

5

The outcomes of investment in skills

This chapter looks at the extent to which proficiency in literacy, numeracy and problem solving in technology-rich environments makes a difference to the well-being of individuals and nations. The answer that emerges is clear: proficiency is positively linked to a number of important economic and social outcomes.

A note regarding Israel

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

To what extent does proficiency in information-processing skills make a difference to the labour-market outcomes and well-being of individuals and nations? Previous chapters of this report have examined the level and distribution of these skills among countries and different groups in the population, as revealed through the Survey of Adult Skills, a product of the OECD Programme for the International Assessment of Adult Competencies (PIAAC). They have also discussed the relationship between proficiency and factors that are thought to help adults develop and maintain their proficiency. This chapter examines the relationship between proficiency and some aspects of individual and social well-being: employment, earnings, and individual and social outcomes like health, participation in associative or volunteer activities, and the sense of influence on the political process.

Among the main findings discussed in this chapter:

- In most countries and economies, proficiency in information-processing skills is positively associated with the probability of being employed and earning higher wages. In practically all countries/economies, proficiency in literacy is valued independently of educational qualifications or experience.
- After the effects of educational attainment are taken into account, a 48 score-point increase in an individual's literacy proficiency (equivalent to one standard deviation) is associated with a 0.8 percentage-point increase in the likelihood of being employed as opposed to being unemployed. For salaried employees, an increase of one standard deviation in literacy proficiency is associated with a 6% increase in hourly wages, on average across OECD countries/economies that participated in the survey.
- In England (United Kingdom), Ireland, Lithuania, New Zealand, the Slovak Republic, Spain and Sweden, proficiency in literacy is a comparatively accurate predictor of employment. In England (United Kingdom), Israel, New Zealand, Singapore and the United States, proficiency in literacy is a comparatively strong predictor of higher wages. In Chile, Jakarta (Indonesia), Singapore, Slovenia and Turkey, educational qualifications are most strongly related to wages.
- Mismatches between skills and what is required or expected at work are pervasive, but only when workers are overqualified do they suffer a strong wage penalty. On average across OECD countries/economies that participated in the survey, about 22% of workers reported that they are overqualified – that they have higher qualifications than required to get their jobs – and 13% reported that they are underqualified for their jobs – that they have lower qualifications than required to get their jobs. Moreover, 11% have higher literacy skills than those typically required in their job, and 4% are underskilled. Some 40% of workers work in an occupation that is unrelated to their field of study.
- Overqualification has a significant impact on wages, even after adjusting for proficiency. Mismatch by field of study does not have a strong impact on wages; in many countries, the impact is not necessarily negative. Only when workers work outside their field and become overqualified do field-mismatched workers suffer a significant wage penalty.
- Proficiency in literacy, numeracy and problem solving in technology-rich environments is positively associated with other aspects of well-being. Adults who scored at lower levels of proficiency on the literacy scale were more likely than those who scored at high levels to have reported poor health, that they have little impact on the political process, and that they do not participate in associative or volunteer activities. Individuals with lower proficiency were also more likely than those with higher proficiency to have reported less trust in others.

The results, which focus primarily on literacy proficiency, suggest that, independent of policies designed to increase participation in education and training, improvements in adults' skills proficiency may provide potentially significant economic and social returns for individuals and society as a whole.¹ Adults' proficiency can be improved through formal schooling, programmes for adults with poor literacy and numeracy skills or with limited familiarity with ICTs, training in the workplace, and better use of skills in and outside of work.

SKILLS PROFICIENCY, LABOUR MARKET STATUS AND WAGES²

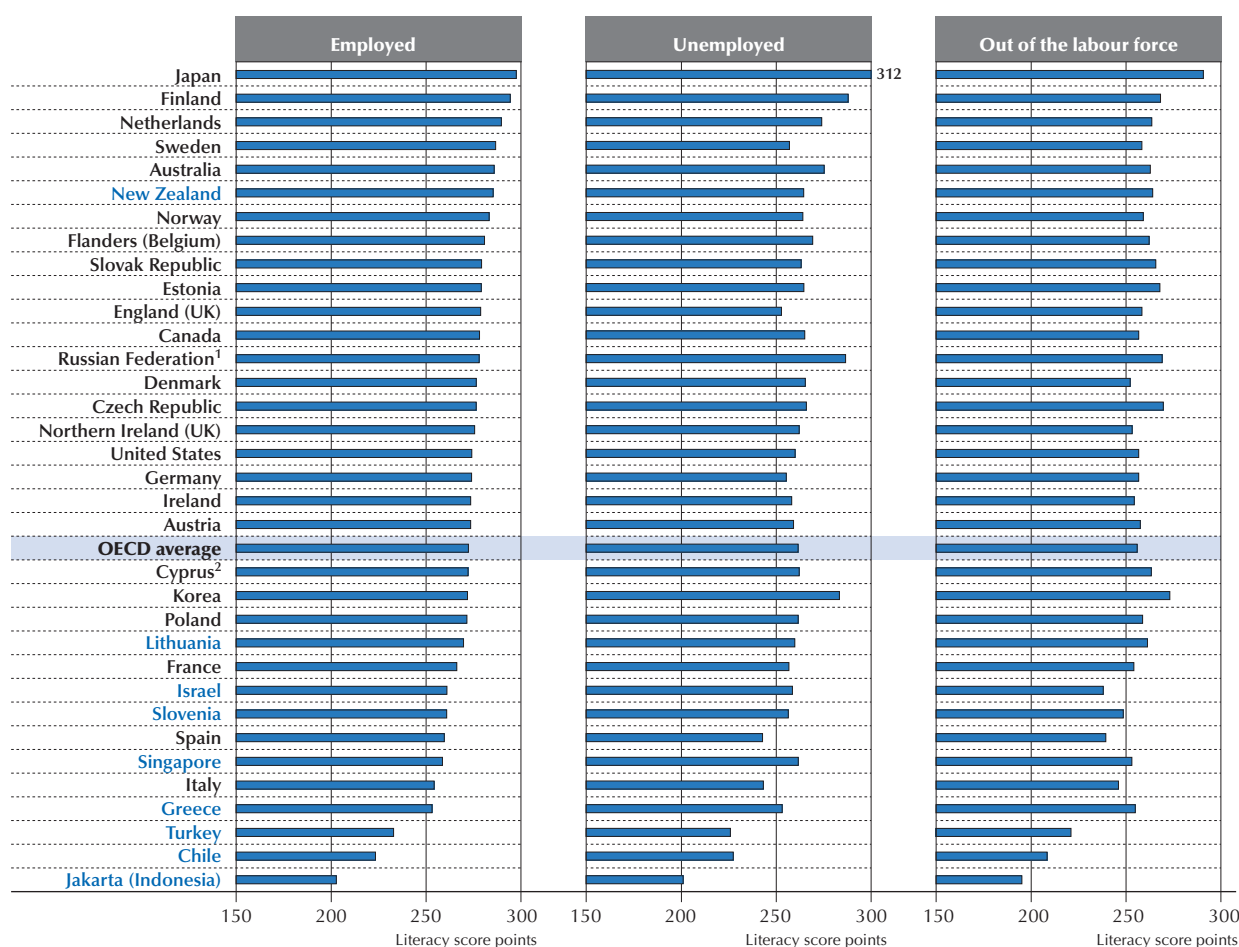
To the extent that workers' productivity is related to the knowledge and skills they have, and that wages reflect such productivity, albeit imperfectly, individuals with more skills should expect higher returns from labour market participation and would thus be more likely to participate in the labour market. Most studies use educational qualifications attained in the past as a proxy for individuals' current productive potential when investigating the returns to investments in human capital. Until the Survey of Adult Skills (PIAAC), only a few studies examined the returns to actual skills (e.g. Leuven, Oosterbek and van Ophem, 2004; Tyler, 2004). PIAAC provides more precise, recent and comparative information on how a person's current skills proficiency positively influences his or her likelihood to work and his or her wages (e.g. Hanushek et al., 2013; OECD, 2013; Vignoles, 2016).³

Analyses for the 24 countries and economies that participated in the Survey of Adult Skills in 2011-12 (Round-1 countries/economies) concluded that, after the effects of educational attainment are taken into account, an increase of one standard deviation in an individual's literacy proficiency (46 score points⁴) is associated with a 20% increase in the probability of being employed as opposed to being unemployed. In this group of countries, and for salaried employees, an increase of one standard deviation in literacy proficiency is also associated with an 8% increase in hourly wages (OECD, 2013). As will be shown in the following sections, similar findings hold when considering countries and economies that participated in the survey in 2014-15 (Round-2 countries/economies).

Proficiency and employment

When the total population is divided into the three standard labour market groups – i.e. employed, unemployed and inactive – the average proficiency in literacy among employed adults is generally higher than that among unemployed and inactive adults (Figure 5.1). However, the differences in proficiency are surprisingly small.⁵ Across the OECD countries/economies that participated in the Survey of Adult Skills, the average literacy score of employed adults is about 11 score points higher (about 4%) than that of unemployed adults, which, in turn, is almost identical to that of inactive adults.

Figure 5.1 ■ Mean proficiency in literacy, by labour force status



Note: Proficiency in literacy ranges between 0 and 500 score points.

1. See note at the end of this chapter.

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

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

Countries and economies are ranked in descending order of workers' mean literacy score.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.1 (L).

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This relatively small difference can be partly attributed to the high rate of unemployment among young people and the fact that many are inactive as they remain in education. Given that proficiency peaks at the age of 30, as described in Chapter 3, young people may be more proficient than their older counterparts, driving up the average literacy score of unemployed or inactive adults. In addition, the difference in proficiency between employed and unemployed adults is much larger when only those individuals who have been unemployed for longer than 12 months – the long-term unemployed – are used in the comparison.

Overall, while there is a relatively large pool of highly proficient adults who are out of work, either unemployed or inactive, some caveats are in order. First, it is important to keep in mind that while some unemployed adults may have scores in literacy, numeracy and problem solving in technology-rich environments that are similar to those of employed adults, they may lack other key skills needed to get a job, for example, job-specific skills or generic skills frequently required at work, such as self-organising skills.

Second, some inactivity might be voluntary and temporary, such as among young people who are still engaged in full-time education or skilled men and women who are caring for family members (Leaker, 2009). Differences in skills proficiency between unemployed and employed adults may be small in countries that offer little unemployment protection as it is those individuals with higher skills and better-paying jobs who can save and afford to spend time unemployed while looking for a job; low-skilled workers are often forced to find a job, any job, as quickly as possible to maintain some income and avoid falling into poverty (OECD, 2014a).

At the same time, the relatively high proficiency found among unemployed adults is important for labour market policy in identifying well-targeted skills-development programmes. Mismatches between people's skills and the skill requirements for jobs, in addition to various institutional constraints, are likely to prevent skilled people from engaging in employment or looking for work.

The skills proficiency among different groups of workers, based on their employment status, highlights the importance of taking stock of the skills held by unemployed individuals at the start of a period of unemployment, both in the domains assessed by the Survey of Adult Skills and in other key areas relevant to labour market needs, including job-specific and generic skills. This would help public employment services to identify the most appropriate course of action for each job-seeker, and to target interventions to ensure that unemployed adults remain motivated, gain relevant skills and do not suffer from skills obsolescence by not putting skills to use (OECD, 2015a).

Literacy proficiency, education and employment

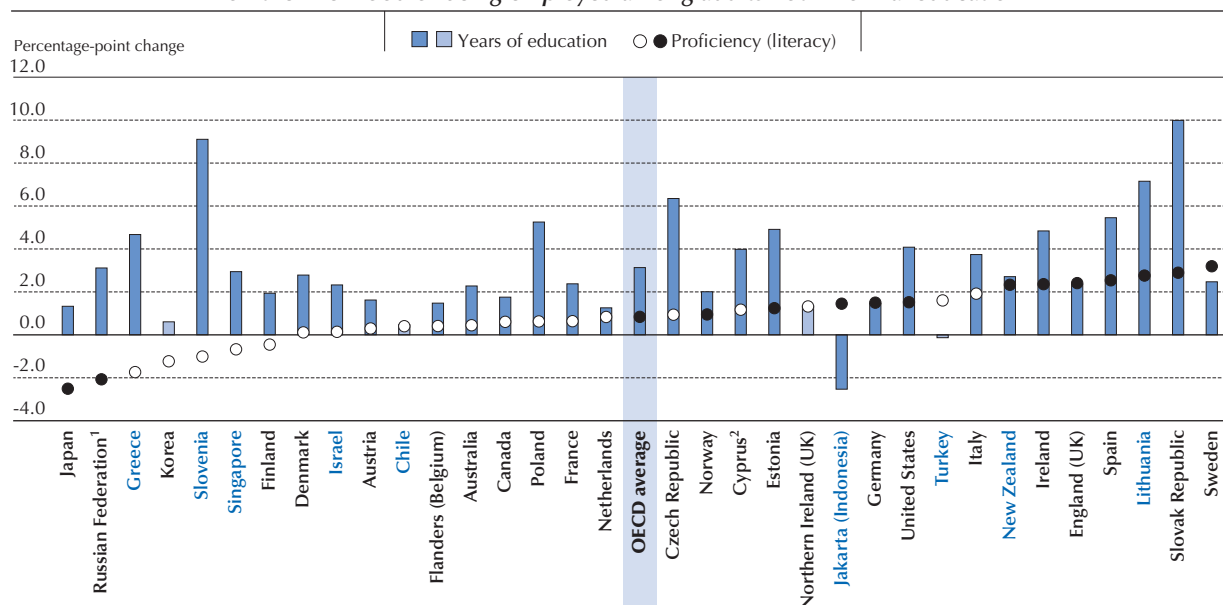
Are workers' actual information-processing skills or their educational attainment better predictors of employment? The relationship between skills proficiency and the likelihood of employment could be the result of compositional effects. Proficiency could simply be the reflection of higher educational attainment, which, in turn, affects the likelihood of employment. This is generally not the case, however. Proficiency plays an important and independent role as a determinant of success in the labour market, over and above the role played by formal education. Although it may be intuitive that adults with higher skills proficiency are more likely to be employed, the direction of cause and effect is unclear. For example, employment may itself favour skills acquisition or prevent the depreciation of workers' skills that are not put to use when adults are unemployed.

Across the OECD countries/economies that participated in the Survey of Adult Skills, an individual who scores 48 points higher than another on the literacy scale (the equivalent to one standard deviation) is 0.8 percentage point more likely to be employed than unemployed (see Figure 5.2). An increase of 3.2 years in formal education (the equivalent of one standard deviation) is related to a 3.1 percentage-point increase in the likelihood of being employed. The relationship between skills proficiency and the likelihood of employment is strongest in England (United Kingdom), Ireland, Lithuania, New Zealand, the Slovak Republic, Spain and Sweden.

The relationship between years of education and the likelihood of employment is strongest in the Czech Republic, Ireland, Lithuania, Poland, the Slovak Republic and Slovenia, where an individual with an additional 3.2 years of education is at least 5 percentage-points more likely to be employed. In Chile, Korea, Northern Ireland (United Kingdom) and Turkey, neither skills proficiency nor years of education are predictive of workers' employment status. Among Round-2 countries/economies, in New Zealand and Lithuania, both years of education and proficiency in literacy predict workers' likelihood of being employed.

The effect of literacy proficiency is computed by comparing the likelihood of being employed among adults with different proficiency in literacy, but who have spent the same number of years in education. Similarly, the effect of years of education is computed by comparing adults with similar proficiency in literacy but who have spent a different number of years in education. Such a calculation is possible because of the imperfect overlap of education and proficiency, as discussed in previous chapters.

Figure 5.2 ■ **Effect of education and literacy proficiency on the likelihood of being employed**
Marginal effects (as percentage point change) of a one standard deviation increase in years of education or literacy
on the likelihood of being employed among adults not in formal education



Notes: The reference category is «unemployed». Results are adjusted for gender, age, marital and foreign-born status. One standard deviation in proficiency in literacy for the working population is 48 score points. One standard deviation in years of education is 3.2 years for the working population. Statistically significant values (at the 10% level) are shown in a darker tone.

1. See note at the end of this chapter.

2. See note 2 under Figure 5.1.

Countries and economies are ranked in ascending order of the effect of proficiency on the likelihood of being employed.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.2.

