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Adults with Low Proficiency in Literacy or Numeracy

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ADULTS WITH LOW PROFICIENCY IN LITERACY OR NUMERACY

Education Working Paper No. 131

By Anke Grotlüschen, David Mallows, Stephen Reder and John Sabatini.

This working paper has been authorised by Andreas Schleicher, Director of the Directorate for Education and Skills, OECD.

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ADULTS WITH LOW PROFICIENCY IN LITERACY OR NUMERACY

ABSTRACT

This paper offers a comprehensive analysis of the information from the Survey of Adult Skills (PIAAC) regarding adults with low literacy and numeracy proficiency. The paper first describes the demographic and socio-economic characteristics of these populations. Although, they are more likely than the rest of the population to exhibit certain characteristics, such as lower levels of educational attainment, lower rates of unemployment or more disadvantaged backgrounds, adults with low literacy are found in among all socio-demographic groups and in all walks of life. The paper then explores the frequency with which adults with low proficiency engage in the reading, writing and numeracy practices and the relationship between these practices and a range of social and economic outcomes. For most outcomes, levels of engagement in literacy practices appear to be as strong predictors as proficiency, indicating the importance of encouraging more intense use of these skills both in and outside of work. The unique data from the Survey of Adult Skills regarding performance on the simple reading tasks (the so called "reading components") is also analysed. Adults with low proficiency are found to be able to easily recognise commonly used words in printed form but often have difficulty with processing the logic of sentences and reading extended passages for basic meaning. Adults with low proficiency are considerably less likely than their more proficient peers to participate in formal or non-formal adult education or training programmes, which is mostly due to the socio-demographic and employment characteristics of this population. However, the lower participation rates among the low proficient adults does not appear to be a consequence of their lack of motivation as much as of the presence of various obstacles to participation, such as lack of time and the cost of training.

RÉSUMÉ

Ce document propose une analyse exhaustive des informations collectées dans le cadre de l'Évaluation des compétences des adultes (PIAAC) concernant les adultes peu compétents en littératie et en numératie. Il commence par décrire les caractéristiques démographiques et socio-économiques de ces groupes. Bien qu'ils soient plus susceptibles que le reste de la population de présenter certaines caractéristiques, telles qu'un niveau moins élevé de formation, un taux plus faible d'emploi ou un milieu d'origine plus défavorisé, les adultes peu compétents en littératie peuvent venir de tous les groupes socio-démographiques et de tous les milieux. Ce document étudie ensuite la fréquence à laquelle les adultes peu compétents s'adonnent à certaines pratiques en rapport avec la lecture, l'écriture et la numératie, ainsi que la relation entre ces pratiques et un ensemble de retombées économiques et sociales. Pour la plupart de ces retombées, la mesure dans laquelle les individus s'adonnent à certaines pratiques en rapport avec la littératie semble être une variable prédictive aussi forte que leur niveau de compétences, d'où l'importance d'encourager une plus grande utilisation de ces compétences, tant dans le cadre professionnel que privé. Ce document propose également une analyse des données uniques de l'Évaluation des compétences des adultes concernant la performance dans les tâches simples de compréhension de l'écrit (aussi appelées « composantes de la lecture »). Il en ressort que les adultes peu compétents sont capables de reconnaître facilement des mots d'usage courant sur un support imprimé, mais ont souvent des difficultés à comprendre la logique d'une phrase et à lire des passages plus longs pour en extraire le sens. Les adultes peu compétents sont en outre nettement moins susceptibles que leurs pairs plus compétents de participer à des activités formelles ou non formelles d'éducation ou de formation pour adultes, constat qui s'explique principalement par leurs caractéristiques socio-démographiques ou professionnelles. Cependant, cette plus faible participation des adultes peu compétents ne semble pas résulter de leur manque de motivation, mais plutôt de la présence de divers obstacles à cet égard, tels que le manque de temps et le coût de la formation.

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EXECUTIVE SUMMARY

The OECD 2012 Survey of Adult Skills (PIAAC) assessed the proficiency of the adult population in literacy and numeracy in 24 countries and regions. Both previous research and the results from PIAAC suggest that proficiency in literacy and numeracy are positively associated with a range of important economic and social outcomes for both individuals and countries. Countries are likely to benefit from policy and programme changes that increase the skill levels of their populations. Equity and efficiency concerns suggest that a particular emphasis should be placed to programmes aimed at adults with low levels of proficiency.

A better understanding of low proficiency populations and how they acquire and use their skills and engage in education provision is essential to help improve policies, training and education programmes that serve them. Using PIAAC data, this paper attempts to provide comprehensive information about characteristics of low proficiency adult populations to programme designers and policy makers so they can better meet the needs of low proficiency adult populations.

How many adults have low proficiency and who are these adults

On average, 12.3% of adults scored at or below Level 1 in both literacy and numeracy across participating OECD countries, while an additional 3.2% of all adults scored at or below Level 1 in literacy alone and 6.7% scored at these levels in numeracy alone.

The proportion of adults who scored at or below Level 1 in literacy and/or numeracy varies between 4.9% in Japan and 27.7% and 27.5% in both Italy and Spain. Among adults who scores at Level 1 or below in at least one domain, over half (55.3%) scored at or below Level 1 in both literacy and numeracy. Some 14.4% scored at literacy alone and 30.3% scored at numeracy alone.

Low proficiency adults are not sharply differentiated from the rest of the adult population in terms of socio-demographic characteristics considered either across or within countries. Broadly speaking, adults with low proficiency in literacy or numeracy are more likely than the rest of the adult population to have not completed upper secondary level education, to have been born in a country other than the country in which they took the test, to be of older age and to be unemployed. However, while they are more likely than the rest of the adult population to exhibit these characteristics, the majority of them do not. Indeed, 65% completed upper secondary (and 9% completed tertiary); 62% were born in the country in which they took the test, and 56% are in employment.

How often adults with low proficiency engage in literacy activities

Proficiency and engagement in literacy practices interact over time and mutually reinforce each other in adult literacy development. As a consequence, proficiency and literacy practice are positively correlated - as literacy and numeracy proficiency levels rise, average levels of engagement in reading, writing and numeracy practices steadily increase. The level of engagement of adults with low proficiency is consistently lower either at or outside of work compared to general adult population. Bot at or outside of work, many low-proficiency adults are not engaged with reading, others not with writing, and others not with numeracy practices. There is broad cross-national variation in levels of engagement of adults with low proficiency in various information-processing practices.

Engagement in reading, writing and numeracy practices appears to be important for individual and societal well-being. In low-proficiency populations, reading, writing and numeracy practices – either at work or outside of work – are related to workers' earnings. At given levels of education and proficiency, the more individuals engage in these cognitive activities (either at work or outside of work), the higher their earnings tend to be.

Reading, writing and numeracy practices of adults with low proficiency are also positively related with a number of important social outcomes. The magnitude of the relationship between cognitive practices and these social outcomes varies with the practice domain and the social outcome (trust, volunteering, political efficacy, general health). Reading is more strongly related than writing, which is more strongly related than numeracy practice for each of the social outcomes.

What basic reading skills adults with low proficiency possess

PIAAC included an assessment of 'reading components' to evaluate how well individuals with low levels of proficiency masters the basic building blocks of reading: the ability to recognise words in printed form ("*print vocabulary"*), the ability to process meaning at the sentence level ("*sentence processing"*), and the ability to comprehend text passages ("*passage comprehension"*).

Almost all adults with low literacy have a basic knowledge of print vocabulary, i.e. they are able to identify the printed word corresponding to a concrete object from out of a set of four alternatives.

Most adults with low proficiency are also able to understand the meaning of sentences of short to medium length and designed to include multiple clauses and complicated logical relations. On average adults at below Level 1 in literacy able to correctly identify meaning of sentences 73% of the time (while taking 4.2 seconds per task, on average), while adults at Level 1 in literacy are correct as much as 85% of the time (3.4 seconds per task).

Adults at Level 1 of literacy proficiency can read passages relatively fluently, correctly answering 84% of passage comprehension tasks (7.5 seconds per task, on average). On the other hand, reading multi-paragraph, continuous prose texts and maintain attention and persistence is a challenge for those below Level 1 of literacy proficiency, who were able to correctly answer only 68% of tasks (9 seconds per task).

Countries differ considerably not only in terms of the number of individuals with low and lowest-proficiency, but also in the basic reading skills that they possess with adults in the United States having particularly low basic reading skills.

There are substantial differences in reading skills among adults with who are native and non-native speakers of the test language, suggesting that the lack of target language skills of non-native speakers is one of the main determinants of the level of basic reading skills of adults with low proficiency.

How often adults with low proficiency participate in the Adult Education and Training

Adult education and training (AET) represents an important opportunity for adults with low literacy and numeracy proficiencies to improve their competences and consequently their chances for better integration in the economic and social life and overall personal wellbeing. However, the participation rates of adults with low literacy proficiency in formal and non-formal AET are much lower than those of highly proficiency adults as well as those of the general population.

The gap in participation rates between adults with low and high literacy proficiency is on average 44 percentage points (29.7% compared to 73.6% respectively) in the case of non-formal AET (that includes open or distant learning, on-the-job learning, seminars and workshops, and private lessons). In the case of formal education, this gap is 12 percentage points (5.9% compared to 18.1%). Similar results are found when comparing adults with low and high numeracy proficiencies.

However, after taking into account socio-demographic and employment characteristics differences in participation rates between adults with low and high literacy fell from initial 44 to 13 percentage points in case of non-formal AET and from 12 to 4 percentage points in the case of formal AET. In other words,

these characteristics account for about 70% - 75% of the initial differences in participation rates in formal or non-formal AET between adults with low and high literacy. Put another way, literacy-related factors accounts for 25% - 30% of the differences in participation rates.

As the supply of different forms of AET – formal, non-formal, informal – varies between countries, rates of participation among adults with lower proficiencies also differ widely across countries. In general, countries with higher general rates of AET also have higher participation rates of adult with lower proficiencies in AET, and vice versa.

CHAPTER 1. INTRODUCTION

1.1. The economic and social importance of literacy and numeracy

Research based on previous international surveys of adult skills has demonstrated the economic and social value of well-developed literacy and numeracy skills for both individuals and societies (Hanushek and Wößmann, 2012a,b). The OECD 2012 Survey of Adult Skills, a product of the OECD Programme for the International Assessment of Adult Competencies (PIAAC), like its predecessors (International Adult Literacy Survey, IALS and Adult Literacy and Lifeskills Survey, ALL), included assessments of adults' literacy and numeracy proficiencies. The first international report of the Survey of Adult Skills made a strong case that these proficiencies and everyday uses of reading, writing, and numeracy skills are of great economic importance to countries participating in the survey (OECD, 2013a).

In one of the first econometric analyses of the Survey of Adult Skills data, Hanushek, Schwerdt, Wiederhold and Woessmann (2013) found substantial wage returns to skills over and above the wage returns attributable to education for prime age workers in the United States and countries around the world. However, the importance of these skills is not limited to economic outcomes OECD (2013a,b). Dinis da Costa et al., (2014) analysed the contributions of skills to a number of social outcomes: social trust, volunteerism, political efficacy and general health. Statistically significant relationships were found between literacy proficiency and each of the social outcomes after taking into account the effects of education and demographic variables (Dinis da Costa et al., 2014; OECD, 2013a,b).

Both education and information-processing proficiencies thus are important and independent predictors of these economic and social outcomes. Recent research suggests that individuals' skill use may also be an important determinant of these outcomes. Desjardins and Rubenson (2011), in analysing ALLS data, found independent effects of education, proficiency and skill use in their wage determination studies.

We thus see systematic connections between information-processing skills – literacy, numeracy, and other proficiencies – and a broad range of social and economic indicators of individual and societal well-being. These connections reflect the extent to which use of information-processing skills is woven into the very social and economic fabric of the societies. Chapter 3 of this report introduces the concept of how uses of skills are "embedded" in key economic and social indicators. The embedding framework offers one important way to quantify aspects of the literate and numerate environments of the societies in which adults live and work.

1.2. The need to understand low proficiency populations

The PIAAC-related research mentioned above makes a strong case that countries and economies are likely to benefit from policy and programme changes that increase the skill levels of their populations, attainable through improved school systems and lifelong learning supports for skill development in adults who are out of school. Amidst numerous calls to improve the overall level of adult skills in many countries, special attention is often given to raising the skill levels of adults with particularly low proficiency levels. Policy makers, adult educators and trainers, employers and social service providers often assume that adults with weak basic skills may need specialised educational provision to adequately develop their skills to meet personal, employment and civic goals. This paper attempts to provide useful information about low proficiency adult populations to programme designers and policy makers so they can better meet the needs of low proficiency adult populations.

A better understanding of low proficiency populations and how they acquire and use their skills and engage in education provision is essential to help improve policies, training and education programmes that serve them. Unfortunately, many commonly held misconceptions about adults with low literacy or

numeracy and stereotypes regarding who they are (e.g. that they are predominantly adults who left school early or from migrant backgrounds) inform societal attitudes and public policy and ultimately shape the design of specific educational provision for them. This report attempts to provide accurate information and analysis of the economic, social and educational characteristics of adults with weak literacy and numeracy skills as an important step in challenging these misconceptions and stereotypes.

An important part of understanding literacy and numeracy development in low proficiency adults is careful consideration of their patterns of skill use. Practice engagement theory research demonstrates that proficiency and skill use (sometimes termed engagement in literacy practices) interact over time and mutually reinforce each other in adult literacy development (Reder, 2009, 2014). Interventions aimed at increasing skill use along with direct instruction may be effective over time in increasing proficiency. We will see that both proficiency and skill use together generate improved economic and social outcomes, so understanding the importance of both dimensions for low proficiency adults will be very useful.

Previous international adult literacy surveys provided little information about the reading skills of adults with low proficiencies. One could not infer whether they had basic reading skills at all or which of their component reading skills needed the most attention. An assessment of reading components was therefore added to the Survey of Adult Skills (PIAAC) to provide more detailed information about the basic reading abilities of adults with low assessed literacy proficiency.

The reading components assessed are basic print processing skills essential for extracting meaning from written texts: knowledge of vocabulary (i.e., recognising the printed form of words in a language), the ability to process meaning at the sentence level, and basic comprehension of text passages. Skilled readers are able to undertake these types of operations automatically, with little conscious effort or attention, freeing up cognitive resources for the more complex, higher level reading required for more advanced literacy practices. As an indicator of the ease and fluency of using these basic reading component skills, the time taken by respondents to complete the tasks was recorded as part of their reading component performance. Understanding how the fluency of reading components and the everyday use of reading skills interact with one another in adults with weak reading skills can help programme designers and policymakers improve supports for the development of literacy among low proficiency populations.

It is also important to consider the learning strategies of low proficiency adults as well as their patterns of participation in various types of formal and non-formal education and training. Previous research based on international adult literacy surveys, the European Adult Education Survey and national surveys consistently finds that adults with more education and better skills are more likely to participate in adult and further education (OECD/CERI, 2008, p. 48ff; Rosenbladt, Bilger, and Gnahs, 2008; Kuper, Unger, and Hartmann, 2013; Desjardins and Rubenson, 2013; Desjardins, Rubenson, Milana, and UNESCO IIEP, 2006; Jonas, 2012; Grotlüschen and Riekmann, 2012; DfES, 2003). One source of this effect may be differences in the learning opportunities afforded to different groups of adults in workplaces and in other contexts. A second source may be differences among groups' choices, preferences and constraints for participating in the programmes available to them. Since many national strategies (as described for several countries Rubenson, 2011; St.Clair, 2011; Gabrielsen, 2011; Pugsley, 2011; Mendelovits, 2011) concentrate on attracting low proficiency adults into their programmes, further information about their distinctive participation patterns and learning strategies will be useful for policymakers and programme designers. Important differences can be found between countries' approaches (Rubenson and Desjardins, 2009). The European High Level Group of Experts recommended benchmarks and activities for all educational sectors (EU High Level Group of Experts on Literacy, 2012).

Chapter 5 of this report provides more detailed analysis and insights on adult education and training (AET) among adults with low proficiency in literacy and numeracy. In particular, it presents participation rates of the adults with low proficiency in formal, non-formal AET programmes as well as in informal

learning activities. Furthermore, it explores the participation gap between adults with low and high proficiencies, its determinants and consequences.

1.3. Defining low proficiency populations

"Low proficiency" adults in this thematic report are defined as those respondents scoring at Level 1 or below Level 1 on the PIAAC literacy or numeracy scales (i.e. having an estimated proficiency score of less than 226). Level 1 on the PIAAC literacy and numeracy scales represents a level of proficiency at which a person can successfully complete reading tasks involving short texts and relatively simple operations or mathematical tasks involving basic operations. These definitions will enable us to map and understand better who these populations are, what they can do with their skills, and suggest effective ways for policies and programmes to further develop their skills. To find out about what adults who scored at or below Level 1 can do, see Box 1 below.

Box 1. What adults at Level 1 or below in literacy or numeracy can do

Literacy

At Level 1, adults can complete simple forms, understand basic vocabulary, determine the meaning of sentences, and read continuous texts with a degree of fluency. Little, if any, competing information is present at this level. Some tasks may require simple cycling through more than one piece of information. Knowledge and skill in recognizing basic vocabulary determining the meaning of sentences, and reading paragraphs of text is expected. Individuals at below Level 1 may have difficulty completing the tasks at Level 1.

For detailed description of proficiency levels in literacy as well as examples of literacy items by proficiency levels, refer to page 64 and 65 of *Skills Outlook 2013: First Results from the Survey of Adult Skills* (OECD, 2013).

Numeracy

Adults at Level 1 can complete tasks involving basic mathematical processes in common, concrete contexts where the mathematical content is explicit with little text and minimal distractors. They can perform simple processes involving counting, sorting, basic arithmetic operations, understanding simple percents, and locating and identifying elements of simple or common graphical or spatial representations. Individuals at below Level 1 have difficulty completing simple tasks at Level 1.

For detailed description of proficiency levels in numeracy as well as examples of numeracy items by proficiency levels, refer to page 76 and 77 of *Skills Outlook 2013: First Results from the Survey of Adult Skills* (OECD, 2013).

Although individuals scoring at a low literacy proficiency level may often be able to perform simple literacy tasks, they are less likely to perform most Level 2 literacy tasks such as the following:

"At Level 2, adults can integrate two or more pieces of information based on criteria, compare and contrast or reason about information and make low-level inferences. They can navigate within digital texts to access and identify information from various parts of a document." (OECD, 2013a: 66)

Similarly, although individuals scoring at a low numeracy proficiency level may often be able to perform simple literacy tasks, they are less likely to perform most Level 2 numeracy tasks such as the following:

"…tasks that require identifying and acting upon mathematical information and ideas embedded in a range of common contexts where the mathematical content is fairly explicit or visual with relatively few distracters. The tasks may require applying two or more steps or processes involving, for example, calculations with whole numbers and common decimals, percents and fractions; simple measurement and spatial representations; estimation; or interpreting relatively simple data and statistics in texts, tables and graphs." (OECD, 2013a: 79)

Proficiencies in literacy and numeracy are closely related. OECD (2013a) reported a correlation between proficiency in literacy and numeracy at the individual level of 0.87. This strong correlation was observed in each country, with the highest values in Norway (0.90), the United States (0.89), Australia (0.89) and the Netherlands (0.89) and the lowest in the Czech Republic (0.80), Italy (0.82) and Estonia (0.83).

Given the strong overall correlations between literacy and numeracy, it is not surprising that there is considerable overlap between the populations with low literacy and those with low numeracy. Among adults age 16 to 65 from all countries participating in the first round of the Survey of Adult Skills, about one in four has low literacy proficiency in literacy, low numeracy proficiency in numeracy, or both, with low numeracy proficiency being somewhat more widespread than low literacy proficiency.

Despite being strongly correlated, literacy and numeracy constitute distinct skills, each defined by its own framework. The distinctiveness of the two proficiencies can be important. We will see in this report, as OECD (2013a) has shown previously, that at the individual level, the strength of the relationship of key social and economic outcomes can vary markedly between literacy and numeracy.

Most of the analyses in this report consider low proficiency in literacy separately from low proficiency in numeracy. Nevertheless it is important to remember that the population with *either* low literacy or low numeracy proficiency is considerably larger than the population that has only low literacy or the population that has only low numeracy proficiency. The skill development and education needs may vary depending on which of the low proficiency populations is being considered. A detailed analysis of the overall performance of adults with low proficiency in literacy, numeracy and in both domains is presented in Chapter 2.

1.4. Approach and organisation of the report

Chapter 2 provides the context for the following chapters by looking in detail at the demographic and socio-economic characteristics of the low proficiency populations. It takes primarily a descriptive approach, highlighting ways in which this group is different from the rest of the population, as well as some of the ways in which they are not. It covers age, gender, education, migration, employment and family background. In attempting to provide a clear picture of the characteristics of this group, the main aim is to support readers in interpreting the analysis in the other chapters.

As we will see, low proficiency adults are not sharply distinct populations in terms of socioeconomic characteristics considered either across or within countries. Although they are more likely than the rest of the population to exhibit certain characteristics, the differences are not absolute. Some distinguishing factors can be identified through analysis of data from the proficiency scores and the background questionnaire. However, these should be interpreted carefully; the clearest message from Chapter 2 is that while policy makers can legitimately target certain groups in the expectation that they will contain above average numbers of adults with low literacy and numeracy proficiencies, such an approach will likely miss the majority of the adult populations with such needs.

Chapter 2 contrasts low proficiency populations, those who scored at below Level 1 or Level 1, with populations who scored at the highest proficiency levels, Levels 4 and 5. The contrast of the poorest performers with the highest performers offers as clear a picture as possible of the target group and of the costs to individuals, families and society of low levels of literacy and numeracy proficiency. Comparisons are also made with the characteristics of adults in the general population to provide a picture of how large certain group of population is within the total population.

Chapter 3 describes the patterns of skill use in low proficiency populations and tries to motivate the conceptualisation of adult literacy development in terms of increasing levels of both proficiency and skill use. Analytical models are presented that predict a range of social and economic outcomes in terms of both proficiency and skill use after taking the effects of education and other variables into account.

We will see that for most outcomes, levels of skill use appear to be as strong or even stronger predictors than proficiencies. Within low proficiency populations, of course, these results could be occurring because of the restricted range of proficiency to begin with. It is thus important to examine the predictive models when applied to the entire adult population as well. For this reason the key comparisons in Chapter 3 are between the models of the low proficiency and the entire adult populations.

Chapter 4 presents data about the performance of the reading component tasks across literacy proficiency levels. The progressively increasing accuracy and fluency of performance across the proficiency spectrum makes it important to contrast the low proficiency population with each of the proficiency levels within the entire adult population.

Chapter 5 presents data about the learning strategies and participation patterns of low proficiency adults in a range of education and training activities. The approach of the chapter is primarily descriptive. As done in Chapter 2, this chapter draws its key contrasts drawn between low proficiency populations and the highest performing populations, namely those scoring at Level 4 or 5. The rationale for making these comparisons is similar to that of Chapter 2: to delineate the distinctive characteristics of low proficiency populations as sharply as possible.

Chapter 6 gathers the results of the individual chapters together into a set of conclusions and recommendations for policymakers and program designers for better meeting the needs of low proficiency populations.

Accessing the data from this report

The data referred to and presented in this report can be accessed and downloaded in the form of Excel spreadsheets at the following address: www.oecd.org/site/piaac/publications.htm

The data files contain the data for all figures and tables included in the text of the report as well as for the additional analyses in the data Annex referred to in Chapter 3.

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CHAPTER 2. WHO SCORED AT LEVEL 1 OR BELOW?

The results of Survey of Adult Skills (PIAAC) demonstrate that a significant proportion of the adult population in all participating countries performed poorly in the literacy and numeracy assessments. The size of that group differs between countries, but even in best performing countries there are substantial number of adults with poor skills in literacy and numeracy.

The primary objective of this chapter is to describe the characteristics of adults who scored at or below Level 1 in literacy or numeracy. The characteristics of interest include socio-demographic factors such as age, gender and educational attainment as well as, migration status and labour market and family status. In order to show how the characteristics of adults with low literacy and numeracy differ from those with higher skills, comparisons are made with the characteristics of adults in the general population and with those who scored at Levels 4 or 5.

This detailed analysis of the data provides a useful picture of the characteristics of adults who scored at Level 1 or below, demonstrating how they differ from adults performing at higher levels of proficiency. It also reveals significant differences among countries, and enabling policy makers to better understand and plan for the specific needs of their adult population.

Before looking at the characteristics of adults with low literacy and numeracy, it is worth briefly revisiting the overall distribution of performance in literacy and numeracy in the countries participating in the Survey of Adult Skills (PIAAC).

2.1. Performance

2.1.1. Literacy

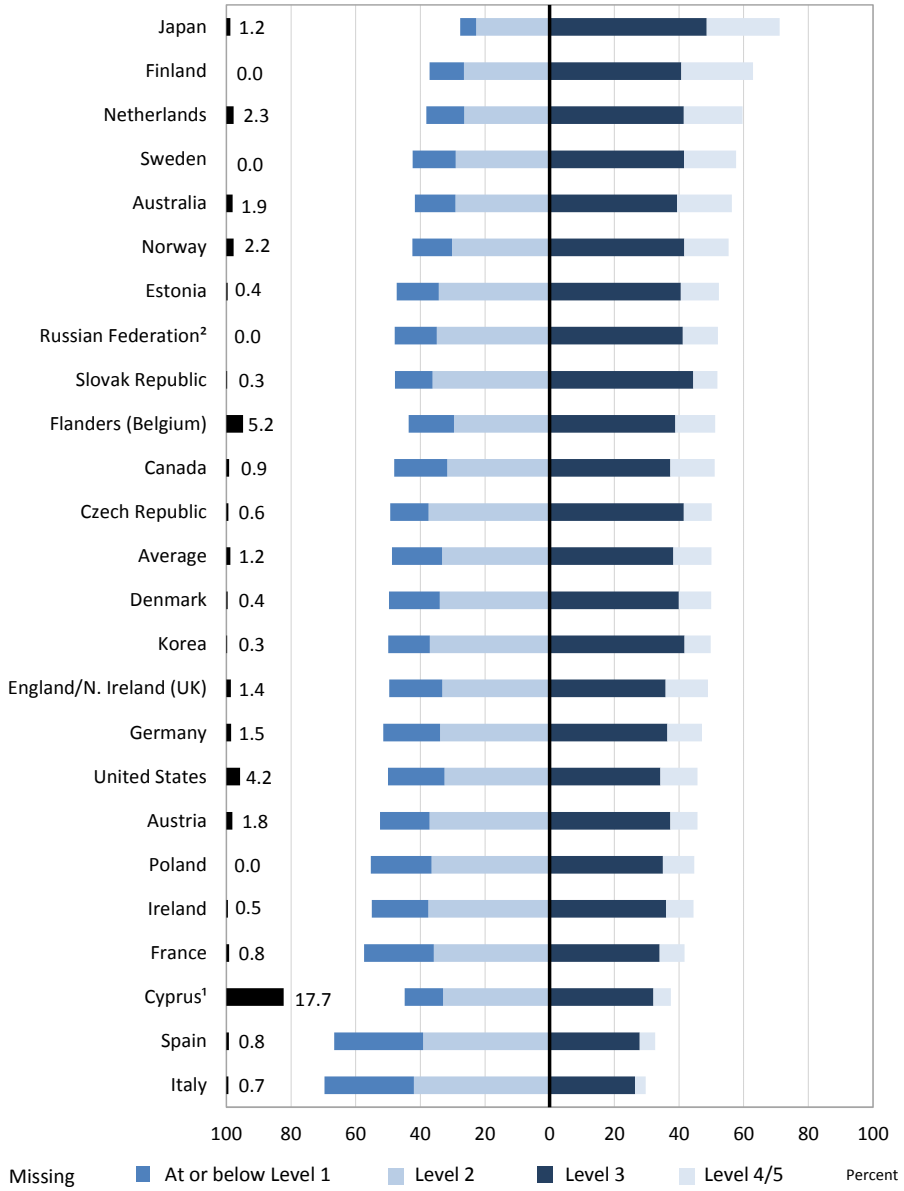
Figure 2.1 presents the percentage of adults aged 16-65 who scored at each of the 6 levels of the proficiency on the literacy scale (Levels 1 through 5 and below Level 1) in each participating country (see Box 1). On average, 15.5% of adults scored at or below Level 1 in literacy, while 83.3% of adults scored Level 2 or above in literacy across participating OECD countries.

The proportion of adults at or below Level 1 in literacy varies across countries. Italy (27.7%), Spain (27.5%), France (21.6%) and Poland (18.8%) have substantially higher proportions of adults who scored at or below Level 1 compared to the average. Among these countries, Italy (3.3%), Spain (4.8%) and France (7.7%) also have one of the smallest proportions of adults at Level 4 or 5. The lowest proportions of adults scoring at Level 1 or below in literacy are found in Japan (4.9%), Finland (10.6%), the Slovak Republic (11.6%), the Netherlands (11.7%) and the Czech Republic (11.8%).

As shown in the Figure 2.2, the proportion of adults performing at Level 1 or below in a country is negatively related to the overall average performance of adults in a country. Differences in mean literacy scores explain around 91% of the variation in the proportion of adults scoring at or below Level 1 across countries.

Figure 2.1. Literacy proficiency among adults

Percentage of adults scoring at each proficiency level in literacy



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

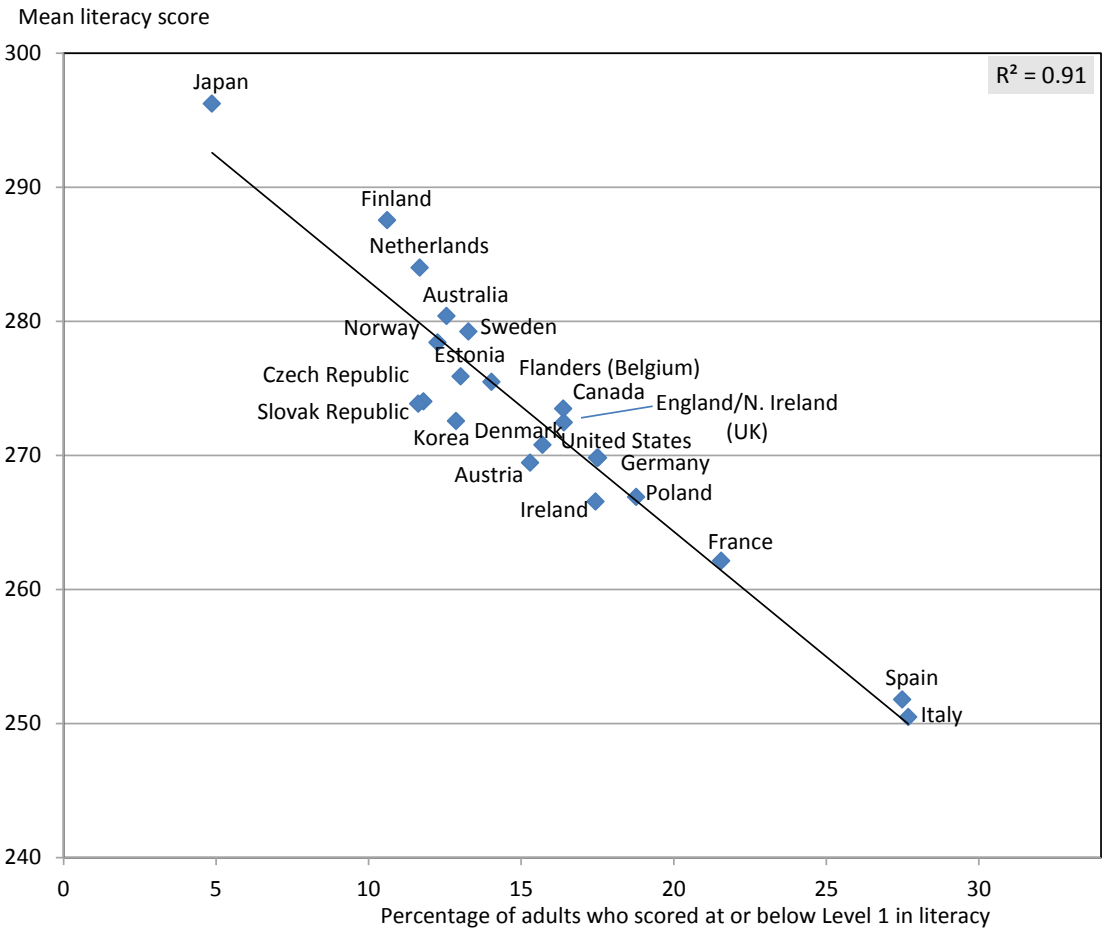
Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of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

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

Adults in the missing category were not able to provide enough background information to impute proficiency scores because of language difficulties, or learning or mental disabilities (referred to as literacy-related non-response).
Countries are ranked in descending order of the combined percentage of adults scoring at Level 3 and Level 4/5.
Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

Figure 2.2. Mean literacy proficiency and percentage of adults at or below Level 1 in literacy

Mean literacy score and percentage of adults scoring at Level 1 or below in literacy



Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

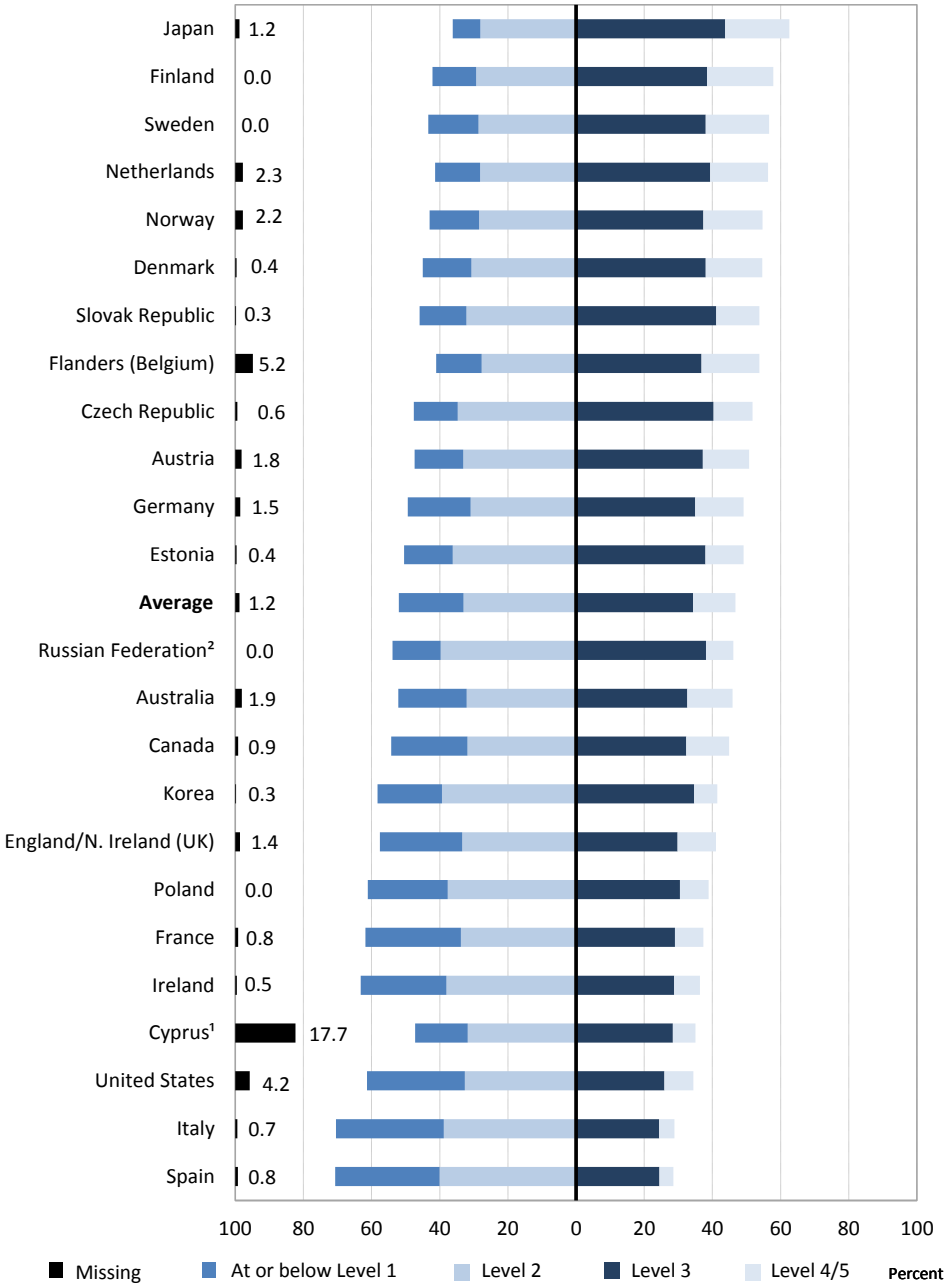
2.1.2. Numeracy

On average, 19% of adults scored at or below Level 1, while 79.8% of adults scored Level 2 or above in numeracy across participating OECD countries.

