks and long-run transformations that have reshaped economic and social systems. These changes have been rapid, leaving less time for individuals, firms and governments to adapt, creating uncertainty. The gaps in who can build, deploy and benefit from essential 21st-century skills, and who is left behind, have been exposed and often widened. Unequal access to skills development impacts not just individuals but also economic growth, which is stunted due to underutilised talent. Disparities in labour market outcomes are varied: those related to socio-economic background arise mainly in the opportunities to develop skills, whereas differences between men and women lie more in how skills are used and rewarded through field-of-study sorting and occupational concentration. Place and immigrant background matter largely via differences in family resources. Returns to skills are large; however, the central challenge for policies is to ensure equal access to the opportunities to develop skills and have them recognised and valued in the labour market. As skills demands evolve faster than traditional policy cycles, targeted investments in lifelong learning and agile, data-driven governance that learns from labour-market intelligence can ease constraints and promote sustained growth.

Co-funded by
the European Union

PRINT ISBN 978-92-64-92977-7
PDF ISBN 978-92-64-50237-6

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