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Educational attainment is a better predictor of employment than skills proficiency. Since it is difficult for employers to judge workers' actual skills proficiency before or outside of work, they are more likely to rely on readily available, albeit potentially imperfect, signals, such as educational qualifications. Skills thus become a stronger predictor of labour market outcomes when workers have more experience and have shown in work what they are capable of doing, a phenomenon called "employer learning" (OECD, 2014b).

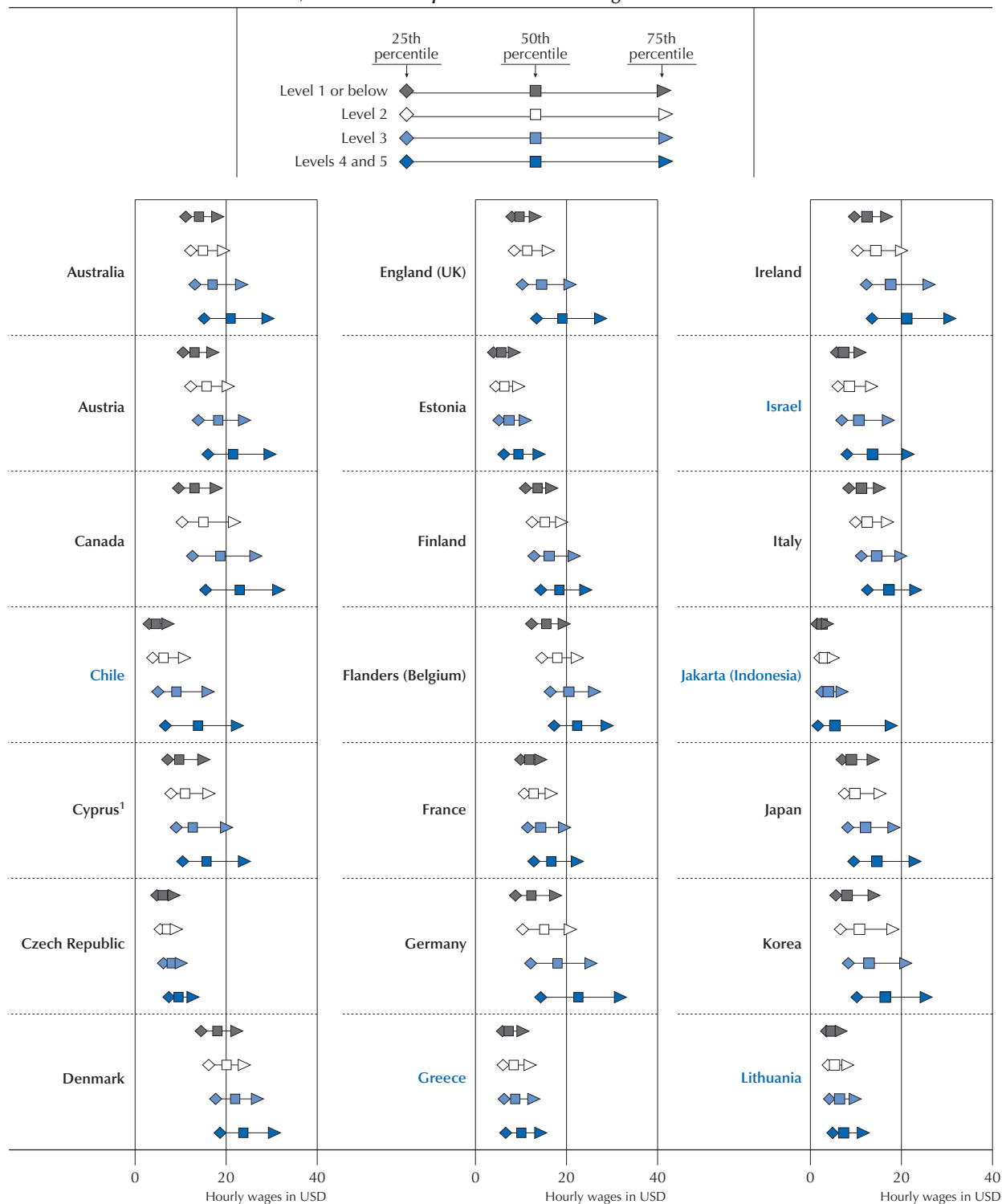
An important result of this analysis, which is confirmed in 14 of the 33 participating countries and economies is that proficiency in literacy plays a role in the likelihood that an adult in the labour force will be employed. This highlights the importance of job-matching policies to ensure that workers' skills are recognised and pay off. In these countries, skills proficiency is recognised and valued in finding employment, highlighting the importance of skills development in active labour market policies to help unemployed adults find work. These results suggest that in these countries there may be more direct rewards to lifelong learning and the development of skills beyond school.

These findings suggest that improving literacy, numeracy and problem-solving skills, together with the ability of employers to identify and recognise these skills, may have a significant impact on the likelihood of being employed, beyond encouraging participation in education and training. Improving the quality of instruction in reading and mathematics in schools, for example, could have long-term beneficial effects, as could improving the quality, targeting and the availability of adult learning opportunities and ensuring that adults' skills are put to use to avoid depreciation.

Proficiency and wages

Hourly wages are strongly associated with skills proficiency (Figure 5.3).⁶ On average across the OECD countries/economies that participated in the Survey of Adult Skills, the median hourly wage of salaried employees scoring at Level 4 or 5 on the literacy scale is 65% higher than that of workers scoring at or below Level 1. Differences in returns to proficiency vary across countries and economies, more so than for employment status. In Greece, as in Denmark, Finland, Norway and Sweden, the distribution of wages appears to be compressed:⁷ the median worker scoring at Level 4 or 5 on the literacy scale earns no more than 40% more than the median worker scoring at or below Level 1.

Figure 5.3 [1/2] ■ **Distribution of wages, by literacy proficiency level**
 25th, 50th and 75th percentiles of the wage distribution



Notes: Employees only. Hourly wages, including bonuses, in purchasing-power-parity-adjusted USD (2012). The analysis excludes the Russian Federation because wage data obtained through the survey do not compare well with those available from other sources. Hence further checks are required before wage data for this country can be considered reliable.

1. See note 2 under Figure 5.1.

Countries and economies are listed in alphabetical order.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table 5.3 (L).

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Figure 5.3 [2/2] ■ **Distribution of wages, by literacy proficiency level**
 25th, 50th and 75th percentiles of the wage distribution



Notes: Employees only. Hourly wages, including bonuses, in purchasing-power-parity-adjusted USD (2012). The analysis excludes the Russian Federation because wage data obtained through the survey do not compare well with those available from other sources. Hence further checks are required before wage data for this country can be considered reliable.

Countries and economies are listed in alphabetical order.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table 5.3 (L).

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At the other extreme, returns to greater proficiency in literacy appear to be extremely large in Jakarta (Indonesia), Korea, Turkey and the United States, where the median worker scoring at Level 4 or 5 earns more than double that of the median worker scoring at or below Level 1. In Chile and Singapore, the median worker in the highest proficiency levels earns almost three times more than the median worker scoring at or below Level 1.

There is significant overlap in the distribution of wages by proficiency level within and across countries. For instance, on average across the OECD countries/economies that participated in the Survey of Adult Skills, the top 25% best-paid workers scoring at Level 2 earn about the same as the median worker scoring at Level 4 or 5, a result that is also observed in Israel, Singapore and Turkey. In Greece and Lithuania, the top 25% best-paid workers scoring at Level 2 in literacy earn 19% and 13% more, respectively, than the median hourly wage of those scoring at Level 4 or 5 (Figure 5.3), suggesting that although literacy is an important and valued skill in the labour market, other skills or attributes are rewarded as well. In Chile, the median worker scoring at proficiency Level 4 or 5 earns almost 30% more than the top earners in Level 2, suggesting that literacy skills are accurate predictors of higher wages.

The assessment allows for a comparison of the earnings of workers with similar proficiency across countries/economies. The median worker scoring at Level 2 in New Zealand and Singapore earns higher hourly wages than the median worker scoring at Level 4 or 5 in the Czech Republic, Estonia, Greece, Jakarta (Indonesia), Lithuania, Poland, the Slovak Republic and Turkey. Put another way, the bottom 25% of earners among workers scoring at Level 4 or 5 in New Zealand and Singapore earn more than the top 25% of earners scoring at the same level in the Czech Republic, Lithuania and the Slovak Republic. These international comparisons raise interesting questions concerning the variation in how literacy skills determine workers' wages and productivity.

Literacy proficiency, education and wages

The relationship between wages and skills proficiency is explored in more detail by adjusting for several individual characteristics, including years of education. Cause and effect between skills proficiency and wages is unclear. Higher wages may be characteristic of occupations that favour workers' skills acquisition through formal training, for example. Distinguishing years of education from skills proficiency in the returns to skills helps determine whether returns to skills merely reflect the fact that high-educated individuals tend to have – but not always do have – higher skills proficiency. This section shows that skills proficiency plays an important and independent role in determining wages, over and above the role played by formal education.

Proficiency and schooling have significant and distinct effects on hourly wages.⁸ The increase in wages associated with a one standard deviation increase in literacy proficiency (around 48 points for the working population) ranges from less than 4% in Finland, Greece, Italy, Lithuania and Spain, to 10% or more in England (United Kingdom), Israel, Singapore and the United States (Figure 5.4). The increase in wages associated with a one standard deviation rise in years of education (around 3.4 years for the working population) is larger, ranging from less than 7% in Sweden to more than 20% in Chile, Jakarta (Indonesia), Slovenia, Turkey and the United States, and to more than 30% in Singapore.

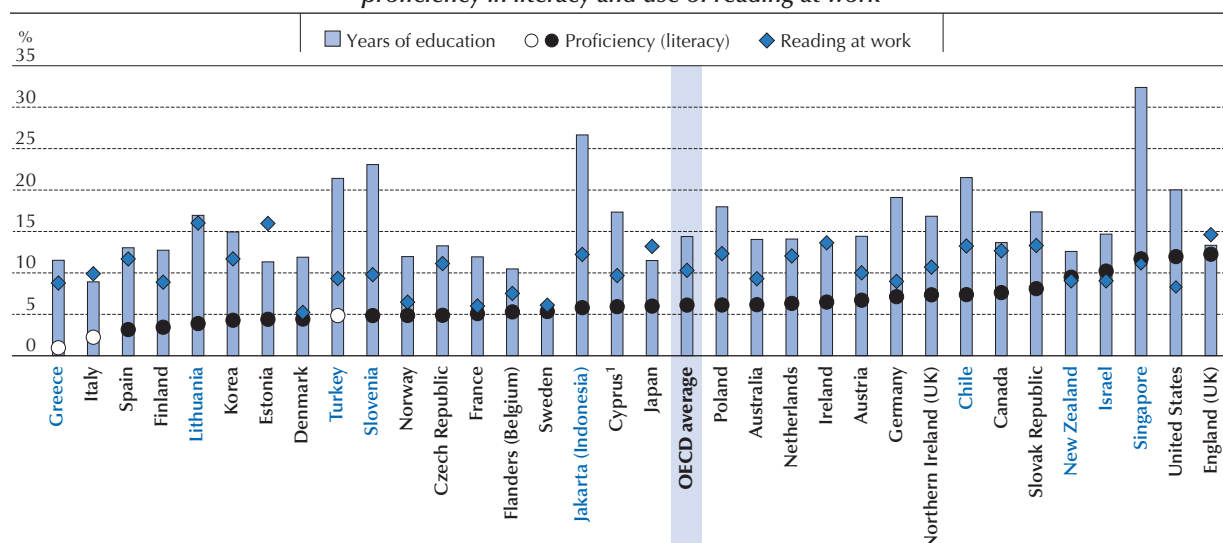
Part of the effect of proficiency on hourly wages may be based on the type of tasks and responsibilities that are part of a worker's job. In addition to years of education and skills proficiency, Figure 5.4 considers the use of reading skills at work. Workers in jobs that require more intense use of reading also earn higher wages, pointing to the fact that wages do not just reflect the supply of skills (workers), but also the demand for skills (employers). This is especially true in England (United Kingdom), Estonia and Lithuania, where returns to skills use are the highest among participating countries. Including skills use at work in the models also serves to show that the effect of skills use proficiency is not driven by selection. It is not that more proficient workers earn more because they are selected for more skills-intensive jobs, but rather that they earn higher wages even when compared to workers in jobs with similar skill requirements.

One can also adjust the estimates by other indicators of skills use at work. Not surprisingly, the inclusion of skills-use variables weakens the effect of both education and proficiency on wages by about a third, on average.⁹ In about half of the participating countries/economies, co-operative skills, influence and task discretion, are positively and significantly correlated with wages, while dexterity is negatively and significantly correlated with wages. In most countries/economies, the use of physical skills is negatively and significantly correlated with wages, while the use of information-processing skills, such as writing, familiarity with ICTs and problem solving, is positively and significantly correlated with wages. The fact that skills use, over and above general proficiency and education, influences wages strengthens the findings on skills mismatch presented below.

Overall, the number of years spent in education tends to have a smaller impact on wages in countries/economies with a more compressed wage distribution, such as the Nordic countries, Flanders (Belgium) and Italy (see OECD, 2015a).

By contrast, greater proficiency and educational attainment are associated with significantly higher wages in Chile, Israel, Jakarta (Indonesia), Singapore and the United States, all of which have relatively high earnings inequality. However, this only suggests a link between the earnings distribution and returns to education, as other factors affect the ranking of countries/economies. For instance, Slovenia, where earnings inequality by proficiency level is relatively low, shows relatively high returns to education.

Figure 5.4 ■ **Effect of education, literacy proficiency and use of reading at work on wages**
Percentage change in wages associated with a one standard deviation increase in years of education, proficiency in literacy and use of reading at work



Notes: Hourly wages, including bonuses, in PPP-adjusted USD (2012). Coefficients from the OLS regression of log hourly wages on years of education, proficiency and use of reading skills at work, directly interpreted as percentage effects on wages. Coefficients adjusted for age, gender, foreign-born status and tenure. The wage distribution was trimmed to eliminate the 1st and 99th percentiles. One standard deviation in proficiency in literacy is 48 points. One standard deviation in years of education is 3.2 years. The analysis excludes the Russian Federation because wage data obtained through the survey do not compare well with those available from other sources. Hence further checks are required before wage data for this country can be considered reliable. Statistically significant values (at the 10% level) are shown in a darker tone.

1. See note 2 under Figure 5.1.

Countries and economies are ranked in ascending order of the effect of literacy proficiency on wages.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.4.

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Finally, all of the above analyses assume that the effects of educational attainment and proficiency on wages are independent; but some recent research suggests that this may not be the case. In the recent past, several OECD countries have reported a sharp increase in wage inequality at the very top of the earnings distribution (OECD, 2015a, 2015b, 2013). One explanation for this is that the returns to skills are significantly larger for the most-educated individuals. Analysis of results from the Survey of Adult Skills confirms this hypothesis. In over half of the countries, estimates of returns to proficiency increase with qualifications, pointing to larger returns to skills acquisition for those who are already highly qualified.

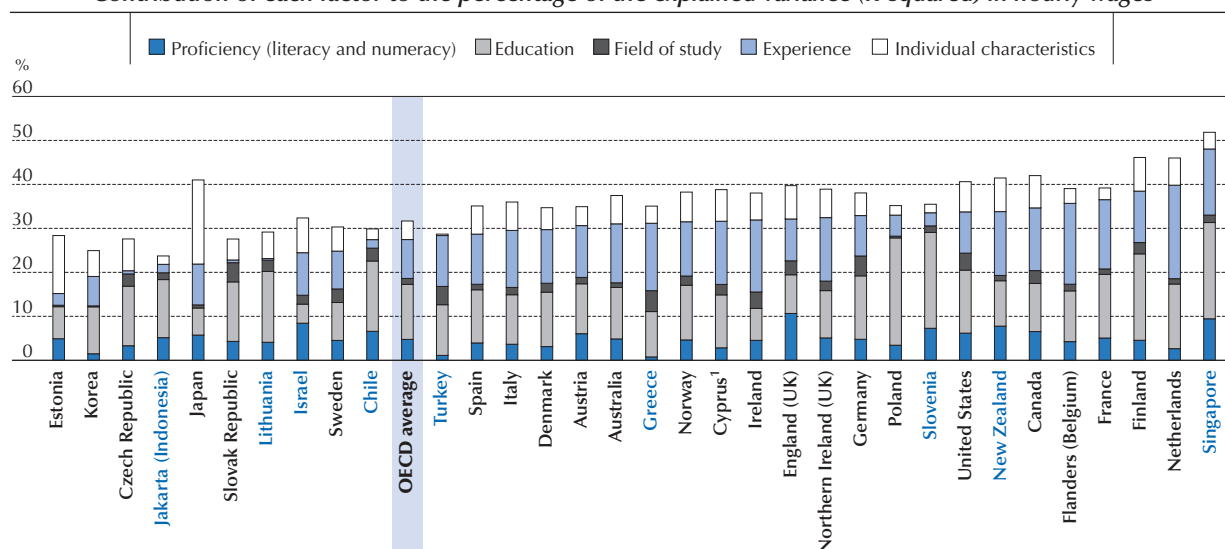
Educational attainment and proficiency in information-processing skills contribute independently to explaining individuals' wages. But what is the relative contribution of each? And what is their relative contribution compared to other human-capital wage determinants, like experience or individual characteristics? The answer to these questions is complicated by the fact that educational attainment and proficiency are measured according to different metrics: years of education and assessment scores, respectively. One way of overcoming this restriction is by analysing how much a standard deviation in educational attainment (or skills proficiency) relates to wages. Another is to look at how much of the variation in wages is explained by each variable (OECD, 2014b).