As in the case of literacy, there is considerable proportion of adults scoring at Level 1 or below among countries. Italy (31.7%), Spain (30.6%), the United States (28.7%) and France (28%) have substantially higher proportion of adults who scored at or below Level 1 compared to the average (Figure 2.3). On the other end of the scale, Japan (8.1%), Finland (12.8%), the Czech Republic (12.9%), the Netherlands (13.2%) and Flanders (Belgium) (13.4%) have considerably smaller proportion of adults at these levels. As in the case of literacy, the share of low performers in numeracy is correlated with overall performance and the proportion of adults at Levels 4 or 5. As in the case of literacy, the proportion of adults performing at Level 1 or below in a country varies in line with the overall average performance of a country. Differences in the mean numeracy scores explain around 96% of the variation in the proportion of adults scoring at or below Level 1 in numeracy across countries.

Figure 2.3. Numeracy proficiency among adults

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



Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.
Adults in the missing category were not able to provide enough background information to impute proficiency scores because of language difficulties, or learning or mental disabilities (referred to as literacy-related non-response).

Countries are ranked in descending order of the combined percentage of adults scoring at Level 3 and Level 4/5.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

2.1.3. Poor performance in Literacy, Numeracy or both

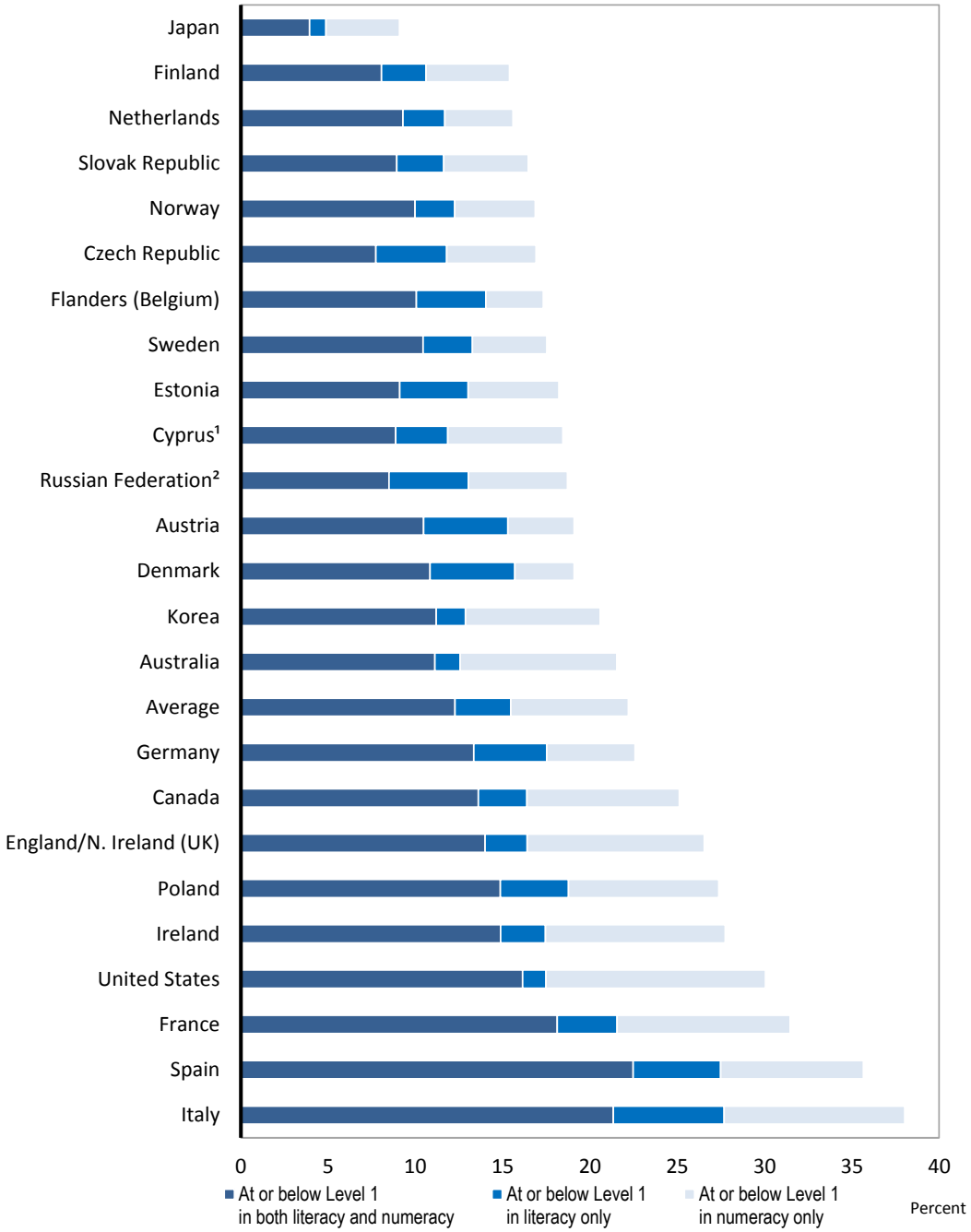
On average, 12.3% of adults scored at or below Level 1 in both literacy and numeracy across participating OECD countries, while an additional 3.2% of all adults scored at or below Level 1 in literacy alone and 6.7% scored at these levels in numeracy alone. More than one in five adults in Spain (22.5%) and Italy (21.3%) scored at or below Level 1 in both literacy and numeracy. France (18.1%) and the US (16.1%) also have substantially higher proportions of adults scoring at or below Level 1 in both literacy and numeracy. Japan (3.9%), the Czech Republic (7.7%) and Finland (8.1%) had the smallest proportions of adults scoring at or below Level 1 in both literacy and numeracy (Figure 2.4).

As performance in literacy and numeracy is highly correlated (0.87) (OECD, 2013), a high proportion of adults at Level 1 or below in literacy would be expected to also perform at this level in numeracy. Among adults who scores at Level 1 or below in at least one domain, over half of adults (55.3%) scored at or below Level 1 in both literacy and numeracy. Some 14.4% scored at literacy alone and 30.3% scored at numeracy alone.

In Spain (63%), Sweden (59.6%), the Netherlands (59.6%), Norway (59.2%) and Germany (59.1%) had more than 59% of adults scoring at or below Level 1 in both literacy and numeracy among those who scored at or below Level 1 in at least one of the domains.

In Japan and the United States, particularly larger proportion of adults scored at or below Level 1 in numeracy among those who scored at or below Level 1 in at least one domain. Some 46.4% scored at or below Level 1 in numeracy alone in Japan and 41.8% in the United States. While only 10.3% and 4.5% scored at or below Level 1 in literacy alone in Japan and in the United States respectively. It is however, important to note that literacy and numeracy scales are different from one another; therefore each level cannot be directly compared to each other.

Figure 2.4. What proportion of adults (16-65) are low-skilled?



Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.
Low-skilled adults are defined as those who score at or below Level 1 in either literacy or numeracy proficiency.

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

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

2.2. Synthesis of socio-demographic differences in literacy and numeracy proficiency

Table A2.1 summarises the socio-demographic characteristics and labour market status of adults who scored at or below Level 1 as well as those who scored at Level 4 or 5 in literacy and numeracy. While certain groups in the population are over-represented among adults scoring at Level 1 or below in literacy or numeracy compared to the rest of the population, it is notable that adults from all segments of the population are found among the low performers. For example, on average, 11.7% of low performers are aged 16-24 years, 9.8% have a tertiary level of education, 56.4% are employed and 9.6% come from a highly educated family background.

In terms of demographics, the majority of adults who scored at or below Level 1 in literacy were aged 45-65 (56.8%), had a highest level of education at upper secondary level or lower (90%), were born in the country (75.8%), and use the same language as the test language at home (82.4%). In contrast, adults at Level 4 or 5 were generally younger, have a higher level of educational attainment, and are more likely to be born in the country and use the same language as home language.

With regard to labour market status, the majority (56.4%) of adults proficient at Level 1 or below in literacy were employed. The employment rate of low performing adults is high (66.5%) when only adults aged between 25 and 55 years of age are considered. Among the adults (aged 16-65) with low literacy in employment, 68.9% had an indefinite contract and also had low incomes (28% with incomes in the lowest 20% and 8.6% in the highest). This compares with adults proficient at the highest levels who were significantly more likely to be employed (78.8%) and when employed to have incomes in the highest 20% of the earnings distribution (36.1%).

In terms of family background, 32.6% of adults who scored at or below Level 1 in literacy have at least one parent who was not born in the country of the test, almost twice the proportion (17.2%) of those who scored at Level 4 or 5. Less than 10% of adults who scored at or below Level 1 had a parent who had obtained a tertiary qualification, again considerably lower than the proportion of high performers (44.3%). Most poor performers in literacy came from households in which there were relatively few books when they were young. Some 55% of adults proficient at Level 1 or below in literacy came from families in which there were less than 25 books in the household when the respondent was 16 years of age compared to only 10% of top performers.

Apart from their distribution across individual background characteristics, it is interesting to see how the proportions of adults with particular combinations of these characteristics vary between the general and low-proficient populations. In Table 2.1 we present the proportions of adults with in groups defined by age (aged 16-29, 30-49, 50-65), education (less than upper secondary level, upper secondary level, tertiary level) and labour force status (employed, unemployed and out of the labour force) both for the general and the low-proficient populations. In addition, the extent to which the proportion of adults with particular characteristics of interest among the adults with proficiency is greater or less than the corresponding proportion in the general population. For example, the proportion of older (50-65), employed adults with less than secondary degree among the low-proficient population is 130% greater than among to the general population.

The findings presented in Table 2.1 confirm the relationship between educational background, employment status and age with proficiency. The highest differences between general and low-proficiency populations are found in the case of older adults with lower levels of education, which are greatly overrepresented in the low-proficiency population. Also, middle-aged adults with less than upper secondary degree are overrepresented among this population. At the same time, adults with tertiary degrees are substantially underrepresented in all age groups and labour force statuses.

Table 2.1. Proportions of adults with different combinations of background characteristics among the general and low-proficiency population

Education	Age	Labour Force Status	Proportion of the group among the general population (%)	Proportion of the group among the low-proficiency population (%)	Over- or under-representation of the group in the low-proficiency population
Less than upper secondary	16-29	Employed	2.8	4.2	53%
		Unemployed	0.8	1.2	57%
		Out of the labour force	4.6	5.0	9%
	30-49	Employed	4.5	9.3	105%
		Unemployed	0.8	2.1	184%
		Out of the labour force	1.7	5.1	197%
	50-65	Employed	4.3	10.0	130%
		Unemployed	0.4	1.0	170%
		Out of the labour force	4.5	13.1	194%
Upper secondary	16-29	Employed	7.9	4.5	-43%
		Unemployed	1.1	0.8	-32%
		Out of the labour force	3.6	1.6	-55%
	30-49	Employed	15.8	12.3	-22%
		Unemployed	1.1	1.2	17%
		Out of the labour force	2.4	2.9	23%
	50-65	Employed	8.4	9.1	9%
		Unemployed	0.5	0.6	22%
		Out of the labour force	4.5	6.4	43%
Tertiary	16-29	Employed	4.5	0.8	-82%
		Unemployed	0.4	0.1	-82%
		Out of the labour force	0.8	0.3	-69%
	30-49	Employed	14.6	3.3	-77%
		Unemployed	0.5	0.3	-46%
		Out of the labour force	1.3	0.9	-35%
	50-65	Employed	6.5	2.8	-57%
		Unemployed	0.2	0.1	-44%
		Out of the labour force	1.7	1.2	-29%

Source: Survey of Adult Skills (PIAAC) (2012)

In the following sections, the characteristics of adults with low proficiency in literacy and numeracy are examined in more detail. The focus of the presentation is on the characteristics of the population of adults with low proficiency in literacy and numeracy and the extent to which this differs from that of the 16-65 year-old population as a whole and the population of adults with high proficiency (i.e. those proficient at Levels 4 or 5) in literacy or numeracy. The composition of low proficiency population in any given country is depends on the composition of the general population in a country. For most of the characteristics discussed below, the relationship between the shares of the population as a whole and of adults with low literacy possessing a characteristic of interest is presented graphically. A 45 degree line was drawn to show the extent to which adults with the characteristic of interest are under- or over-represented among adults with low proficiency compared to the general population.

2.3. Demographics

2.3.1. Age

Older adults are over-represented among adults with low proficiency in literacy or numeracy. The majority (56.8%) of adults who scored at or below Level 1 in literacy were aged 45-65 years. An almost identical age distribution is observed among adults proficient at Level 1 or below in numeracy. Adults aged 45-65 represent 41.7% of the general population and only 24.6% of adults proficient at Levels 4 or 5 in literacy.

The smallest proportions of low-performers in literacy among young adults (25-34 years old) are found in Korea (6.6%), Japan (8%) and Finland (8.5%), however these three countries also had the highest proportions low-performers in literacy among the older population (45-65 year-olds): Japan- 76.2%, Finland- 70.4%, and Korea- 75.3%. On the other hand, England/N.Ireland (UK) and the Slovak Republic show exactly the reverse pattern. There is over-representation of young adults among those who scored at or below Level 1 while there are considerably smaller proportions of older cohorts among the low performers in these countries.

Young adults at or below Level 1

While the age distribution of adults proficient at low levels of literacy and numeracy is skewed towards the older age groups, 11.7% of adults who scored at or below Level 1 in literacy are aged 16-24 years and 14.3% in numeracy (Tables 2a and 2b). England/N.Ireland (UK) has a particularly high proportion of young adults among those who scored at or below Level 1 in literacy. Around 20% of low performers were aged 16-24 years - in England/N.Ireland (UK) nearly double the average. This compares with its high performing counterparts such as Korea and the Netherlands where only 3.6% and 7.1% respectively of their low performing adults were aged 16-24 years. Norway (18.9%), the Slovak Republic (16.1%), Australia (15.1%) and the United States (14.3%) also had substantially higher than average proportions of young adults among the population of adults with low literacy. In numeracy, Norway had the highest proportion of young adults among the low performers (21%). Considerably higher proportions of young adults were found among the low performers in the United States (18.8%), England/N.Ireland (18.7%) and Denmark (17.3%) compared to the average in numeracy (14.3%).

Among the low performers aged 16-24 years, slightly less than half (48%) were studying for a formal qualification on average across participating countries. In contrast, among 16-24 year-olds who scored at Level 4 or 5, three quarters (76.6%) were in the process of obtaining a formal qualification.

The proportion of young adults with poor literacy who were in the education system varied considerably between countries. Over 60% of 16-24 year-olds performing at Level 1 or below in literacy were studying for a formal qualification in Sweden (68%), Denmark (64%), and the Netherlands (60%).

At the same time, only around one third of this group were enrolled in formal education in Austria (35%), Korea (35%) and Spain (33%). The differing shares of low performing young adults in education observed between countries may reflect the influence of a range of factors relating to the education and training system and the labour market in different countries. Among these are varying compulsory education leaving ages, activity requirements applying to young people (e.g. a requirement to be in either training or work), the availability of work/study programmes and the state of the labour market. It would be interesting to evaluate whether retention of young people with poor literacy and numeracy in education system is an effective strategy both in terms of improving literacy and numeracy but also more generally in improving labour market chances.

2.3.2. Gender

Men (50.1%) and women (49.9%) are equally represented among adults with low literacy. A greater share of women than men is found among the low numeracy population. Most countries follow the same pattern, with a few exceptions. More men were found among the low performers in literacy in Poland (56.3%) and Denmark (54.6%), while higher proportions of women were found among the low performers in Korea (56%), the Netherlands (53.1%), Germany (52.5%), and Flanders (52.5%). In numeracy, women outnumber men among low performers in all but two countries: Poland and the Slovak Republic.

2.3.3. Educational attainment

Unsurprisingly, adults with low proficiency in literacy and numeracy have generally low levels of educational attainment compared to both the adult population as a whole and adults at the highest levels of proficiency. On average, 49% of those who scored at or below Level 1 in literacy or in numeracy have not completed upper secondary. This compares to 24% of 16-65 year-olds and 6% to 7% of adults proficient at Levels 4 or 5 in literacy or numeracy. At the same time, around 10% of adults with low literacy and low numeracy proficiency have completed a tertiary qualification.

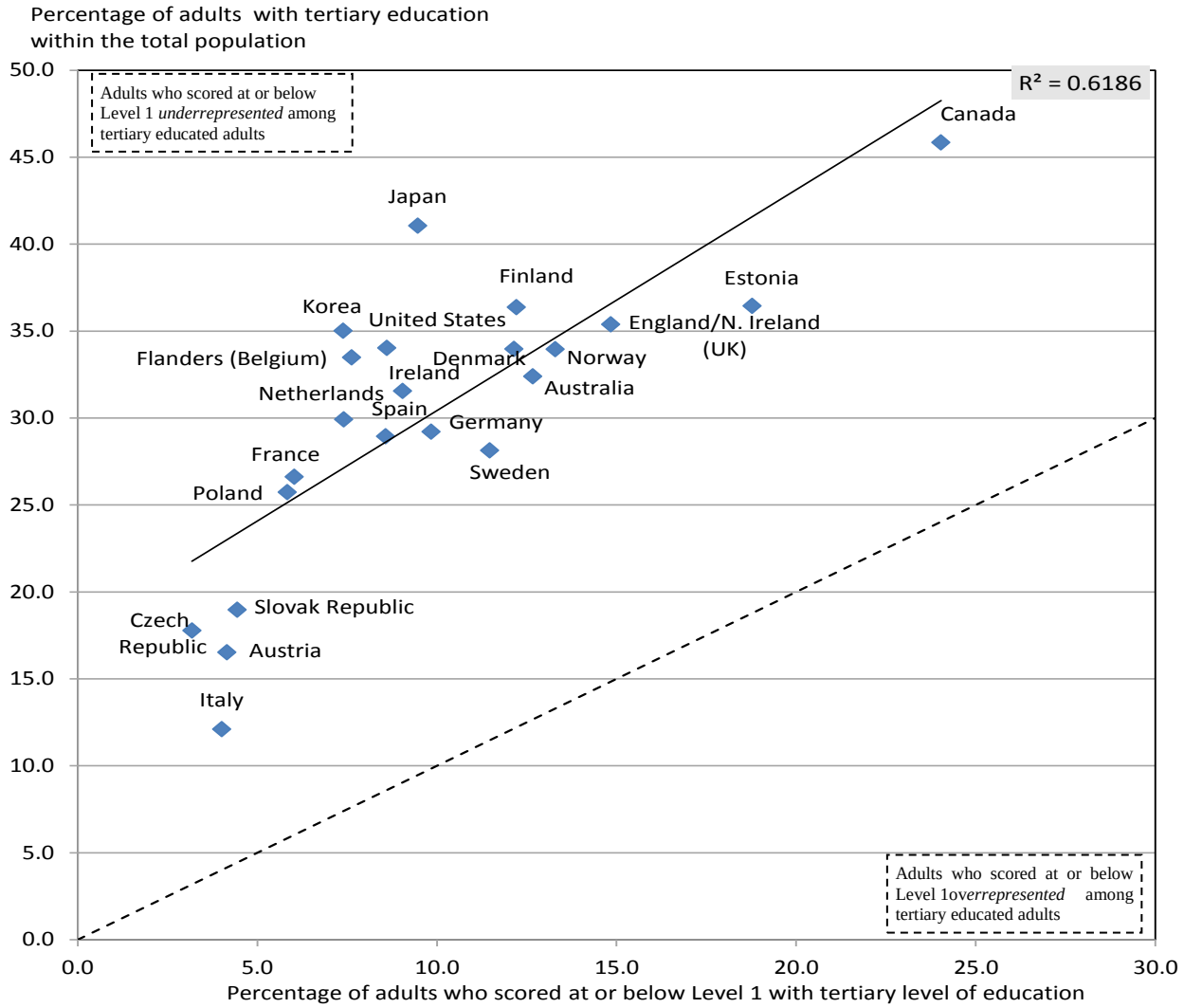
There is considerable variation between countries in the distribution of adults with low literacy and numeracy across the different levels of educational attainment. The proportion of adults with low literacy who have a highest qualification at less than upper secondary levels varies between 25% and 76%. The lowest are proportions found in Poland (25%), the Czech Republic and Estonia (33%) and the highest in Italy (75.9%), Spain (75.8%) and the Netherlands (68.7%). At the other end of the attainment spectrum, the proportion of adults with low literacy who have tertiary qualifications varies between 3% and 24%. Extremely low proportions of tertiary graduates are found among those who scored at or below Level 1 in the Czech Republic (3.2%), Italy (4%), Austria (4.2%), Slovakia (4.4%) and Poland (5.8%) and high proportions in Canada (24%), Estonia (18.8%) and England/N.Ireland (UK) (14.8%). The higher proportions of low proficiency adults with tertiary education in some countries may be partly due to the higher numbers of immigrants and adults whose mother tongue is not the native language of their country of residence.

The countries in PIAAC have very different education systems and have had different patterns of educational expansion over the half century preceding the collection of PIAAC data. This is reflected in the distribution of their populations by levels of educational attainment. As can be seen from Figure 2.5, the variation between countries in the attainment levels of adults with low proficiency is closely related to the different patterns of attainment observed in the general population. In all countries, adults with lower levels of education are over-represented and those with tertiary education are under-represented among the population performing at Level 1 or below in literacy or numeracy. However, at the same time, the relative shares of adults in different levels of educational attainment reflect the overall shares of these groups in the

population. For example, countries with relatively high shares of tertiary graduates tend to have relatively high shares of tertiary graduates among adults with low literacy and numeracy.

Figure 2.5. Adults with tertiary education and low literacy performance

Percentage of adults with tertiary education within the total population and adults with low literacy proficiency



Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

2.3.4. Country of birth and language

On average, almost one in four (24%) of the adults who scored at Level 1 or below in literacy was not born in the country in which they took the test with a slightly smaller proportion (22%) among the poor performers in numeracy. Adults born in a country other than the country in which they took the assessment are over-represented on average among adults with low proficiency compared to their representation in the 16-65 year-old population (11.7%) and their representation in the population proficient at the highest levels of literacy (7.1%).

Given the very different immigration patterns both in terms of the numbers of immigrants and the composition of intakes across the countries participating in PIAAC, there is considerably variation in the share of adults born outside the test country among countries. In a number of countries the share of adults born outside the test country among adults with low proficiency in literacy is around 40% or more. This is the case in Sweden (55.8%), Canada (42.1%), Australia (40.4%) and the Netherlands (39%). At the other end of the scale, there are several countries in which the share of immigrants among adults with low proficiency is less than 5% (in increasing order, Poland, Japan, the Slovak Republic and Korea).

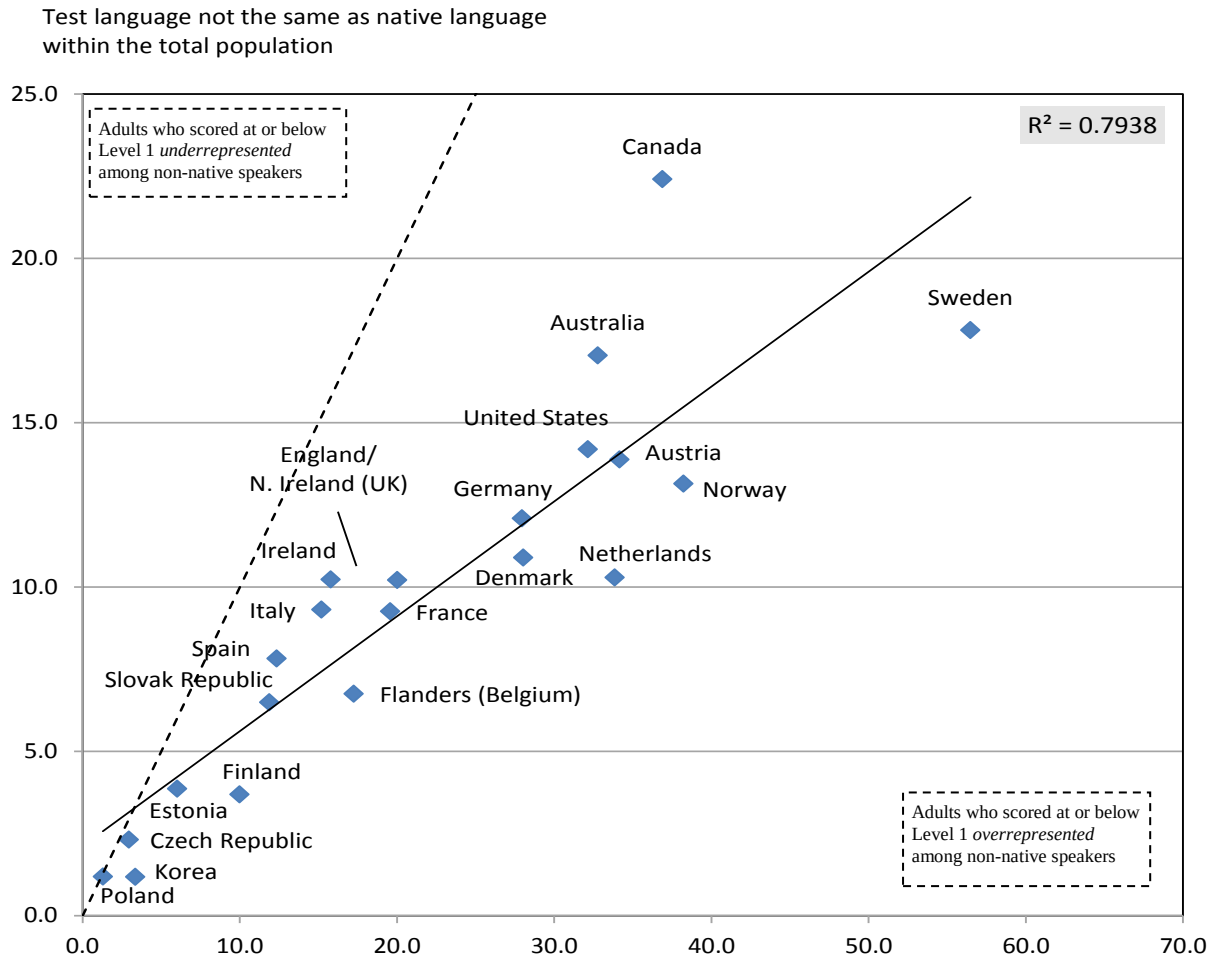
2.3.5. Test language

On average, approximately 20% of adults who scored at or below Level 1 in literacy spoke a language other than the test language at home (Table 10a) and undertook the test in a language other than their native language (Table 9a). As in the case of country of birth, there is wide variation between countries in the proportion of non-native speakers in the low literacy group. More than half (56%) of adults with poor literacy have a native language different to that of the test language in Sweden. In Norway (38.2%), Canada (36.9%), Austria (34.2%), the Netherlands (33.8%) and Australia (32.8%) a third or more of adults with poor literacy have a native language other than the test language. In other countries almost all adults with poor literacy are native speakers. This is the case in Japan (99.1%), Poland (98.6%), Korea and the Czech Republic (both 96.6%). A very close correlation is found between the overall proportion of adults whose native language is different from the test language and the proportion among adults with low literacy (Figure 2.6).

Non-native speakers are over represented among adults with low literacy compared to the 16-65 population as a whole (21% as compared to 9%) and the population scoring at Levels 4 or 5 in literacy (21% as compared to 5%). With the exception of the Czech Republic, Poland and Korea (all of which have very small immigrant populations), adults whose native language is different to that of the test language are over represented among adults with low literacy in all countries.

Figure 2.6. Adults who do not have the test language as their native language and low literacy performance

Percentage of adults who do not use test language as their native language within the total population and adults with low literacy proficiency



Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

2.3.6. Health

PIAAC collects information on self-reported health status. Respondents rated their health on a 5 point scale of *Excellent, Very good, Good, Fair, Poor.* Some 68% of adults who scored at or below Level 1 in literacy reported that their health was excellent, very good, or good and 31.7% reported that their health was either fair or poor. Among the population as a whole, to the proportion reporting that their health was good to excellent and among was 80% and among adults with high literacy proficiency the proportion was 90%. The distribution reported health status is virtually identical between by numeracy level.

The proportion of adults with low literacy reporting good to excellent health varies between 32% in Korea and 82% in the Czech Republic with most countries being in the range of 60%-80%. The much lower than average rates of good to excellent health reported by adults with low literacy in Korea probably

reflect a very country specific relationship to the reporting of health status as a similarly low rate of good health is reported by the general population.

2.4. Labour market status and the characteristics of employment

The PIAAC background questionnaire provides a great deal of information about the labour force status of respondents and, for the employed, features of their jobs. In this section, in addition to the labour force status of adults with low literacy, the type of employment contract, earned income and occupational category of adults with low literacy who are in employment is also explored.

2.4.1. Labour force status

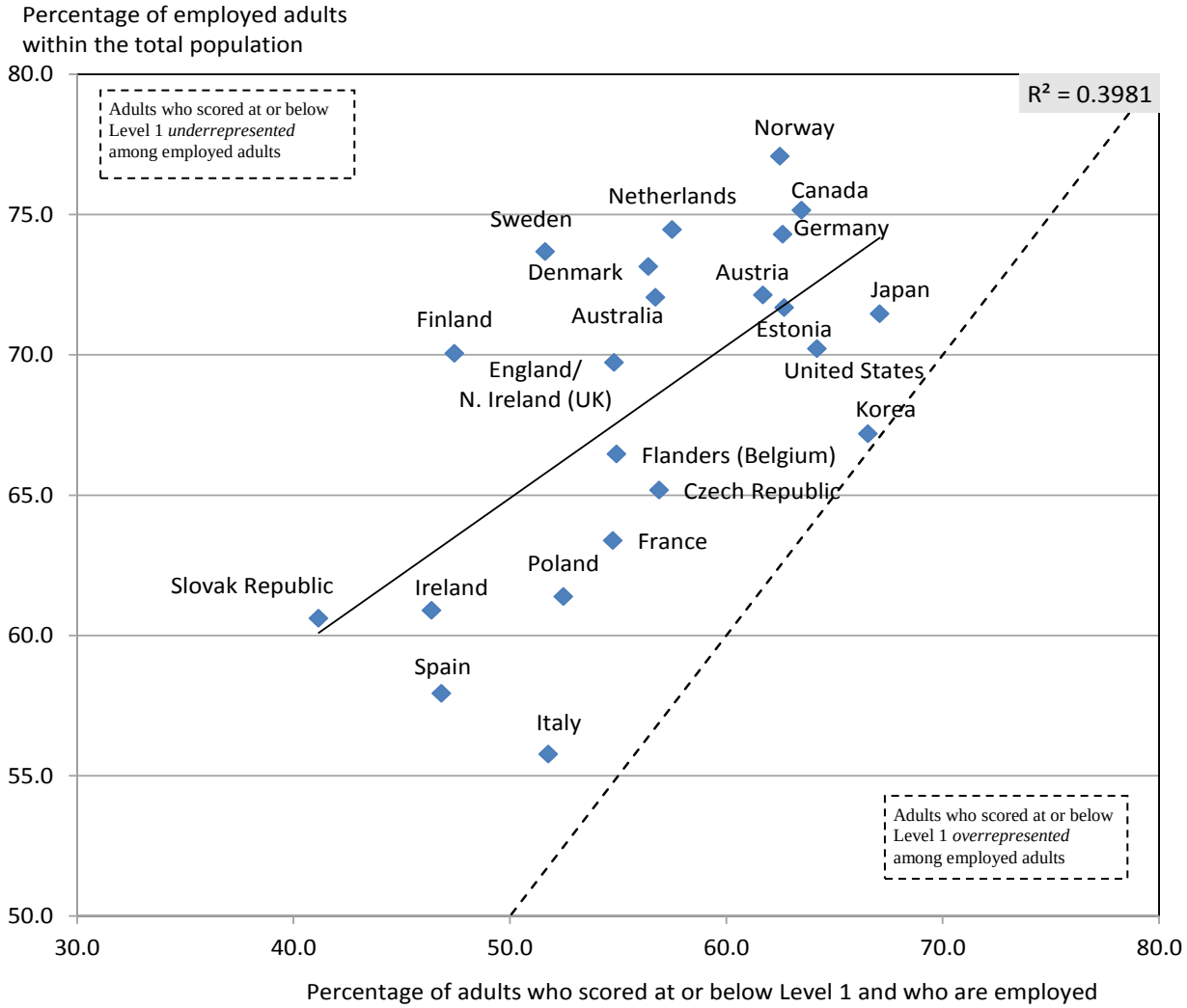
Overall, the majority (56%) of adults with low literacy skills are employed with 36% out of the labour force and 8% unemployed. Compared to both the general population and adults proficient at Levels 4 or 5, adults with low literacy are less likely to be employed and more likely to have left the labour force. Among the 16-65 year-old population, 68% are employed and among adults with high literacy proficiency, 79% are employed. The proportion of the population that has left the labour force among these two groups is 25% and 17% respectively.

The lower employment rate and the higher rate of non-participation in the labour force among adults with low literacy and numeracy in employment reflect the older average age of this group to some extent. The difference between the employment rates of adults with low and high proficiency falls from 26% to 22% when 25-55 year-olds only are considered.[1]

The proportion of adults with low literacy in employment varies from 41% to 67% between countries. The Slovak Republic (41%), Italy and Sweden (both 52%) have the lowest proportion of adults with low proficiency in employment and Japan (67%), Korea (67%), and the United States and Canada (both 64%) the highest. In terms of withdrawal from the labour force, the highest proportions of adults who have left the labour force are found in Finland (48%), the Slovak Republic (45.8%), Flanders (Belgium) (42.7%) and the lowest in Canada, Japan and Korea (all 31%). Both the different institutional features of national labour markets (e.g. employment protection legislation, statutory retirement ages) and cyclical factors (e.g. the severity of the effects 2008-9 financial crisis) will affect overall percentage of employed adults and withdrawal from the labour market among those who scored at or below Level 1as well as among the general population. As shown in Figure 2.7, there is a reasonably strong relationship between the overall proportion of adults in employment in a country and the proportion of adults with low literacy who are employed. Differences in the percentage of adults employed within the total population explain around 40% of the variation in the proportion of adults scoring at or below Level 1 who are employed across countries. This indicates that there are various national level factors, such as overall economic conditions, that affect employment rates irrespective of one's skill levels. However, it is also evident that the proportion of adults in employment is smaller among low-skills than among the general adult population in all countries except in Korea and to a lesser extent Italy. This indicates that this population faces additional difficulties in finding employment on top of those that are present for general population.

Figure 2.7. Adults in employment and low literacy proficiency

Percentage of employed adults within the total population and adults with low literacy proficiency



Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

2.4.2. Type of occupation

Adults with low literacy who are employed tend to be concentrated in low skilled occupations. On average, 55% of employed adults who scored at Level 1 or below in literacy and 51.8% of those who scores at Level 1 or below in numeracy were employed in semi-skilled blue-collar or elementary occupations. This compares with 27.7% of the employed population as a whole and 12.3% of adults performing at Level 4 or 5 in literacy. At the same time in the Czech Republic (65%) and Poland (65.4%), more than 65% of adults who scored at or below Level 1 in literacy were employed in semi-skilled blue-collar or elementary occupations. Lower proportions are found in Canada (43%) and Norway (40.2%).

A significant minority (16.1%) of employed adults with literacy proficiency at Level 1 or below are employed in skilled occupations with the highest proportion being observed in Canada (25.3%). This is

not that surprising given the relatively high proportions of tertiary graduates with low literacy in some countries and the fact that immigrants with poor literacy in the language of their receiving country may, nonetheless, be employed in skilled jobs. Again, while adults with low literacy are over-represented in low skilled jobs and under-represented in skilled occupations, the overall occupational distribution of employed adults with low literacy reflects the overall occupational distribution of employment within a country.

2.4.3. Income

Given their occupational status, it is not surprising that workers with low literacy are predominantly low income earners. On average, 28% of workers with literacy proficiency at Level 1 or below had incomes[2] among the lowest 20% in their country and only 8.6% had incomes among the highest 20%. This contrasts with adults proficient at Level 4 or 5 in literacy. Among this group, 13.6% had incomes in the lowest 20% nationally and 36.1% had incomes in the highest 20%. Similar results are found for numeracy.

The proportion of workers with low literacy being among the lowest income earners varies across countries. In Australia (21.7%), Canada (21.7%), the Czech Republic (15.5%), and Poland (22.6%), have the smallest proportions of workers with low literacy with incomes in the lowest 20% of in their country. France (33.9%), Korea (33.3%), Norway (35%), the Slovak Republic (36.6%) and Flanders (34.4%) have the largest proportions.

At the same time, some workers with low literacy are among the top income earners in every country. In Estonia, Italy, Japan, Korea, Poland and Spain, more than 10% of workers with low literacy proficiency have wage incomes among the top 20% in their country. At the other end of the scale, this is true of 6% or less of workers with low literacy in Estonia (5.7%), France (6%), Ireland (5.3%), Sweden (5%) and Northern Ireland (UK) (3.5%).

2.5. Family

2.5.1. Parents' level of educational attainment

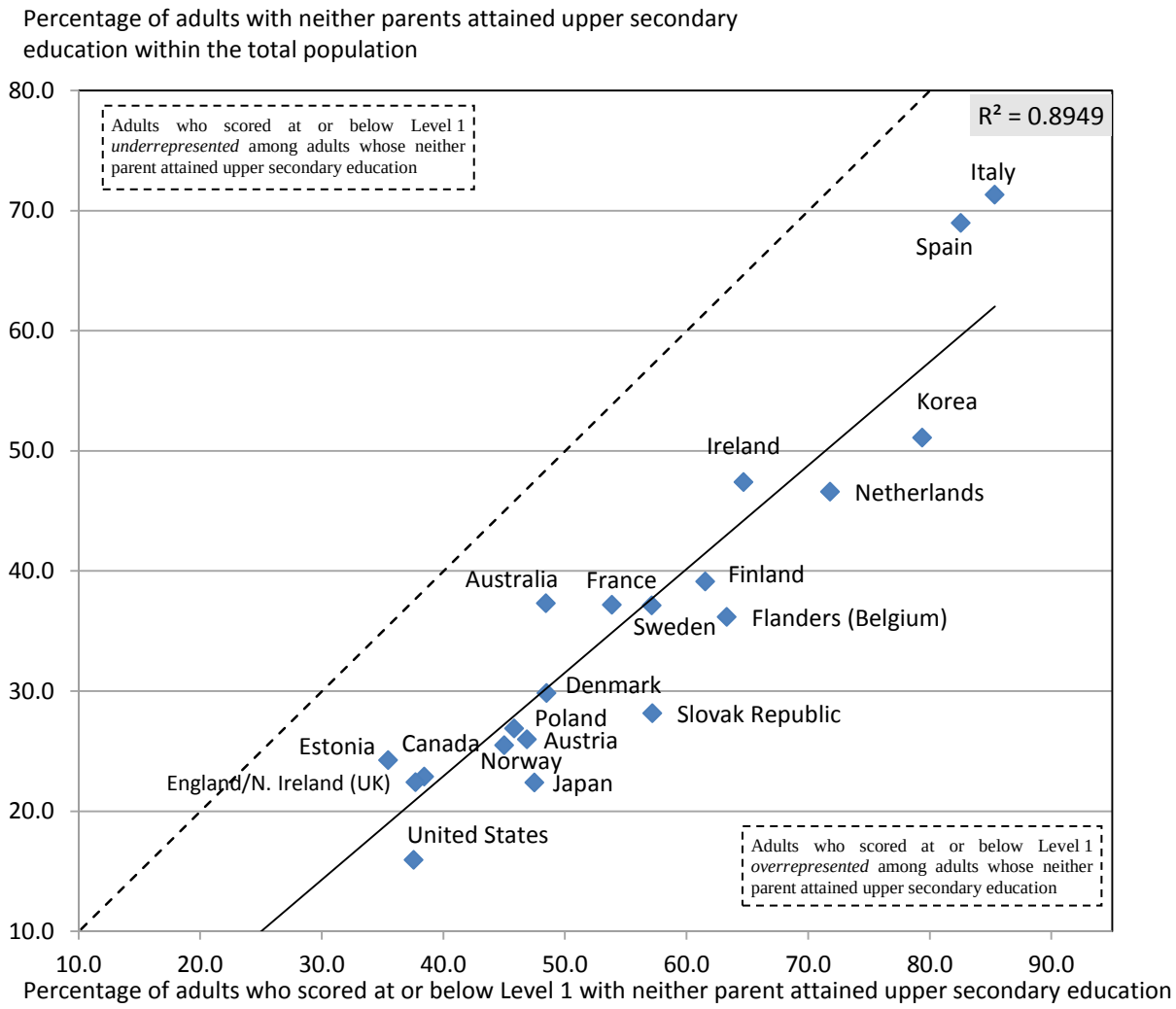
Adults proficient at Levels 1 and below in literacy tend to come predominantly from families in which their parents had lower levels of education compared to the general population and adults with high levels of literacy. Slightly more than one in two adults (52.2%) who scored at or below Level 1 in literacy had parents who had not completed upper secondary level of education. This compares with 33% in the general adult population and only 16% among highly literate adults. Only 10% of adults with low literacy came from families in which at least one parent had a tertiary qualification, compared to 24% of adults in the general population and 44% of highly literate adults. .

In Italy (85.4%), Spain (82.6%), Korea (79.4%) and the Netherlands (71.8%) have exceptionally high proportion of adults who scored at or below Level 1 in literacy who came from families in which both parents had less than upper secondary level attainment. The lowest proportions are observed in the Czech Republic (19%), Germany (22%) and Estonia (36%). The proportion of adults with low literacy coming from advantaged educational backgrounds (at least one parent has a tertiary qualification) is highest in Canada (20%), Estonia (18%), Norway and Sweden (both 17%) and lowest in the Slovak Republic (3%) and France, Poland and Spain (all 4%).

As in the case of the educational attainment of the adult population, there are wide variations between countries in the levels of attainment of the parents of respondents. Figure 2.8 shows that the extent of educational disadvantage among the low literate adults (as measured by having both parents with less than upper secondary attainment) is related to the overall level of parental educational attainment in a country.

Figure 2.8. Adults with neither parents attained upper secondary education and low literacy performance

Percentage of adults with neither parents attained upper secondary education within the total population and adults with low literacy proficiency



Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

2.5.2. The number of books in the household when the respondent was age 16

The number of books in the family home when the respondent was aged 16, can be seen as an indicator of the nature of the 'literate environment' in which adults were brought up and the extent of early familiarisation with reading in particular. Adults with low literacy were general raised in families in which there were relatively few books in the family home when the respondent was 16 years of age. Some 55% of adults with low literacy came from households in which there were fewer than 25 books. This is far lower than the proportion among the general population (30%) and adults with high proficiency in literacy (10%). The highest proportions of adults with low literacy brought up in households owning less than 25 books are observed in Italy (72%), and Belgium (Flanders), Japan and Korea (all 70%) and the lowest in the Czech Republic (22%) and Estonia (30%).

Notes

[1] Among adults aged 25 to 54, the employment rate of adults with low literacy proficiency is 66.5% compared to 88% among high performers.

[2] Monthly earnings including bonuses for salary earners and self-employed adults.

REFERENCES

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

CHAPTER 3. SKILL USE: ENGAGEMENT IN READING, WRITING AND NUMERACY PRACTICES

This chapter focuses on information provided by respondents about their uses of reading, writing and numeracy skills both at work and outside of work. Although previous international surveys of adult literacy such as the Adult Literacy and Lifeskills Survey (ALLS) included some questions about such skill use, the Survey of Adult Skills, a product of the OECD Programme for the International Assessment of Adult Competencies (PIAAC), contains the most extensive and systematically developed information about skills use to date. The innovation of such systematic reporting of skill use has been prompted by a growing body of research conducted in a social practices framework that calls for contextualised understandings and assessments of literacy and other adult skills that lead to a deeper understanding of literacy skills that what is possible based on standardised proficiency assessments alone (Carpentieri, in press; Reder, 2009a).

Although proponents of the social practices approach have offered strong critiques of the interpretive and policy frameworks that rely on standardised test scores alone (e.g. Hamilton, 2001; Hamilton and Barton, 2000; Street, 1997), alternatives have not been proposed that are practical for use on a large scale. This gap is particularly problematic for the development of more effective adult literacy and numeracy programs, a development that would be facilitated by the availability of richer measures of learner progress and program evaluations based on those measures. In reviewing a number of possible reasons for this gap, Reder (2009a) suggested that large scale assessments could usefully incorporate both standardised proficiency measures and improved measures of adults' engagement in everyday literacy and numeracy practices.

Initial analyses of ALLS data about skill use in the workplace (Desjardins and Rubenson, 2011) and in PIAAC (OECD, 2013a) demonstrate how useful such data can be in the context of large-scale assessments. Analyses of the skill use data in both surveys showed substantially increased earnings for workers at higher levels of skill use. In the case of their more in-depth analyses of ALLS, Desjardins and Rubenson (2011) estimated 32%, 20% and 10% increased earnings for high levels of reading, writing and numeracy skill use at work, respectively, compared to low levels of skill use after controlling for proficiencies, demographics, education, work experience, occupation and industry. With the more sophisticated measurement of skill use now available in the Survey of Adult Skills, more comprehensive understandings of the relationship between skill use proficiency and a range of social and economic variables become possible.

The potential impact of skill use, of course, is not limited to economic outcomes. OECD (2013a) estimated the likelihood of positive social outcomes (social trust, volunteerism, political efficacy and health status) of adults with high levels of literacy proficiency (Level 4 or 5) compared with adults with low literacy proficiency (at or below Level 1). For each of these outcomes, individuals with high levels of assessed literacy proficiency were more likely to have positive social outcomes, even after controlling for demographic and educational attainment variables. Dinis da Costa, Rodrigues, Vera-Toscano and Weber (2014) analysed the same four social outcomes in more detail for countries in the European Union, and found proficiencies to be more important than education in determining these key social outcomes. Neither of these analyses looked closely at the role played by skill use in these social outcomes as we will do in this chapter.

There may be more at stake here than just describing empirical associations between variables of interest in the Survey of Adult Skills. The descriptive relationships could indicate that effective adult basic skills programs might not only improve adults' literacy and numeracy abilities, they might improve the

economic and social dimensions of their lives as well. Using strong quasi-experimental controls, Reder (2014a) found that participation in such programs appears to lead to substantial gains in long-term earnings (and other outcome variables) of high school dropouts in the United States. The recent Canadian UPSKILL project, in a random control trial, also found substantial impacts of basic skills instruction for incumbent hospitality industry workers on proficiency gains, increased skill use on the job, measures of job performance and employer profits (Gyarmati et al., 2014).

Increased skill use may be an important mediating variable linking these programs to diverse changes in economic and social outcomes. Research on adult basic skills programs indicates that instruction has an immediate effect on levels of literacy practice (Purcell-Gates, Degener, Jacobson and Soler, 2000; Reder, 2009b). Both longitudinal (Reder, 2009b) and cross-sectional studies (Sheehan-Holt and Smith, 2000) have shown that program participation has positive short-term effects on levels of literacy practices but not on literacy proficiency levels. Three comprehensive reviews of research on the impact of program participation on literacy proficiency found no systematic effects in studies that involved comparison groups and statistical controls (Beder, 1999; Brooks et al., 2001; Smith, 2009).

Practice engagement theory (Reder, 1994, 2015; Smith, 2009) holds that proficiency and engagement in literacy practices mutually reinforce each other across the adult lifespan. Longitudinal studies of adult literacy development find clear program impact on *long-term* proficiency gains but not on short-term changes (Reder, 2014b). Models of practice engagement theory that have examined data on literacy practices and literacy proficiency measured at multiple points in time provide strong evidence of the mutual influence of literacy practices and proficiency across the lifecourse (Reder, 2015). These findings are directly relevant to this chapter because they suggest that interventions designed to increase low proficiency adults' uses of skills – whether at work or outside of work – could be an important strategy for raising their proficiency levels over longer periods of time. We will return to consider this possibility at the end of the chapter after reviewing what PIAAC tells us about skill use among low-proficiency adults.[3]

Data for additional analyses

This chapter makes reference to a number of charts and tables that are not presented in the report, but which are available in an Annex to the report located at the following address www.oecd.org/site/piaac/publications.htm. Readers can access the additional tables and charts referred to in the text of this chapter as well as the data for all figures and tables presented in the report in this and the other chapters.

3.1. Measures of Engagement in Reading, Writing and Numeracy Practices in the Survey of Adult Skills (PIAAC)

The Survey of Adult Skills (PIAAC) developed a methodology for measuring individuals' use of skills based on the Job Requirements Analysis (JRA) framework (Felstead, Gallie, Green and Zhou, 2007; OECD, 2013a,b,c). One module of the background questionnaire asked respondents about the frequency with which they performed specific tasks in their current or last job (if they were currently or recently employed) and another module asked about performance of those tasks outside of work.

For reading, individuals were asked about whether they engaged in each of eight tasks:

- read directions or instructions;
- read letters, memos or e-mails;
- read articles in newspapers, magazines or newsletters;
- read articles in professional journals or scholarly publications;

- read books;
- read manuals or reference materials;
- read bills, invoices, bank statements or other financial statements;
- read diagrams, maps or schematics.

Respondents indicated, on a Likert scale, how often they did each task:

- never;
- less than once a month;
- less than once a week but at least once a month;
- at least once a week but not every day;
- every day.

In one module, all respondents were asked about performing these tasks in non-work settings. In another module, respondents who were currently or recently employed were asked about performance of the tasks at work.

For writing, individuals were asked about whether they engaged in each of four tasks:

- write letters, memos or e-mails;
- write articles for newspapers, magazines or newsletters;
- write reports;
- fill in forms.

Respondents indicated for each task, using the same Likert scale described above, how often they did the task.

For numeracy, individuals were asked about whether they engaged in each of six numeracy tasks:

- calculate prices, costs or budgets;
- use or calculate fractions, decimals or percentages;
- use a calculator, either hand-held or computer-based;
- prepare charts, graphs or tables;
- use simple algebra or formulas;
- use more advanced math or statistics such as calculus, complex algebra, trigonometry or regression techniques.

Respondents indicated for each task, using the same Likert scale described above, how often they did the task.

Responses to items about how often each of the above tasks was performed were grouped into six sets for analysis and scaling: reading at work, reading outside of work, writing at work, writing outside of work, numeracy at work, and numeracy outside of work. Responses were pooled across all participating countries and each set of items was scaled independently using Item Response Theory (Partial Credit Model).[4] Each scale was set to have a mean value of 2.0 and a standard deviation of 1.0.

Table 3.1 shows the percentage of adults pooled across countries who responded with “Never” on all items of a given scale. Although relatively few adults (1.3%) are “all nevers” for reading outside of work, a larger percentage (4.8%) of the low literacy population is “all nevers” for reading outside of work. The percentages of the general and low literacy workforces who do not read at work are considerably higher: 6% and 15.5%, respectively. This same pattern is evident for writing and numeracy, with higher percentages of “all nevers” in low-proficiency adults and higher percentages of non-use in work than outside of work settings. Sizeable fractions of the low literacy populations do not use writing at all, either

at work (32.9%) or outside of work (24.9%). Comparable numbers do not use numeracy at all, either at work (39.9%) or outside of work (19.5%).

Table 3.1. Percentage of adults who respond "Never" on all items relating to how often they use particular skills at work or outside of work - International average

Skill domain	Adults proficient at Level 1 or below[1]		Overall population (16-65)	
	%	S.E.	%	S.E.
Reading at Work	15.53	(0.48)	5.97	(0.09)
Reading Outside of Work	4.82	(0.20)	1.28	(0.04)
Writing at Work	32.94	(0.63)	14.64	(0.13)
Writing Outside of Work	24.93	(0.42)	9.90	(0.10)
Numeracy at Work	39.87	(0.61)	19.39	(0.15)
Numeracy Outside of Work	19.47	(0.34)	9.36	(0.11)

Note:
1. In the case of reading and writing at or outside of work presented results refer to those at Level 1 or below in literacy and in case of numeracy at or outside of work to those at Level 1 or below in numeracy.
Percentages shown for use of skills at work are only for currently or recently employer adults. International average for OECD countries participating in the Survey of Adult Skills.

Source: Survey of Adult Skills (PIAAC) (2012)

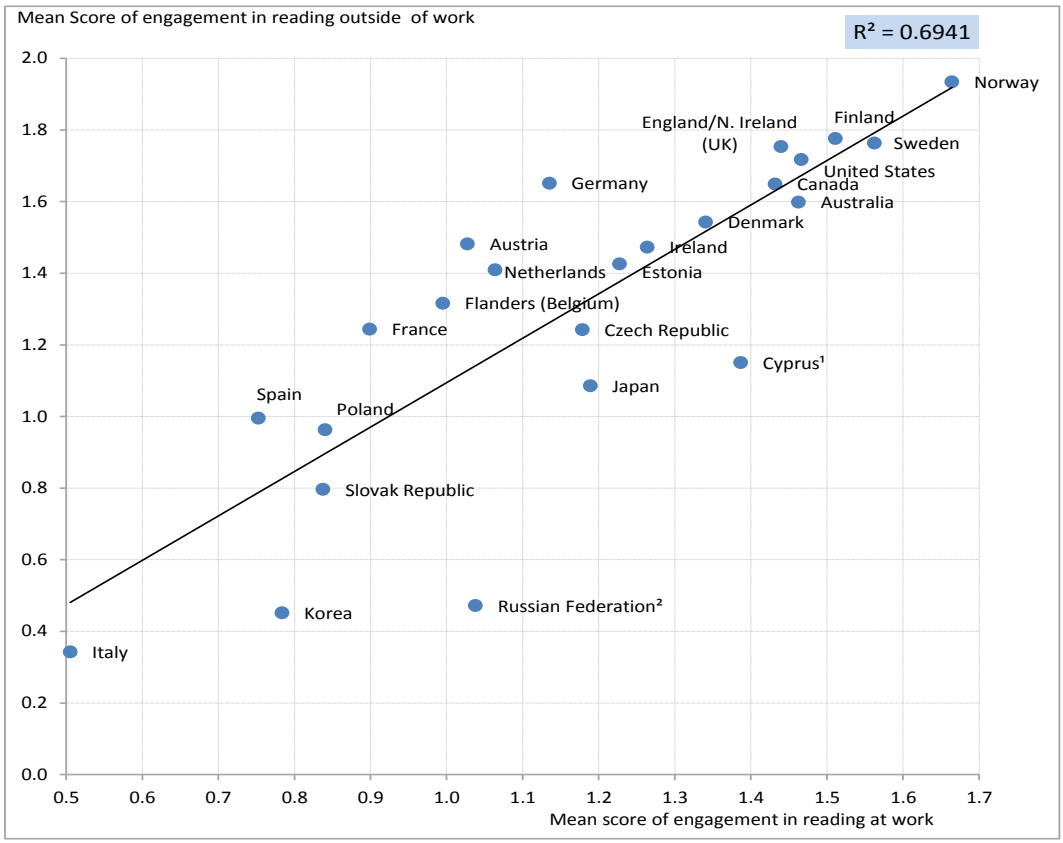
3.2. Country Variation in Patterns of Reading, Writing and Numeracy Practices

The average values for the six literacy and numeracy practice engagement measures – reading in work and non-work settings, writing in work and non-work settings, and numeracy in work and non-work settings – vary widely among the countries. Annex Table B3.1 displays the country-specific averages of engagement in reading, writing and numeracy practices for work and outside of work settings. These tables show average values for the currently employed adult populations at work and for the entire adult populations outside of work settings.

Figures 3.1, 3.2 and 3.3 show average engagement levels in reading, writing and numeracy practices, respectively, for the low-proficiency populations of the countries. Figure 3.1 displays average engagement level by country for reading in work and outside of work settings.

Figure 3.1. Engagement of low-proficiency population in reading practices in work and outside of work settings

Mean scores of reading skills use at and outside of work by country



Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

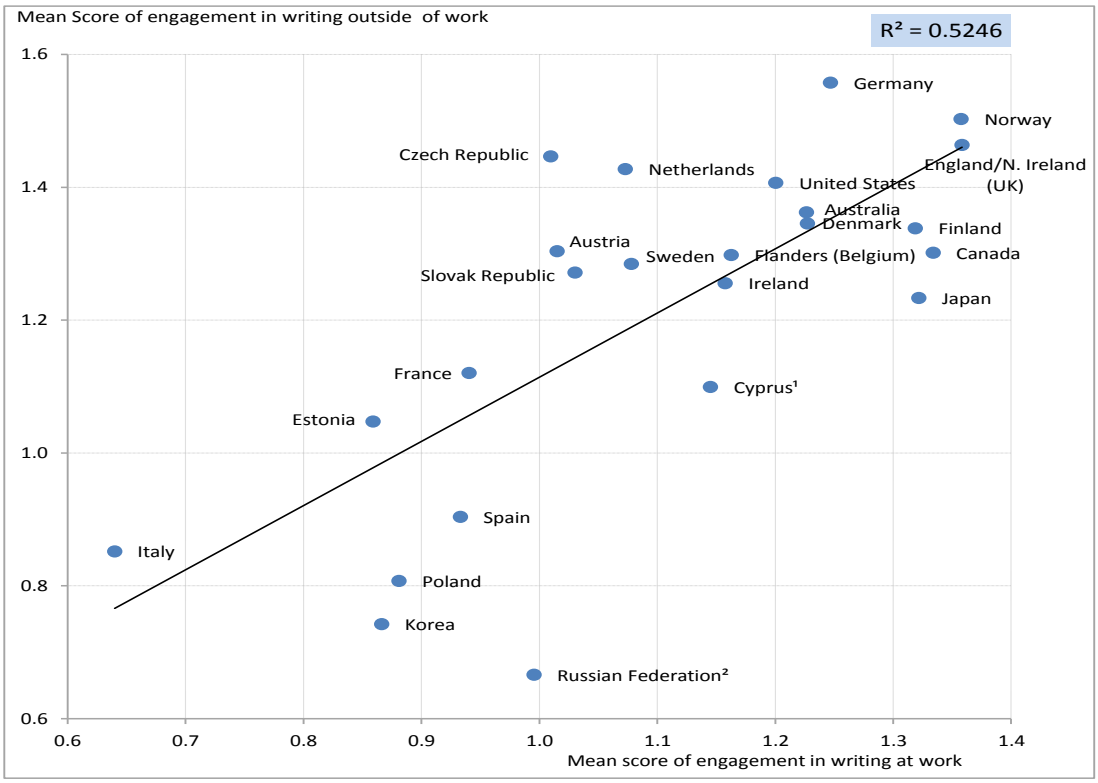
Recall that the various engagement measures are each independently scaled to have means of 2.0 and standard deviations of 1.0 across the entire PIAAC population. However, the distributions of the modified versions of the corresponding indexes used in this paper have somewhat different means and standard deviations. The average levels of engagement shown in the figure for the low-literacy populations, centered approximately around mean values of 1.16 at work and 1.35 outside of work, are of course much lower than those of the general populations that center around the scaled mean levels of 1.86 at work and 2 outside of work. The Scandinavian and English-speaking countries are concentrated in the upper quadrant of the figure, reflecting their high average levels of engagement with reading in both workplace and non-workplace settings. By contrary, Italy, Korea and the Slovak Republic, in the lower left quadrant, exhibit relatively low levels of engagement with reading at work and outside of work. The Russian Federation shows an average level of reading engagement at work but much lower levels outside of work.[5]

The scatter of the countries' points in the figure reflects a positive correlation between countries' average levels of reading engagement in work and outside of work settings. These patterns are evident between countries as shown in the figure as well as within populations of the individual countries. For individuals in every country, engagements in reading at work and outside of work are positively correlated. The correlation for all adults within a country ranges from 0.26 to 0.57 over countries, with an average

correlation of 0.44. Within just the low-proficiency populations, the correlations are similar, ranging from 0.33 to 0.62 with an average value of 0.47.

Figure 3.2. Engagement of low-proficiency population in writing practices in work and outside of work settings

Mean scores of writing skills use at and outside of work by country



Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

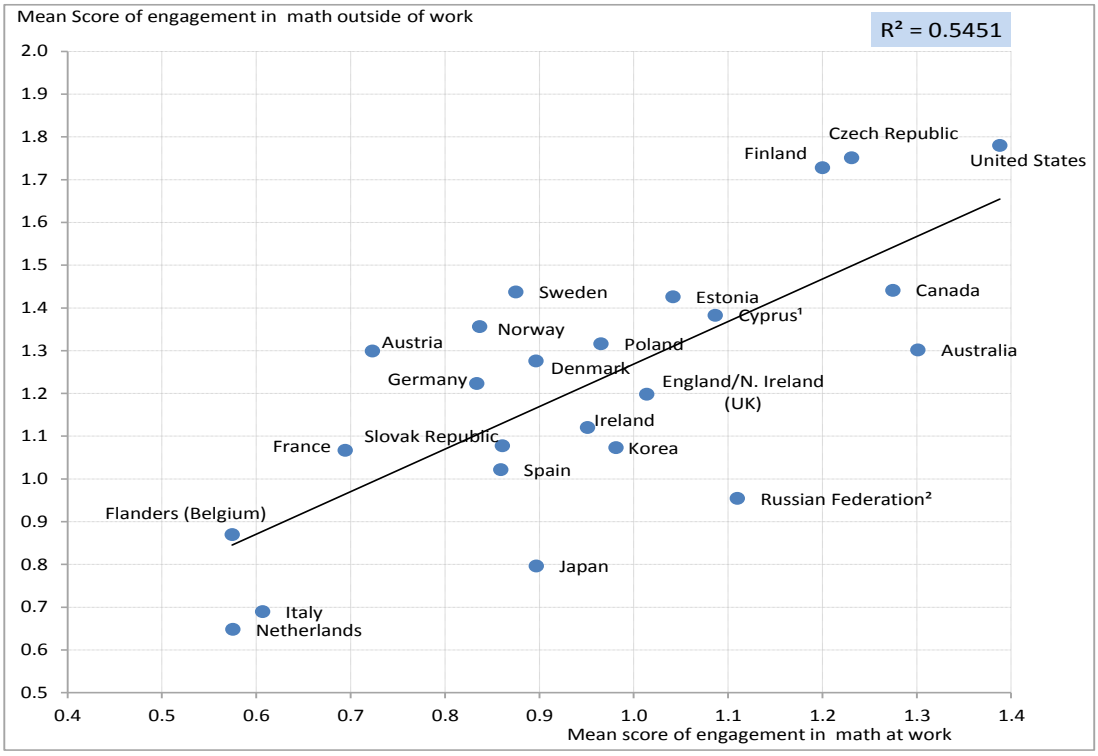
The corresponding data for the low-proficiency populations' engagement in writing practices in work and outside of work are plotted in Figure 3.2. The arrangement of countries for writing engagement appears to be shaped somewhat differently than for reading. The average levels of engagement shown in the figure for the low-proficiency populations are centred approximately around mean values of 1.10 at work and 1.24 outside of work, compared to the corresponding mean values of 1.72 and 1.82 for the general population. Northern European countries such as Germany and the Netherlands, for example, are positioned more towards the top right quadrant than they were for reading, reflecting their higher relative levels of engagement with writing than with reading. Some countries such as the Slovak Republic have a much higher relative position for writing engagement than for reading engagement within their low-proficiency population. Italy and Korea continue to have the lowest level of engagement in writing as well as reading both at work and outside of work.