Human capital components, that is experience, years of education, field of study and proficiency in literacy and numeracy, account for almost 30% of the variation in wages, on average across countries/economies. Information-processing skills contribute 5%, educational attainment accounts for 13%, field of study 1% and experience accounts for 9%, on average across the OECD countries and economies that have participated in the Survey of Adult Skills. Individual characteristics, like gender, immigrant background, marital status and language spoken at home, account for 4% combined. More than 60% is related to other individual and human capital characteristics. Skills use, occupation, industry and firm characteristics also determine individual wages.¹⁰

Proficiency in literacy and numeracy, education, field of study and experience can all be considered different aspects of workers' human capital. The contribution of literacy and numeracy skills, relative to educational attainment, field of study and experience, is greatest in England (United Kingdom), Estonia and Israel, where workers' proficiency explains a third of the overall contribution of the different components of human capital. In Chile, Jakarta (Indonesia), Japan, New Zealand and Slovenia, the relative importance of skills proficiency is also high, explaining more than one-fifth of the variation in wages. These are countries where the returns to skills are more important in understanding the returns to human capital.

Years of education are most relevant, *vis-a-vis* information-processing skills and experience, in the Czech Republic, Lithuania and Poland, where they account for more than two-thirds of the overall variation in wages explained by components of human capital. These are countries where educational credentials have more power in explaining the wage distribution. As a component of human capital, experience accounts for a larger share in Flanders (Belgium), Greece, Ireland and the Netherlands (Figure 5.5).

Figure 5.5 ■ **Contribution of education, literacy and numeracy to the variation of hourly wages**
Contribution of each factor to the percentage of the explained variance (R-squared) in hourly wages



Notes: Results obtained using a regression-based decomposition following the methods in Fields (2004). Each bar summarises the results from one regression and its height represents the R-squared of that regression. The sub-components of each bar show the contribution of each factor (or set of regressors) to the total R-squared. The Fields decomposition is explained in more detail in Box 5.4 of the *OECD Employment Outlook 2014* (OECD, 2014b). The dependent variable in the regression model is the log of hourly wages, including bonuses in PPP-adjusted USD (2012). The regressors for each factor are: years of working experience and its squared term for "Experience"; proficiency in literacy and numeracy for "Proficiency"; years of education for "Education"; and gender, marital status, migration status and language spoken at home for "Individual characteristics".

The analysis excludes the Russian Federation because wage data obtained through the survey do not compare well with those available from other sources. Hence, further checks are required before wage data for this country can be considered reliable.

1. See note 2 under Figure 5.1.

Countries and economies are ranked in ascending order of the sum of the contributions of education, proficiency, field of study and experience.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.5.

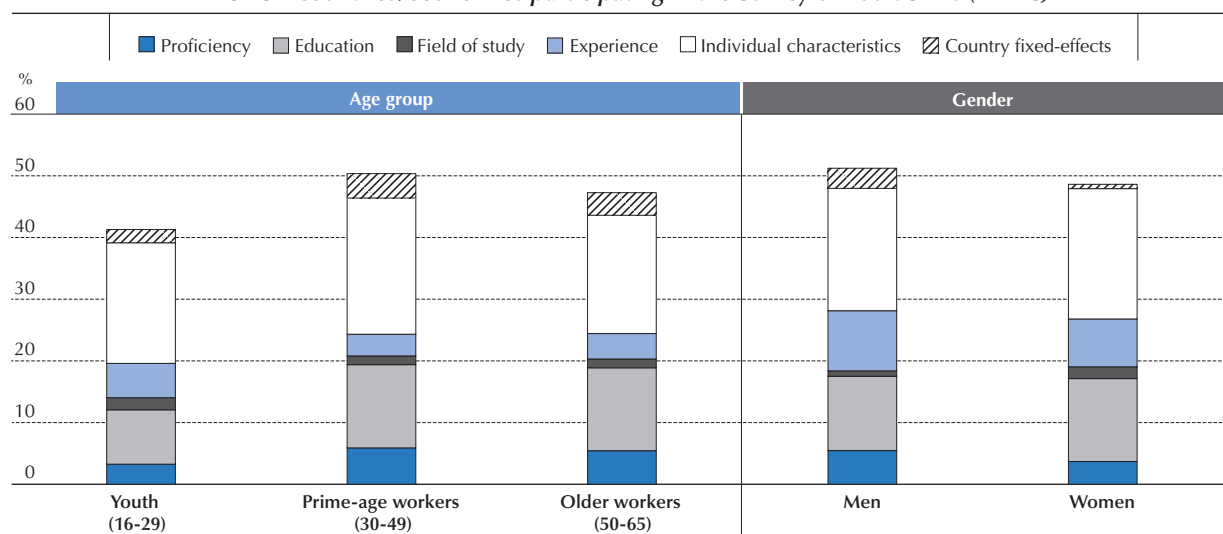
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The phenomenon of employer learning is most clearly illustrated in Figure 5.6. Information-processing skills and experience explain a larger share of the variation in wages among prime-age (30-49 years) and older workers (50-65 years) than among younger workers (16-29 years), on average across participating OECD countries/economies. The components of human capital (years of education, proficiency in literacy and numeracy, field of study and experience) explain a larger share of the variation in wages among prime-age and older workers. Across all participating countries/economies, and net of differences between them, proficiency in numeracy and literacy accounts for 3% of the variation in wages among younger adults, 6% among prime-age workers and 5% among older workers. Experience accounts for a larger part among young adults than prime-age workers, highlighting the importance of work-experience training schemes and the value of work-related skills for youth.

There are gender differences in the extent to which different components account for wages. Proficiency in numeracy and literacy and experience account for a larger share of the variation in wages among men than women, but educational attainment accounts for a greater share of wage variation among women than among men.

Figure 5.6 ■ **Contribution of education, literacy and numeracy to the variation of hourly wages, by age group and gender**

Contribution of each factor to the percentage of the explained variance (R-squared) in hourly wages in OECD countries/economies participating in the Survey of Adult Skills (PIAAC)



Notes: The dependant variable is the log of hourly wages, including bonuses, in PPP-adjusted USD (2012). The factors are: years of work experience and a squared term; proficiency in literacy and numeracy; years of education; and demographic variables (gender, marital status, immigrant background and the language spoken at home).

Results obtained using regression-based decomposition through the formulae proposed by Fields (2004). Each bar summarises the results from one regression and the height of each bar represents the total R-squared for that regression. The subcomponents of each bar show the contribution of each factor (or set of regressors) to the R-squared. The Fields decomposition is explained in more detail in Box 5.4 of the *OECD Employment Outlook 2014* (OECD, 2014b).

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Tables A5.6a and A5.6b.

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These results suggest that educational attainment, experience and proficiency in literacy and numeracy reflect different aspects of individuals' human capital, each of which has independent and statistically significant effects on wages. Educational attainment, either in itself or expressed as years of education, represents a wider set of knowledge and skills, including job- and domain-specific competencies, as well as personal attributes, than does proficiency in the domains assessed in the Survey of Adult Skills. Since it is more difficult for a prospective employer to assess skills than qualifications, the relative strength of the influence of years of education and proficiency on wages may also reflect the fact that wage negotiations that occur during hiring are based on the observable characteristics of individuals, i.e. formal qualifications, and have a lasting impact on wages.

In the course of the employment relationship, employers may learn about the competencies of their employees, which is then translated into a larger effect of proficiency on wages (Pinkston, 2009). Evidence of this phenomenon of employer learning has been found in the Survey of Adult Skills (OECD, 2014b). However, the fact that proficiency has an independent influence on wages, beyond that of educational attainment, confirms the importance of maintaining and acquiring skills throughout a lifetime. Differences across countries and economies in the magnitude of the effects are heavily influenced by how wages are distributed across occupations and, in turn, by the labour market institutions, such as minimum wages and unions, that affect that distribution.

MISMATCH BETWEEN WORKERS' SKILLS AND JOB REQUIREMENTS, AND ITS IMPACT ON WAGES

Ensuring a good match between the skills acquired in education and on the job and those required in the labour market is essential if countries want to make the most of their investments in human capital and promote strong and inclusive growth. It is also a desirable outcome for individuals who have, themselves, invested in education. A mismatch between workers' skills and the demands of their job has potentially significant economic implications. At the individual level, it affects job satisfaction and wages. At the firm level, it increases the rate of turnover and may reduce productivity. At the macro-economic level, it increases unemployment and reduces GDP growth through the waste of human capital and/or a reduction in productivity (e.g. Adalet McGowan and Andrews, 2015).

Because of the difficulty of measuring the relationship directly, studies infer the consequences of mismatch on productivity either by relying on human capital theory, equating wages to productivity, or by studying the effect of mismatch on job satisfaction. Using these approaches, most studies conclude that, by comparing workers with similar credentials/skills but in jobs for which they are well-matched or overqualified/overskilled, mismatch has a negative impact on productivity: overqualified/overskilled workers earn less than their well-matched peers with similar credentials or skills proficiency.

Adalet McGowan and Andrews (2015) analyse productivity directly and find strong negative effects of mismatch. However, when comparing workers performing a similar job, those who are overqualified are more productive, as they have more human capital than their colleagues (Kampelmann and Rycx, 2012). Thus, at the firm level, mismatch can lead to higher productivity; but, on the aggregate level, this may not be the case.

Yet some level of mismatch is inevitable. Requirements regarding skills and qualifications are never fixed. The task content of jobs changes over time in response to technological and organisational change, the demands of customers, and in response to the evolution of the supply of labour. Young people leaving education and people moving from unemployment into employment, for example, may take jobs that do not necessarily fully match their qualifications and skills. Thus, for a number of reasons, some workers are likely to be employed in jobs for which they are too qualified and others may be in jobs, at least temporarily, for which they lack adequate schooling.

Mismatch, understood as a poor fit between an individual worker's qualifications or skills and those demanded or required by his or her job, needs to be distinguished from aggregate balances or imbalances in the supply of and demand for different types of qualifications and skills in the labour market, such as skill shortages or the oversupply or undersupply of people with different educational qualifications or skills. Although these two phenomena are distinct, they are, nevertheless, related.

Imbalances (e.g. shortages or oversupply of individuals with particular qualifications or skills) have an effect on the prevalence and type of mismatches observed at the individual level (Montt, 2015). But that relationship is not automatic. A balance between the supply of and demand for workers at a given qualification does not guarantee that individual workers will be matched to jobs that require the level of education they have attained. A high level of mismatch at the individual level does not imply any particular level of imbalance between aggregate supply and demand.

The discussion of qualification, field-of-study and skills mismatch that follows focuses on the question of mismatch at the individual level, that is, on the outcomes of allocating individuals to jobs and adapting job tasks to workers' skills. It does not address the extent of the balance or imbalance in the supply of and demand for individuals with particular educational qualifications or skills. From this perspective, any evidence of mismatch between workers' qualifications and skills and those required by their jobs should be interpreted primarily as suggesting that there are economic benefits (and benefits in terms of the well-being of workers) to be gained from better management of human resources. The evidence should not be interpreted as indicating the existence of "overeducation" or "overskilling" in the economy as a whole.

Mismatch in the Survey of Adult Skills

The Survey of Adult Skills provides a rare opportunity to simultaneously measure qualification, field-of-study and skills mismatch. Some workers may be overqualified or underqualified for their jobs. Others may be working in a sector of the economy (or in a job) that is unrelated to their field of study. And other workers may be mismatched in a particular type of skill, like numeracy, if their ability to deal with numbers, calculation and other numeracy tasks exceeds (or is insufficient for) those required by the job. (Box 5.1 provides more details on measuring these forms of mismatch in the Survey of Adult Skills).

Because qualifications do not accurately reflect actual skills held by individuals – not even those acquired in initial education – and occupations do not accurately describe the specific job held by an individual, the resulting measures of qualification and field-of-study mismatch do not precisely describe how a worker's skills set matches the skills needed to carry out his or her tasks at work. Skills mismatch refers more precisely to a worker's actual skills and to the skills needed in his or her specific job.

Despite these important differences, the three measures of mismatch overlap to some extent, in the same way as education and skills do. Some researchers use the term "genuine mismatch" to indicate when a worker is both overqualified and overskilled (or both underqualified and underskilled) for his or her job. The term "apparent qualification mismatch"¹¹ is used to refer to workers who are overqualified (underqualified) but not overskilled (underskilled).

For instance, workers may hold a tertiary qualification but not have the skills expected of a tertiary graduate, making them overqualified but not overskilled for a job normally requiring an upper secondary qualification. Similarly, field-of-study mismatch is generally accompanied by overqualification. Workers who find jobs outside their field may not have their highest qualification recognised and must settle for a job that requires lower educational attainment. As such, they may be also overskilled if they do not use all their skills in their mismatched job.

Although qualifications are an imperfect proxy for skills, qualification and field-of-study mismatch should not be simply dismissed as a “bad” measure of skills mismatch. First, by uncovering the causes of “apparent” qualification mismatch, for example when there is a mismatch between the skills learned in school and those required in the labour market, the areas requiring policy intervention are revealed. Second, workers have many different skills, ranging from information-processing skills, to occupation-specific/sector-specific knowledge and abilities, to generic skills. As a result, any concept of mismatch based on an individual’s skills offers only a partial view of the match between a worker and his or her job.

Qualifications reflect several different skills, including both information-processing and job-specific competencies, and could complement narrower, though more precise, skills measures. Field-of-study, if associated with qualifications mismatch, may reflect the difficulty workers face in having their credentials recognised and valued in other fields. In addition, skills use depends, at least partly, on the effort that workers invest in their jobs, making it difficult to define precise skills requirements. Qualification requirements are easier to define.

Thus, several measures of qualifications and skills mismatch can be derived using the data available from the Survey of Adult Skills on qualifications, field of study, occupation skill requirements and skills use (Table 5.1 and Box 5.1). Analysing them simultaneously and seeing how they overlap offers insights into the linkages between education and the labour market, and sheds light on appropriate policy responses (e.g. Montt, 2015; OECD, 2016a).

Table 5.1 Glossary of key terms related to mismatch

	Mismatch concept	Measure used in this chapter
Qualification mismatch	Overqualification	A worker is classified as overqualified when the difference between his or her qualification level and the qualification level required in his or her job is positive.
	Underqualification	A worker is classified as underqualified when the difference between his or her qualification level and the qualification level required in his or her job is negative.
	Required qualification	Based on respondents’ answers to the question “If applying today, what would be the usual qualifications, if any, that someone would need to get this type of job?” Qualifications were translated into years of education based on the structure of each country’s education system.
Skills mismatch in literacy, numeracy or problem solving	Overskilling in literacy, numeracy or problem solving	When a worker’s proficiency is above the maximum required by his or her job.
	Underskilling in literacy, numeracy or problem solving	When a worker’s proficiency is below the minimum required by his or her job.
	Skill requirements	The minimum and maximum levels required correspond to the minimum and maximum observed proficiency of workers who answer negatively to both questions used to identify self-reported over- and underskilling.
Field-of-study mismatch	Mismatch by field of study	A worker is classified as mismatched by field of study if the area of study of his or her highest qualification is not related to the field that is most relevant to the worker’s job following the coding used by Wolbers (2003), Quintini (2011) and, for ISCO 08 occupations, Montt (2015).
	Matched by field of study	A worker’s area of study of his or her highest qualification matches the field of study that is most relevant for his or her job.