The greater dispersion of countries around the regression line indicates lower correlations between average country scores in writing engagement at work and outside of work than what was observed for reading engagement. This is also the case for correlations between scores of individual adults in writing at work and outside of work. In particular, correlations between individual scores in writing engagement at work and outside of work are lower (0.34) than those observed for reading engagement (0.44). There is a

similar pattern within the low-proficiency populations, with correlations between individual scores in writing engagement at work and outside of work having an average value of 0.36.

Figure 3.3. Engagement of low-proficiency population in numeracy practices at work and outside of work settings

Mean scores of numeracy skills use at and outside of work by country



Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

The corresponding data for the low-proficiency populations' engagement in numeracy practices are shown in Figure 3.3. The average levels of engagement shown for the low-proficiency populations have mean values of 0.99 at work and 1.21 outside of work, well below the corresponding means of 1.62 and 1.80 for the general population. Again the arrangement of countries for numeracy engagement differs somewhat from their arrangements for reading engagement and writing engagement. Some countries such as the Czech Republic and the Russian Federation that have relatively low levels of literacy engagement in their low-proficiency populations show relatively high levels of numeracy engagement in their low-proficiency populations. Other countries such as France and the Netherlands show the opposite pattern.

Correlations between individuals' numeracy engagement at work and outside of work range over countries from 0.27 to 0.48, with an average value of 0.37 as compared with 0.44 correlation for reading engagement between settings and the 0.34 for writing engagement between settings. There is a similar pattern within the low-proficiency populations, with individuals' correlations between numeracy engagement in work and outside of work ranging from 0.25 to 0.61 over countries with an averaged value of 0.39. The substantially stronger cross-setting correlation for reading engagement likely reflects a

greater selectivity in how work design draws on the use of writing and numeracy than it does on reading. This appears to be the case for both the low-proficiency and general adult populations.

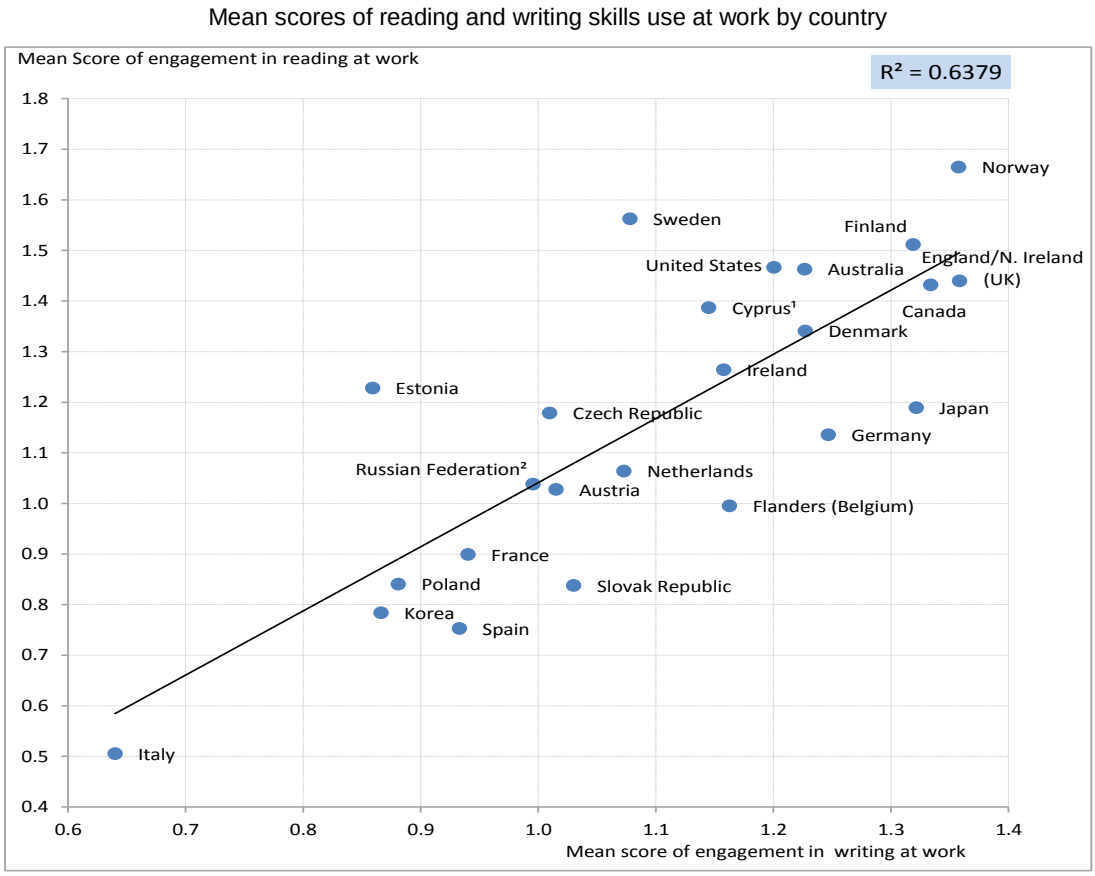
3.3. Relationships between Reading, Writing and Numeracy Practices at Work and Outside of Work

The previous section examined relationships between individuals' engagement with a particular set of skills in two settings: work and outside of work. This section considers the relationship between engagement with different sets of skills in a given setting, either the work setting or the outside of work setting.

In the work setting, correlations between individuals' engagement in reading and writing practices vary over countries from 0.57 to 0.71, with an average of 0.64. Correlations between reading and numeracy engagement are lower, ranging from 0.49 to 0.60, with an average of 0.55. Correlations between writing engagement and numeracy engagement are lower yet, ranging from 0.49 to 0.57, with an average of 0.50. Annex Figures A3.1, A3.2 and A3.3 display scatterplots of countries' mean levels of engagement of reading x writing, reading x numeracy, and writing x numeracy, respectively. Country-specific correlations are given in Annex Table A3.2.

In the low-literacy population, the correlations between reading and writing engagement in work settings are similar to those correlations within the general population, ranging from 0.52 to 0.68 over countries, with an average of 0.61. Figure 3.4 displays a country-by-country scatterplot of average levels of engagement in reading and writing for low-proficiency populations in work settings.

Figure 3.4. Engagement of low-proficiency population in reading and writing practices, work settings



Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

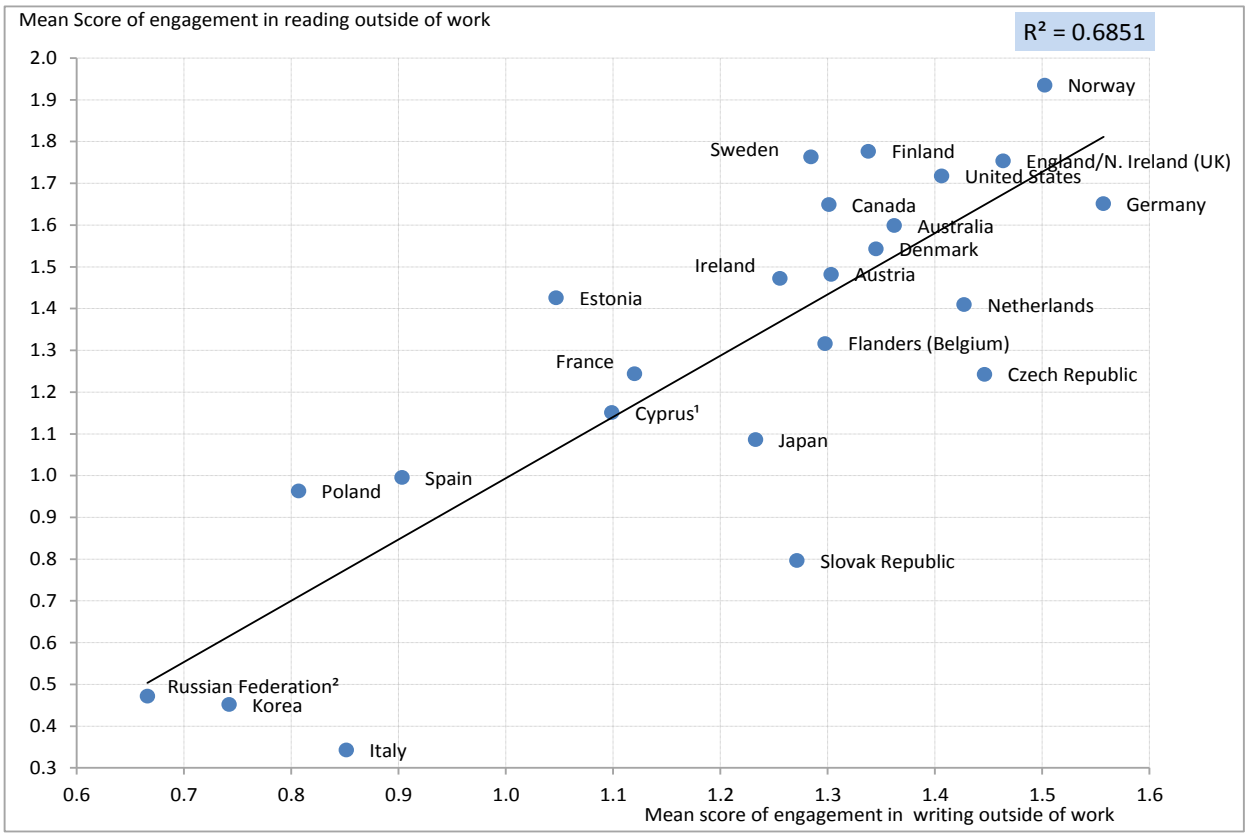
Similar patterns of relationships are found between engagement in reading, writing and numeracy practices outside of work. Correlations between individuals' engagement in reading and writing practices vary over countries from 0.53 to 0.67, with an average of 0.60. Correlations between reading and numeracy engagement are lower, ranging from 0.47 to 0.63, with an average of 0.54. Correlations between writing engagement and numeracy engagement are lower yet, ranging from 0.43 to 0.58, with an average of 0.50. Annex Figures A3.4, A3.5 and A3.6 display scatterplots of countries' mean levels of engagement of reading by writing, reading by numeracy, and writing by numeracy, respectively. Country-specific correlations are given in Annex Table A3.2.

The correlations between reading and writing engagement outside of work are similar in the low-literacy and general populations. In low-literacy populations, the correlations range over countries from 0.51 to 0.67, with an average of 0.56. Figure 3.5 displays a country-by-country scatterplot of average levels of engagement in reading and writing outside of work for low-proficiency populations.

The results presented imply that given settings, whether at work or outside of work, often involve use of multiple cognitive skills. As would be expected, this high co-occurrence is especially evident in the case of reading and writing practices. It is also interesting to note that the correlations within the same setting (at work or outside of work) are stronger than correlations within the same activity (reading, writing or numeracy). This could suggest that external requirements at work and outside of work are somewhat stronger determinants of skill use compared to personal characteristics.

Figure 3.5. Engagement of low-proficiency population in reading and writing practices, outside of work settings

Mean scores of reading and writing skills use outside of work by country



Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.

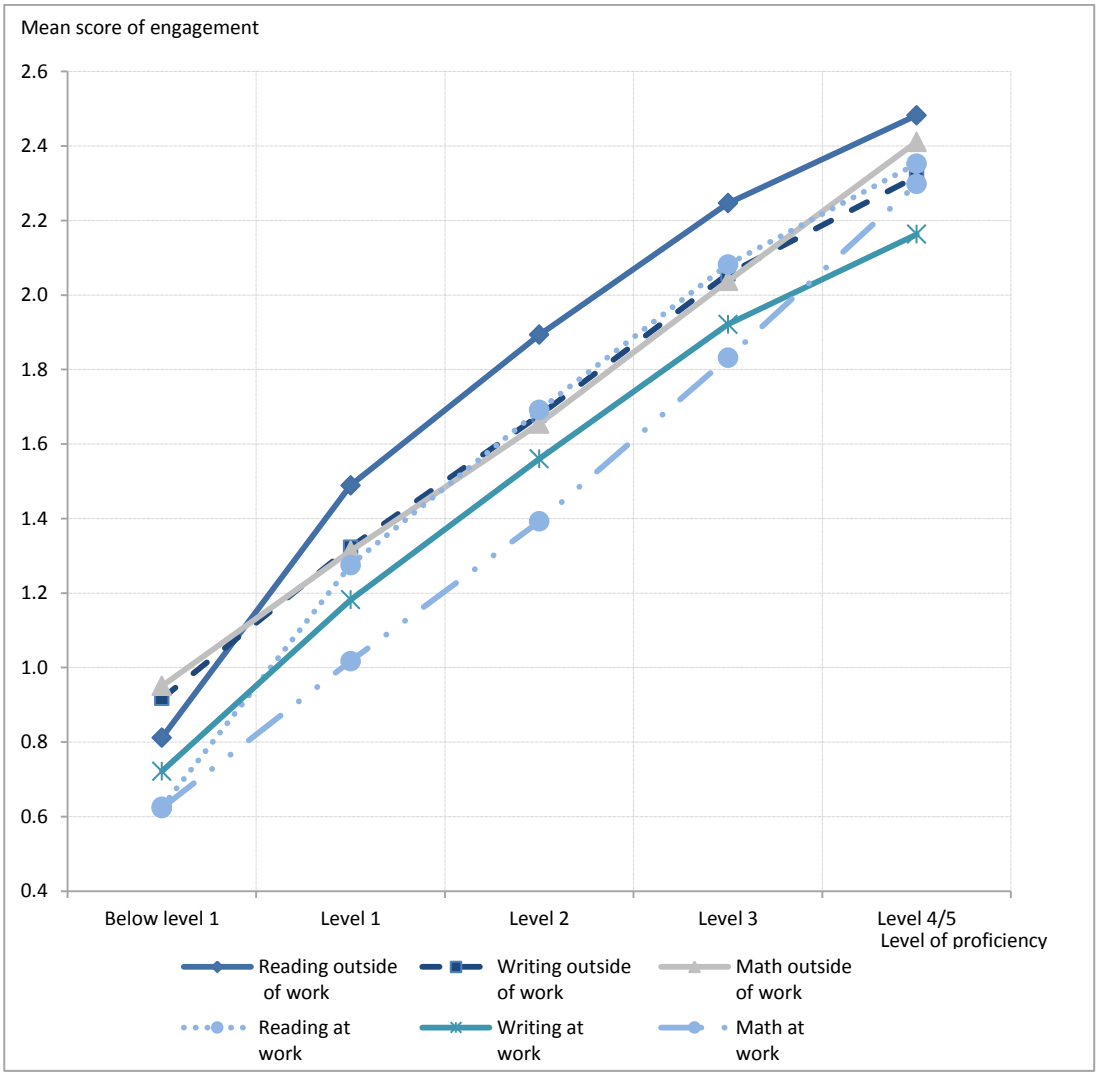
Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

3.4. Relationships between Proficiencies and Practices

Figure 3.6 shows adults' average level of engagement in reading, writing and numeracy practices in terms of their proficiencies in literacy and numeracy. Engagement in reading and writing practices are plotted against literacy proficiency level, whereas engagement in numeracy practices is plotted against numeracy proficiency level. The low-proficiency populations are comprised of "below Level 1" and "Level 1". The figure shows a clear linear relationship between proficiency level and practice engagement.

Figure 3.6. Engagement in skills use by level of proficiency

Mean scores of reading, writing and numeracy skills use at and outside of work by level of proficiency (OECD average)



Note: Engagement in reading and writing are plotted against literacy proficiency levels whereas engagement in numeracy is plotted against numeracy proficiency levels.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data. Results by country are available in Table A3.9.

Although the figure shows that low-proficiency populations are less engaged in literacy and numeracy practices, it also indicates that this is a part of a broader relationship between skills and practice engagement across the proficiency spectrum. It is important to recognise that relationships between average levels of proficiency and practice engagement in the population reflect a broad range of individual levels of practice engagement within the low-proficiency population. Many individuals in the low-proficiency population, for example, have relatively high levels engagement with reading practices, while some more proficient individuals have low levels of engagement with reading at work and/or outside of work.

This relatively strong correspondence between engagement in literacy and numeracy practices and proficiency levels is by no means surprising and can in general be regarded as a consequence of a number

of mechanisms. First of all, it could be expected that low-skilled adults will be more limited in application of their skills for the very reason of their lower literacy and numeracy proficiencies. Likewise, their lower skills can prevent them accessing those jobs or situations where they could practice these skills more often. Moreover, they may also self-select into those jobs and situations which require less engagement in these practices, thus avoiding possible situations in which their skills could be insufficient. Finally, reduced opportunity of practicing these skills prevents maintenance of existing and development of new skills, thus creating a vicious cycle and additionally contributing to the widening skill gap among adults.

3.5. Demographic and Proficiency Determinants of Engagement in Reading, Writing and Numeracy Practices

We saw above that some of the variability of practice engagement levels is attributable to differences in individuals' literacy and numeracy proficiencies. Those proficiencies in turn are partly determined by individual's educational attainment and influenced by individual demographic characteristics such as age, gender, birthplace, and so forth (OECD, 2013b). Regressions of the engagement measures on demographic characteristics and literacy and numeracy proficiencies can illustrate some of the unique patterning of reading, writing and numeracy practices engagement. A pair of engagement determination equations was estimated for each skill domain (reading, writing and numeracy practices). The baseline equation of each pair included demographic predictors (age, gender, and nativity) and educational attainment. The enhanced equation of each pair added the appropriate proficiency measure to the baseline equation as a predictor. Literacy proficiency was added to the baseline equations for reading and writing engagement, while numeracy proficiency was added to the baseline equation for numeracy engagement. Tables summarizing these pairs of regression models – baseline and enhanced – for reading, writing and numeracy engagement at work and outside of work for the entire and low-proficiency adult populations are shown in Annex Table A3.3.

These practice engagement equations generally have low predictive power, with r-squared values in the 0.08–0. 24 range, indicating they predict about 8–24% of the variance of each measure. In general, the pattern of results for the low-proficiency and general populations are similar, with slightly more variance accounted for when an equation is estimated for the general compared to the low-proficiency population. For either population, the enhanced models that include the proficiency measure predict a statistically significant amount of additional variance over what is predicted by the baseline model containing demographics and education, consistent with practice engagement theory (Reder, 2009b). It should be noted that lower predictive power of the proficiency in the low-proficiency population should be expected due to the design effect, i.e. the restricted range of variation of this variable within this population. Practice engagement in a skill domain (reading, writing or numeracy) is generally better predicted at work than outside of work.[6]

The net effects of educational attainment and proficiencies are very consistent in these models. Educational attainment and proficiency are major positive predictors of engagement with reading, writing and numeracy practices, both at work and outside of work, for both the general and low-proficiency populations. Education and proficiency are likely to combine with variables not observed in PIAAC such as individual predispositions to engage in reading, writing and numeracy as well as the demands for skill use in specific contexts of work and social life to determine individual levels of practice engagement.

Age has systematic net effects in these regression models. The net effects of age vary with the context of practice engagement being predicted, work or outside of work. Age has positive net effects on practice engagement in work settings, with older individuals tending to be more engaged in the use of reading, writing and numeracy in work. Outside of work, age has negative net effects on practice engagement, with older individuals tending to be less engaged with the use of reading, writing and numeracy. One important consideration here is that among workers, age may be a proxy for work

experience, such that more experienced workers tending to have jobs or work styles that afford more opportunities for practice engagement. We will consider this possibility more carefully in the following section on the embedding of reading, writing and numeracy practices in economic outcomes.

Gender also has some common effects on practice engagement in these models. Within the general population, women tend to engage less than men with reading, writing and numeracy practices in the workplace when other variables are controlled. In the low-proficiency population, women tend to be more engaged than men with reading, writing and numeracy outside of the workplace. Other generalizations about the net effects of gender are not as clear-cut. The specifics need further exploration and analysis. We will see additional effects of gender in the following section below when we look at how the use of skills is embedded in economic outcomes.

3.6. Embedding of Literacy and Numeracy in Economic and Social Outcomes

Data from the Survey of Adult Skills (PIAAC) and earlier international surveys of adult skills has been helpful in examining the relationships between assessed skills and a range of economic and social outcomes. Previous research looking at relationships between information-processing skills and economic and social outcomes has focused on literacy and numeracy proficiencies. The measures of engagement in literacy and numeracy practices in Survey of Adult Skills enable us to expand the scope of this research by examining the importance of both proficiency and skill use on these economic and social outcomes. In this section, we consider multivariate regression models of various economic and social outcomes that incorporate a range of variables including measures of both proficiency and practice engagement.

In these models, the statistical associations found between proficiency and an outcome or between practice engagement and the outcome do *not* necessarily reflect specific causal or explanatory models of underlying mechanisms linking literacy and numeracy to the outcome. We will say that reading, writing or numeracy practices are *embedded* in an outcome when there are positive correlations between engagement in reading, writing or numeracy practices and the outcome after controlling for demographic, education, proficiency and other variables. Because we have seen that proficiency is positively correlated with practice engagement, care is needed in interpreting positive correlations between practice engagement measures and an outcome. Measures of practice engagement could be proxies for proficiency measures. By controlling proficiency measures, it becomes easier to see the unique relationship between engagement in reading, writing or numeracy practices and the outcome variable.

We will examine *embedding* with pairs of predictive models: the *baseline* model of the pair includes the practice engagement measure along with demographic, education and possibly other control variables, whereas the *enhanced* model of the pair also includes the relevant proficiency measure as a control. If the practice engagement measure is a significant positive predictor of the outcome in *both* the baseline and enhanced models, then we will say those practices are *embedded* in that outcome.

The terminology of embedding is intended to be reminiscent of such popular phrases as “literacy is embedded in poverty”, referring to a myriad of underlying relationships between literacy and poverty that underlie their correlation; such embedding is not meant to convey a single, a simple or a unidirectional influence between the two constructs. Such embedding can, however, serve as a starting point for other investigations of possible underlying mechanisms between information processing (proficiencies and practices) and the various economic and social outcomes considered here.

3.6.1. Embedding in Economic Outcomes

Embedding in earnings. In low-proficiency populations, reading, writing and numeracy practices – whether at work or outside of work– are embedded in workers’ earnings. In the general population,

reading, writing and numeracy practices in the workplace are embedded in workers' earnings, but their engagement in these practices outside of work is not embedded in earnings. Reading and writing practices show equivalent magnitudes of embedding in earnings, considerably larger than the magnitude of embedding of numeracy practices in earnings. With practice engagement, education and other variables controlled, literacy and numeracy proficiencies are also important determinants of earnings within the general adult population.

Table 3.2. Summary of embedding of reading, writing and numeracy practices in prime age (25-54) workers' earnings, for low-proficiency and general populations

Practices	Low-proficiency population	General population
Reading at work	Yes	Yes
Reading outside of work	Yes	No
Writing at work	Yes	Yes
Writing outside of work	Yes	No
Numeracy at work	Yes	Yes
Numeracy outside of work	Yes	Yes

Research based on numerous surveys of skills in previous decades in OECD and non-OECD countries have demonstrated the economic value of well-developed literacy and numeracy skills to both individuals and societies (Hanushek and Wößmann, 2012a,b). The first Survey of Adult Skills (PIAAC) results reported by OECD (2013a) lays out a descriptive case for the importance of both proficiencies and skill use for economic outcomes. Hanushek, Schwerdt, Wiederhold and Woessmann (2013), in one of the first econometric analyses of the Survey of Adult Skills data, report substantial wage returns to assessed proficiencies over and above the wage returns attributable to education for prime age workers in countries around the world. Desjardins and Rubenson (2011), analysing the earlier ALLS data, extended theses type of wage models to include both assessed proficiencies and self-reported information about skill use in the workplace. PIAAC's innovations in assessing skill use open up important new analytical possibilities.

Building on this earlier work, we estimate Mincer (1974) type wage determination equations with Survey of Adult Skills data from currently employed, prime age adults. These models regress individuals' total monthly earnings on educational attainment, assessed literacy and numeracy proficiencies, and levels of engagement in reading, writing and numeracy practices, at work or outside of work. The models include controls for demographic characteristics, occupational groups and work experience.

Embedding models for reading, writing and numeracy practices in workers' earnings were developed as pairs of earnings equations as described above. Both the baseline and enhanced models in a pair regress the logarithm of total monthly earnings on the same baseline set of variables: demographic variables, dummy variables specifying educational attainment levels and occupational groups, years of work experience and the measure of practice engagement. The enhanced model adds the relevant proficiency measure to the baseline model – either literacy proficiency to models involving reading and writing engagement or numeracy proficiency to models involving numeracy engagement. As explained above, when the practice engagement measure is a positive predictor of earnings in *both* the baseline and enhanced models, we will identify those practices as embedded in the earnings outcome.

Our primary focus here is on the embedding of skills in the earnings of the low-proficiency populations. Tables of parameter estimates of the embedding models for low-proficiency and the entire populations are available in Annex Table A3.4. As we present findings about embedding of practices

within the low-proficiency populations, we will note whether the same findings are applicable to the general population. The embedding models were estimated separately for each country, with country-specific estimates averaged across OECD countries into the pooled estimates shown in the tables.

Reading at work. Annex Table A3.4 displays the models of the embedding of reading engagement in workers' earnings. The table shows the pair of regression models of log earnings on engagement in reading practices at work. The two models have the same structure except that the enhanced model on the right adds literacy proficiency as an independent variable. The key result here is that with demographic, educational attainment, occupation and work experience controls in place, engagement in reading practices at work is a significant positive predictor of earnings. Coefficients in the two specifications are very similar, including the coefficient for reading at work, which is estimated at 0.1100 in the baseline model and remains essentially unchanged at 0.1072 when literacy proficiency is added to the model. Literacy proficiency is not a statistically significant predictor of earnings once engagement in reading at work is taken into account. Similar results occur when these models are applied to the general adult population, as summarized in Annex Table A3.4. Although engagement in reading practices at work is the more potent predictor of the two, literacy proficiency is a significant, positive predictor of earnings within the general population. It is not surprising that literacy proficiency, with greatly reduced variability by definition of the low-proficiency population, has much less predictive influence within the low-proficiency population. Thus, it is difficult to know whether the lower predictive power of literacy proficiency in the low-skilled population is due to substantive or design reasons. Engagement in reading practices at work is embedded in earnings, for both low-proficiency and adult workers more generally.

Age is not a significant predictor of earnings in these models but years of work experience is. In many multivariate wage determination equations estimated on other data sets, age is a positive predictor of earnings but is generally thought to be a proxy for years of work experience. In the Survey of Adult Skills data, where both age and years of work experience are available, it is the stronger predictor and has a significant positive coefficient in the models. Educational attainment, modeled here as dummy variables (Ed2 is a binary indicating completion of secondary school; Ed3 is a binary indicator of a postsecondary degree), has strong positive effects on earnings as almost always found in such models. Gender has significant effects on earnings even after all of these variables are taken into account, with the coefficients here indicating that women earn about 31-32% less than men on average, given the same general occupations, education, proficiencies, skill use and work experience. Immigrant status is not significantly associated with earnings in this multivariate modeling environment.

It is of considerable interest that engagement in reading practices at work is a more potent predictor of earnings than literacy proficiency is within these models. In evaluating similar earnings models in ALLS data using the same literacy proficiency measure but a less well developed measure of reading practices, Desjardins and Rubenson (2011) and OECD (2013a) emphasized that although literacy proficiency is a characteristic of the individual worker (like age or gender), the reading tasks carried out at work are characteristics of the *job*. In their analysis, assessed literacy proficiency is a supply side factor in wage determination whereas reading practices are a demand side factor; the employer specifies the reading demands of the job, the worker supplies the necessary proficiencies.

Although the results in Annex Table A3.4 are consistent with the framework proposed by Desjardins and Rubenson, their interpretation of what we call practice engagement may not be the best way to understand such findings for the low-proficiency population. It could be, as they propose, that the opportunity to utilize skills on the job is determined by the employer. It is also possible, however, that individuals differ in the extent of and manner in which they use their information processing skills in performing a given job, so that individual engagement in reading practices at work would generally vary with both the individual and the job. There is not enough data (nor quite the right kind of data) in PIAAC

to disentangle these two components of variation, as might be done if sufficient numbers of individuals performing the same job were sampled.

Reading outside of work. Annex Table A3.4 provides some additional insight about interpreting practice engagement effects in these earnings models. The embedding models in Table A3.4 use workers' engagement in reading *outside of work* as a predictor of earnings. Note the similar pattern of covariate coefficients for demographic, education, occupation and work experience variables for the reading engagement models using either reading at work or outside of work. Despite shifting from engagement in reading at work to reading outside of work, the overall results shown in Annex Table A3.4 are quite similar for low-proficiency populations. Their engagement in reading practices, either at work or outside of work, is a positive predictor of earnings in multivariate models that control for demographics, educational attainment, occupation and work experience, and literacy proficiency. These findings indicate that for low-proficiency populations, engagement in reading practices is important for earnings but not necessarily because it indexes the kind of jobs to which individuals have access. We conclude that reading practices – whether at work or outside of work – are embedded in the earnings of the low-proficiency population.

As Annex Table A3.4 shows, this conclusion does not apply to general (as opposed to low-proficiency) adult populations. Literacy proficiency is a significant, positive predictor of earnings in the general population, whereas engagement in reading practices outside of work is not a significant predictor when proficiency is controlled.

Writing at work. Results for the embedding of writing practices are generally similar to those for reading practices. Annex Table A3.4 displays the estimated regression parameters for writing at work in low-proficiency populations. Literacy proficiency is not a significant predictor of earnings, whereas engagement in writing practices at work is a significant, positive predictor in both the baseline and enhanced models. The coefficients for demographic, education, occupation and work experience variables are patterned similarly in the writing and the reading engagement models. Results for engagement with writing at work for the general adult population are shown in Annex Table A3.4 – they are similar to those for engagement in reading at work in the general population. Writing engagement at work, either by itself or in combination with literacy proficiency, is a significant, positive predictor of earnings. Writing at work is embedded in workers' earnings, both in the low-proficiency and general populations.

Writing outside of work. Results for writing outside of work are displayed in Annex Table A3.4. Within the low-proficiency population, engagement in writing, like engagement in reading, is embedded in earnings regardless of whether the writing practices are at work or outside of work. These results do not apply to the general population, as shown in Annex Table A3.4. Engagement in writing outside of work is not related to earnings, in contrast to writing at work.

Numeracy at work. The embedding of numeracy practices at work in the earnings of low-proficiency populations is shown in Annex Table A3.4. Engagement in numeracy practices at work is a positive predictor of earnings in both specifications – with and without numeracy proficiency – and so numeracy practices at work are embedded in earnings. Similar results are found in the general population, as shown in Annex Table A3.4. In all of these models, numeracy proficiency is also positively associated with earnings. The patterns of coefficients for demographic, education, occupation and work experience variables are very similar to those in the embedding models for other measures of practice engagement.

Numeracy outside of work. Annex Table A3.4 shows the corresponding findings for engagement in numeracy practices outside of work. Again we see that numeracy practices – whether at work or outside of work – are embedded in workers' earnings in the low-proficiency population. In all of these models, numeracy proficiency is also positively associated with earnings. The patterns of coefficients for demographic, education, occupation and work experience variables are very similar to those in the

embedding models for other measures of practice engagement. These findings also apply to the general population, as shown in Annex Table A3.4.

3.6.2. Embedding in Social Outcomes

Reading, writing and numeracy practices may be embedded in social as well as economic outcomes. OECD (2013a) identified contributions of proficiencies to a number of social outcomes: social trust, volunteerism, political efficacy and general health. For each social outcome variable, the OECD estimated a regression-adjusted odds ratio for a negative social outcome given low versus high levels of literacy proficiency. For example, adults with low levels of literacy proficiency were found to be about four times as likely to have a negative health outcome as their counterparts with the highest levels of literacy. Significant odds ratios were estimated in this way for each of the four social outcomes. Dinis da Costa et al. (2014) analysed these same four social outcomes in more depth for countries of the European Union, and found proficiencies to be more important than education in predicting better outcomes for each measure.

Embedding in social outcomes. The results that are presented below about the embedding of information-processing practices in social outcomes are summarized in Table 3.3. Reading, writing and numeracy practices (all outside of outside of work) are embedded in each of social outcomes examined, within both the low-proficiency and the general populations, with the only exception being that numeracy practices are not significantly embedded in social trust within the low-proficiency population. Increased engagement in information-processing practices (reading, writing, numeracy) outside of work is positively associated with better social outcomes, controlling for demographic, education and proficiency variables.

Table 3.3. Summary of embedding of reading, writing and numeracy practices outside of work in social outcomes, for low-proficiency and general populations aged 25 to 65

	Reading	Writing	Numeracy
Low-proficiency			
Social trust	Yes	Yes	No
Volunteering	Yes	Yes	Yes
Political efficacy	Yes	Yes	Yes
Health	Yes	Yes	Yes
General			
Social trust	Yes	Yes	Yes
Volunteering	Yes	Yes	Yes
Political efficacy	Yes	Yes	Yes
Health	Yes	Yes	Yes

Note: 'Yes' indicates that engagement in specified practices outside of work is embedded in the given social outcome variable.

The mechanisms and processes linking information-processing skills with these social outcomes are complex and may well differ across outcome measures as well as between countries and social groups. Some possibilities were discussed by OECD (2013a) and Desjardins (2008, 2003). There is widespread consensus among researchers that information processing skills are linked to various forms of political participation (e.g. Tolbert and MacNeal, 2003). There is also a substantial research base in health literacy that connects information-processing skills with health, although there is far more research about how skills are used for accessing health information than for communicating with health-care providers or managing one's own health and care (e.g. Feinberg, Greenberg and Frijters, 2015; Rudd, Kirsch and Yamamoto, 2004).