Sources: Montt, G. (2015), “The causes and consequences of field-of-study mismatch: An analysis using PIAAC”, *OECD Social, Employment and Migration Working Papers*, No. 167; Quintini, G. (2011), “Right for the job: Over-qualified or under-skilled?”, *OECD Social, Employment and Migration Working Papers*, No. 120; Wolbers, M. (2003), “Job mismatches and their labour market effects among school-leavers in Europe”, *European Sociological Review*, Vol. 19, pp. 249-266.

The key way of determining the extent of qualifications mismatch is to measure the level of education required at work.¹² The most frequently used measure is the modal qualification of workers in each occupation and country/economy. However, this measure combines current and past qualification requirements as it reflects the qualifications of people who were hired at different times.

The Survey of Adult Skills asks workers to report the qualifications they consider necessary to get their job today. The comparison between workers’ qualifications and this self-reported requirement shows that, on average, 22% of workers are overqualified while about 13% are underqualified (Figure 5.7). The prevalence of qualifications mismatch varies significantly across countries. The share of overqualified workers ranges from less than one in seven workers in Italy, Jakarta (Indonesia), Slovenia and Turkey, to around one in three workers in France, Israel, Japan and New Zealand.

Box 5.1 **Measuring qualifications, skills and field-of-study mismatch in the Survey of Adult Skills**

There are several ways to measure every type of mismatch. Surveys can ask respondents about their own appraisal of potential mismatch (subjective measures), or compare a respondent to what is common in his or her country (statistical approach) or to what is appropriate (normative approach). Each type of measure has its advantages and disadvantages (OECD, 2016a).

Qualifications mismatch arises when workers have an educational attainment that is higher or lower than that required by their job. If their qualification level is higher than that required by their job, workers are classified as overqualified; if the opposite is true, they are classified as underqualified. In the Survey of Adult Skills, workers are asked what would be the usual qualifications, if any, “that someone would need to get (their) type of job if applying today”. The answer to this question is used as each worker’s qualification requirements and compared to their actual qualifications to identify mismatch. While biased by individual perceptions and period or cohort effects, self-reported qualification requirements along these lines have the advantage of being job-specific rather than assuming that all jobs with the same occupational code require the same level of qualifications.

Skills mismatch arises when workers have higher or lower skills proficiency than that required by their job. If their skills proficiency is higher than that required by their job, workers are classified as overskilled; if the opposite is true, they are classified as underskilled. For the purpose of this chapter, skill requirements at work, the key term in the measurement of skills mismatch, are derived following Pellizzari and Fichen (2013). Though a robust measure, it does not measure mismatch on all possible domains as it focuses on information-processing skills (for other approaches to measuring skills mismatch, see Perry, Wiederhold and Ackermann-Plek, 2014).

Field-of-study mismatch arises when workers are employed in a different field from that in which they have specialised. The matching is based on a list of occupations (at the 3-digit ISCO classification) that are considered as an appropriate match for each field of study. Workers who are not employed in an occupation that is considered a good match for their field are counted as mismatched. The list of fields and occupations used in this chapter can be found in Annex 5 of the *OECD Employment Outlook 2014* (OECD, 2014b). The list is largely based on that developed by Wolbers (2003) but has been adapted to the ISCO08 classification (Montt, 2015).

Sources:

Montt, G. (2015), “The system-level causes and consequences of field-of-study mismatch: An analysis using PIAAC”, *OECD Social, Employment and Migration Working Papers*, No. 167, <http://dx.doi.org/10.1787/1815199x>.

OECD (2016a), *Getting Skills Right: Assessing and Anticipating Changing Skill Needs*, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264252073-en>.

OECD (2014b), *OECD Employment Outlook 2014*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/19991266>.

Pellizzari, M. and A. Fichen (2013), “A new measure of skills mismatch: Theory and evidence from the Survey of Adult Skills (PIAAC)”, *OECD Social, Employment and Migration Working Papers*, No. 153, <http://dx.doi.org/10.1787/5k3tpt04lcnt-en>.

Perry, A., S. Wiederhold and D. Ackermann-Piek (2014), “How can skill mismatch be measured? New approaches with PIAAC”, *Methods, data, analyses*, Vol. 8/2, pp. 137-174, <http://dx.doi.org/10.12758/mda.2014.006>.

Wolbers, M. (2003), “Job mismatches and their labour market effects among school-leavers in Europe” *European Sociological Review*, Vol. 19, pp. 249-266.

The prevalence of underqualification is lowest in the Czech Republic, Japan and the Slovak Republic. It varies between less than 10% in Lithuania and Israel among Round-2 countries/economies to more than one in six workers in Chile, Italy, the Netherlands and Sweden. This might reflect the rapid growth in educational attainment and the fact that workers today need higher qualifications to enter jobs that were previously accessible to workers with lower qualifications. If this were the case, workers – especially older workers – may have difficulties transitioning to other jobs if their experience is not recognised.¹³ The prevalence of overqualification may also be the result of economic cycles: under favourable labour market conditions or full employment, employers seeking employees may recruit less-qualified workers to meet the demand at a given wage rate.

The survey asked workers whether they feel they “have the skills to cope with more demanding duties than those they are required to perform in their current job” and whether they feel they “need further training in order to cope well with their present duties”. According to the survey’s measure of skills mismatch, workers are classified as well-matched in

a domain if their proficiency score in that domain is between the minimum and maximum score observed among workers who answered “no” to both questions in the same occupation and country.¹⁴ Workers are overskilled in a domain if their score is higher than the maximum score of the self-reported well-matched worker; they are underskilled in a domain if their score is lower than the minimum score of the self-reported well-matched worker.

The survey’s measure of skills mismatch may be an improvement over existing indicators as it is more robust with respect to reporting bias, such as overconfidence, and it does not impose the strong assumptions needed when directly comparing skills proficiency and skills use.¹⁵ However, this approach does not measure all forms of skills mismatch; it focuses on mismatch in the proficiency domains assessed by the Survey of Adult Skills, leaving out mismatch related to job-specific skills or that involve generic skills. (A detailed discussion of the survey’s measure of skills mismatch, its advantages and disadvantages as well as its underlying theoretical framework is presented in Fichen and Pellizzari [2013]).

Figure 5.7 ■ **Qualification, literacy and field-of-study mismatch**

Percentage of mismatched workers, by type of mismatch



Note: Field-of-study mismatch is unavailable for Australia due to the unavailability of ISCO 3-digit information for Australian workers in the Survey of Adult Skills (PIAAC).

1. See note at the end of this chapter.

2. See note 2 under Figure 5.1.

Countries and economies are ranked in descending order of the prevalence of qualification mismatch (overqualification or underqualification).

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.7.

StatLink <http://dx.doi.org/10.1787/888933366353>

On average across the OECD countries/economies that participated in the Survey of Adult Skills, about 11% of workers are overskilled while about 4% are underskilled in literacy (Figure 5.7). Austria, Greece and Lithuania show the highest prevalence of overskilling in literacy, while among Round-2 countries, Israel and Singapore are below the average for OECD countries/economies. The prevalence of overskilling is lowest in Canada, Finland, France and Sweden. By contrast, the highest prevalence of underskilling in literacy is observed in Chile, England (United Kingdom), Greece and the Russian Federation, while the lowest prevalence is found in Austria, the Czech Republic, Germany, Korea and Slovenia.

Survey respondents were also asked to describe their occupation and to point out the field of specialisation of their highest qualification.¹⁶ Mismatch by field of study is gauged by identifying each occupation's most relevant field of study (or fields of study, if more than one field is best related to the occupation) and comparing it to workers' actual field of study. Workers can report one of nine possible fields: i) general programmes; ii) teacher training and education science; iii) humanities, languages and arts; iv) social sciences, business and law; v) science, mathematics and computing; vi) engineering, manufacturing and construction; vii) agriculture and veterinary medicine; viii) health and welfare; and ix) services. The matching of field(s) most relevant to each occupation follow(s) the coding used by Wolbers (2003), Quintini (2011) and Montt (2015).

As shown on the right-most panel of Figure 5.7, and on average across OECD countries/economies that participated in the Survey of Adult Skills, 40% of workers are mismatched by field of study. Field-of-study mismatch is largest in Chile, England (United Kingdom), Italy, Jakarta (Indonesia), Korea and New Zealand, with values showing that around one in two workers is mismatched by field of study. By contrast, the least prevalence of mismatch is found in Austria, Finland, Germany and Slovenia, where fewer than one in three workers is mismatched by field of study.

Field-of-study mismatch does not necessarily lead to wage penalties for individuals if the skills are transferable and recognised as workers transition from one field to another. It can translate into lower wages when this transferability does not take place and workers must downgrade – become overqualified – to find a job in another field (Montt, 2015).

Overlap between skills, field-of-study and qualifications mismatch

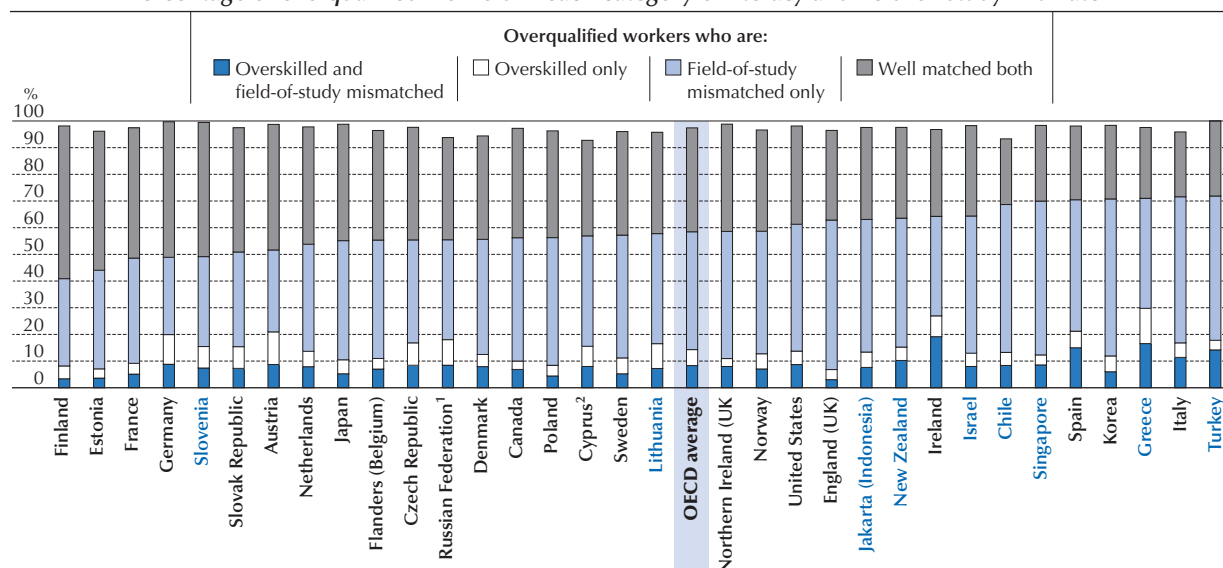
These different forms of mismatch overlap (Figures 5.8a and 5.8b). Workers can be simultaneously overqualified, overskilled and mismatched by field of study. These are workers who are not using all their skills, and their qualifications are not being recognised when working outside their field. By contrast, workers working outside their field can be well-qualified and well-matched if their qualifications are recognised and valued outside their field. Those working within their own field can be overqualified but not overskilled if their qualification does not necessarily reflect their actual skills level. Different combinations of these forms of mismatch point to different challenges to align the credentials, skills and the demands of the labour market.

Who are the overqualified? Are they genuinely or apparently mismatched? Overall, only a subset of overqualified workers has literacy skills that exceed those required for their jobs, so only a part of the overqualified population is “genuinely” overqualified (Figure 5.8a). Across the OECD countries/economies that participated in the Survey of Adult Skills, 14% of overqualified workers (working in or out of their field of study) are also overskilled, meaning that a majority of overqualified workers is well-matched in terms of the literacy skills required at work (or what is sometimes referred to as “apparent” mismatch). This suggests that qualifications are an imperfect proxy for skills, and also suggests that overqualification may reflect the underuse of skills other than literacy.

In all countries, the majority of workers who are overqualified are also mismatched along another dimension. Overqualified workers are either overskilled, mismatched by field of study or both, as depicted by the white, light blue and blue bars, respectively, in Figure 5.8a. In Greece and Ireland, more than one in four overqualified workers is also overskilled – pointing to a comparatively large share of genuine mismatch. Overqualification tends to be associated with field-of-study mismatch in Chile, England (United Kingdom), Israel, Italy, Korea, Singapore and Turkey. In these countries, more than one in two overqualified workers are also mismatched by field of study, but well-matched by skills. This raises questions about the capacity of workers to find jobs in their field and to transfer their skills to other sectors. In these countries/economies, the skills of workers who transition out of their field may not be recognised, and so the workers must downgrade in order to find work (Montt, 2015).

Figure 5.8b shows workers who are mismatched by field of study. Are these workers also likely to be overqualified and overskilled, meaning that their highest credentials and skills proficiency are not recognised when they find work in another field? On average across countries, workers mismatched by field of study also tend to be overqualified or overskilled. Almost 40% of workers who are mismatched by field of study are either overskilled or overqualified or both. This is most markedly the case in Greece, Ireland, Lithuania and Spain, where around half of workers who work outside their field are also overqualified or overskilled. In Singapore, by contrast, workers are more likely to work outside their field and their highest credentials and literacy skills are recognised (Figure 5.8b).

Figure 5.8a ■ **Overqualified workers who are mismatched by literacy or field of study**
 Percentage of overqualified workers in each category of literacy and field-of-study mismatch



Notes: Overqualified workers who are “underskilled and field-of-study mismatched” or “underskilled and field-of-study well-matched” are omitted from the figure and together correspond to the remaining part of the total 100%. Field-of-study mismatch is unavailable for Australia due to the unavailability of ISCO 3-digit information for Australian workers in the Survey of Adult Skills (PIAAC).

1. See note at the end of this chapter.

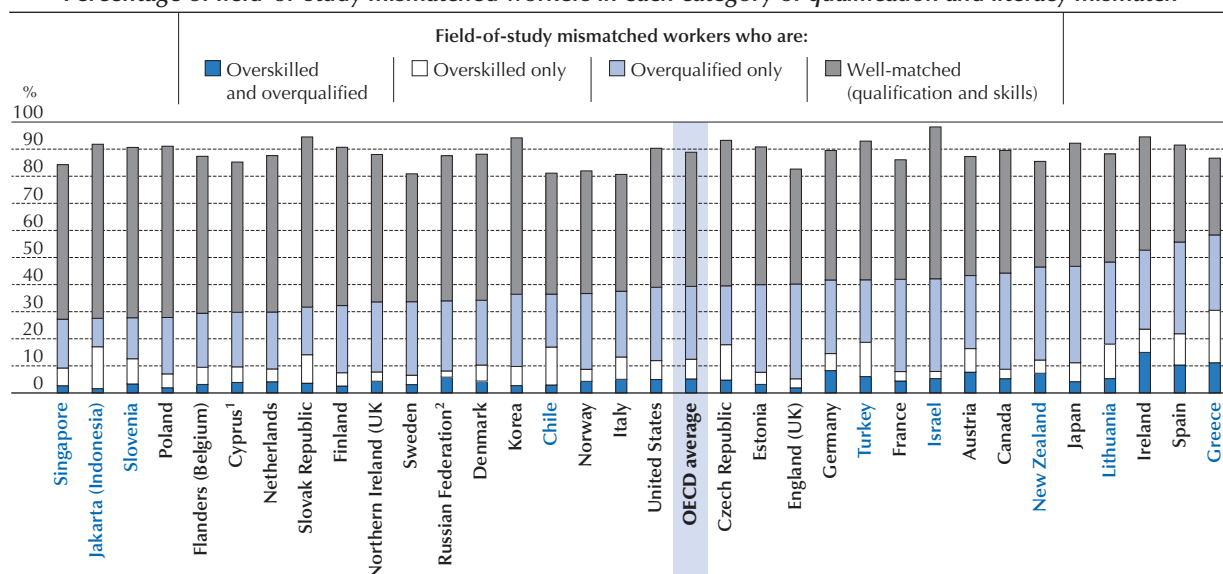
2. See note 2 under Figure 5.1.