The initial analyses of the social outcomes in PIAAC point to the importance of examining these social outcomes in low-proficiency populations and understanding how both proficiencies and engagement in reading, writing and numeracy practices may lie at the foundations of civil societies. We will expand this emerging research topic by looking at the embedding of reading, writing and numeracy practices in these social outcomes, especially in low-proficiency populations. The embedding models will be set up in much the same way as they were for the earnings outcome, except that here the populations of interest will be adults age 25-65 rather than the prime age workers considered for the economic outcomes. Since each of these social outcomes is measured on an ordinal rather than continuous scale (OECD, 2013a,c), ordinal logistic regressions are conducted on the outcome variables. Because adults who are currently employed as well as those who are not currently employed are included, embedding will be modeled for reading, writing and numeracy practices outside of work. Occupation and work experience variables are omitted from the model specifications while a binary variable, WORKING, is added to specify current employment status.

Social trust. Annex Table A3.5 presents results for the embedding of reading, writing and numeracy practices, respectively, in social trust within low-proficiency populations. Both reading and writing practices are embedded in social trust but numeracy practices are not. Proficiency measures are not significantly related to social trust in these models. Age is negatively related to social trust, such that older adults have lower levels of social trust, but neither gender nor immigrant status is significantly related to social trust. Both education and employment status are positively associated with social trust; those with more education and those currently working have higher levels of social trust. Results for the general population, shown in Annex Table A3.5, are a bit different, in that reading, writing and numeracy practices are all embedded in social trust for the general adult population. Proficiency measures are also positively associated with social trust in the embedding models for the general adult population.

Volunteerism. Results for the embedding of reading, writing and numeracy practices in volunteerism for low-proficiency populations are shown in Annex Table A3.6. Engagement in each of these domains of practice is embedded in volunteerism. Literacy proficiency is not significantly related to volunteerism but numeracy proficiency is positively associated with volunteerism. Neither age nor immigrant status is significantly related to volunteerism. Both education and employment status are positively associated with volunteerism; those with more education and those currently employed have higher levels of volunteerism. Results for the general adult population, shown in Annex Table A3.5, are generally similar, with reading, writing and numeracy practices embedded in volunteerism. One difference in results for the general population is that literacy proficiency is positively associated with volunteerism in the general population.

Political efficacy. The embedding models of reading, writing and numeracy practices in political efficacy within low-proficiency populations are shown in Annex Tables A3.7, respectively. Engagement in each of these domains of practice is embedded in political efficacy. Neither literacy nor numeracy proficiency is significantly associated with political efficacy. Both education and employment status are positively associated with political efficacy; those with more education and those currently employed have higher levels of political efficacy. Effects of age, gender and immigrant status on political efficacy vary over the different practices models. Results for the general adult population, shown in Annex Table A3.7, are similar, with reading, writing and numeracy practices embedded in political efficacy and proficiencies positively associated with political efficacy.

Health status. The analysis of the embedding of reading, writing and numeracy practices in health status within low-proficiency populations is displayed in Annex Table A3.8. Engagement in each of these domains of practice is embedded in health status. Both literacy and numeracy proficiency are significantly associated with health. Age is also significantly related to health, with younger adults

reporting better overall health status. Both education and employment status are positively associated with health; those with more education and those currently employed have better health status. Neither gender nor immigrant status has a significant association with health status in these modeling contexts. Results for the general adult population, shown in Annex Table A3.8 are generally the same, with reading, writing and numeracy practices embedded in better health status and proficiencies positively associated with health.

3.7. Summary

Individuals' engagement with a given domain of cognitive practices – whether reading, writing or numeracy – is positively correlated (ranging between 0.35-0.45) between the two settings of work and outside of work. This relationship holds at the level of individuals as well as at the level of countries. There is broad cross-national variation in levels of engagement in various information-processing practices. These findings are observed in both low-proficiency and general adult populations. At the same time, at work, many low-proficiency adults are not engaged with reading, others not with writing, and others not with numeracy practices. Outside of work, many other low-proficiency adults are not engaged with some of these domains of practice. On the one hand, these moderate correlations indicate that individuals tend to use same sets of skills at different settings. This could be expected given that using skills in one setting help maintain and improve those skills, thus making them more likely to be used in other situations. However, the moderate strength of these correlations also shows that there is high degree of context dependency in terms of engagement in cognitive practices. In other words, the fact that certain skills are used at work by no means indicates that they will necessarily be used outside of work or vice versa.

Engagement levels in reading and writing practices are strongly correlated in a given setting, whether that is at work or outside of work. It is important to note that these correlations (ranging between 0.50-0.65) are stronger than the correlations between engagements in the same practices across different settings. This could be seen as an indication of somewhat stronger role of external requirements compared to individual characteristics in terms of likelihood of engaging in these cognitive practices.

Literacy proficiency is correlated with engagement in reading and in writing practices. Numeracy proficiency is correlated with engagement in numeracy practices. As literacy and numeracy proficiency levels rise, average levels of engagement in reading, writing and numeracy practices steadily increase. In addition to proficiency, both educational attainment and demographic characteristics systematically shape individuals' levels of engagement in reading, writing and numeracy practices, both at work and outside of work. As indicated before, the positive relationship between proficiency levels and engagement in cognitive practices could be expected for a number of reasons. On the one hand, lower proficiency can create various subjective and objective barriers for engaging in these types of activities. On the other hand, lower engagement on its own can limit skill development and widen skill gaps.

Engagement in reading, writing and numeracy practices appears to be important for individual and societal well-being. In low-proficiency populations, reading, writing and numeracy practices – whether at work or outside of work– are embedded in workers' earnings. At given levels of education and proficiency, the more individuals engage in these cognitive activities (either at work or outside of work), the higher their earnings tend to be. Although proficiencies remain important predictors of economic outcomes in the general population, these results indicate that engagement in literacy and numeracy practices is by itself an important dimension of the relationship between skills and earnings, even after proficiency is taken into account.

Although others have suggested that measures of skills used at work specifically reflect properties of individuals' jobs, our finding that reading, writing and numeracy practices *outside of work* are also embedded in workers' earnings challenges the idea that proficiency is a characteristic of the individual and skill use is a characteristic of only the job (Desjardins and Rubenson, 2011). We suggest instead that practice engagement at work should be seen as resulting from a process of adaptation of workers and tasks to each other, so that levels of skill use will jointly reflect characteristics of workers and jobs.

Reading, writing and numeracy practices are also embedded in a number of important social outcomes for both the low-proficiency and general adult populations. The sole exception to this was that engagement in numeracy practices is not significantly embedded in social trust for the low-proficiency population. Increased engagement in information-processing practices outside of work is positively associated with better social outcomes after controlling for demographic, education and proficiency variables. The magnitude of the embedding of practices in these social outcomes varies with the practice domain (reading, writing, numeracy) and the social outcome (trust, volunteering, political efficacy, general health). Reading is more embedded than writing which is more embedded than numeracy for each of the social outcomes. For social trust, volunteering and political efficacy, the reading, writing and numeracy are more embedded within the general adult population than within the low-skilled population, whereas for general health, reading, writing and numeracy practices are more strongly embedded in the low-skilled than the general adult population. To get a sense of the magnitude of these impacts, consider the embedding of reading practices in volunteering: With demographic, education and proficiency variables held constant, a unit increase in reading engagement is associated with 61% greater odds of a higher rate of volunteering in the general adult population (the corresponding number is 54% for the low-proficiency population).

Within both the low-proficiency and general adult populations, proficiency is a significant predictor of general health after controlling for engagement in information-processing practices and other variables. Proficiency also predicts the other social outcomes for the general adult populations, but is not a significant predictor within low-proficiency adult populations, in part because of the restricted range of proficiency by definition within in low-proficiency populations.

The embedding of reading, writing and numeracy practices in these social outcomes reflects the society's literate and numerate environments. The embedding of these practices in the social outcomes is part of the fabric with which the social worlds are woven. Although the frequencies with which individuals engage in various reading, writing and numeracy activities certainly index the literate and numerate environments, the embedding of those practices in key social outcomes takes this relationship a step further. To the extent that society broadly values social trust, volunteerism, political efficacy and general health, the embedding of reading, writing and numeracy practices in those social outcomes becomes a hallmark feature of the literate and numerate environments.

It is worth emphasizing again that the pervasive embedding of information-processing practices we observe in these social and economic outcomes do not necessarily imply direct causal relationships between practice engagement and those outcomes. The embedding results do suggest, however, that we conduct more research on this topic with an eye towards developing policies and programs to increase low-proficiency populations' engagement with reading, writing and numeracy practices. As detailed in the introduction to this chapter, previous research indicates that adult basic skills programs can directly affect students' engagement in literacy and numeracy practices, and over time, gains in practice engagement can lead to longer term proficiency gains (Reder, 2009b, 2014b). The embedding of reading, writing and numeracy practices in a broad range of social outcomes further suggests that adult education programs may lead to broad social improvements as well as to increased earnings. Further research and development efforts should be directed towards determining the types of adult education

programs and policies that might have these broad impacts on earnings and social outcomes. We will consider these points further in Chapter 6.

Notes

[3] "Skill use" can be framed in two different ways. One approach is concerned with the extent to which an employer or an economy effectively uses the skills of its workforce. This perspective has been utilized, for example, in analyses of "skills mismatch" between the demands of particular jobs and the assessed proficiencies of those holding them. This demand-side framework of "skill use" prioritizes assessed proficiencies and utilizes measures of "skill use" to estimate how effectively workers' proficiencies are utilized in various types of jobs, industries, and economies more generally (Cedefop, 2010; Desjardins and Rubenson, 2011; OECD, 2013ac, 2011; Pellizzari and Fichen, 2013). This chapter, in contrast, frames "skill use" in terms of the individual's engagement in everyday reading, writing and numeracy practices. Measures of practice engagement are utilised in analyses of social and economic phenomena along with measures of individuals' proficiencies, educational attainment and demographic characteristics. The practice engagement measures can be understood as indicators of human capital in supply-side frameworks of work. These two frameworks for skill use are not contraries, of course, but offer partially overlapping lenses for understanding literacy and numeracy skills in the workplace.

[4] Each of these six scales was found to have acceptable psychometric properties (OECD, 2013b), reflecting a single dimension of engagement with a broad set of reading, writing or numeracy practices. An important limitation of the way these data were scaled is that individuals who responded "Never" to all items comprising a particular scale were not assigned a scale score, they were given a missing value for that particular scale. For example, an individual who did no writing at work (i.e., answered "Never" to each question about how often they performed the writing tasks at work) was given a missing value rather than a low scale score for writing at work. In contrast, an individual who answered "Never" to each item except for the item about filling in forms for which "Less than once a month" was answered -- received a very low scale score. Rather than omitting many individuals from analyses who answered with all "Nevers" on a scale, the report team decided to impute low scale scores for them on the corresponding practice engagement scales. The lowest value assigned to any individual (in any of the participating countries) on a given scale was selected as the value to be imputed for the "all nevers" responses on that scale.

[5] Please refer to the note concerning data from the Russian Federation at the beginning of this paper. 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 (www.oecd.org/site/piaac/_Technical%20Report_17OCT13.pdf).

[6] One way to strengthen the interpretation of this comparison would be to estimate the equations for engagement at work and outside of work for the same populations. Questions about skill use (e.g. reading) at work were only asked of employed adults, whereas questions about skill use outside of work were asked of everyone. To compare, for example, engagement in reading at work and outside of work, the two equations could both be estimated for the employed subpopulation.

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CHAPTER 4: READING COMPONENTS

Throughout the history and evolution of international assessments of adult literacy, there has been a strong emphasis on a definition and construct of literacy that "is conceived as a skill that involves constructing meaning, and evaluating and using texts to achieve a range of possible goals in a variety of contexts" (OECD, 2013: 1). That is, an acknowledgement that "literacy extends well beyond the skills of decoding or comprehending texts" (OECD, 2013: 1).

Thankfully, for most countries that participate in The Survey of Adult Skills (PIAAC), 95% or more of the adults surveyed have skills that extend well beyond the ability to decode and comprehend basic texts. But what about those adults who have difficulty even with the most basic, applied literacy items? The fact is, even among the adults near the bottom of the ability distribution, there is a range of skills for engaging in and understanding written texts. In this chapter, we examine the abilities of adults with proficiency estimates below Level 1 in comparison to those at or above Level 1.

The reason for introducing reading components into the PIAAC literacy framework and surveys was to better understand what literacy skills adults below Level 1 possessed or lacked. These were individuals who in previous surveys essentially could not answer any of the literacy items correctly and therefore were assigned a score at the bottom of the literacy scale. Were these individuals entirely nonliterate? Or did they possess some reading skills? The research literature suggested that, given the opportunity to engage in fine-grained skills tasks, at least some of these adults would demonstrate some level of literacy knowledge and skills (e.g. Baer, Kutner, and Sabatini, 2009; Jeantheau, 2006). These fine-grained skills are what we call reading components.

Thus, while it makes sense to employ a conception of applied literacy tasks in the main survey task set, this approach may not be optimal for understanding individuals below Level 1. Why? Because when one learns a new competency, one does not do so only and always by performing real-world tasks. Learning, especially formal learning such as that which occurs in education or training programs, often includes learning new content and skills directly, as well as practice applying those skills in exercises that build up fluency of application (Bransford, Brown, and Cocking, 1999). The foundational skills adults possess may be overlooked if only the performance on relatively complex, applied, real world tasks is observed.

Therefore, for the first time ever in an international survey, the measurement of reading components was introduced. Reading components are indicators of adults' competencies with the most fundamental aspects of understanding written texts – the ability to recognise and understand printed words and to build meaning from sentences and passages. Higher level literacy skills are built upon a foundation of fluent, component skills (Abadzi, 2003; Baer et al., 2009; Curtis, 1980; Perfetti, 2003; Sabatini, 2002; Sabatini and Bruce, 2009; Stine-Morrow, Miller, and Hertzog, 2006; van den Bos, Zijlstra, and Spelberg, 2002).

While the broader report here is focused more generally on all adults at or below Level 1 and the challenges they and countries face in raising their skills, there remain in each country adults who may lack even the most basic foundational skills, or if they do possess them, those skills are so fragile and effortful to deploy that their participation in a literate world is severely limited. The results here, however, show that many of the adults who score below Level 1 do possess some literacy skills. They can recognise familiar words in print, as well as evaluate the meaning of sentences and passages, at least when the overall complexity of the text and task is constrained.

Proficiency in components skills represents a milestone on a pathway that leads to higher levels of reading proficiency (Strucker, Yamamoto, and Kirsch, 2003). In the development of skilled reading, there is a gradual fading of the conscious awareness of the words on the page towards an introspective perception of reading as essentially invisible or implicit, where all of one's attention and cognitive effort is directed towards understanding, evaluating, using and engaging with written texts towards higher purposes. The readers of this report, for example, likely perceive reading as entirely an act of meaning construction. The printed words, their spellings, the typeface, the punctuation, and so on, do not constantly impinge on one's conscious awareness while reading – only the meaning.

That is, regrettably, not the perception of the individual who must struggle with nearly every word, phrase, and grammatical structure of the written sentences of text they encounter. For adults with foundational skill challenges to achieve a level of fluency and engagement with text – where it is both useful and pleasurable to read – will require a commitment to learning, with instruction and practice that addresses their individual learning needs.

To target instructional programs and supportive policies, it would be beneficial to better understand the relative strengths and weaknesses of adults' foundational reading skills (National Research Council, 2012). That is, as Chall (1967) distinguished, some adults may possess sufficient foundational reading components skills to benefit from instruction solely focused on *reading to learn or to do*, while others would still benefit from instruction helping them to *learn to read*. Knowing how to effectively and efficiently help adults become fluent and efficient readers requires more detailed information than is available from a single literacy proficiency score. Reading components are a bridge to deeper understanding of the needs and capabilities of the subpopulation of adults that scores at or below Level 1 in literacy.

4.1. What are reading components and why do we include them in the PIAAC Reading Literacy Conceptual Framework

In the research literature, reading literacy can be conceptualized as a dimension of language (Hoover and Tunmer, 1993; Kintsch, 1998). When one learns a new language, one usually is concerned with four dimensions – reading, writing, speaking, and listening. Speaking and listening are often secondary concerns when one is learning to read and write in one's native language(s), because one already has foundational language knowledge and skill in these dimensions. One has a productive/receptive vocabulary of words that one knows when one listens or speaks. One can process the syntax or grammar of the language implicitly, turning utterances of phrases and sentences into meaning. A competent speaker/listener of a language can listen to another native speaker and understand what they are saying in 'real-time', that is, they are making meaning at the speed that the speaker is speaking, which is generally in the range of 150 to 175 words per minute for the average adult speaker, at least in English (Carver, 2003). Recognizing that reading proficiency is, in part, intertwined with language skill yields the implication that learning to read is aligned with the structure of one's language.

When one accepts the premise that reading literacy is, in part, a dimension of language understanding, then one might become interested in the structure of the language. Though there is surely much continued debate among professional linguists, major categories of study in the structure of languages include phonetics, phonology, morphology, syntax, semantics, pragmatics, discourse analysis, and semiotics. How do these structures relate to reading? At the risk of oversimplification, we can draw a few implications with respect to how reading relates to language.

First, reading always requires learning to map the writing system (i.e., the printed visual symbols individually and in combination) to the spoken form of the language. i.e., the phonetics, phonology, and

morphology (Perfetti, 1985, 2003). However, there is a great deal of variation across languages in how this mapping is addressed. For example, in alphabetic writing systems, the mapping is at the level of the phoneme – the smallest linguistic unit of sound. In syllabic-based languages (e.g. Korean), the mapping is at the level of the syllable. In other languages, much of the mapping may occur at the level of the word or morpheme, though these languages often incorporate some sight to sound mapping systems as well, for example, Japanese has a logographic system (Kanji) and a syllabic system (Kana).

Another important distinction, especially among alphabetic writing systems, concerns the regularity of the mapping of the sight to sound system. In what are termed 'transparent' orthographies or spelling systems, the mapping is highly regular. This means that, with a pronunciation guide, the same spelling pattern routinely maps to the same sounds when spoken. German, Italian, Finnish, Swedish, and Spanish are examples of relatively transparent orthographies. In languages that are less transparent or more opaque, like English, the relations between sight and sound (and vice versa) are less consistent, and therefore may require more learning and practice before fluency is achieved (Vaessen et al., 2010).

The variations in how a writing system maps to the language can impact the method used to teach an individual to read and may impact the ease of learning to read fluently in the language. However, this also makes it rather complex to fashion comparable assessment tasks across languages at the decoding and word recognition level of a language. The reading components framework (Sabatini and Bruce, 2009) includes discussions of decoding and word recognition components, as well as a discussion of the alphanumeric system, or whatever is the visual symbol system used in a language. However, the literacy expert group concluded that attempting to measure decoding and word recognition in this first attempt at measuring reading components internationally was beyond project scope.

Instead, the reading components developed for PIAAC targeted three other levels of reading literacy that correspond to structural levels of language. One component task set targets word meaning or print vocabulary, that is, the mental lexicon of words that comprise an individual's catalogue of word meanings in the language. Another component task set targets sentence meaning, which corresponds to basic syntactic and semantic knowledge and processing. Finally, a third reading component task set targets basic passage comprehension, which corresponds to discourse analysis. Each of these task sets and its corresponding interpretation is discussed more fully in the following sections.

There is one other critical element of reading component knowledge and skill. Proficient reading component competencies, in any language, are characterized by the ease, speed, and minimal attentional resources required when cognitively processing written text, sometimes referred to as automaticity (LaBerge and Samuels, 1974). The introspective perception of a skilled reader is a focus on understanding, evaluating, using and engaging with written texts. As noted previously, the processing of the text itself should become a nearly unconscious, implicit operation – like our daily awareness of breathing. True, we occasionally notice that we are breathing (like when we exercise or meditate), but thankfully, most of the time breathing proceeds without one's conscious attention to it. So, too, should proficient reading be. An association between reading rate – an index of fluency and automaticity of text processing - and literacy proficiency is consistently found in studies of adult readers (Abadzi, 2003; Baer et al., 2009; Sabatini, 2002). In subsequent sections, we return to this issue of fluency or automaticity in characterizing at or below Level 1 in comparison to adults higher in the continuum of skills.

In the PIAAC survey, three reading components were assessed: word meaning (print vocabulary), sentence processing, and basic passage comprehension.

4.1.1. Word meaning (print vocabulary)

Recognising the printed symbols on the page as representing meaningful words is foundational to reading literacy (Anderson and Freebody, 1981; Hirsch, 2003; Nagy and Scott, 2000; Nagy and Townsend, 2012; Ouellet, 2006). In the print vocabulary task set, the task is for the reader to identify everyday words that average adult speakers of the language would understand if they heard the words spoken aloud. The items do not include specialized technical or academic words that would only be known by more educated individuals in the population. Instead, the words selected are very general words commonly known across country contexts (e.g. sun, triangle, foot). The purpose of the vocabulary component measure of this survey, then, is to investigate whether individuals possess foundational literacy skills sufficient to recognise and understand written words that they would otherwise understand when listening to those words.

How was this task implemented in PIAAC? First, high frequency and visualizeable terms were chosen, which were then depicted as line drawings. Adults viewed a line drawing then were asked to select the word that corresponded to the drawing from a set of four words (e.g. ➔ = 'arrow'). The vocabulary set consisted of 34 items, with two items appearing on each page of a printed booklet, and total time to complete all items was recorded.

4.1.2. Sentence processing

The sentence is a natural 'chunk' when reading continuous text (e.g. Carlisle and Rice, 2002; Kintsch, 1998). To build meaning from a sentence includes understanding all the words, parsing the syntactic structure, and encoding the propositions in memory. Depending on the specifics of a sentence, other operations might include making anaphoric inferences (e.g. relating pronouns to their referent), causal inferences, or knowledge-based inferences. Thus, each sentence requires some syntactic and semantic processing.

In the PIAAC sentence task set, an attempt was made to control for vocabulary difficulty by using simple, high frequency words. Sentence complexity was manipulated to provide a range of challenges that a reader might encounter in deriving the meaning in typical text sources. Thus, in the sentence processing task, sentence length or complexity is varied. The adult is asked to make a judgment whether a sentence makes sense, based on the content of the sentence, either in relation to common knowledge about the world (see Example 1) or based on the internal logic of the sentence (Example 2). This task demand is consistent with the 'evaluation' goal of reading in the PIAAC reading literacy framework (PIAAC Literacy Expert Group, 2009). Even at the most basic reading level, comprehension or understanding may require evaluating text meaning against ones knowledge of the world, to judge its veracity. That is, one cannot always believe what one reads!

Here are two examples of sentence tasks, with the appropriate answer in **bold**:

- Example 1: "The sky is green." YES or **NO**
- Example 2: "If a house is taller than a person, then the person is shorter than the house." **YES** or NO

The simple judgment of whether a sentence is sensible is a type of literal comprehension proficiency. However, the logical truth or falsity of basic facts in the empirical world can be slippery. One can imagine exceptions to most absolute statements. Also, language is often used figuratively and metaphorically (e.g. "The sky is grey or black" may conjure images of a storm or night time; "The sky is pink" conjures images of a sunrise or sunset). In the item design of sentences used in this task, an attempt was made to minimize ambiguity of meaning as much as possible, and all items were field tested to confirm that adults could

accurately and reliably make the judgment called for in the task. Adults responded to 22 sentences and the total time to complete the entire set was recorded.

The focus in the sentence task was entirely on meaning judgments. There was no attempt to systematically vary grammatical/syntactic complexity, because there is no simple way to equate difficulty (grammatically) across different languages. Instead, difficulty was manipulated by adding more informational density (e.g. more phrases and clauses) and by changing the conditions or relations that needed to be processed to construct sentence meaning.

4.1.3. Passage comprehension

Skilled reading is rapid, efficient, and fluent (whether reading silently or aloud). The PIAAC passage reading task set targets silent reading for basic meaning comprehension in multi-paragraph prose texts (Fuchs and Fuchs, 1992; Wayman, Wallace, Wiley, Ticha, and Espin, 2007). As the adults read silently through a passage, they see a word-choice item in selected sentences. They need to circle the word among the alternatives that fits the meaning of the sentence. The incorrect choice is meant to be obviously wrong to a reader with some basic comprehension skills. The incorrect choice may be grammatically or semantically wrong. While most items could be answered based primarily on one's sentence comprehension skills, the passage content facilitates a more fluent, efficient response by constraining the likelihood that the incorrect term would make sense given the passage context.

The adult is permitted as much time as necessary to complete each passage (four in total), but the total time to complete each was recorded. For adults with very limited literacy skills, the accuracy score may be sufficient to estimate their basic comprehension ability. However, for adults who have some foundational skills, the time to complete may add additional information about the fluency and efficiency of their reading processes.

For adults relatively higher on the proficiency scale, total correct on the passages may approach ceiling levels. By taking into consideration total time to complete the task, however, one can estimate their basic reading efficiency. A skilled reader would be able to choose all correct responses quickly, without much effort, and continue on reading at a normal rate. That is, adults with high accuracy scores may differ in their efficiency in processing continuous text relative to other adult readers.

4.1.4. How the components were implemented in the PIAAC survey

Reading components were only administered to adults who took the paper-based version of the PIAAC survey. The paper booklet began with simple instructions that were read to the adult by the survey administrator. The three task sets always appeared in the same order – Vocabulary, Sentences, and Passages. For the vocabulary items, two pictures appeared on each page, and the adult circled the word corresponding to the picture and then turned the page to see the next pair of items. The administrator started the timer when the adult turned the page for the first item, then stopped it when the adult completed the final item.

For the sentence task, the administrator read the directions: "Please read each sentence, then circle YES if the sentence makes sense, or circle NO if the sentence does not make sense". Then, the adult was asked to complete three practice items. The 22 items appeared across two printed pages, with 13 on the first page and nine on the second. The administrator started the timer when the adult turned the page for the first item, then stopped it when the adult completed the final item.

For the passage task, four passages were administered. The administrator read the directions: "Read the following articles. When you come to two words that have been underlined, circle the one word that makes the sentence make sense". Each passage appeared on a separate page. For the first two passages, the

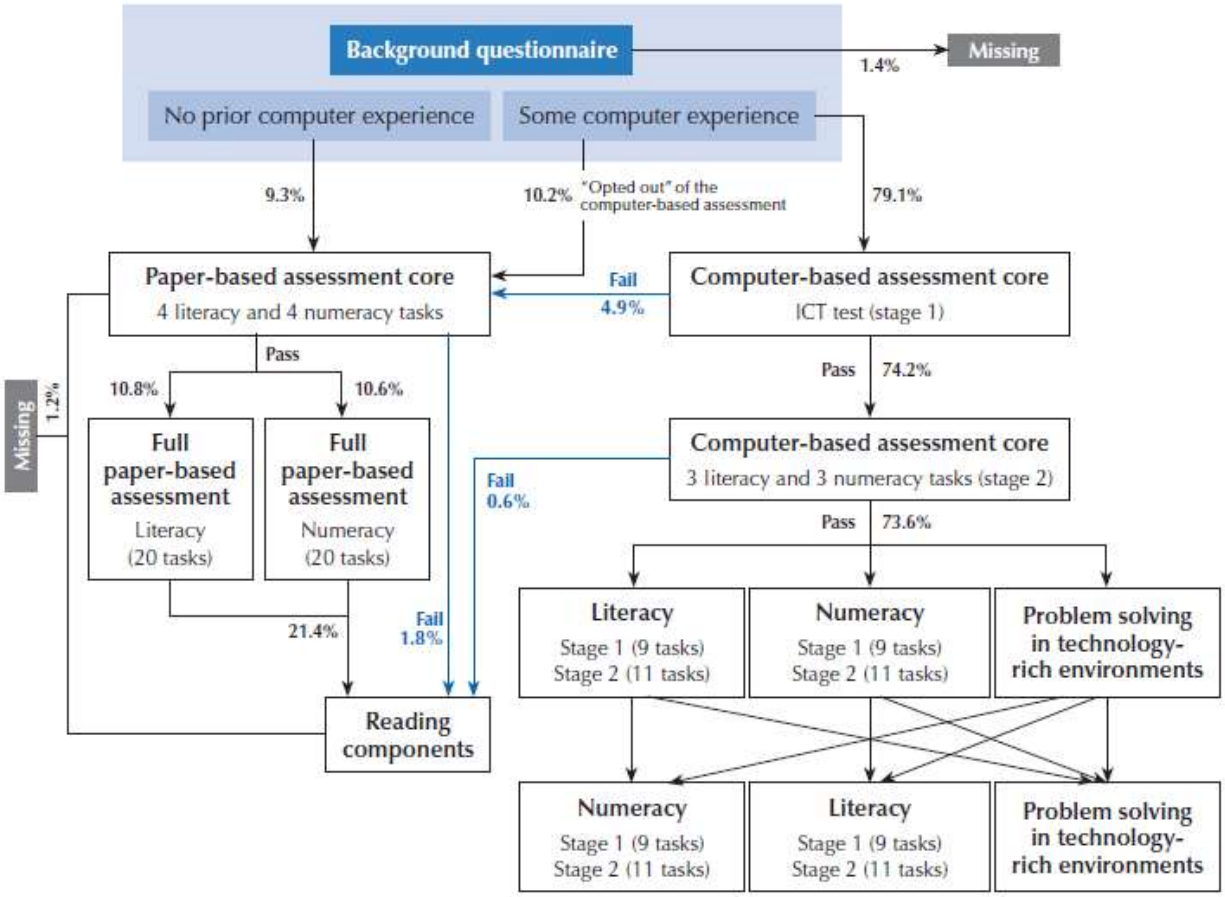
administrator started the timer when the adult turned the page to start the passage, then stopped it when the adult completed the final item for that passage. For the third and fourth passages, the administrator started the timer when the adult turned the page for the third passage, then stopped it when the adult completed the final item for the fourth passage. Thus, three separate time estimates were recorded, one for each passage (with the last two passages combined into one time).

However, not every adult who took a paper-based pathway was at or below Level 1. Many adults branched down the paper-based pathway for different reasons. In the next section, we review in detail who took the Reading Components.

4.2. Pathways in the Survey that led to Reading Components

The complex assessment design of the PIAAC survey meant that there were different pathways that would lead to taking the paper-based reading components. Every adult who traversed the paper-based assessment (PBA) was administered reading components. Most of the adults in the paper-based pathway, however, were not at or below Level 1 proficiency. Following are the various PBA pathways, percentage of the PBA routed adults who traversed that pathway, and a brief description of the reason for their PBA routing. The final bullet describes the group that failed the literacy/numeracy core and was routed directly to reading components. Figure 4.1 shows possible pathways through the assessment in more detail.

Figure 4.1. Percentage of respondents taking different pathways in PIAAC



Note: The figures presented in this diagram are based on the average of OECD countries participating in the first round of PIAAC.
Source: OECD, The Survey of Adult Skills: Reader's Companion (2013).

Table 4.1 includes details about each pathway group including whether they passed the core literacy/numeracy task set, which of the assessment blocks they completed, the percentage of the full sample (PBA + CBA) that took each path, and the percentage of the PBA subsample (see Chapter 2 or OECD, 2013, for further details of sample).

- **No computer experience**: Routed to PBA (9.3%) Adults who responded that they had no prior computer experience were routed directly to the PBA core.
- **Some computer experience, but opted out of CBA** (10.2%): Adults who responded that they did have prior computer experience, but chose to opt out of the CBA in favor of taking the remainder of the survey in the PBA core.
- **Some computer experience, but failed CBA core** (4.9%): Adults who responded that they did have prior computer experience, tried but then failed the CBA core were re-routed to the PBA core.
- **Passed CBA core, but then failed literacy/numeracy core** (0.6%): Adults who passed the CBA core, demonstrating that they had basic computer navigation skills, but then failed the literacy/numeracy core screener, and were routed directly to reading components.

Table 4.1. Percentages of adults who took the paper-based Assessment (PBA) grouped by path

Group	Core Task Set Performance	Assessments Blocks Administered	% of Full Sample	% of PBA Subsample
No Computer Experience	Pass	Literacy or Numeracy Block and RC	9.3	37.2%
Some Computer Experience, but Opted out of CBA	Pass	Literacy or Numeracy Block and RC	10.2	40.8%
Some Computer Experience, but Failed CBA core	Pass	Literacy or Numeracy Block and RC	4.9	19.6%
Passed CBA core, but then Failed Literacy/Numeracy core	Fail	RC only	0.6	2.4%
Total Taking PBA			25.0	100%

Source: Survey of Adult Skills (PIAAC) (2012).

The pathways to reading components tell a story of their own. First, 25% of all adults surveyed in PIAAC were routed down the PBA pathway. Of that percentage, 2.4% of the entire cross country sample of adults (the 0.6% and 1.8% of adults who failed the literacy/numeracy core in CBA and PBA modes) surveyed showed evidence of possessing below Level 1 literacy proficiency, based on their failing of a literacy/numeracy core task set, and therefore routed directly to reading components. This is consistent with the low estimate of 2% from previous surveys and the original target subpopulation for which reading components was designed. This 2.4% constitutes about 10% of the adults who took the PBA pathway.