Countries and economies are ranked in ascending order of the percentage of overqualified workers who are overskilled in literacy and/or mismatched by field of study.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.8a.

StatLink <http://dx.doi.org/10.1787/888933366362>

Figure 5.8b ■ **Field-of-study mismatched workers who are mismatched by qualification or literacy**
 Percentage of field-of-study mismatched workers in each category of qualification and literacy mismatch



Notes: Field-of-study mismatched workers who are underskilled or underqualified are omitted from the figure and together correspond to the remaining part of the total 100%. Field-of-study mismatch is unavailable for Australia due to the unavailability of ISCO 3-digit information for Australian workers in the Survey of Adult Skills (PIAAC).

1. See note 2 under Figure 5.1.

2. See note at the end of this chapter.

Countries and economies are ranked in ascending order of the percentage of field-of-study mismatched workers who are overqualified and/or overskilled in literacy.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.8b.

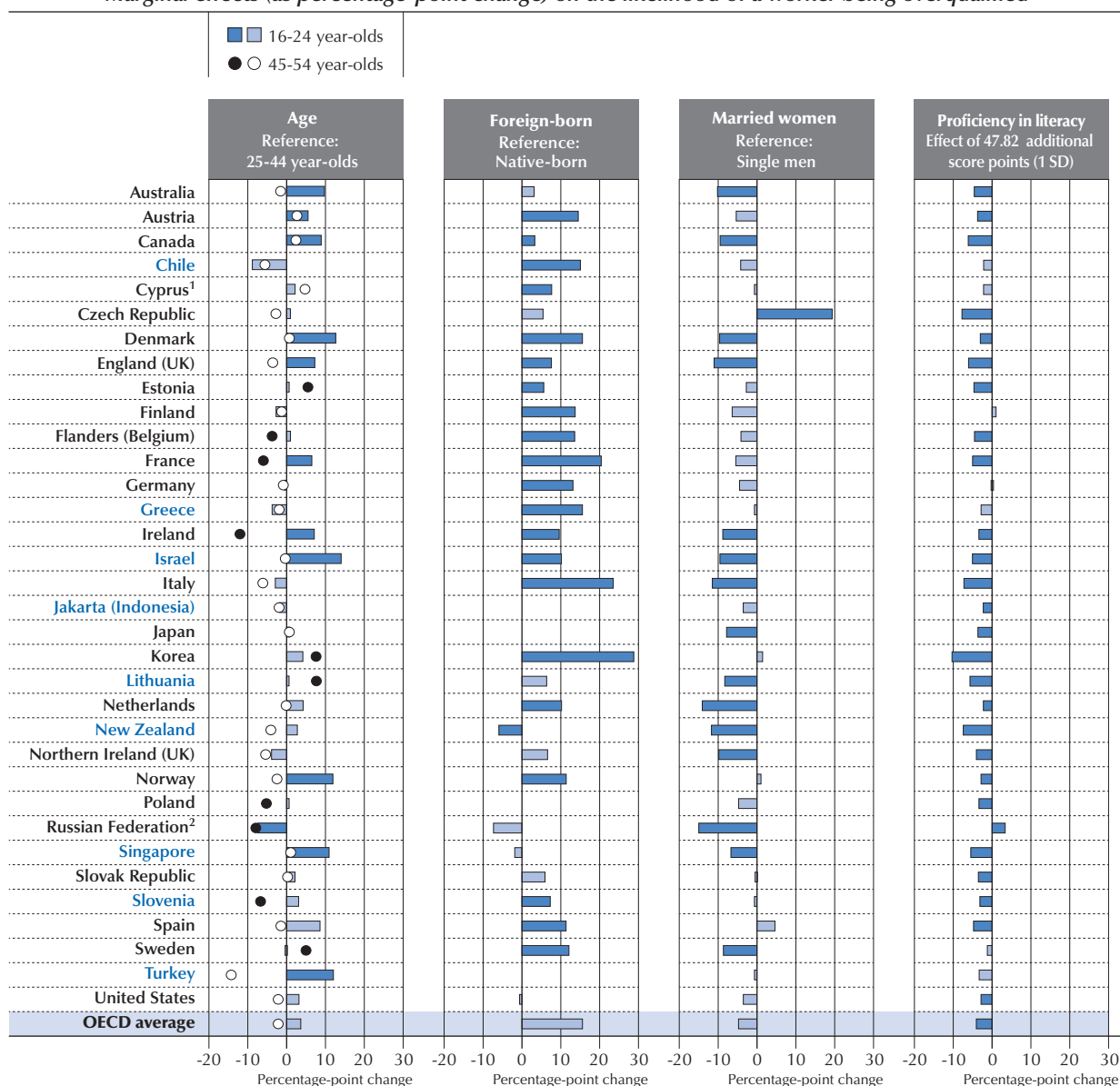
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How mismatch interacts with proficiency and other individual and job characteristics

Mismatch and proficiency

Several studies show that there are significant differences in skills proficiency among workers with the same qualifications (Quintini, 2011). In the context of qualifications mismatch, the best-skilled individuals in a given qualification category may get jobs that require higher formal qualifications while the least skilled will only be able to get jobs requiring lower formal qualifications. Hence, individuals in the former group will appear as underqualified, despite having the skills required for their jobs, while those in the latter group will appear as overqualified, even though they lack some of the key skills needed to get and do a job with higher qualification requirements.¹⁷

Figure 5.9 [1/2] ■ **Overqualification, by individual and job characteristics**
Marginal effects (as percentage-point change) on the likelihood of a worker being overqualified



Note: Statistically significant values (at the 10% level) are shown in a darker tone.

1. See note 2 under Figure 5.1.

2. See note at the end of this chapter.

Countries and economies are listed in alphabetical order.

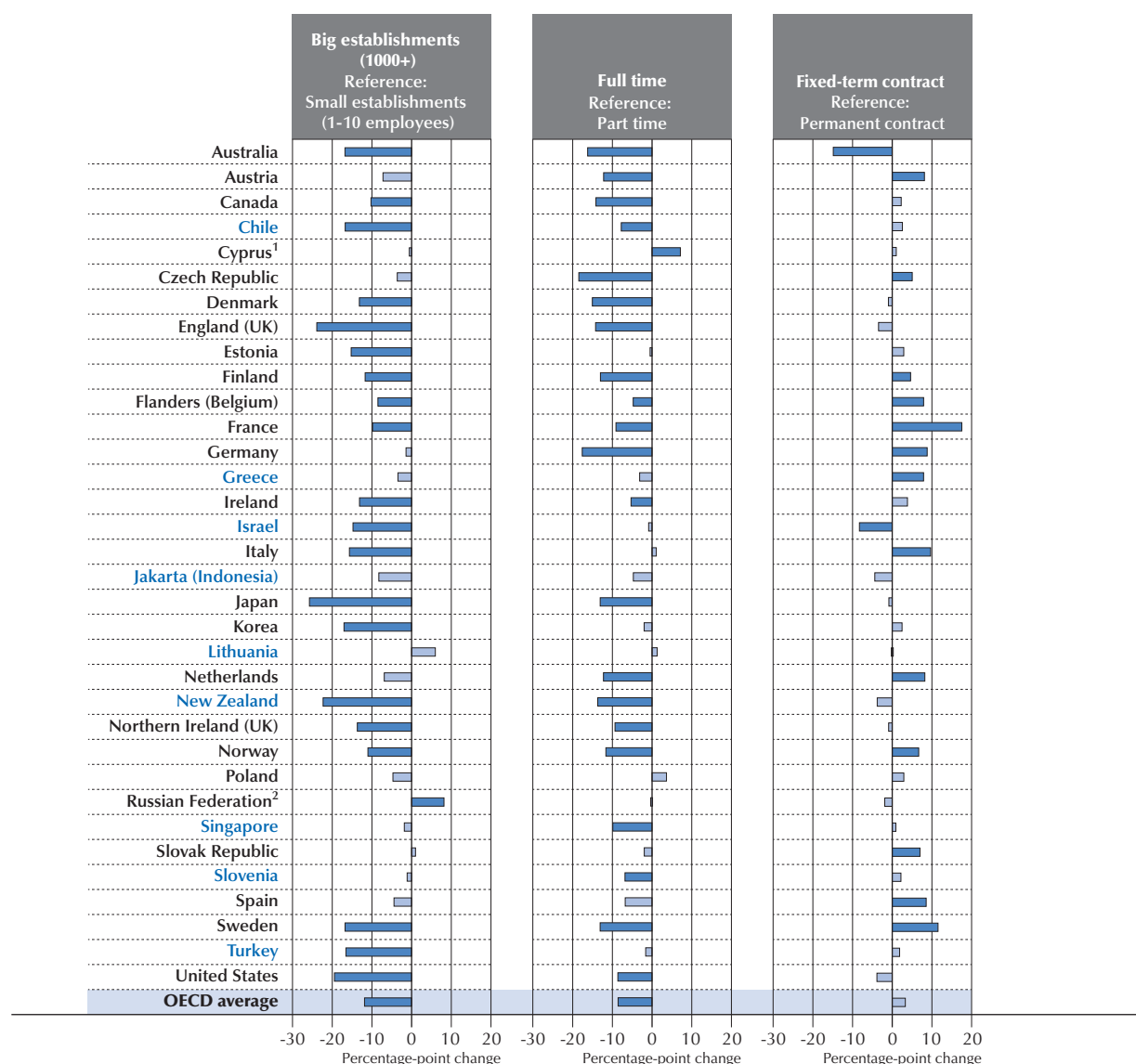
Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.9.

StatLink <http://dx.doi.org/10.1787/888933366386>

In addition, lower-skilled workers in a particular qualification level may prefer to work outside their field of study to secure higher wages.¹⁸ Alternatively, in tight labour markets, workers unable to find a job in their field may have to settle for a job outside their field of study, often having to downgrade and become overqualified in the process (Montt, 2015).

On average, and in most countries, overqualified and field-mismatched individuals score lower in literacy proficiency than their well-matched counterparts (Figures 5.9 and 5.11). This supports the theory that differences in proficiency within qualification levels and fields of study explain some qualifications mismatch, a phenomenon also referred to as “skills heterogeneity” (Quintini, 2011). Less-proficient workers may become overqualified because their qualifications do not adequately reflect their skills proficiency. They are also more likely to be mismatched by field of study, suggesting that workers work in occupations outside their field of study because they may find better wage or employment opportunities there.

Figure 5.9 [2/2] ■ **Overqualification, by individual and job characteristics**
Marginal effects (as percentage-point change) on the likelihood of a worker being overqualified



Note: Statistically significant values (at the 10% level) are shown in a darker tone.

1. See note 2 under Figure 5.1.

2. See note at the end of this chapter.

Countries and economies are listed in alphabetical order.

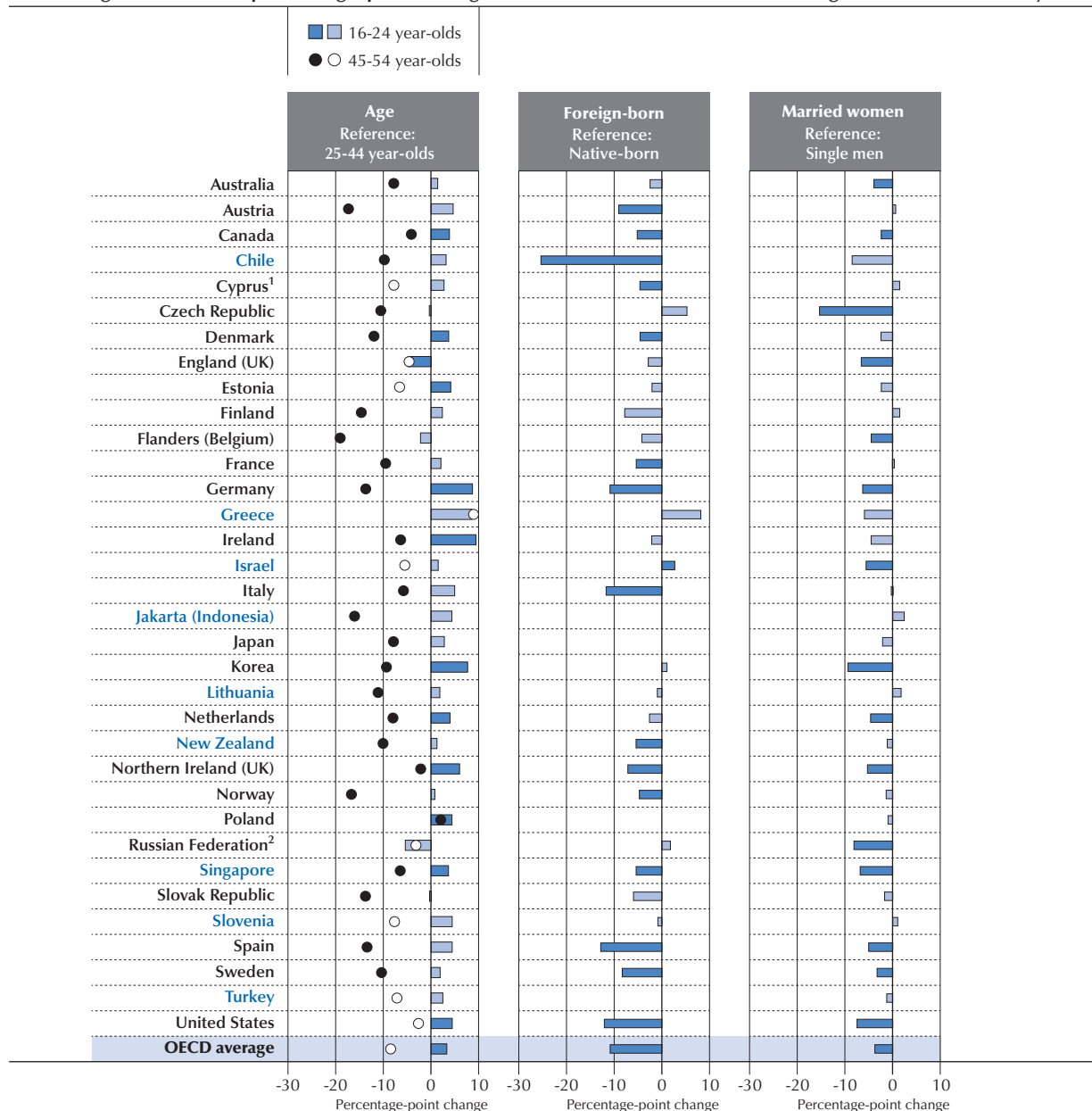
Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.9.

StatLink <http://dx.doi.org/10.1787/888933366386>

Socio-demographic and job characteristics and mismatch

Individual and job characteristics may influence the likelihood of mismatch too (Figures 5.9, 5.10 and 5.11). For example, it may take young people, as new entrants into the labour market, some time to sort themselves into well-matched jobs. Or, some workers may choose to accept a job for which they are overqualified. This can happen when workers wish to remain close to their families or better reconcile work and family life and accept part-time jobs or jobs outside their field of study. It can also happen during economic downturns and an overqualified job is preferred over unemployment.

Figure 5.10 [1/2] ■ **Overskilling in literacy, by individual and job characteristics**
Marginal effects (as percentage-point change) on the likelihood of a worker being overskilled in literacy



Note: Statistically significant values (at the 10% level) are shown in a darker tone.