Interestingly, of the 73.2% of adults who passed the CBA core, only 0.6% then failed the literacy/numeracy core and were therefore routed directly to the reading components block. More than 99% of adults who passed the CBA core also passed the literacy/numeracy core. This perhaps makes intuitive sense – how (or why) would one acquire basic computer navigation skills absent even

rudimentary literacy and numeracy skills. Computers are primarily literacy and numeracy tools/environments.

However, passing versus failing the core set is not a perfect predictor of possessing below Level 1 literacy (or numeracy) skills. In fact, the Plausible Literacy Values for these individuals – which is estimated from a broader set of indicators including performance on literacy tasks and background information – predicts that some of these individuals would possess literacy skills at or above Level 1.

The vast majority of adults who took the PBA pathway (93%) passed the literacy/numeracy core and therefore completed a literacy or numeracy block and reading components. This larger group demonstrated proficiency levels across the ability spectrum. As a reminder, the design of the reading component tasks was intentionally targeted towards the 2.4% of adults with the very lowest literacy levels. Thus, the goal was to design mostly very simple tasks that adults with minimal literacy skills could still complete with some success. For adults with more literacy skills, the tasks were thus very easy and high accuracy would be expected. One might also expect that a small percentage of the group that passed the literacy/numeracy core might still show below Level 1 literacy skills, having just narrowly passed the PBA core, or perhaps passing on the strength of their numeracy skills rather than their literacy skills.

A further side consequence of this design is that the total number of participants with below Level 1 literacy who completed the reading components is a very small number of cases in the sample. Table 4.2 shows how the percentages of those who took the paper-based pathway are divided among the proficiency levels. On average, 93% of those who took the paper-based form were Level 1 or above.

Because of the small country sample sizes below Level 1, there is often inadequate power to detect significant differences within countries, especially as analyses become more complex. Thus, absent larger country samples, or oversampling of this low literacy group, analyses are limited. Nonetheless, even with a basic palette of analytic approaches, there is much to be learned, as we describe next.

Table 4.2. Percentages of paper-based pathway sample at different proficiency levels by country

Percentage of PBA	Proportion that took the PBA	Below	Level 1	Level 2	Level 3	Level 4	Level 5
Australia	0.22	7.59	19.04	34.87	29.43	8.56	0.51
Austria	0.25	5.16	23.31	45.67	22.97	2.84	0.05
Canada	0.18	10.20	22.50	35.41	24.55	6.90	0.44
Cyprus[1]	0.46	2.73	11.77	37.25	39.60	8.27	0.37
Czech Republic	0.25	3.09	13.73	44.99	33.41	4.40	0.38
Denmark	0.14	9.91	28.22	41.24	18.88	1.72	0.03
England (UK)	0.15	9.32	22.27	38.30	24.34	5.23	0.54
England/N. Ireland (UK)	0.15	9.18	22.36	38.60	24.17	5.16	0.53
Estonia	0.29	3.54	13.85	38.73	35.91	7.43	0.55
Finland	0.19	4.77	17.05	38.92	30.32	8.07	0.86
Flanders (Belgium)	0.16	11.50	24.42	37.70	22.90	3.30	0.19
France	0.29	10.65	23.76	37.12	23.39	4.76	0.32
Germany	0.18	7.88	26.30	41.19	21.08	3.31	0.24
Ireland	0.32	5.98	18.79	43.07	28.24	3.81	0.10
Italy	0.42	8.99	29.25	43.24	16.92	1.58	0.02
Japan	0.37	1.34	7.50	31.00	44.35	15.03	0.78
Korea	0.30	5.11	22.70	44.58	24.50	3.10	0.02
Netherlands	0.11	11.65	25.71	34.08	22.30	5.23	1.02
Northern Ireland (UK)	0.18	5.75	24.51	45.76	20.18	3.57	0.23
Norway	0.14	4.86	18.81	40.91	30.16	5.04	0.23
Poland	0.50	6.88	19.88	39.57	26.98	6.12	0.57
Russian Federation[2]	0.34	2.30	11.72	36.32	41.04	8.39	0.24
Slovak Republic	0.36	4.71	15.86	41.43	34.35	3.58	0.08
Spain	0.34	13.48	29.64	38.82	15.91	2.06	0.10
Sweden	0.12	9.53	27.49	40.72	19.86	2.31	0.10
United States	0.16	14.44	30.84	36.19	16.53	1.95	0.04

Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.

Source: Survey of Adult Skills (PIAAC) (2012).

4.2.1. Variables and analyses

Table 4.3 shows the total items per reading components task set, derived total score variables (if applicable), total time component task variable labels, the number of choices for each item in the specific reading components subtest, the approximate total score, and percentage correct for an adult scoring at chance levels. That is, an adult who could not read at all and guessed at every item is likely to receive a total score of about 9, 11, and 22 for Print Vocabulary, Sentence Processing, and Passage Comprehension

by chance. When reporting percentage correct, we have simply divided the total correct by the total possible score. We have therefore treated all items left blank (either skipped or by failing to complete a task set) as incorrect responses. Given the relatively brief duration of the component task sets (on average the time to complete each task set was under five minutes) and the sequencing of items roughly in increasing difficulty, it seems reasonable to draw the conclusion that those who were unable to complete them did so because they found the tasks too difficult, rather than assuming that they stopped for other reasons. This should be taken into account when interpreting total or percentage correct scores on components for different proficiency levels. Note that France, Japan, and Finland did not participate in the reading components option.

Table 4.3. Number of items, choices, and chance levels for Reading Component Task Sets

Reading Component	Total Items per Set	No. of Choices per Item	Chance level Total Score	Chance Level Percentage Correct
Print Vocabulary	34	4	8-9	25%
Sentence Processing	22	2	11	50%
Passage Comprehension	44	2	22	50%
Total (Sum) All Items	100	2 or 4	41-42	41.5%

Source: Survey of Adult Skills (PIAAC) (2012).

4.3. Reading Component Performance Results

As Tables 4.4 to 4.6 illustrate, there is wide cross-country variation in performance on each of the reading components. In the discussion that follows, it is important to remember that chance performance on the vocabulary assessment is about 25% correct, while on the sentence and passage tasks, chance performance is around 50%.

Print Vocabulary is the most basic of the reading component task sets. The international average even for the below Level 1 group is 90% correct, with the average at Level 1 at 95%, and at Level 2 at 97%. These results suggest that even at below Level 1, most adults can recognise and pick out the printed spelling of highly familiar, concrete nouns (e.g. bird, circle, chair). Interestingly, four of the seven countries with means below 90% are English speaking countries,[7] though only the United States and Canada are significantly below the international mean. As noted, English has highly irregular sight-sound correspondences, and the incorrect item choices were designed to make it difficult to pick out the correct spelling just by simple cues, like the same first letter sound. In countries with highly transparent, regular sight to sound correspondences, it may have been easier to pick out the correct answer from a single visual cue, like the correct first letter or sound. Regardless, for the most part, most adults, even those scoring below Level 1, know how to read words that appear frequently in their language.

Table 4.4. Percentage correct for Print Vocabulary by Proficiency level by Country

	Below Level 1			Level 1			Level 2			Level 3			Level 4/5		
	%		S.E.	%		S.E.	%		S.E.	%		S.E.	%		S.E.
OECD															
National entities															
Australia	0.89		(0.04)	0.97		(0.02)	0.99	*	(0.00)	0.99	*	(0.00)	1.00		(0.00)
Austria	0.89		(0.02)	0.95		(0.01)	0.97		(0.00)	0.98		(0.00)	0.98		(0.01)
Canada	0.84	*	(0.03)	0.92	*	(0.02)	0.96		(0.01)	0.98		(0.01)	0.98		(0.02)
Czech Republic	0.96		(0.06)	0.97		(0.02)	0.98	*	(0.00)	0.99		(0.00)	1.00		(0.01)
Denmark	0.91		(0.03)	0.93		(0.02)	0.96		(0.01)	0.96		(0.02)	c		c
Estonia	0.95	*	(0.02)	0.97	*	(0.01)	0.99	*	(0.00)	0.99	*	(0.00)	0.99	*	(0.00)
Finland	m		m	m		m	m		m	m		m	m		m
France	m		m	m		m	m		m	m		m	m		m
Germany	0.93		(0.02)	0.96		(0.01)	0.98		(0.00)	0.99		(0.01)	c		c
Ireland	0.89		(0.02)	0.94		(0.01)	0.96		(0.01)	0.98		(0.01)	0.99		(0.01)
Italy	0.90		(0.02)	0.94		(0.01)	0.96	*	(0.01)	0.98		(0.01)	0.99		(0.01)
Japan	m		m	m		m	m		m	m		m	m		m
Korea	0.94		(0.03)	0.97	*	(0.01)	0.99	*	(0.00)	0.99	*	(0.00)	0.99		(0.01)
Netherlands	c		c	0.95		(0.01)	0.97		(0.01)	0.98		(0.01)	c		c
Norway	c		c	0.91		(0.02)	0.95	*	(0.01)	0.97		(0.01)	1.00		(0.00)
Poland	0.94	*	(0.01)	0.98	*	(0.01)	0.98	*	(0.00)	0.99	*	(0.00)	1.00		(0.00)
Slovak Republic	0.92		(0.01)	0.98	*	(0.01)	0.99	*	(0.00)	0.99	*	(0.00)	0.99		(0.01)
Spain	0.91		(0.01)	0.96		(0.01)	0.98	*	(0.00)	0.99		(0.01)	0.99		(0.01)
Sweden	c		c	0.95		(0.01)	0.98		(0.01)	0.99	*	(0.00)	c		c
United States	0.77	*	(0.04)	0.89	*	(0.02)	0.95		(0.01)	0.98	*	(0.01)	c		c
Sub-national entities															
Flanders (Belgium)	0.88		(0.02)	0.96		(0.01)	0.98		(0.01)	0.98		(0.01)	c		c
England (UK)	0.88		(0.03)	0.95		(0.01)	0.98		(0.01)	0.98		(0.01)	0.99		(0.02)
Northern Ireland (UK)	0.86		(0.08)	0.92		(0.03)	0.98		(0.01)	0.99		(0.01)	1.00		(0.01)
England/N. Ireland (UK)	0.88		(0.03)	0.95		(0.01)	0.98		(0.00)	0.98		(0.01)	0.99		(0.02)
OECD average	0.90		(0.01)	0.95		(0.00)	0.97		(0.00)	0.98		(0.00)	0.99		(0.00)
Partners															
Cyprus[1]	0.94	*	(0.02)	0.97		(0.01)	0.99	*	(0.00)	1.00	*	(0.00)	1.00	*	(0.00)
Russian Federation[2]	m		m	m		m	m		m	m		m	m		m

* Estimates significantly different from the OECD average.

1. See note 1 on page 20.
2. See note 2 on page 20.

Source: Survey of Adult Skills (PIAAC) (2012).

The Sentence Processing task set includes sentences that range from 3 to 26 words in length. Thus, it is not surprising that even highly proficient adults may make some errors on the longest, most difficult sentences. In general, this task set was more challenging for adults below Level 1, with an international average of 73% correct. Given that there is a 50% chance for correctly guessing the answer to each item (and assuming adults did attempt every item in a task set), we can make inferences about the difficulty of the types of sentences that adults were likely to answer correctly. For example, an average of 73% (i.e. providing correct answer for around 16 items out of the 22 items) suggests that adults were able to reliably understand about the first 10-11 of the 22 sentence items, while scoring at chance levels on the remainder (i.e. randomly guessing correct answers in case of 5-6 items out of the remaining 11 items). These first sentences were up to 8-12 words, with a simple structure of subject, verb, object, prepositional phrase, and perhaps a relative clause. Applying the same logic, an average of 85% correct (i.e. around 19 correct answers out of the 22 items) suggests that the Level 1 group could consistently understand about the first 14-15 of the 22 sentence items, scoring at chance levels on the remainder (thus, randomly guessing correct answers for 4-5 items of the remaining 8-9 items). The sentences in this range spanned from 14-18 words with complex sentence structures including multiple clauses. To answer correctly often required that the individual resolve logical relations among those clauses (e.g. time sequence, cause-effect, magnitude).

The passage task set included four passages that ranged in length from 159 to 278 words across two to three paragraphs. The international average for Passage Comprehension at below Level 1 is lower than in Sentence Processing, however, by Level 1, the percentage correct for Passages is about the same as for Sentences, and then at higher proficiency levels the averages for Passages even exceed those of Sentences. This reflects the design of the sentence processing versus passage comprehension task sets. Most of the items in each of the four passages are of relatively similar difficulty, in contrast to the sentence task set in which the sentence items get progressively more complex and difficult. Thus, one might interpret the relatively lower performance of the below Level 1 group as reflecting the relative challenge of reading multi-paragraph, continuous prose texts, while maintaining one's attention and persistence. At Level 1, adults are able to maintain their comprehension across about a 1 000 words (four separate passages) of continuous text with adequate accuracy – which is consistent with the description of proficiency at Level 1.

Table 4.5. Percentage correct on Sentence Processing task by Proficiency Level by Country

	Below Level 1			Level 1			Level 2			Level 3			Level 4/5		
	%		S.E.	%		S.E.	%		S.E.	%		S.E.	%		S.E.
OECD															
National entities															
Australia	0.70		(0.05)	0.87		(0.02)	0.94		(0.01)	0.97		(0.00)	0.97		(0.01)
Austria	0.65		(0.06)	0.84		(0.02)	0.93		(0.01)	0.97		(0.01)	0.98		(0.01)
Canada	0.66	*	(0.02)	0.82	*	(0.02)	0.91	*	(0.01)	0.96		(0.01)	0.98		(0.01)
Czech Republic	0.85		(0.10)	0.90		(0.03)	0.95	*	(0.01)	0.97		(0.00)	0.96		(0.02)
Denmark	0.74		(0.05)	0.85		(0.02)	0.92		(0.01)	0.95		(0.01)	c		c
Estonia	0.80		(0.03)	0.91	*	(0.01)	0.94	*	(0.00)	0.96		(0.00)	0.98		(0.00)
Finland	m		m	m		m	m		m	m		m	m		m
France	m		m	m		m	m		m	m		m	m		m
Germany	0.72		(0.05)	0.85		(0.02)	0.93		(0.01)	0.97		(0.01)	c		c
Ireland	0.71		(0.03)	0.85		(0.02)	0.92		(0.01)	0.95		(0.01)	0.97		(0.01)
Italy	0.79		(0.03)	0.89	*	(0.01)	0.94		(0.01)	0.96		(0.01)	0.97		(0.02)
Japan	m		m	m		m	m		m	m		m	m		m
Korea	0.82	*	(0.02)	0.87		(0.01)	0.94		(0.00)	0.97		(0.00)	0.98		(0.01)
Netherlands	c		c	0.86		(0.02)	0.93		(0.01)	0.96		(0.01)	c		c
Norway	c		c	0.82		(0.03)	0.90	*	(0.02)	0.94	*	(0.01)	0.97		(0.02)
Poland	0.84	*	(0.02)	0.90	*	(0.01)	0.94	*	(0.00)	0.97		(0.00)	0.98		(0.01)
Slovak Republic	0.77		(0.02)	0.89	*	(0.01)	0.94	*	(0.00)	0.97		(0.00)	0.98		(0.01)
Spain	0.80	*	(0.02)	0.89	*	(0.01)	0.94	*	(0.00)	0.96		(0.01)	0.98		(0.01)
Sweden	c		c	0.84		(0.03)	0.92		(0.02)	0.97		(0.01)	c		c
United States	0.52	*	(0.04)	0.72	*	(0.03)	0.87	*	(0.02)	0.95		(0.01)	c		c
Sub-national entities															
Flanders (Belgium)	0.67		(0.03)	0.87		(0.01)	0.93		(0.01)	0.96		(0.01)	c		c
England (UK)	0.69		(0.05)	0.81		(0.02)	0.92		(0.01)	0.95		(0.01)	0.97		(0.01)
Northern Ireland (UK)	0.67		(0.10)	0.82		(0.04)	0.93		(0.01)	0.96		(0.01)	0.97		(0.02)
England/N. Ireland (UK)	0.69		(0.05)	0.81		(0.02)	0.92		(0.01)	0.95		(0.01)	0.97		(0.01)
OECD average	0.73		(0.01)	0.85		(0.00)	0.93		(0.00)	0.96		(0.00)	0.97		(0.00)
Partners															
Cyprus[1]	0.76		(0.04)	0.84		(0.02)	0.92		(0.01)	0.94	*	(0.00)	0.95	*	(0.01)
Russian Federation[2]	m		m	m		m	m		m	m		m	m		m

* Estimates significantly different from the OECD average.

1. See note 1 on page 20.
2. See note 2 on page 20.

Source: Survey of Adult Skills (PIAAC) (2012).

Table 4.6. Percentage correct on Passage Comprehension task by Proficiency Level by Country

	Below Level 1			Level 1			Level 2			Level 3			Level 4/5		
	%		S.E.	%		S.E.	%		S.E.	%		S.E.	%		S.E.
OECD															
National entities															
Australia	0.71		(0.06)	0.90	*	(0.02)	0.96	*	(0.01)	0.99	*	(0.00)	1.00	*	(0.00)
Austria	0.61		(0.07)	0.84		(0.02)	0.94		(0.01)	0.97		(0.01)	0.99		(0.01)
Canada	0.59	*	(0.04)	0.81		(0.03)	0.92		(0.01)	0.97		(0.01)	0.99		(0.01)
Czech Republic	0.83		(0.11)	0.89		(0.04)	0.97	*	(0.01)	0.98		(0.01)	0.98		(0.02)
Denmark	0.69		(0.06)	0.85		(0.03)	0.92		(0.02)	0.96		(0.02)	c		c
Estonia	0.74		(0.05)	0.89	*	(0.02)	0.95		(0.01)	0.98		(0.00)	0.99		(0.01)
Finland	m		m	m		m	m		m	m		m	m		m
France	m		m	m		m	m		m	m		m	m		m
Germany	0.70		(0.07)	0.85		(0.03)	0.93		(0.02)	0.98		(0.01)	c		c
Ireland	0.63		(0.05)	0.85		(0.02)	0.94		(0.01)	0.97		(0.01)	0.99		(0.01)
Italy	0.64		(0.05)	0.79		(0.02)	0.90	*	(0.01)	0.96		(0.01)	0.99		(0.02)
Japan	m		m	m		m	m		m	m		m	m		m
Korea	0.73		(0.04)	0.83		(0.02)	0.95		(0.01)	0.98		(0.00)	0.99	*	(0.00)
Netherlands	c		c	0.82		(0.04)	0.95		(0.02)	0.98		(0.01)	c		c
Norway	c		c	0.79		(0.04)	0.92		(0.02)	0.98		(0.01)	0.99		(0.02)
Poland	0.77	*	(0.03)	0.89	*	(0.01)	0.94		(0.01)	0.98		(0.01)	0.99		(0.01)
Slovak Republic	0.68		(0.05)	0.84		(0.02)	0.94		(0.01)	0.96	*	(0.00)	0.96	*	(0.01)
Spain	0.71		(0.02)	0.85		(0.02)	0.95		(0.01)	0.97		(0.01)	0.98		(0.03)
Sweden	c		c	0.84		(0.04)	0.95		(0.02)	0.98		(0.01)	c		c
United States	0.47	*	(0.06)	0.73	*	(0.04)	0.90		(0.02)	0.98		(0.01)	c		c
Sub-national entities															
Flanders (Belgium)	0.65		(0.04)	0.89	*	(0.02)	0.96	*	(0.01)	0.98		(0.01)	c		c
England (UK)	0.69		(0.05)	0.82		(0.03)	0.95		(0.01)	0.98		(0.01)	0.98		(0.02)
Northern Ireland (UK)	m		m	m		m	m		m	m		m	m		m
England/N. Ireland (UK)	0.69		(0.05)	0.82		(0.03)	0.95		(0.01)	0.98		(0.01)	0.98		(0.02)
OECD average	0.68		(0.01)	0.84		(0.01)	0.94		(0.00)	0.97		(0.00)	0.99		(0.00)
Partners															
Cyprus[1]	0.69		(0.07)	0.83		(0.03)	0.94		(0.01)	0.98		(0.00)	0.99		(0.00)
Russian Federation[2]	m		m	m		m	m		m	m		m	m		m

* Estimates significantly different from the OECD average.

1. See note 1 on page 20.
2. See note 2 on page 20.

Source: Survey of Adult Skills (PIAAC) (2012).

Table 4.7 summarizes the international average of percentage correct by proficiency level for each of the reading component task sets. To simplify the data representations, we have only included below Level 1 to Level 3. As one can see, at Level 3 and above, most countries are at or near ceiling level performance on all component task sets. This table more clearly shows that most adults below Level 1 have some print vocabulary knowledge, are challenged somewhat at the sentence level, and even more strongly so when reading passages for basic meaning. However, for adults at Level 1, passage performance is at about the same level as sentence performance, with an average of 84-85% correct.

Table 4.7. International mean percentage correct on each reading component task set

Component	Below	Level 1	Level 2	Level 3
Print Vocabulary	0.90	0.95	0.97	0.98
Sentences Processing	0.73	0.85	0.93	0.96
Passage Comprehension	0.68	0.84	0.94	0.97

Source: Survey of Adult Skills (PIAAC) (2012).

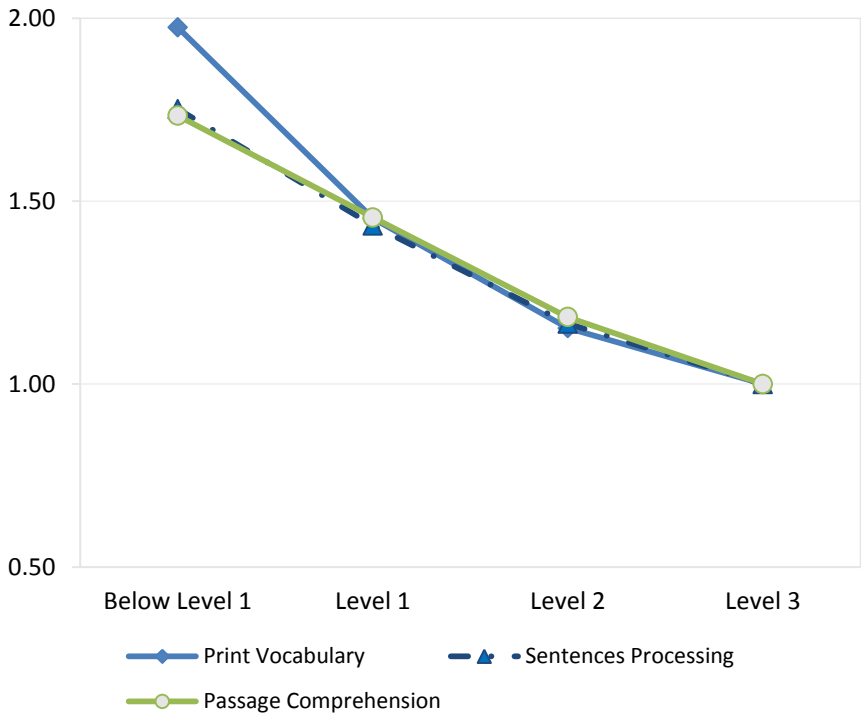
Table 4.8 shows the average time in minutes for completing the RC task sets (top), as well as the ratio of time for each of the levels, using Level 3 as a baseline (bottom). The pattern shows that as proficiency level increases, the time to complete the task set decreases. That is, proficiency in reading components is related to efficiency of processing. The ratio information shows that adults below Level 1 take about 1.73 to 1.97 more time to complete each component task set in comparison to Level 3 adults. The ratio of adults at Level 1 to Level 3 is about a 1.43-1.46 more time on average to complete each task set. The line chart shows the decrease in time across proficiency levels.

Table 4.8. Reading component means for time to complete task sets (minutes) and ratio to Level 3 mean as baseline

Component	Below	Level 1	Level 2	Level 3
Vocabulary	3.93	2.89	2.29	1.99
Sentences	4.16	3.41	2.77	2.38
Passage	8.92	7.49	6.09	5.15
Ratio to Level 3	**Below**	**Level 1**	**Level 2**	**Level 3**
Vocabulary	1.97	1.45	1.15	1.00
Sentences	1.75	1.43	1.17	1.00
Passage	1.73	1.46	1.18	1.00

Source: Survey of Adult Skills (PIAAC) (2012).

Figure 4.2. Ratio of reading component mean time to complete task sets against Level 3 mean as baseline



Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

Table 4.9 presents the descriptions of respondents capacities and limitations in regards to each of the three reading component tasks. It is based on the results presented in Tables 4.7 and 4.8. Given that there is only minimal difference between scores in reading components between Levels 2, 3 and above, it shows common description for all levels above the Level 1.

Table 4.9. What adults at different proficiency levels can do on each reading component task set

	Below Level 1	Level 1	Above Level 1
Vocabulary knowledge	The great majority of respondents can recognise and pick out the printed spelling of highly familiar, concrete nouns (e.g. bird, circle, chair).	Almost all respondents can recognise and pick out the printed spelling of highly familiar, concrete nouns (e.g. bird, circle, chair).	Almost all respondents can recognise and pick out the printed spelling of highly familiar, concrete nouns (e.g. bird, circle, chair).
Sentence processing	On average, respondents were able to understand sentences up to 8-12 words, with a simple structure of subject, verb, object, prepositional phrase, and perhaps a relative clause.	On average, respondents were able to understand sentences up to 14-18 words, with complex sentence structures including multiple clauses. In most cases they were able to resolve logical relations among those clauses (e.g. time sequence, cause-effect, magnitude).	On average, respondents were able to understand almost all sentences, including those with more than 20 words in length. They were capable in dealing with complex sentence structures including multiple clauses. In almost all cases they were able to resolve logical relations among those clauses (e.g. time sequence, cause-effect, magnitude).
Passage fluency	In most cases respondents have difficulties in reading multi-paragraph, continuous prose texts, while maintaining their attention and resolve.	In most cases respondents were able to achieve basic reading comprehension across four multi-paragraph passages (ranging from 159-278 words in length). However, they still made routine errors across the passages, suggesting some residual difficulty in maintaining basic comprehension, attention and resolve when reading prose texts.	Almost all respondents are able to integrate decoding, word recognition, vocabulary, and sentence processing and maintain their attention across the entire four sets of passages, demonstrating basic reading fluency and comprehension.
Reading rate	In most cases respondents have difficulties in maintaining an adequate reading rate, spending nearly double the time of fluent readers, while making many more errors.	In most cases respondents were able to maintain an adequate reading rate while achieving adequate performance levels, however their rates averaged 20-25% slower than fluent readers.	In most cases respondents were able to maintain a strong reading rate while achieving high performance levels, demonstrating strong reading fluency, as well as comprehension.

4.4. Performance by background variables

In this section, we review how reading component performance differs when the native language of the individual was different than the test language, by educational attainment level, and by computer experience. We will examine both accuracy and rate variables, to determine whether these provide additional information about subgroups. But before going into more detailed analyses, in Table 4.10 we present proportions of adults with different background characteristics that took the paper based assessment across different categories of the three background variables. These results indicate that people born outside the residence country took the PBA more often (35%) than adults who were born in the country of residence (23%). Also, adults with lower than upper secondary attainment were about 4 times more likely to take the paper based assessment compared to those with tertiary qualifications (42% compared to 11%). Finally, apart from all those with no computer experience, the paper based assessment was also taken by 17% of those with computer experience.

Table 4.10. Percent of adults (16-65) with different background characteristics who took the paper based assessment

Background variables	Categories	Percent who took PBA out of those with given characteristic
Born in residence country	Yes	23%
	No	35%
Education levels	Lower than upper secondary degree	42%
	Upper secondary degree	24%
	Tertiary degree	11%
Computer experience	Yes	17%
	No	100%

Source: Survey of Adult Skills (PIAAC) (2012).

4.4.1. Native vs. Non-native Speaker of the Test Language

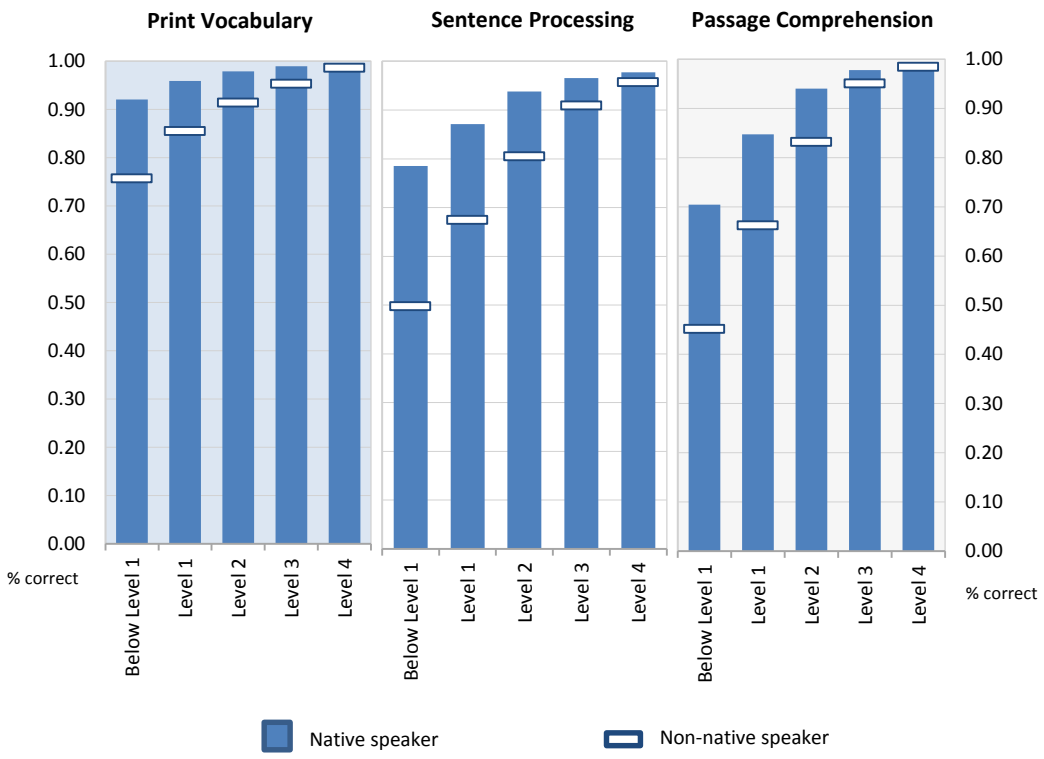
Table 4.11 and Figure 4.3 show how component performance differs between native and non-native speakers of the test language internationally. These analyses indicate that there is typically a significant difference in performance in below Level 1 readers based on whether they are native versus non-native speakers of the test language. This makes intuitive sense and is consistent with the broader trends in the literacy survey. Note, however, that the gap begins to lessen as early as Level 1 for Sentence processing and by Level 2 for Passage Comprehension. This may suggest that as non-native speakers develop their language and literacy skills, they can process smaller chunks of language (i.e., sentences) better than continuous prose discourse (i.e., passages). The small, persistent difference in vocabulary percentage correct across the literacy levels may also represent the way that language skills develop in non-native speaking groups, such that there is a small set of the vocabulary task set that, despite being highly familiar and easy for a native speaker, remains challenging for non-native speakers even at Level 1 or 2. Native speakers of the test language do not show as much of a disparity.

Table 4.11. International native vs. non-native group mean differences on reading components by proficiency level

Reading Component	Native - Speaker	Below	Level 1	Level 2	Level 3	Level 4
Print Vocabulary	Non-native	0.76	0.85	0.91	0.95	0.99
	Native	0.92	0.96	0.98	0.99	0.99
Sentence	Non-native	0.50	0.67	0.80	0.91	0.96
	Native	0.79	0.87	0.94	0.97	0.98
Passage	Non-native	0.45	0.66	0.83	0.95	0.98
	Native	0.70	0.85	0.94	0.98	0.99

Source: Survey of Adult Skills (PIAAC) (2012).

Figure 4.3. International native vs. non-native speaker percentage correct differences on reading components by proficiency level



Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

With respect to time to complete (Table 4.12, Figure 4.4), we see that non-native speakers of the test language generally take more time to complete tasks than native speakers. Non-native speakers take 10-30% more time on average to complete tasks even at Level 3 proficiency levels. Non-native speakers tend to read relatively slower than native speakers across the distribution. However, consistent with the accuracy results, there is a pattern of rate increase at each higher proficiency level, with native and non-native speakers showing similar rates of increase. For the below Level 1 adults, the ratio of the rate to

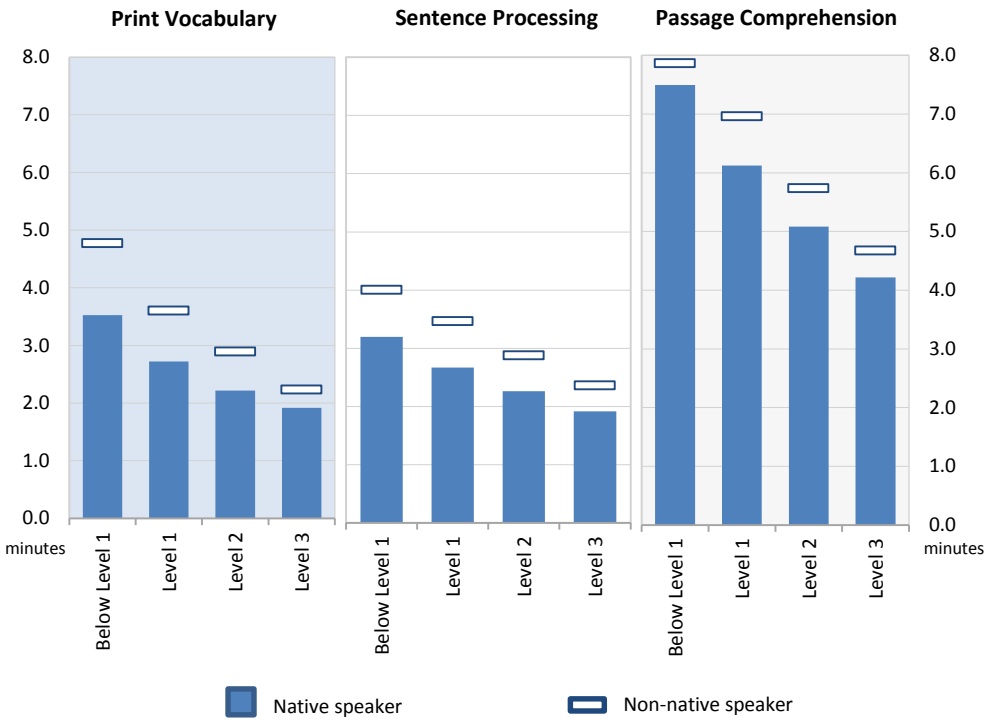
Level 3 native speakers is about two to one, while for native speakers this same ratio comparison ranges from 1.69 to 1.85.

Table 4.12. International native vs. non-native group mean time to complete task sets (minutes) by reading components by proficiency level (right) and ratio of time to complete in relation to Level 3 (left)

	Time to complete task sets (minutes)					Ratio of time to complete to Level 3 Native speaker			
Vocabulary	**Below**	**L1**	**L2**	**L3**		**Below**	**L1**	**L2**	**L3**
PV - Non-native	4.8	3.6	2.9	2.2		2.53	1.89	1.53	1.16
PV - Native	3.5	2.7	2.2	1.9		1.84	1.42	1.16	1.00
Ratio: Non-native to native	1.37	1.33	1.31	1.15					
Sentence	**Below**	**L1**	**L2**	**L3**		**Below**	**L1**	**L2**	**L3**
SP - Non-native	4.0	3.5	2.9	2.4		2.11	1.84	1.53	1.26
SP - Native	3.2	2.7	2.3	1.9		1.68	1.42	1.21	1.00
Ratio: Non-native to native	1.25	1.30	1.26	1,26					
Passage	**Below**	**L1**	**L2**	**L3**		**Below**	**L1**	**L2**	**L3**
PC - Non-native	7.9	7.0	5.7	4.7		1.88	1.67	1.36	1.12
PC - Native	7.5	6.1	5.1	4.2		1.79	1.45	1.21	1.00
Ratio: Non-native to native	1.05	1.14	1.12	1,12					

Source: Survey of Adult Skills (PIAAC) (2012).

Figure 4.4. International native vs. non-native group mean time to complete task sets (minutes) by reading components by proficiency level



Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

4.4.2. Education Level

As one might anticipate, there is a relationship between reading components and education levels. There are some individuals with high school and even more than high school levels of education that score at or below Level 1, but in general, their means are not highly different than the group reporting less than high school. The one exception appears to be in Passage Comprehension, where those with less than high school score lower than those with more formal education in their background.

Table 4.13. International education level group mean differences on reading components by proficiency level

Vocabulary	Below	Level 1	Level 2	Level 3
Less than High School	0.84	0.92	0.96	0.98
High School	0.89	0.95	0.98	0.99
More than HS	0.88	0.92	0.97	0.98

Sentence	Below	Level 1	Level 2	Level 3
Less than High School	0.65	0.81	0.91	0.95
High School	0.72	0.84	0.93	0.96
More than HS	0.73	0.81	0.92	0.96

Passage	Below	Level 1	Level 2	Level 3
Less than High School	0.56	0.77	0.90	0.97
High School	0.70	0.85	0.94	0.97
More than HS	0.73	0.84	0.95	0.98

Source: Survey of Adult Skills (PIAAC) (2012).

4.4.3. Computer Experience

Interestingly, the average differences between individuals with and without computer experience on reading components is rather modest (Table 4.14). The one exception appears to be in Passage Comprehension, where there is a relatively larger advantage for those with computer experience for the below Level 1 and Level 1 proficiency groups. By and large, the gap is reduced by Level 2.

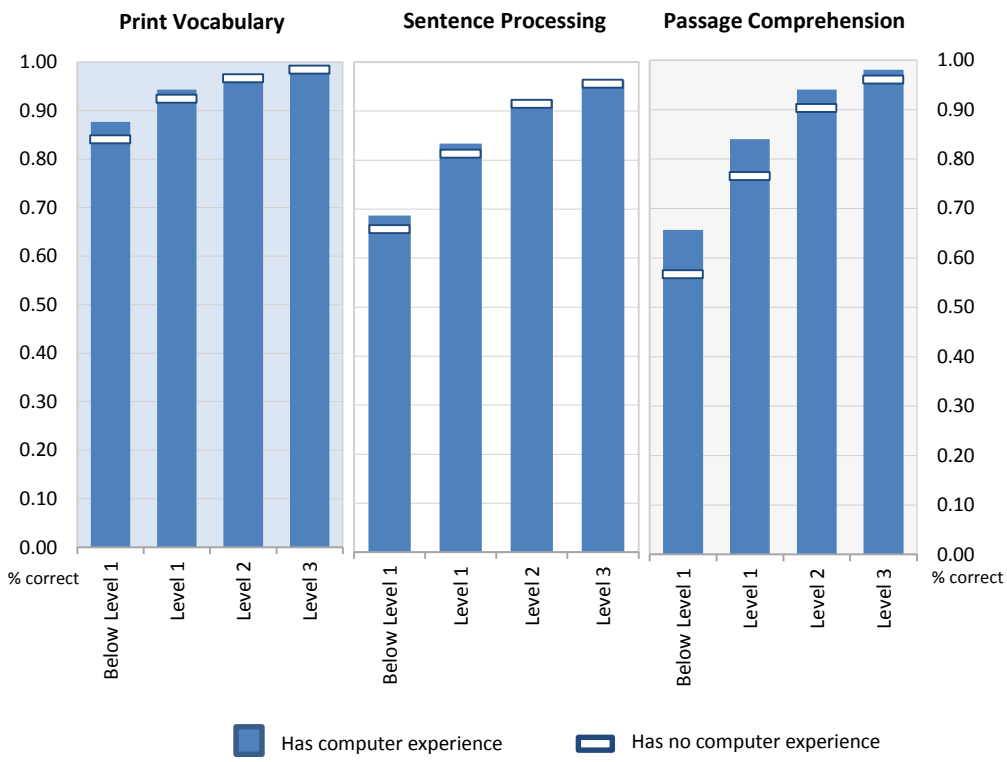
There is, however, a great deal of cross-country variability in the interaction of computer experience with below Level 1 reading components total score (summed across three task sets). In several countries, the difference is actually reversed, with those reporting some computer experience scoring on average lower than those claiming no experience.

Table 4.14. International computer experience group mean differences on reading components by proficiency level

Computer Experience	Below	Level 1	Level 2	Level 3
PV-Yes	0.91	0.95	0.97	0.98
PV- No	0.90	0.95	0.97	0.98
SP - Yes	0.75	0.86	0.93	0.96
SP - No	0.73	0.85	0.92	0.96
PC - Yes	0.72	0.86	0.94	0.98
PC - No	0.64	0.82	0.93	0.97

Source: Survey of Adult Skills (PIAAC) (2012).

Figure 4.5. International computer experience group mean differences on reading components by proficiency level



Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

4.5. Associations between Reading Components and Literacy Proficiency Level

Another way to understand the relation of reading components to overall proficiency is to look at how strongly they are related to literacy proficiency scores in isolation and in combination. The regression models in Table 4.15 are computed using the entire ability distribution of those who took the paper-based assessment pathway, not just adults below Level 1. That is, we included all adults who were administered reading components regardless of predicted literacy proficiency score. Because we know that mean accuracy scores converge around Level 3, we can infer that most of the predictive value of reading components will be in describing scores below this level. This assumption will not necessarily hold for the time to complete task sets, as we observed that there is a decrease in average time across the entire ability distribution.

We use the literacy proficiency scores as dependent variables in these analyses. Table 4.15 shows variance accounted for in literacy proficiency scores by Vocabulary, Sentence, and Passage Comprehension, their combination, and finally with time to complete task sets information included. Print Vocabulary accuracy shows the weakest relation to literacy scores. This most likely reflects the near ceiling performance levels beyond Level 2. Sentence processing and passage comprehension, on the other hand, show modest, but robust relations across the ability ranges. Adding vocabulary and sentence together adds only a little to the variance explained, but adding the passage scores, increases the strength of the relation. Finally, including the timing information makes a large significant contribution to the relation, with an international average of 30% of the variance accounted for by the component skill scores. Note also that there is significant between-country variation in the relation between components and literacy scores.

Table 4.15. Univariate and multiple regression model adjusted R-squared values with literacy proficiency scores as dependent variable and combinations of reading components (RC) as independent variables

Country	PV R^2	SP R^2	PC R^2	PV+SP R^2	PV+SP+PC R^2	PV+SP+PC + Time to complete all tasks R^2
Australia	0.07	0.21	0.15	0.21	0.22	0.37
Austria	0.05	0.18	0.13	0.18	0.19	0.32
Canada	0.06	0.19	0.16	0.20	0.22	0.36
Cyprus[1]	0.04	0.11	0.13	0.11	0.15	0.27
Czech Republic	0.01	0.06	0.05	0.06	0.09	0.22
Denmark	0.01	0.08	0.08	0.09	0.11	0.27
England (UK)	0.07	0.18	0.14	0.18	0.20	0.33
England/N. Ireland (UK)	0.07	0.18	0.14	0.18	0.20	0.33
Estonia	0.01	0.09	0.06	0.09	0.11	0.24
Flanders (Belgium)	0.06	0.21	0.18	0.21	0.24	0.35
Germany	0.03	0.17	0.11	0.18	0.18	0.32
Ireland	0.03	0.12	0.12	0.13	0.15	0.22
Italy	0.03	0.09	0.11	0.09	0.13	0.23
Korea	0.02	0.15	0.15	0.16	0.20	0.35
Netherlands	0.02	0.13	0.14	0.13	0.18	0.30
Northern Ireland (UK)	0.06	0.15	0.12	0.16	0.17	0.18
Norway	0.07	0.12	0.13	0.12	0.15	0.27
Poland	0.03	0.09	0.08	0.09	0.11	0.25
Slovak Republic	0.03	0.14	0.15	0.14	0.18	0.29
Spain	0.05	0.11	0.13	0.12	0.15	0.26
Sweden	0.10	0.17	0.16	0.17	0.21	0.35
United States	0.10	0.23	0.23	0.24	0.27	0.42
Average	0.04	0.14	0.13	0.15	0.17	0.30

Notes:
1. See note 1 on page 20.

Source: Survey of Adult Skills (PIAAC) (2012).

The relations found here with literacy values across the ability distribution are consistent with the theoretical literature and the view that reading components are foundational skills to higher levels of proficiency. Further, the relatively robust association between rate and ability over and above accuracy is consistent with views that as literacy proficiency improves, the fluency or automaticity of underlying foundation skills increases as well, and also that this efficiency is associated with literacy proficiency across the entire ability distribution.

4.6. Summary

In this chapter, we reviewed how reading components are related to performance, focusing on below and at Level 1 proficiency. We described the rationale and theoretical foundations for including reading

components in the PIAAC survey to better understand the reading skills of adults at or below Level 1. We described each component measure type – print vocabulary, sentence processing, and passage comprehension. We reviewed how the PIAAC design routed adults to the paper-based assessment which included the reading components task sets, and how this design limits the sample sizes available to make inferences. We then presented results of benchmark analyses showing how average performance changes with proficiency level for each of the components. Key results included the following:

- **General**: There is significant variation across countries in the percentage of adults at or below Level 1 Literacy, with a range from 15% to 3% of those who took the paper-based instrument. In most cases, Level 2 adults are near ceiling level on reading components, while Level 1 adults are generally performing with relatively high accuracy (85% correct or higher) across reading component tasks.

- **Print Vocabulary**: The international average for percent correct for below Level 1 Print Vocabulary was 90% (as compared to above 95% for adults at Level 1 and 97% at Level 2). This suggests that even very low skill adults can recognise printed forms of words associated with common objects such as animals, furniture, and shapes. *While there remains significant variation among countries, even in low performing countries, the average Print Vocabulary for Below Level 1 remains well above chance performance.*

- **Sentence Processing**: The international average for percent correct for below Level 1 Sentence Processing was 74% (as compared to above 85% for adults at Level 1 and 93% at Level 2). With chance performance at about 50%, this indicates that many below Level 1 adults can understand short sentences and evaluate whether they are factually sensible. *However, below Level 1 adults have significant difficulty with processing complex sentences. There remains some variation in performance among Level 1 adults, though by Level 2 performance is near ceiling levels*.

- **Passage Comprehension**: The international average for percentage correct for Passage Comprehension was 63% (as compared to 85% for adults at Level 1 and 94% at Level 2). With chance performance at about 50%, this indicates that while many below Level 1 adults can recognise some printed words and understand short sentences, they have considerably more difficulty reading passages for basic meaning. In general, the performance difference between below Level 1 and Level 1 adults is larger than the difference between Level 1 and Level 2.

- **Reading Components Rate**: Differences in accuracy of performance are all mirrored in speed or rate for completing task sets across the entire ability distribution. This suggests that fluency or automaticity of component skill processing is part of the underlying foundation of literacy for most adults. That is, below Level 1 adults need more time to achieve their levels of performance than Level 1 adults, who themselves need more time than Level 2 adults, and so on across Levels 3, 4, and 5.

- **Native vs. Non-native Speakers of the Test Language**: A significant proportion of the gap between at or below Level 1 groups in some countries is attributable to a sizeable subpopulation of non-native speakers of the test language. Thus, their language skills may be negatively impacting their performance on reading components tasks. This varies considerably across different country contexts.

- **Level of Education**: As one might expect, individuals reporting less than a high school education scored on average lower than those reporting a high school or more education. This trend persisted for passage comprehension only for the Level 1 group and had disappeared by Level 2.

- **Computer Experience**: In general, below Level 1 adults who had never used a computer scored slightly lower than those who answered that they had, though there were a few country level exceptions to this pattern. The pattern was much more mixed for Level 1 adults across countries, and disappears at Level 2.

- **Predicting literacy scores with reading components**: Multiple regression models demonstrated the theoretically predicted relationship between reading component accuracy and rate with literacy scores. The model for the international average showed a small amount of variance (4%) predicted by picture vocabulary alone, more with sentence processing (13%) or passage comprehension (14%) alone, and 17% when all three were used together. Adding the time to complete information resulted in a stronger relationship (30%) across the entire ability distribution, confirming the association of efficient (accuracy plus rate) text processing as skill levels increase.

4.7. Implications for future research and policy

The wide variability within and across countries on the three reading component task sets is counter evidence to the assumption that all below Level 1 adults lack any reading skills, and is counter to the assumption that all are homogeneous with regard to reading skill profiles. Therefore, more attention should be given to assessments of foundational reading component skills in adults at or below Level 1, to better understand and align policies, as well as instructional and training programs to the strengths and weaknesses adults have in reading printed text.

Even among those scoring below Level 1, most adults have some working knowledge of the writing system and a basic reading vocabulary. In designing policies and programs, it will be important to plan for variation in the level of initial skill and therefore the nature of instructional support required.

Adults at or below Level 1 can typically make evaluative judgments about the plausibility or truth of simple statements. The evidence does not support a simple word calling (i.e., being able to recognise words, but not comprehend meaning) profile. Comprehension develops simultaneously with learning to decode written text, and therefore should be fostered as adults learn to read.

Adults at Level 1 are relatively stronger in passage level performance in comparison to adults below Level 1. Practice and engagement in continuous text reading, as soon as is instructionally feasible, seems warranted, with improved performance on simple passage reading tasks serving as an early indicator/milestone of learning progress.

The strong, consistent association between increases in accuracy and decreases in processing speed across the entire ability distribution implies that instructional or training programs should strongly encourage extended practice and engagement with text to enhance the ease, speed, and efficiency that adults process written text. This implication is consistent with (and therefore supported by) a large body of cognitive psychological and learning science research on building fluency, automaticity, and expertise in a domain.

The relatively slower speeds per unit of accuracy performance of non-native speakers of the test language implies the following. First, more attention should be given to assessing (oral) language skill levels of adults in which the target language is not their native language. One cannot assume that the instructional or training programs, nor developmental trajectory, for adults learning to read, write, speak, and listen in the target language will be the same as for those in which it is their primary language.

Computer usage is modestly related to component performance for the 27% of the entire PIAAC sample that followed the paper-based pathway. In addition, of the 73% who passed a basic computer navigation screening core, only .6% failed the basic literacy/numeracy core. Given that so much personal, workplace, and commercial reading literacy takes place on or is migrating to electronic devices (e.g. smartphones, tablets, personal computers, etc.), providing access to and training with and on digital devices seems a sensible policy position.

Though not directly addressed in PIAAC, research on individuals with learning, mental, or physical disabilities should be considered when interpreting the results here, as it is likely that the scores of some segment of the sampled individuals may have been impacted by pre-existing learning, mental, or physical conditions, with consequence for the instruction or policies that will be effective in helping them to enhance their reading abilities.

4.8. Conclusions

In conclusion, reading components provide a more detailed profile of the foundational reading skills adults possess when attempting to complete literacy tasks. The generally competent performance of so many adults below Level 1 is cause for some optimism. The results reported in this chapter suggest that assumptions of their 'Illiteracy' are overstated. Further research employing reading component assessments can help uncover how best to identify in any country context the specific subgroups of individuals at or below Level 1 and how best to target literacy services for them (e.g. Jeantheau, 2006). Understanding the relationships among components and general literacy proficiency can be helpful in creating policies and planning instructional programs for adults seeking to enhance their literacy abilities.

Note

[7] Canada is a mix of adults who were administered tests either in English or in French. In Belgium, the test was only administered in Dutch.

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CHAPTER 5: PARTICIPATION IN THE ADULT EDUCATION AND TRAINING

5.1. Introduction

Adult education and training provides opportunities to (further) develop or maintain cognitive skills needed both at work and in everyday life. Empirical evidence indicates that adult learning is associated with employability and a reduced risk of unemployment. It is also positively related with an active approach to searching for work and re-employment after job loss (OECD, 2004). Moreover, these relationships are stronger in case of adults with lower levels of education. Knowledge about the demand for education and training among adults with poor literacy and numeracy skills is relevant for policy makers and practitioners who want to plan provision in the light of the needs and options of these subpopulations. Following the publication of the results of large scale assessments of adults in several countries (e.g. IALS,[8] ALL,[9] LEO[10] and IVQ[11]), policy makers realized that the share of the population with poor literacy and numeracy proficiencies was much higher than had been previously thought. Several countries launched programmes or strategies to improve literacy and numeracy skill levels among adults. Germany launched the WeGebAU programme in 2006, providing educational support to improve the employability of workers without vocational qualifications, those with low proficiencies and older workers. In 2013, Germany initiated a new initiative, the so-called 'late-starter' programme to support young adults in making up for a professional qualification.[12] In 2015, the German government launched a National Literacy Decade. The Swedish Adult Education Initiative and Norwegian BKI programme also aimed at strengthening the basic skills of adults in reading, writing, numeracy, foreign languages, etc. However, there is ongoing concern that those who have been left behind in initial schooling and vocational education tend to be less involved in adult education as well. In 2011 the European Adult Education Survey (AES)[13] found that, in the 27 EU countries 40.3% of adults (25-65 years of age) participated in some form of education and training in the preceding 12 months. The Labour Force Survey (LFS) found that participation in some form of adult learning in European countries during the four weeks preceding the date of survey (as opposed to 12 months in the case of the AES) was much smaller – 10.7%. Recognizing the importance of lifelong learning, the European Union set, as one of its strategic objectives, that at least 15% of the adult population should participate in lifelong learning activities by 2020 (Council of the European Union, 2009). Some countries[14] established more ambitious targets to increase participation rates of both the general adult population and adults with low literacy or numeracy proficiencies in formal and non-formal adult education and training.

Adults performing at Level 1 or below in literacy and numeracy represent 15.5% and 19% respectively of the adult population in the countries participating in the first round of the Survey of Adult Skills (PIAAC). Roughly a third of adults with poor literacy participate in adult education, a level that can be seen as inadequate. Surveys such as AES, LFS and the Continuing Vocational Training Study (CVTS) regularly point to differences in participation rates according to certain socio-demographic characteristics (i.e. age, gender, migration, formal education, employment, family status, income). According to the latest LFS data, for example, only 4.4% of low-qualified adults (ISCED 0-2) participated in AET during the four preceding weeks, compared to 10.7% of the general population (Eurostat - EU LFS, 2014). As seen in Chapter 2, these findings are confirmed by the Survey of Adult Skills. The added interest of the data from PIAAC, beyond the coverage of non-European countries, lies in the fact that it permits exploration of the relationship between access to on-going education and training and the level of adults' proficiency in the key information processing skills of literacy and numeracy.

Using the data from PIAAC, in this chapter we will explore the participation of adults with low literacy in adult education and training.

PIAAC data will help answer following questions:

- What are participation rates of adults with low proficiency in adult education and training, and how do these compare with high skilled adults?
- What type of education and training provision (formal or non-formal) attracts more adults with low literacy and numeracy?
- In what kind of education and training formats (e.g. workshops, private lessons or e-learning) adults with low proficiency are mostly involved?
- To which degree these adults are involved of informal learning at work, and what are characteristics of their involvement?
- How much training is demanded by the adults with low proficiencies?
- What are the main reasons for participation and non-participation?
- How can more adults with low literacy or numeracy proficiencies participate in adult education?

It is important to note that the analysis in this chapter concentrates on the 25 to 65 year-old population since *Adult education and training* (AET) is usually and pragmatically defined as participation in learning activities that occurs from the age of 25 onwards (Rubenson, 2011). This operational definition largely avoids mixing initial formal education with later adult education and training programmes and is applied in a number of surveys on related topics, such as LFS, AES, IALS, etc. (e.g. see Eurostat, 2007: 2013).[15] The classification of learning activities into formal, non-formal and informal is in accordance with international practice with following definitions of these concepts:

- **Formal Education and Training** covers structured learning activities that led to the award of a recognised educational qualification. Formal education and training is provided in the system of schools, colleges, universities and other formal educational institutions that normally constitutes a continuous "ladder" of full-time education starting in childhood and continuing into adulthood.
- **Non-formal education** covers any organised and sustained educational activities that do not lead to the award of formally recognized educational qualifications. Non-formal education may therefore take place both within and outside educational institutions, and cater to persons of all ages. Depending on country contexts, it may cover educational programmes to impart adult literacy, basic education for out of school children, life-skills, work-skills, and general culture.
- **Informal learning** covers intentional learning activities that are less organised and less structured and may include for example learning events (activities) that occur in the family, in the work place, and in the daily life of every person, on a self-directed, family-directed or socially directed basis. In PIAAC, the only information available regarding informal learning available concerns informal learning activities at work.

More information about details of the measurement of education and training in PIAAC can be found in the annex to this chapter.

5.2. Participation in the Adult Education and Training

Participation in AET programmes does not necessary guarantee the achievement of learning outcomes. Nonetheless, participation rates are a reasonable indicator for lifelong learning activities in a country and a long research tradition has shown that participation improves the employability and overall human capital of adults. A brief look at the European Adult Education Survey (AES, 2012) shows that Scandinavian and some western European countries have higher participation rate than eastern European countries, but what is more interesting is the fact that the average rose by 5 percentage points from 2007 to 2012 with especially steep rise in France and the UK. These data show that on average most countries are moving in the right direction,[16] but also indicate that progress still needs to be made. This is especially true in the case of the adults with low proficiency who are, at the same time, the most important and the most elusive target of adult education programmes.

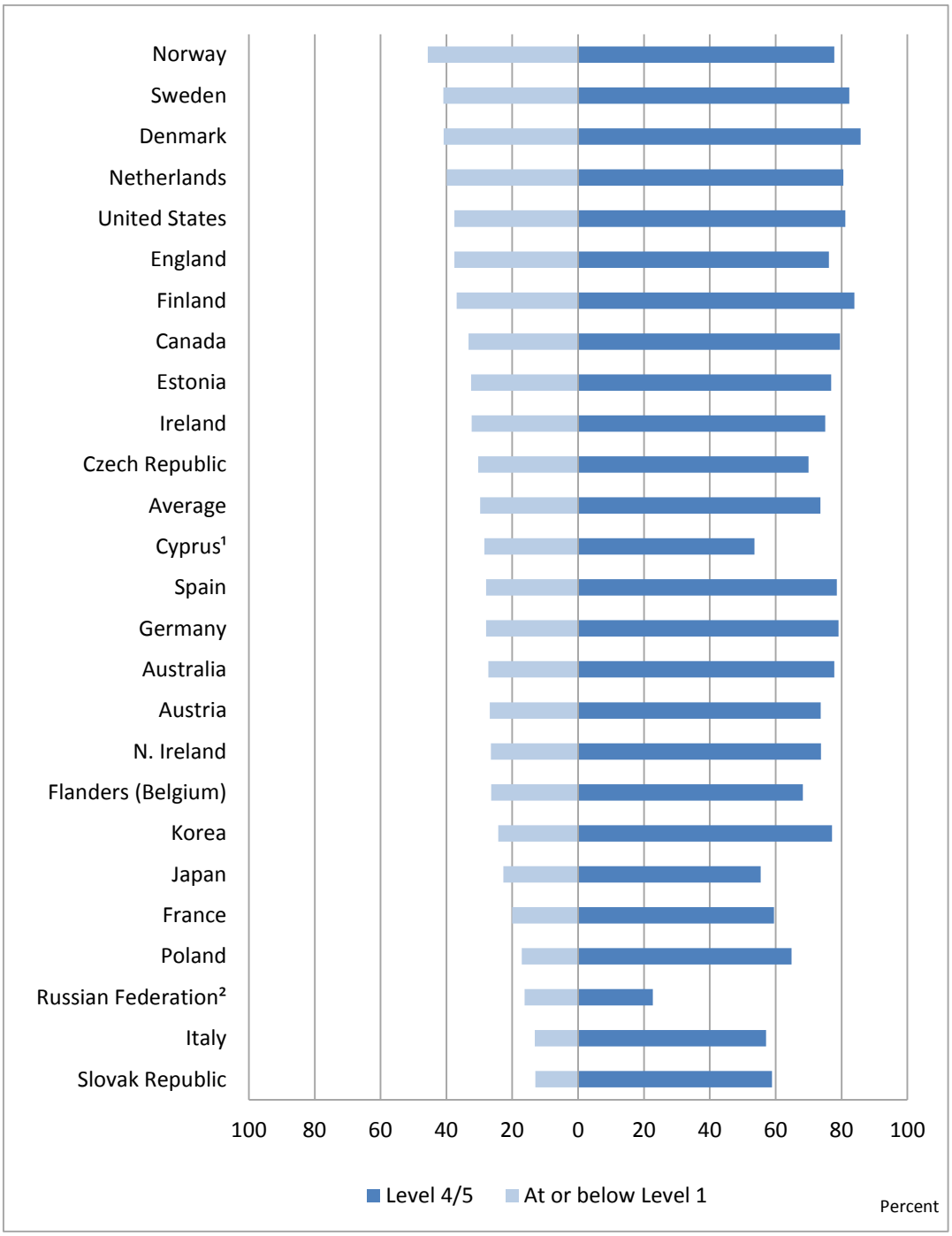
Overall participation rates in formal and non-formal adult education and training differ substantially between countries. In some, around two thirds of the adult population participates in lifelong learning, while in other countries only one quarter is involved in these activities (OECD, 2013: 208). In all countries, it is high skilled adults who participate most in formal and non-formal adult education.

On average among the 22 OECD countries in PIAAC, only 29.7% of adults aged 25-65 at Level 1 and below in literacy have participated in some form of adult education and training in the previous 12 months, while the rate for the general adult population (i.e. all persons aged 25-65) is twice as large (51.3%).The highest rates of participation among the low proficiency group is 46% in Norway, 41% in Sweden and Denmark, and 40% in the Netherlands. The lowest participation rates are found in the Slovak Republic and Italy (13%), the Russian Federation (16%), and Poland (17%) (Figure 5.1).

Adults with low literacy and numeracy are far less involved in adult education than other adults. The large variation between countries in the rates of participation among adults with low literacy – from 7% to 51% – resembles the wide variation of the participation rates of the overall adult population that ranges from 25% to 65%. It could be expected that in those countries where overall participation rates are higher, adults with low proficiency will also be more involved in the lifelong learning and vice versa. Indeed, this trend can be observed in in Figure 5.2 below, which shows a strong correlation ($r=0.84$; $R^2=0.71$) between the participation rates of adults with low proficiency and adults aged 16-65 years (although participation rates for adults with low proficiencies are, on average, some 25 percentage points lower). These results suggest that factors affecting participation rates at national level are to a large extent common to both general and low-proficiency populations. At the same time, the lagging participation rates of the adults with low proficiency may also be seen as an indication of the lack of more targeted programmes that would specifically aim to increase lagging participation rates of the adults with low proficiency. These results also show that countries can learn from those countries with high participation of adults who scored at or below Level 1 in literacy or numeracy.

Figure 5.1. Participation rates in adult education and training

Percentage of adults (25-65) at Level 1 of below and Level 4/5 in literacy involved in formal or non-formal AET



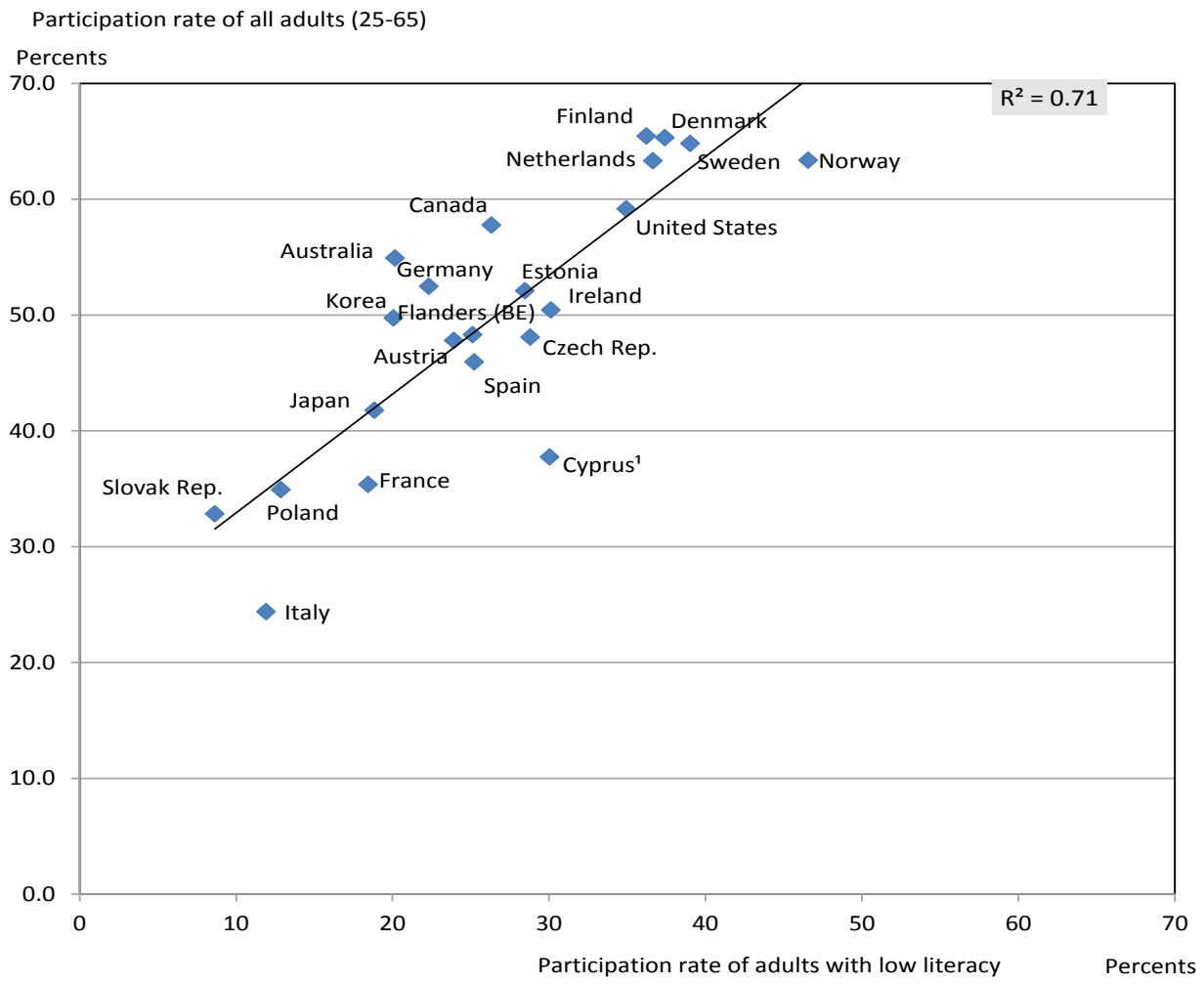
Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.
Countries are ranked in descending order of the percentage of adults at the Level 1 or below that participate in AET.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

There are many reasons for the varying rates of participation across countries. In part, the explanation lies in the features of existing educational policies and availability and characteristics of the adult education and training programmes. However, many other factors play a role. Given that a large proportion of AET programmes are provided by companies at the workplace, differing rates of investment in employee training and development in the private sector are an important determinant as well (European Commission, 2015). Apart from the availability and accessibility of the opportunities for involvement in the lifelong learning, actual participation also depends on the perceived learning needs of adults (Laxdal, 1982). From this demand perspective, the nature and structural characteristics of labour markets, the ease of losing and finding a job, job types and characteristics, unemployment levels, etc., are all important conditions that can improve or hinder participation rates. Finally, these rates will also depend on actual proficiency levels, with more skilled adults being more likely to participate and make use of available programmes. Along with the participation rates, these factors will also affect the format and content of learning activities, making them more or less related to specific jobs or to general skill improvement. For example, the German survey of the low proficiency population (Level-One Survey, LEO) finds that the majority of courses in which these adults participate are work-related (forklift or truck driving licenses, work security, welding licenses) or – for immigrants – German language courses (Bilger, 2012). All these areas are subject to regulation and law and the attendees of these courses are usually obliged to participate.