1. See note 2 under Figure 5.1.

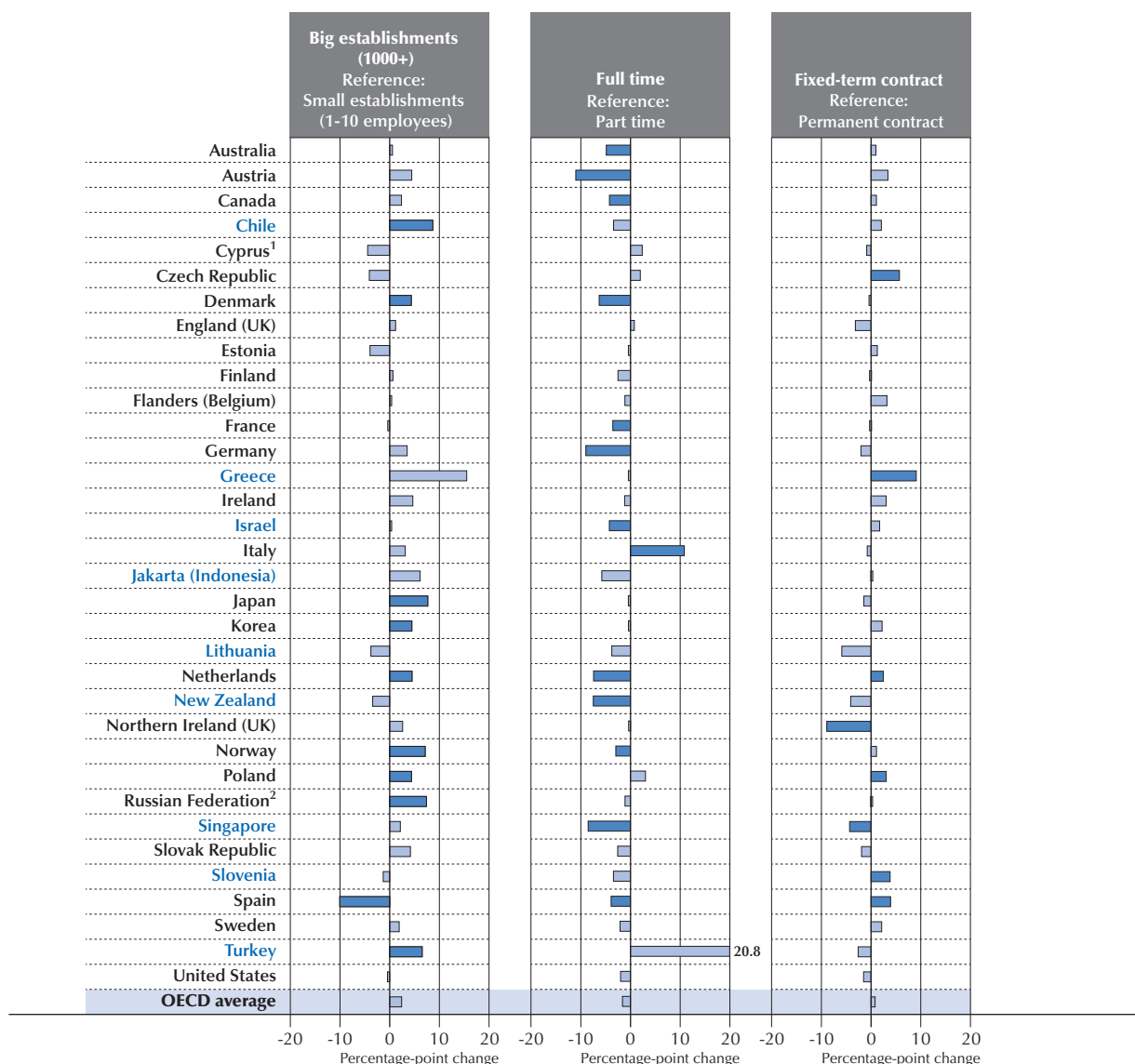
2. See note at the end of this chapter.

Countries and economies are listed in alphabetical order.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.10.

StatLink <http://dx.doi.org/10.1787/888933366397>

Figure 5.10 [2/2] ■ **Overskilling in literacy, by individual and job characteristics**
Marginal effects (as percentage-point change) on the likelihood of a worker being overskilled in literacy



Note: Statistically significant values (at the 10% level) are shown in a darker tone.

1. See note 2 under Figure 5.1.

2. See note at the end of this chapter.

Countries and economies are listed in alphabetical order.

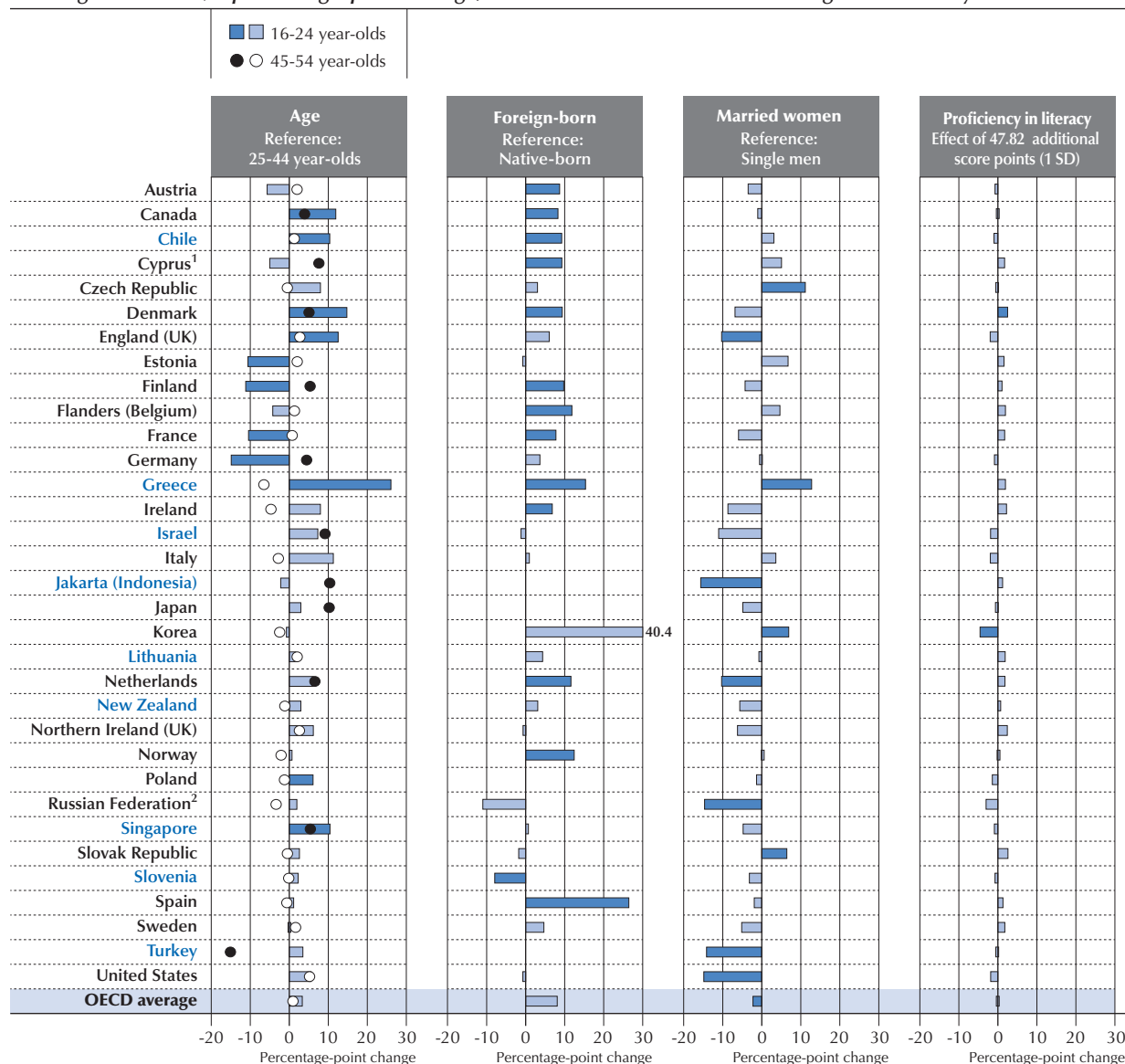
Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.10.

StatLink <http://dx.doi.org/10.1787/888933366397>

An analysis of the relationship between socio-demographic characteristics and mismatch shows clearly that foreign-born workers are more likely to be overqualified (even if they have the same proficiency in literacy) and mismatched by field of study than their native-born counterparts (Figures 5.9 and 5.11). This could be because qualifications acquired outside the host country are not recognised, and so highly qualified migrants are relegated to working in lower-skilled jobs.

However, foreign-born workers are less likely to be overskilled in literacy, possibly pointing to the barriers facing foreign-born adults who are not fluent in the host country's language. This finding also underscores the importance of offering language programmes so that host countries and immigrants themselves can fully benefit from immigrants' skills.

Figure 5.11 [1/2] ■ **Field-of-study mismatch, by individual and job characteristics**
 Marginal effects (as percentage-point change) on the likelihood of a worker being field-of-study mismatched



Notes: Statistically significant values (at the 10% level) are shown in a darker tone. Field-of-study mismatch is unavailable for Australia due to the unavailability of ISCO 3-digit information for Australian workers in the Survey of Adult Skills (PIAAC).

1. See note 2 under Figure 5.1.

2. See note at the end of this chapter.

Countries and economies are listed in alphabetical order.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.11.

StatLink <http://dx.doi.org/10.1787/888933366405>

In addition, in some countries 16-24 year-olds are more likely to be overqualified than 25-44 year-olds,¹⁹ although the relationship is often not statistically significant; and older workers are less likely to be overskilled. Contrary to the assumption that women are more likely to be overqualified because of family constraints, once socio-demographic and job characteristics are accounted for, married women are slightly less likely to be overqualified than their single male counterparts, and are also less likely to be overskilled in many countries.²⁰

Workers in larger firms and workers working full time are less likely to be overqualified and also less likely to be mismatched by field of study than workers in smaller firms or part-time workers (Figure 5.9). One possible explanation for this is that establishment size is a proxy for the quality of human-resource policies, with larger establishments being better at screening candidates and at understanding how overqualification may affect satisfaction at work and, ultimately, productivity.

Figure 5.11 [2/2] ■ **Field-of-study mismatch, by individual and job characteristics**
Marginal effects (as percentage-point change) on the likelihood of a worker being field-of-study mismatched



Notes: Statistically significant values (at the 10% level) are shown in a darker tone. Field-of-study mismatch is unavailable for Australia due to the unavailability of ISCO 3-digit information for Australian workers in the Survey of Adult Skills (PIAAC).

1. See note 2 under Figure 5.1.

2. See note at the end of this chapter.

Countries and economies are listed in alphabetical order.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.11.

StatLink <http://dx.doi.org/10.1787/888933366405>

Large establishments may also have larger internal labour markets through which workers can be transferred to better matching tasks and jobs inside the firm. Part-time jobs may have lower skills content, but they attract qualified workers because they are more compatible with personal/family life or a preferred option over unemployment during economic downturns. Fixed-term contract jobs could be expected to have lower qualification requirements than permanent jobs, but they often attract tertiary-educated workers who cannot find a permanent position. This hypothesis is supported by the data in most countries.

The effect of mismatch on wages

Overqualification has a stronger negative impact on hourly wages than overskilling or field-of-study mismatch, when workers are compared with their equally-qualified and equally-proficient well-matched counterparts (Figure 5.12).

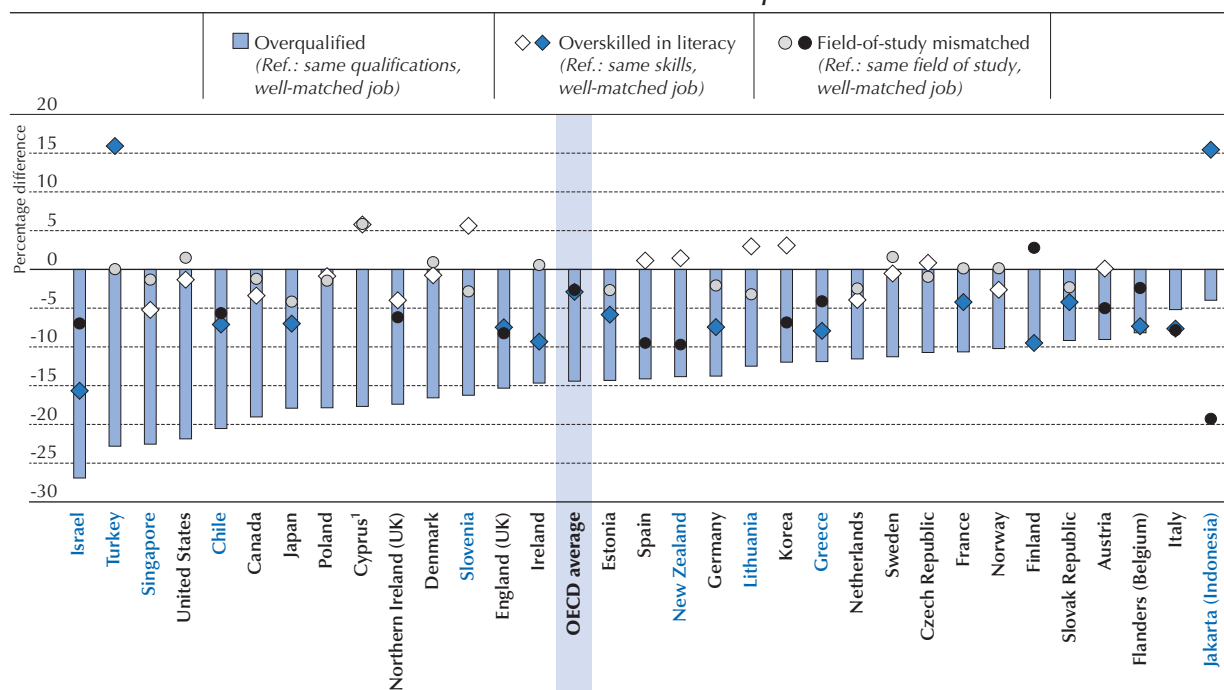
On average across countries and economies, overqualified workers earn about 14% less than well-matched workers with the same qualifications and skills proficiency. The wage penalty associated with overqualification is 20% or more in Canada, Israel, Singapore, Turkey and the United States.

The effect of overskilling on wages is small and often not statistically significant, and remains so even when the controls for qualification mismatch are removed (Figure 5.12). The largest and statistically significant differences are observed in Israel, where overskilled workers earn about 16% less than their equally skilled, well-matched counterparts. This relatively large negative effect is in addition to the sizeable adverse effect of overqualification on wages.

After accounting for overqualification and overskilling, field-of-study mismatch entails a small wage penalty of less than 3%, on average across countries and economies. It entails a wage penalty of more than 6% in Estonia, Germany, Ireland, Israel, Italy, Jakarta (Indonesia), Lithuania and Northern Ireland (United Kingdom). Though field-of-study mismatch may not be linked to a wage penalty (or only a minimal one), this is only the case when workers are mismatched by field of study but are well-matched in terms of qualifications. Figure 5.8b, however, shows that a large part of field-mismatched workers are also overqualified. To the extent that workers who venture outside their field need to downgrade in order to find a job, field-of-study mismatch will result in a penalty that is largely related to their overqualification (Figure 5.12).

This evidence should not be interpreted as suggesting that having skills in excess of those required at work is not valued at all on the labour market. On average across countries and economies, overqualified workers earn about 4% more than well-matched workers in similar jobs. In other words, a tertiary graduate who holds a job requiring only an upper secondary qualification will earn less than if he or she were in a job requiring a tertiary qualification, but more than an upper secondary graduate in a job requiring upper secondary qualifications.

Figure 5.12 ■ **Effect of qualification, literacy and field-of-study mismatch on wages**
Percentage difference in wages between overqualified, overskilled or field-of-study mismatched workers and their well-matched counterparts



Notes: Coefficients from OLS regression of log hourly wages on mismatch directly interpreted as percentage effects on wages. Coefficients adjusted for years of education, age, gender, marital status, working experience, tenure, foreign-born status, establishment size, contract type, hours worked, public sector dummy, proficiency in literacy and use of skills at work. The wage distribution was trimmed to eliminate the 1st and 99th percentiles. Statistically significant values (at the 10% level) are shown in a darker tone. The regression sample includes only employees. The analysis excludes the Russian Federation because wage data obtained through the survey do not compare well with those available from other sources. Hence further checks are required before wage data for this country can be considered reliable.

1. See note 2 under Figure 5.1.

Countries and economies are ranked in ascending order of the effect of overqualification on wages.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A5.12.

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Qualifications mismatch and skills mismatch might each have distinct effects on wages, even after adjusting for both qualifications level and proficiency scores, because jobs with similar qualification requirements may have different skill requirements. This may happen because employers can evaluate qualifications but they cannot measure skills directly. In addition, the kinds of mismatch in skills captured by the two indicators are different. The survey's indicators of skills mismatch are based on numeracy, literacy and problem solving, while skills mismatch captured by qualification-based indicators may be interpreted as more general mismatch with the job or may also include, for example, mismatch that relates to job-specific skills.

Box 5.2 **The STEP Skills Measurement Study: A skills survey in low- and middle-income countries**

The framework for analysing and measuring adult skills by the Survey of Adult Skills has also been applied in low- and middle-income countries. The World Bank's STEP Skills Measurement Study was launched in 2010 to gather more evidence on the level and distribution of skills – including socio-emotional skills – relevant to the labour market in the adult populations of developing countries. The study consisted of one survey for individuals and one for employers. The individual survey contained three modules focused on cognitive skills, technical (job-specific) skills and socio-emotional skills. In addition to collecting self-reported information regarding certain cognitive skills, the cognitive module involved administering a direct assessment of reading literacy based on the Survey of Adult Skills instruments.

Eight countries participated in the first wave of data collection, which took place in 2011: Plurinational State of Bolivia (hereafter “Bolivia”), Colombia, Ghana, Lao People's Democratic Republic (hereafter “Lao PDR”), Sri Lanka, Ukraine, Viet Nam, and the Yunnan province of the People's Republic of China (hereafter “China”). The second wave, which took place in 2012-13, involved five countries: Armenia, Azerbaijan, Former Yugoslav Republic of Macedonia (FYROM), Georgia, and Kenya.

Some relevant findings:

- **Over 80% of adults pass the literacy threshold in most countries.** In four of the five countries surveyed in 2012-13, more than 80% of adults passed the core test (i.e. responded correctly to at least three out of eight items). In Lao PDR, only 67% of adults reached the literacy threshold.
- **The relationship between reading literacy and gender varies by country.** In Sri Lanka, Viet Nam and Yunnan province (China), the proportion of men and women who passed the core module is similar. However, in the case of Lao PDR and Bolivia, men had higher pass rates than women.
- **Educational attainment is positively related to performance.** In all countries except Yunnan province (China), adults with primary education or less were more likely to answer fewer than three responses correctly. Interestingly, there is little difference in performance between adults who completed secondary and post-secondary education, probably because the core assessment is designed to screen adults with low literacy.
- **As respondents' age increases, there is an increase in conscientiousness and stability, a decrease in openness, and no change in agreeableness and extraversion.** A correlation was found between personality traits and age. In three of the five countries surveyed in 2012-13, conscientiousness and stability increased with age, while in Bolivia and Yunnan province (China), these two traits remained stable across all age groups.
- **Cognitive skills are associated with higher earnings, especially for wage workers.** Greater use of cognitive skills (reading and numeracy) is associated with higher earnings for both wage earners and self-employed workers. In most countries, more frequent reading and using mathematics at an advanced level are associated with higher earnings. Interestingly, the basic reading literacy assessment score is positively correlated with employees' wages in all five countries, but is statistically significant only in Lao PDR and Sri Lanka.
- **Socio-emotional skills are correlated with educational attainment.** In all STEP countries, greater openness and higher levels of conscientiousness are correlated with a higher level of education; neuroticism seems negatively correlated. Extraversion and agreeableness are not significantly correlated with education.
- **Higher scores on socio-emotional skills scales are correlated with greater earnings, but no particular skill can be singled out as being important in all countries.** Openness to experience is associated with greater earnings for wage earners in Bolivia and Lao PDR and for self-employed workers in Sri Lanka and Viet Nam. More grit is associated with higher wages in Bolivia, Viet Nam and Yunnan province (China), but not at all with the earnings of self-employed workers. Conscientiousness is significantly associated with earnings for self-employed workers in Bolivia and Yunnan province (China), but not with the earnings of wage earners.

SKILLS AND NON-ECONOMIC OUTCOMES

While employability and wages are important for individual well-being, individuals and policy makers are becoming aware that non-economic factors also contribute to individual well-being and to the smooth functioning of societies as a whole. The report by the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz, Sen and Fitoussi, 2009) is one example of the interest in developing broader measure of well-being, going beyond traditional measures of economic success like wages (at the individual level) and GDP (at the country level).

The Survey of Adult Skills collects information on four non-economic outcomes: the level of trust in others; participation in associative, religious, political, or charity activities (volunteering); the sense of being able to influence the political process (i.e. political efficacy); and self-assessed health conditions. Trust, volunteering, and political efficacy are variables collected in many surveys, such as the World Value Survey and the European Social Survey. They are often used as proxies to measure social capital in the large economic and sociological literature that, starting from the seminal contribution of Putnam (1993), has investigated the link between social capital (and cultural traits) and long-term economic development.²¹

There is a large body of empirical literature documenting the relationship between economic and non-economic outcomes. The mechanisms linking the two, as well as the individual determinants of non-economic outcomes (and, ultimately, of individual well-being) have been much less investigated, partly because of lack of data, and partly because of the inherent difficulty in determining causal relationships. In this respect, the Survey of Adult Skills offers a unique opportunity to better understand the relationship among education, skills proficiency, and widely used measures of social capital and individual well-being. Depending on the subjective value one attaches to the various non-economic outcomes, they can be seen as either interesting outcomes *per se*, or, in light of the vast literature on the relationship between social capital and economic growth, as mediating variables in studying the relationship between skills proficiency and economic outcomes.

Proficiency in information-processing skills is positively associated with trust, volunteering, political efficacy and self-assessed health. These relationships hold even after accounting for the usual range of socio-demographic characteristics, like education, parents' educational attainment, age, gender and immigrant and language background. The strength of the association, however, differs across countries (Figure 5.13).

For each of these non-economic outcomes, Figure 5.13 shows adjusted and unadjusted differences in the likelihood of reporting positive outcomes between highly proficient adults and adults with low proficiency, defined, respectively, as people scoring at Level 4 or 5 or at or below Level 1 on the literacy scale.

Across countries and economies, there is a positive correlation between skills proficiency in literacy and trust, volunteering and political efficacy (with correlation coefficients in the order of 0.40). The strength of the relationship between literacy skills and self-assessed health is almost uncorrelated with the strength of the relationship with the other three social outcomes.

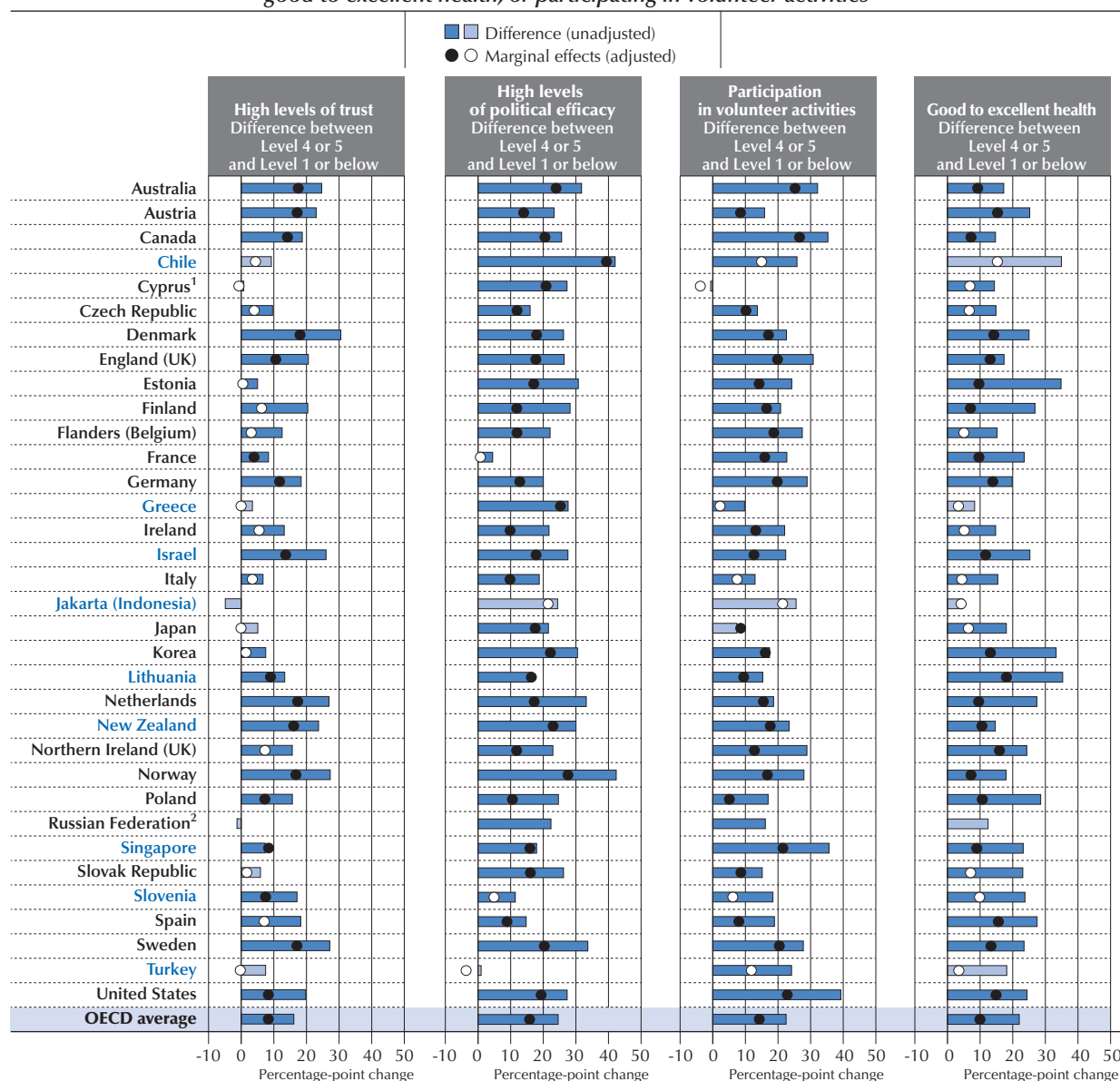
Trust

Interpersonal trust, especially generalised trust, is a strong predictor of economic prosperity (Fukuyama, 1995; Knack and Keefer, 1997; Putnam, 1993) and individual well-being (Helliwell and Wang, 2010), although recent research by Butler, Guiso and Giuliano (2009) also shows that, at the individual level, excessive trust can be detrimental.²² Generalised trust develops out of a feeling of goodwill towards anonymous others, and enables smooth social and economic interactions in complex societies where people engage frequently in interactions with others whom they do not know and from whom they differ in many ways. In such contexts, the absence of trust can result in negative consequences for economic activity. In particular, the literature has identified a number of channels through which trust can affect economic performance (Algan and Cahuc, 2014): trust is thought to be essential for the smooth functioning of financial markets; it is likely to play an important role in economic activities that involve a high degree of uncertainty (like investments in research and development, which are the sources of technological innovations), or in which contracts are difficult to enforce; and by promoting co-operation, trust can improve firm organisation and the quality of labour relations.

While institutions, such as efficient judicial systems, are crucial in sustaining trust, education and skills policies are also likely to play an important role. Higher information-processing skills can help people to better understand the motives underlying others' behaviours, as well as the negative consequences of lack of co-operation. Education and cognitive skills help build the socio-emotional skills needed to engage in fruitful social relationships (Borgonovi and Burns, 2015). Indirectly, societies with larger shares of skilled individuals might function more efficiently, thus helping to sustain trust.

Figure 5.13 ■ Literacy proficiency and positive social outcomes

Adjusted and unadjusted difference between the percentage of adults with high proficiency and the percentage of adults with low proficiency who reported high levels of trust and political efficacy, good to excellent health, or participating in volunteer activities



Notes: Statistically significant differences are marked in a darker tone. Adjusted differences are based on a regression model and take account of differences associated with the following variables: age, gender, education, immigrant and language background and parents' educational attainment. Adjusted differences for the Russian Federation are missing due to the lack of language variables.

1. See note 2 under Figure 5.1.

2. See note at the end of this chapter.

Countries and economies are listed in alphabetical order.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Tables A5.13(L) and A5.14(L).

StatLink <http://dx.doi.org/10.1787/888933366425>

The Survey of Adult Skills allows for the creation of a measure of interpersonal trust through the answers to the question: "Do you agree that only few people can be trusted?". For the purpose of the analysis carried out in this section, individuals who disagreed or strongly disagreed with this statement are classified as having high levels of trust.

Trust is the social outcome whose relationship with literacy proficiency varies the most across countries/economies. In Greece and Turkey, trust is less sensitive to adults' proficiency in skills. When moving from at or below Level 1 to Level 4 or 5 on the literacy scale, the probability of reporting high levels of trust increases by less than six percentage points,

a difference that is not statistically different from zero. In Israel and New Zealand, by contrast, trust is comparatively more sensitive to proficiency: adults who scored at Level 4 or 5 in literacy were about 25 percentage points more likely to have reported high levels of trust when compared to adults who scored at or below Level 1. The relationship remains strong (at about 15 percentage points) even after accounting for socio-demographic characteristics.

Volunteering

Higher proficiency in literacy is associated with a greater likelihood of engaging in voluntary work for non-profit organisations (e.g. political, charity or religious organisations). Active participation in this kind of activity is likely to be a good proxy for altruism and civic engagement, whose link with skills has been attributed to civic education. Like trust, altruism can also be beneficial for economic performance, in that it may foster co-operation (Bowles and Polania-Reyes, 2012). Under this framework, higher proficiency allows adults to participate, and to understand the conditions, limits and possibilities of participation (Pallas, 2000).

The association between literacy proficiency and volunteering is weakest in Greece, where adults who scored at Level 4 or 5 were about 10 percentage points more likely to have reported engaging in volunteer activities than adults who scored at or below Level 1. Among the countries and economies that participated in the second round of the survey, Singapore is the country where literacy proficiency is more strongly associated with participation in volunteer activities: an adult who scored at Level 4 or 5 was 36 percentage points more likely to have reported volunteering than an adult who scored at or below Level 1 (Figure 5.13). This is similar to what was observed in the first round in Canada (a difference of 35 percentage points), and only slightly below the value observed in the United States (39 percentage points).

Controlling for other socio-demographic characteristics does not change the picture substantially, although the association weakens. The adjusted difference becomes statistically indistinguishable from zero in Greece. In Singapore it remains large, at 21 percentage points, close to what was observed in Australia (25 percentage points), Canada (27 percentage points) and the United States (23 percentage points).

Political efficacy

When it comes to political participation, a minimum level of literacy is needed to cast a vote. Higher skills are needed to make reasoned decisions, understand and follow political campaigns, and research and evaluate the issues and candidates (Hillygus, 2005). Political efficacy, traditionally defined as “the feeling that individual political action does have, or can have, an impact on the political process, i.e. that it is worthwhile to perform one’s civic duties” (Campbell, Gurin and Miller, 1954), is considered as one of the most important factors that sustain and develop successful democratic systems (Pateman, 1970), and can be considered to be a building block of political trust (Almond and Verba, 1989).

Political efficacy is measured in the Survey of Adult Skills as the extent to which respondents (dis)agree with the question “People like me don’t have any say about what the government does”. This can be considered as a measure of *external* political efficacy (referring to the individual’s beliefs in the responsiveness of political bodies to citizens’ demands), as opposed to *internal* political efficacy (which refers to feelings of personal competence to understand and participate effectively in societies). Both internal and external political efficacy have been found to be correlated with actual political participation (Clarke and Acock, 1989; Pollock, 1983). External political efficacy, which can be also thought of as a measure of trust in institutions, is clearly crucial for the effective functioning of democratic societies, although the direction of causality between individual political efficacy and the quality of political institutions can clearly run both ways.

Higher skills proficiency is also associated with higher levels of political efficacy. In Turkey, the link between skills proficiency and political efficacy is weakest. The share of adults in Turkey who reported high levels of political efficacy is in line with the international average among adults who scored at or below Level 1, but is well below the average (23% versus 48%, see Table A5.13[L]) among people who scored at Level 4 or 5, resulting in a difference between the two groups not significantly different from zero. Political efficacy is even lower in France, where the likelihood of reporting high levels of political efficacy ranges from 8% among the least proficient adults to 12% among adults with the highest levels of literacy proficiency, resulting in a difference of less than 5 percentage points. Other countries in which the relationship between political efficacy and skills proficiency is weak are the Czech Republic, Lithuania, Singapore, Slovenia and Spain. In these countries, moving from Level 1 or below to Level 4 or 5 increases the likelihood of reporting high levels of political efficacy by less than 20 percentage points.

In Greece, Israel and New Zealand, adults who scored at Level 4 or 5 were about 30 percentage points more likely to have reported high levels of political efficacy compared to adults who scored at or below Level 1. Similar differences are recorded in Australia, Estonia, Finland, Korea, the Netherlands, Sweden and the United States. In Chile and Norway the relationship is strongest, at 42 percentage points (Figure 5.13).

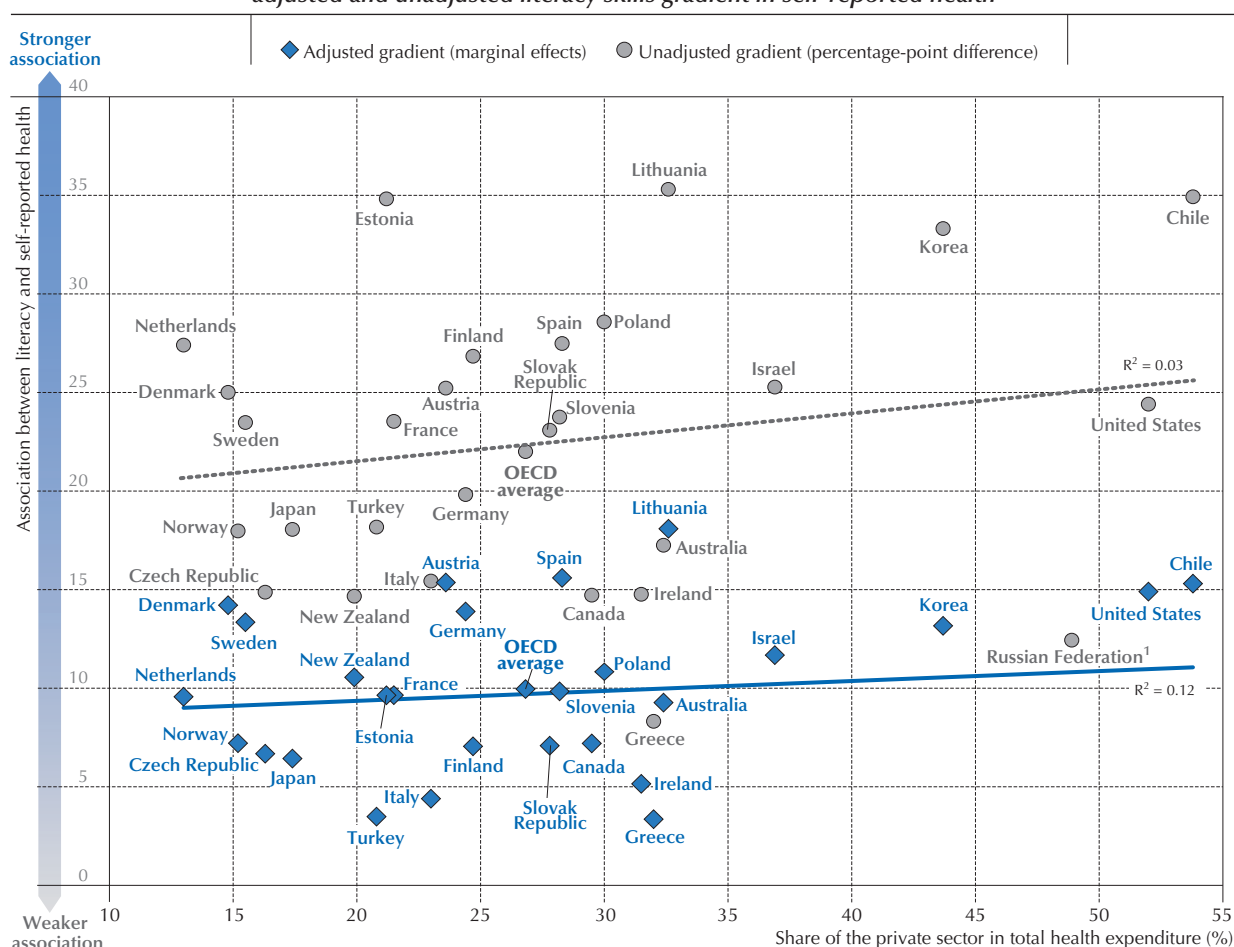
Health

Health is a crucial element of individual well-being, as well as an area that absorbs a significant share of public expenditure. There is also increasing awareness and alarm about rising levels of inequalities in health status, often related to individuals' occupation or geographical location. Promoting practices that favour healthy lives is a top policy priority.

Increasingly complex healthcare systems, requiring adults to process a large amount of health-related information, as well as increased polarisation, by which highly skilled individuals are more and more likely to end up in "good" jobs and to be able to afford living in "good" places, all strengthen the link between health and proficiency in information-processing skills (Borgonovi and Pokropek, 2016).

The relationship between health and literacy proficiency is strong in most countries/economies that participated in the Survey of Adult Skills. On average, the chances of reporting good to excellent health are 22 percentage points higher among people who scored at Level 4 or 5 than among those who scored at or below Level 1. Greece is somewhat of an exception, with the difference between the two groups at only 8 percentage points (further reduced to a statistically insignificant 3 percentage points after differences in other socio-demographic characteristics are accounted for). This is because even among individuals who scored at or below Level 1, 84% reported good to excellent health.

Figure 5.14 ■ **Private health expenditure and association between literacy and self-reported health**
Relationship between the share of the private sector in total health expenditure in 2012, and adjusted and unadjusted literacy skills gradient in self-reported health



Notes: The unadjusted gradient is the percentage-point difference among adults who reported being in good or excellent health between those performing at Level 4 or 5 and those at Level 1 or below. The adjusted gradient refers to the average marginal probability of scoring at Level 4 or 5 in literacy among adults who reported good or excellent health (reference is Level 1 or below). The gradient is adjusted for age, gender, education, immigrant and language background and parents' educational attainment. Adjusted gradient for the Russian Federation is missing due to the lack of language variables.

Sources: OECD Health Statistics 2015 and Survey of Adult Skills (PIAAC) (2012, 2015), Tables A5.13 (L), A5.14(L) and A5.15.

StatLink <http://dx.doi.org/10.1787/888933366436>

By contrast, the difference is much larger – more than 30 percentage points – in Chile and Lithuania. In both countries, the relationship between literacy proficiency and self-reported health remains strong (at 15 and 18 percentage points, respectively) after accounting for other socio-demographic characteristics. However, because of the low number of adults scoring at Level 4 or 5, differences are estimated imprecisely in Chile, and end up being not statistically significant.

In an attempt to explain why the strength of the relationship between skills proficiency and self-reported health varies across countries, one could look at between-country differences in the organisation of healthcare systems. The role of the private sector in the financing of healthcare expenditure, for instance, can be interpreted as a proxy for the inclusiveness of healthcare, which could have an impact on the relationship between skills proficiency and health. Figure 5.14 shows that the relationship between skills and health tends to be stronger in countries where a larger share of health expenditure is financed by the private sector. This makes intuitive sense. When the financing of healthcare is devolved to the private sector, one could expect to see less-than-universal access to healthcare. The association between skills proficiency and health could thus become stronger, either because income becomes a barrier to accessing healthcare (and more skilled individuals, by earning more, could be in a better position to afford quality healthcare), or because individuals are expected to assume more responsibility for managing their health, and more proficient individuals are in a better position to do so, by making better-informed choices.

SUMMARY

This chapter began with a question: To what extent does proficiency in literacy, numeracy and problem solving in technology-rich environments make a difference to the well-being of individuals and nations? The answer that emerges is clear: proficiency is positively linked to a number of important economic and social outcomes.

Proficiency in literacy is positively and independently associated with the probability of being employed, and with higher wages in many countries and economies. On average, as an individual's proficiency increases, his or her chances of being employed increase too, as do his/her wages. Proficiency in literacy, numeracy and problem solving in technology-rich environments reflects aspects of individuals' human capital that are identified and valued in the labour market separately from other aspects related to education or personal attributes and characteristics.

Proficiency in these information-processing skills is also positively associated with other important aspects of well-being, notably health, beliefs about one's impact on the political process, trust in others, and participation in volunteer or associative activities. There is a clear interaction between proficiency and educational attainment in relation to these outcomes. In nearly all countries/economies, adults with low proficiency and low levels of education show the lowest probability of reporting positively on all the social outcomes considered. Conversely, adults with higher proficiency and high levels of education have the greatest probability of reporting positive social outcomes.

Overall, the results suggest that investments in improving adults' proficiency in literacy, numeracy and problem solving in technology-rich environments may have significant benefits. Independent of policies designed to increase participation in education and training, improvements in teaching literacy and numeracy in schools and programmes for adults with poor literacy, numeracy, skills and ICT may result in potentially significant economic and social returns for individuals and for society a whole.

Findings also point to the existence of significant mismatch between skills and how they are used at work, particularly for some socio-demographic groups. Data show that overqualification is particularly common among young and foreign-born workers and those employed in small establishments, in part-time jobs or on fixed-term contracts. Overqualification has a significant impact on wages, even after accounting for proficiency, and on workers' productivity. It also implies a "waste" of human capital, since overqualified workers tend not to use their skills fully.

However, part of this type of mismatch is due to the fact that some workers have poorer skills proficiency than would be expected given their qualifications, either because they performed poorly in initial education or because their skills have depreciated over time. By contrast, underqualified workers are likely to have the skills required at work, but not the qualifications to show for them. Mismatches in skills proficiency have a weaker impact on wages than do qualifications mismatch. This suggests either that labour market mismatch may be more often related to job-specific or generic skills than to those measured in the survey, and/or that employers succeed in identifying their employees' real skills, irrespective of their formal qualifications, and adapt job content accordingly.

Proficiency in information-processing skills is also positively correlated with important non-economic outcomes, such as trust, political efficacy, participation in volunteering activities, and self-reported health status. These are all important dimensions of individual well-being, both because many people value these outcomes in themselves, and because they are often found to be important ingredients for a smooth and more efficient functioning of economies and societies.

Notes

1. This is in line with findings that precede the Survey of Adult Skills (PIAAC), like those from the British Birth Cohort Studies, the American Longitudinal Study of Adult Learning or the Canadian Youth in Transition Survey (OECD, 2010; Reder and Bynner, 2009).
2. To limit the influence of outliers and extreme values, analyses in this report follow the standard practice of trimming the sample at the top and bottom 1% of the wage distribution in each country.
3. Although literacy, numeracy and problem-solving competencies – the skill domains that are explicitly tested in the PIAAC assessment exercise – are important elements of people's productive capacity, it should be kept in mind that they only imperfectly proxy workers' overall set of skills.
4. Among the countries and economies that conducted the Survey of Adult Skills in 2011-12, the standard deviation in literacy skills was 46 points. Among the OECD countries and economies that have participated in the survey (in either 2011-12 or 2014-15), the standard deviation for the sub-population of workers is 48 points.
5. In some countries, particularly Chile and Singapore but also Greece, Israel and Slovenia, the proficiency in literacy is similar to that of employed adults, a result that might reflect that in some of these countries relatively few unemployed adults participated in the survey or that higher-skilled workers may have more support during unemployment to find a well-matched job.
6. The measure of hourly wages includes bonuses.
7. A compressed wage distribution is one in which the differences in wages among individuals are limited.
8. The set of control variables includes years of education, gender, age, marital status and immigrant background. In the wage analysis, the control set is augmented with tenure. The set of control variables used to produce the estimates presented in this section is more limited than those commonly used in the literature. The reason for this is twofold. First, the results are meant to be as comparable as possible with those on employment (Figure 5.2). Second, the estimated effects are meant to capture a broad notion of the association between wages and proficiency or education. For example, since the control set does not include occupation or industry, some of the effects might be due to the fact that more educated or more proficient individuals are employed in higher-paying sectors or occupations. However, such individuals might obtain these jobs precisely because they are more educated or more proficient, so it is unclear whether it would be more interesting to broaden the control set.
9. This consists in adding the skills-use indicators (see Chapter 4) to the control set of the linear regressions. For brevity's sake, results are not reported.
10. Other human capital attributes not measured in the Survey of Adult Skills may also contribute to the explanation of the variance in workers' hourly wages.
11. Most often, this term is used with reference to apparent overqualification. See for example, Chevalier (2003).
12. While this is complicated by the fact that some jobs may not have an obvious requirement in terms of qualifications or workers may not be fully aware of it, survey experts have found that both workers and employers tend to find it easier to define jobs in terms of required qualifications than in terms of individual skills.
13. Because qualifications mismatch shown in Figure 5.7 is based on workers' views of what qualification is required to get their job, the results may be affected by respondents' bias – i.e. the tendency to overvalue- or undervalue the content of one's work – or by qualification inflation – i.e. whereby employers raise minimum job requirements as a result of an increase in the number of tertiary-qualified candidates without upgrading job content. The latter would tend to reduce the prevalence of overqualification when the self-reported measure is used, while the former may bias the results in either direction.
14. To limit the potential impact of outliers on these measurements, the 5th and the 95th percentiles instead of the actual minimum and maximum are used for computing skills mismatch.
15. The comparison of skills proficiency and skills use rests on the assumption that the two can be measured on the same scale, an assumption that is difficult to defend for concepts that are so clearly distinct theoretically and that cannot be represented along the same metrics. In addition, the measures of skills proficiency and skills use are based on structurally different pieces of information. Indicators of skills use normally exploit survey questions about the frequency (and/or the importance) with which specific tasks are carried out in the respondents' work activities, whereas skills proficiency is measured through information-processing tests. Work is underway to improve this comparison in future waves of the Survey of Adult Skills.
16. Survey respondents are asked "What was the area of study, emphasis or major for your highest level of qualification? If there was more than one, please choose the one you consider most important" with respondents asked to select one of nine field categories: i) general programmes; ii) teacher training and education science; iii) humanities, languages and arts; iv) social sciences, business and law; v) science, mathematics and computing; vi) engineering, manufacturing and construction; vii) agriculture and veterinary medicine; viii) health and welfare; and ix) services. Respondents are also asked an open question about their job title and their responsibilities in the job (for their current job or the one they held last, if they had paid work in the previous five years). These descriptions are used

to derive each respondent's ISCO-08 3-digit occupation. Using Montt's (2015) coding strategy, each occupation is assigned to one or more of the nine fields of study. Whenever a worker reported having studied in a field that is different than the field(s) that correspond to his/her occupation, the worker is considered to be mismatched by field of study. The coding that assigns each occupational code to the corresponding field or fields of study is available in Annex 2 in Montt (2015). Under this coding scheme, certain occupations may be matched to more than one field, as a particular occupation may provide a relevant destination for graduates from different fields (e.g. an author, journalist or linguist [ISCO-08 code 264] is considered to be matched to his/her field of study if he/she graduated from the "Humanities, languages and arts" or "Social sciences, business and law" fields).

17. These differences in skills proficiency within a qualification level are not necessarily related to performance in initial education. Some graduates may lack the generic skills, such as communication, team-work and negotiating skills, that the education system can foster, but that are better learned in the workplace. In addition, some workers may have the skills expected of their qualification level at graduation, but these skills may atrophy or become obsolete over time, particularly if they are not used or upgraded.

18. In principle, this is true for higher-skilled workers too, as could be the case for philosophers from prestigious universities sought after for work in the financial sector. Montt (2015) explores this possibility and finds that, for the most part, highly skilled workers within a field are more likely to remain in the field than be mismatched to receive higher wages.

19. This could be explained by the fact that young people entering the labour market for the first time lack experience and are more likely to be hired for jobs that are below their qualification levels. However, it could also be due to an increase in the prevalence of overqualification over time, such that younger adults are more affected. Unfortunately, the data do not allow for separating these two effects.

20. This is consistent with the mixed results, found in other studies, concerning the role played by gender and family status in explaining qualifications mismatch (Quintini, 2011). Husbands tend to optimise their job search, while their wives' job search is considered – by both the husband and the wife – to be of secondary importance. Also, some researchers have argued that women with children may be more likely to be overqualified because of the constraints on job choice imposed by childrearing. However, there is no empirical evidence to support these claims.

21. Classical references are Knack and Keefer (1997) and Routledge and von Amsberg (2002). Recent reviews of the existing literature include Temple (2003), Durlauf and Fafchamps (2005), Guiso, Sapienza and Zingales (2006), and Algan and Cahuc (2014). We also refer the interested reader to OECD (2001).

22. Recent studies have been able to establish a causal link between trust and economic growth (Algan and Cahuc, 2010). This continues to be an active field of current research (Algan and Cahuc, 2014).

A note regarding the Russian Federation

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

More detailed information regarding the data from the Russian Federation as well as that of other countries can be found in the *Technical Report of the Survey of Adult Skills, Second Edition* (OECD, forthcoming).

References and further reading

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