Figure 5.2. Participation rates of general adult population and adults with low literacy by country

Percentage of general adult population (aged 25-65) and adults at Level 1 or below in literacy involved in AET by country



Notes:
1. See note 1 on page 20.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

5.2.1. Adult Education and Proficiency – Selectivity vs Efficacy

As the OECD Skills Outlook reports, the likelihood of participating in adult education and training (OECD 2013: 209) is strongly related to the level of literacy proficiency. However, the size of the gaps in the rates of participation of adults proficient at Level 1 and below and Level 4 or 5 differs considerably across countries – from 29 percentage points in Norway to 49 percentage points in Korea. As could be expected, the gap in the participation rates is even more dramatic when comparing adults with proficiencies below Level 1 with adults whose proficiencies are at the Level 4 or 5 (Rammstedt, 2013). In this regard, PIAAC offers a unique opportunity to investigate the relationship between proficiency and participation in the adult education and training programmes.

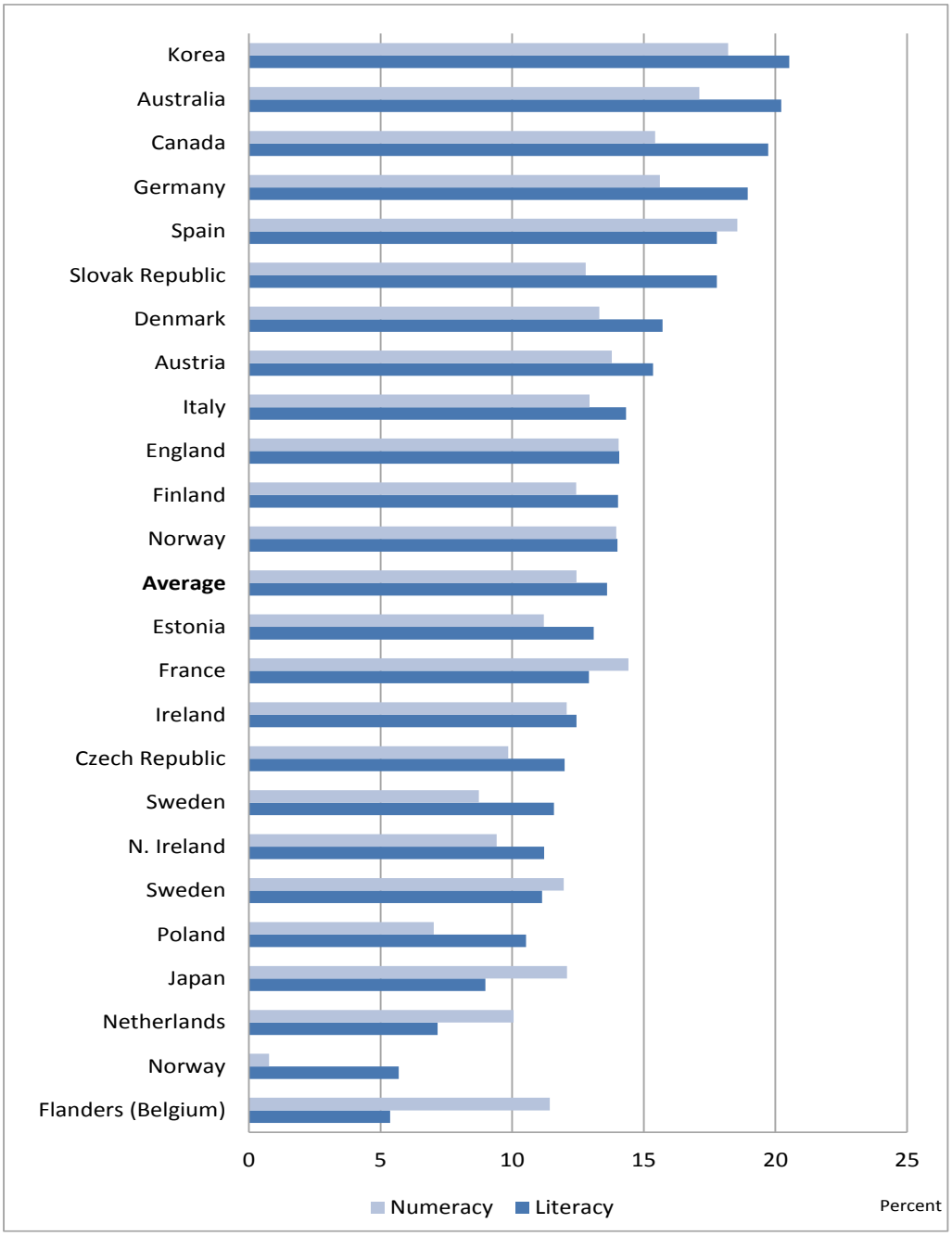
The effectiveness of adult education and training programmes is directly linked to funding and provision strategies. When access to training is non-selective, it is likely that learning outcomes will be lower compared when only better performers among a subpopulation (e.g. the unemployed) are selected to enter the learning group. Consequently, when funders expect training providers to demonstrate the effectiveness of training such as through the evaluation results, providers tend to select participants more carefully and prefer to train those that have greater chances of performing well. This so-called "creaming" effect is well known and often represents unintended consequence of programme evaluations (e.g. OECD, 2005; Blache, 2011). In this situation, all parties, the funders, the participants and the suppliers face something of a dilemma. Funding strategies, for example, should emphasize both the quantity and quality of the learning outcomes and the targeting of the most in need (i.e. those least likely to succeed). The first will be understood as efficacy and the latter as selectivity. The combined effects of selection and performance contribute to the observed correlations between *training participation* and *proficiencies* based on PIAAC's cross-sectional data. However, it is important to note that these are by no means the only determinants of this relationship. Given that the majority of AET programmes are job-related and organised by enterprises, in many cases, this correlation may be driven by work context and differences in skill levels required at work. In particular, workers in high or medium skilled jobs will have higher literacy on average and at the same time likely to have access to AET.

The difference between rates of participation in formal and non-formal education between adults proficient at Level 1 or below and Level 4/5 in literacy is 43.9 percentage points: the participation rates for the two groups being 29.7% and 73.6% (average across 22 OECD countries) respectively.[17] In other words, adults with high skills are almost three times more likely than adults with lower proficiencies to be involved in adult learning activities at some point during preceding year. However, since participation rates vary substantially across a number of socio-demographic characteristics (see Chapter 2), it is necessary to control for these in order to obtain a more valid estimate the strength of association between proficiency and participation rate in AET programmes. Thus, taking into account the results from Chapter 2, we have controlled for two sets of background variables. In the first set, we controlled for differences in age, gender, parent education, country and language of birth, the number of books in the respondent's household at the age of 16, and educational attainment. In the second set, we accounted for differences in employment and occupational status. When these two sets of controls are included, the difference in participation rates between adults with low (Level 1 and below) and high (Levels 4 and 5) proficiencies in literacy and numeracy drops to 13.6 and 12.6 percentage points respectively. This indicates that the relation between proficiency and participation in AEL is relatively strong even after controlling for wide scope of socio-demographic and employment variables. On the other hand, it also shows that a substantial part of initial differences in participation rates between these two groups can be attributed to the differences in their socio-demographic and employment profiles.

After controlling for the two sets of background variables, the rate of participation in adult education and training (formal and non-formal) also varies between countries, although the degree of variation is not large and is similar for both proficiencies (Figure 5.3). It is highest in Korea, Australia, and Canada in case of literacy and in Spain and Korea in case of numeracy. On the other hand, in Norway there is virtually no gap between the participation rates of adults with different levels of numeracy skills, once their socio-demographic and employment differences are taken into account. Overall, these results indicate that in most countries total participation rate in the AET activities is substantially related to literacy and numeracy levels, even after controlling for differences in a wide range of other population characteristics.

Figure 5.3. Adjusted differences between adults with low and high proficiencies in the rate of participation in AET

Differences between adults at Level 1 or below and Level 4/5 in literacy and numeracy in the rates of participation in AET after controlling for socio-demographic and employment characteristics



Notes: Participation 12 months prior to the survey. Participation rates for adults aged 25-65.

Countries are ranked in descending order of the size of participation gap in literacy.

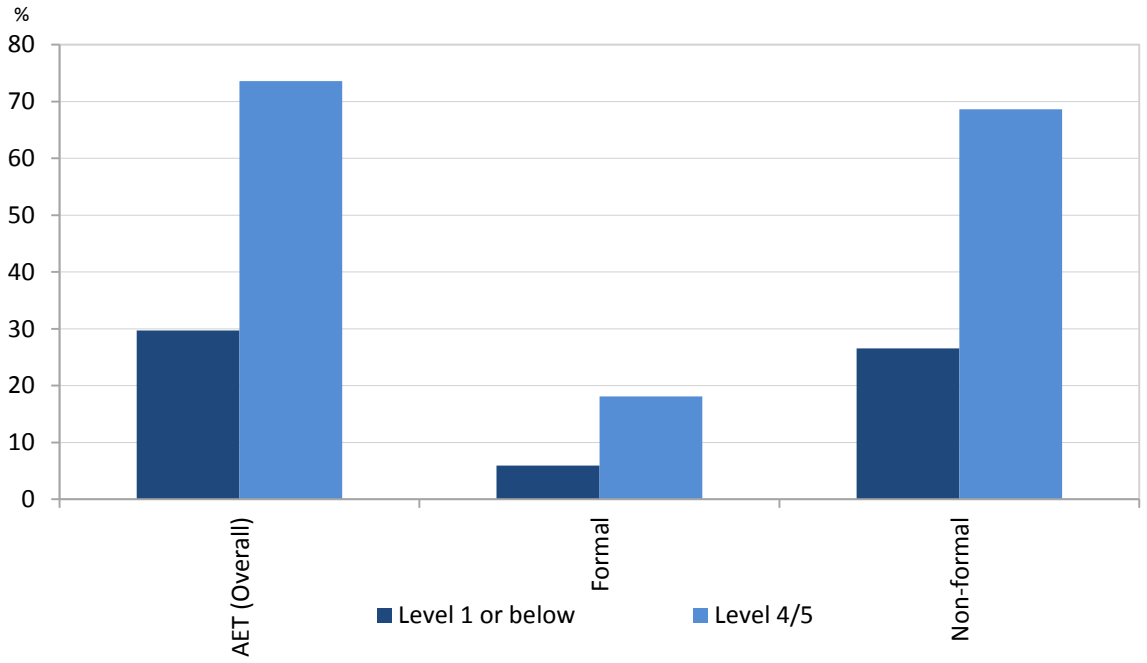
Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

5.2.2. Participation Differences across different Forms of Learning

Participation in different forms of adult education by adults with low literacy varies considerably as does the gap between the rates of participation of low and high skilled (Figure 5.4). Some 6% of adults with low proficiency in literacy participated in formal adult education and training in the previous 12 months compared to 18.1% of adults proficient at Levels 4 or 5. In the case of non-formal education and training, the respective proportions were 26.6% and 68.6%. Similar rates are obtained in the case of adults with low and high numeracy proficiencies.

Figure 5.4. Participation rates by literacy level and type of AET

Percentage of adults (25-65) at Level 1 or below and Level 4/5 in literacy involved in different forms of AET (International average)



Notes: Participation 12 months prior to the survey. Participation rates for adults aged 25-65.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

The gaps in the rates of participation in formal and non-formal adult education between the low and high performers are relatively large. The gap is especially large in the case of non-formal education, where higher skilled are more than twice as likely to be involved in this form of AET compared to adults with low proficiency.

However, the question is to which degree these differences are related to proficiencies themselves rather than to other observed characteristics that distinguish adults with low and high proficiencies differ. In particular, on average, adults with lower proficiencies tend to be older, with lower educational attainment, more likely to be foreign born, unemployed, with low occupational status, etc. As shown in Chapter 2 all these characteristics are negatively associated with the participation rates. The question is then to which degree differences in the AET participation rates across low and high skilled adults are independent of other personal and employment characteristics. In order to answer this question we have

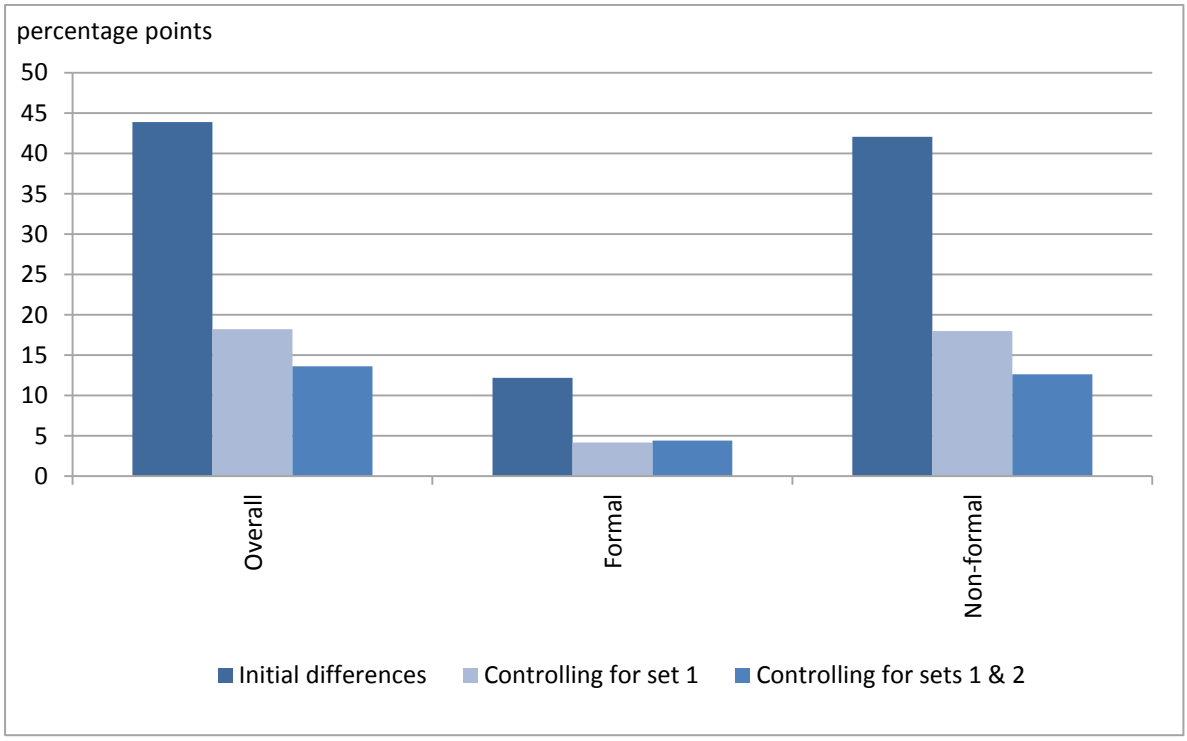
examined these differences while controlling for a number of socio-demographic and employment variables that could affect these results - the same two sets of variables indicated above.

As shown in the Figure 5.5, after controlling for the two sets of control variables the gaps in participation are substantially reduced. Adults with low literacy proficiency are still less likely to participate in the formal and non-formal AET than adults with high proficiency, but these differences are much smaller in the case of participation rates in the overall and non-formal AET and almost insubstantial in the case of formal AET. These patterns are very similar to those obtained when comparing adults with low and high numeracy proficiency.[18]

Another important pattern that can be observed from these results is that the socio-demographic variables from set 1 affect results much more than the employment and occupation status. This suggests that older age, lower education and social background are the most important factors behind the lower rates of participation in AET of adults with low proficiency. On the other hand, while employment and occupational status influence likelihood of participation in non-formal AET, they are not important in the case of formal AET.

Figure 5.5. Differences between adults with low and high literacy in the rate of participation by type of AET

Differences between adults at Level 1 or below and Level 4/5 in literacy in the rates of participation in different forms of AET before and after controlling for socio-demographic and employment characteristics (International average)



Notes: Participation 12 months prior to the survey. Participation rates for adults aged 25-65.
Set 1 includes gender, age, parental education, education, the number of books at home at age 16 and whether mother language is the country language.
Set 2 includes employment status and occupation type.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

5.3. Formal Adult Education and Training

Formal adult education and training is defined as adult education and training that leads to certified and valid qualifications (see definitions above). Examples include courses leading to school leaving certificates or university entry certificates, vocational certificates and university degrees.

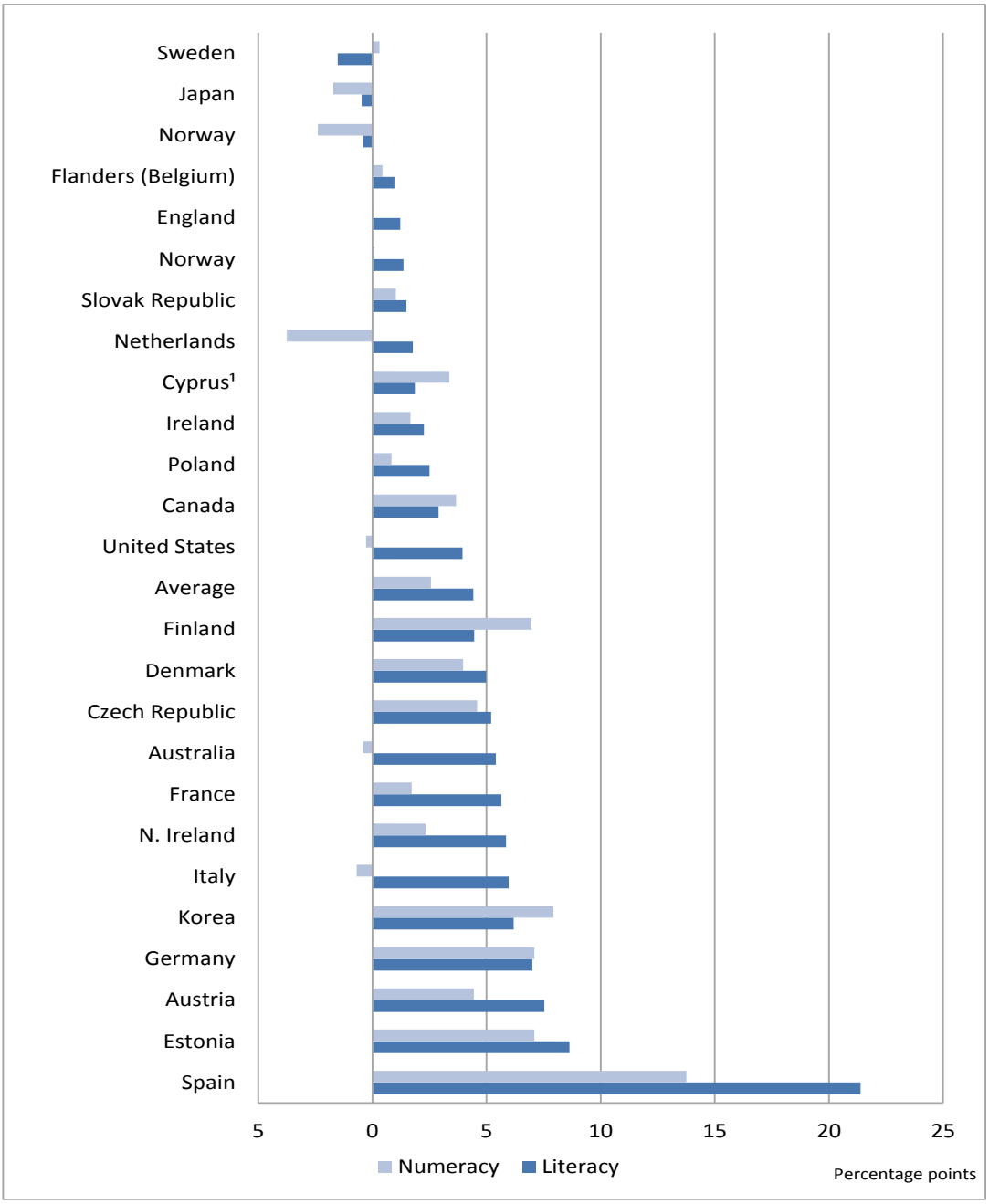
The average share of adults proficient at Level 1 and below in literacy who participate in formal adult education and training is 5.9%, which is more than three times less than the average rate observed among the highly skilled adults (18.1%). In terms of numeracy, the rates are 6.5% and 15.9% respectively. The highest participation rates in formal AET among the low proficiency population are found in three Scandinavian countries (Norway, Sweden and Denmark). The participation rates in this form of AET among the low proficiency population are very small in several countries, including Japan and Korea. The rates observed change only slightly when low numeracy proficiencies are considered.

However, as shown in the previous section, once controls are included for socio-demographic and employment variables (sets 1 and 2), the difference in the participation rates in formal AET between adults with low and high literacy proficiencies drops to only 4.4 percentage points, which is only about the third of its original value (12.2 percentage points). Furthermore, in the case of numeracy proficiency, the difference is reduced to an even greater extent – to only 2.6 percentage points. This means that individual's socio-economic background, age, education and employment and occupation status are responsible for substantial part of the observed lower participation rates of the adults with low proficiency.

In most countries small differences in participation rates in formal education and training between adults with low and high proficiency are found, with Spain being the only outlier.

Figure 5.6. Adjusted differences between adults with low and high proficiencies in the rate of participation in Formal AET

Differences between adults at Level 1 or below and Level 4/5 in literacy and numeracy in the rate of participation in Formal AET after controlling for socio-demographic and employment characteristics



Notes:
1. See note 1 on page 20.

Countries are ranked in ascending order of the difference in participation rates between adults with low and high literacy proficiencies.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

5.4. Non-formal Adult Education and Training

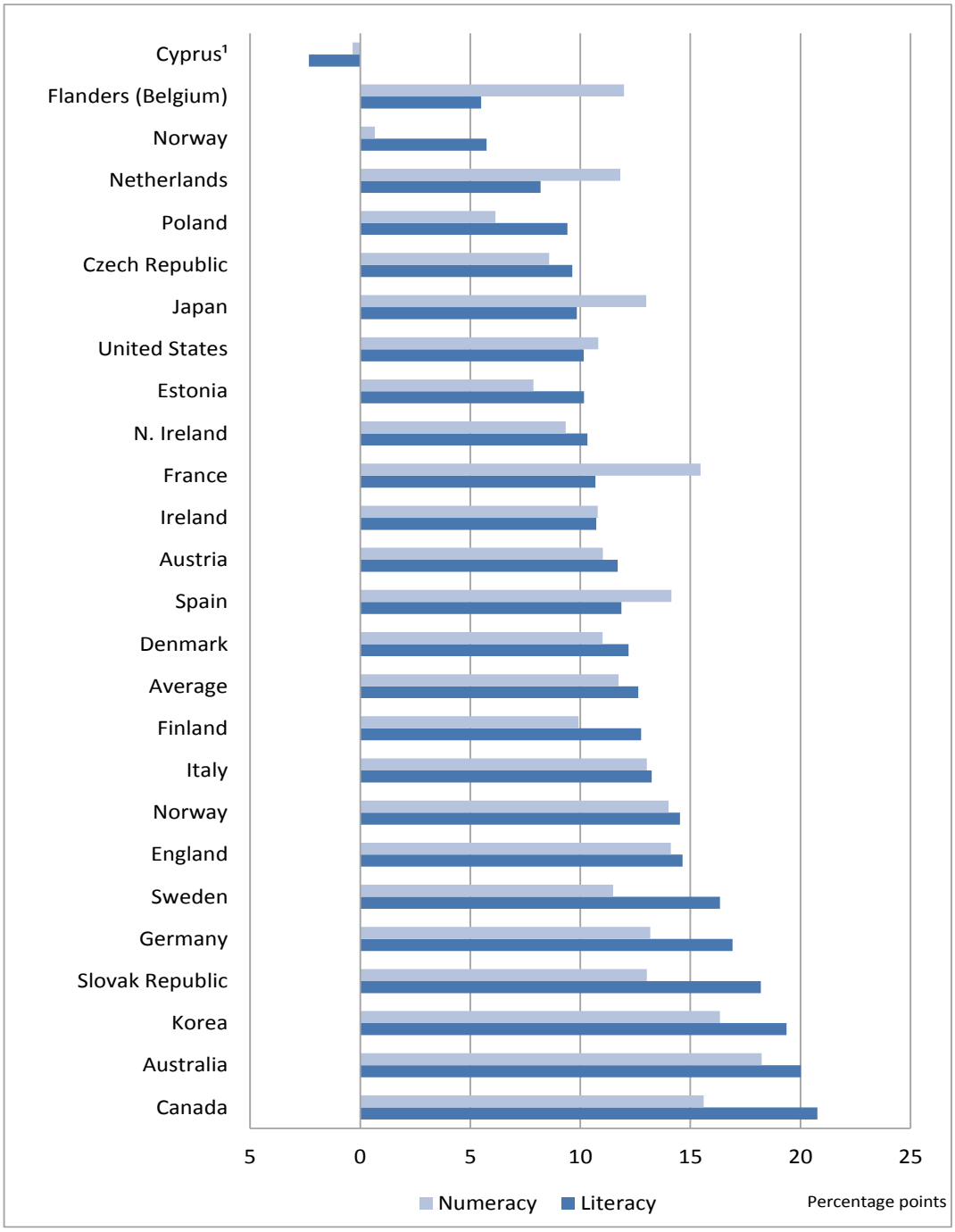
Non-formal education denotes any type of organised and sustained educational activities that does not lead to the award of formally recognised educational qualifications, such as seminars, workshops, online courses, etc. organised at education and training institutions, at work, or at home. On average, 27% of adults with low proficiency in literacy participated in non-formal education in the 12 previous months. This compares to more than 69% of the highly proficient adults, a difference of more than 40 percentage points. In numeracy, the shares are very similar - 27% and 68% for adults with low and high proficiencies respectively. While there is considerable variation in the participation of adults with low proficiency in non-formal education and training across countries, greater differences are still observed within countries, between adults with low and high proficiency.

The gap in participation in job-related non-formal education between *workers* with low and high proficiency in literacy or numeracy is much smaller than the difference in participation in participation rates in all non-formal education and training between adults with low and high proficiency in the general population: 33.2% and 33.4% in the case of literacy and numeracy respectively. However, as is true for formal education and training, after controlling for socio-demographic and employment characteristics (sets 1 and 2), these differences, although still substantial, are much less pronounced, falling to 12.6 and 11.7 percentage points for literacy and numeracy respectively. Such a substantial drop in differences between participation rates of the low and high proficiency adults indicates that the main reasons for reduced involvement of adults with lower proficiencies in various forms of non-formal education are related primarily to their disadvantaged socio-economic background. In addition, their lower employment rate and occupational status play substantial role as well as indicated by somewhat smaller gap between these two groups in the case of workers. This effect of the workplace on participation in non-formal training is well documented in adult education research (CEDEFOP European Center for the Development of Vocational Training 2010; Kaufmann et al., 2014; Friebel et al., 2000; Brüning und Kuwan, 2002; Kuper et al., 2013a).

There are no large variations across countries in the gap between low and high proficiency adults in terms of their participation in non-formal AET. In particular, the gap varies between 10-20 percentage points in almost all of the countries (Figure 5.7). In addition, the size of the gap is mostly similar for literacy and numeracy proficiency.

Figure 5.7. Adjusted differences between adults with low and high proficiency in the rate of participation in non-formal AET

Differences between adults at Level 1 or below and Level 4/5 in literacy and numeracy in the rate of participation in Non-formal AET after controlling for socio-demographic and employment characteristics



Notes:
1. See note 1 on page 20.

Countries are ranked in ascending order of the difference in participation rates between adults with low and high literacy skills.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

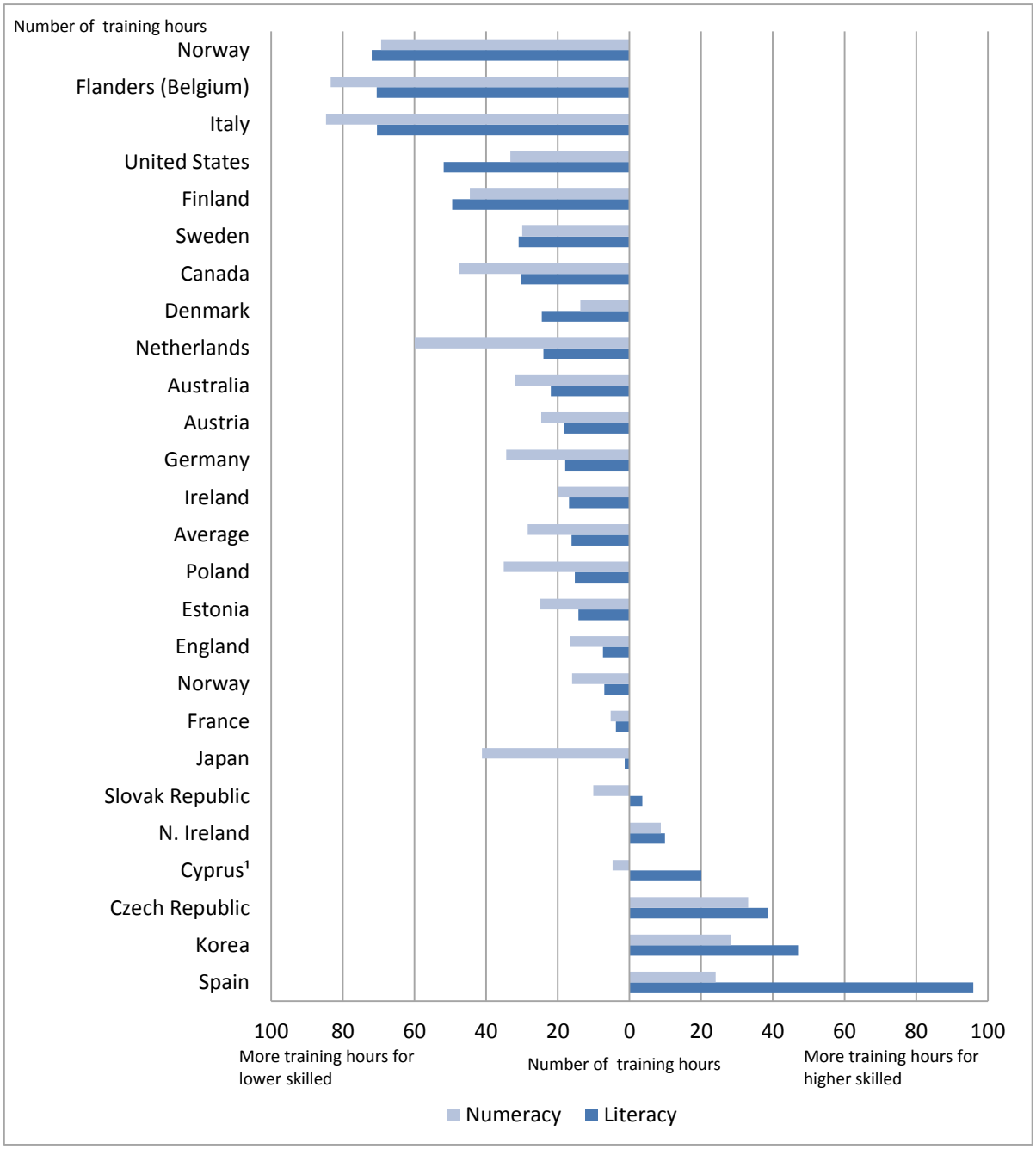
When the intensity of learning is taken into account the picture becomes more nuanced. Among adults who participate in non-formal education, those with low proficiency in literacy actually undertake slightly more hours of non-formal training their highly proficient peers. The average annual volume of training for adults proficient at Level 1 and below in literacy is some 139 hours compared to 123 hours for highly proficient adults (Level 4 or 5) and 114 hours for adults proficient at Level 2 and 117 hours for adults at Level 3. In the case of numeracy, adults with lower proficiencies are in even better position, with the gap being 33 hours – 146 and 113 for adults with low and high proficiencies respectively.

The distribution by country shows that the peak in hours is found at different levels of proficiency. In several northern European countries, adults at Level 1 or below spend the most hours in non-formal education, in England/Northern Ireland (UK), the differences in hours in education and training are not significant across the levels. Adults at Level 4 or 5 in countries like Korea and Spain spend much longer hours in non-formal education and training than do adults at lower levels. In Australia, Poland and the United States, adults at Levels 2 or 3 spend the longest time in training compared to adults at other levels of proficiency.

When controls are included for socio-demographic and employment characteristics (sets 1 and 2), the average gaps in training intensity between adults with low and high proficiency do not change greatly. On average, adults with low literacy and numeracy still spend respectively 16 and 28 hours more in training than do adults with higher proficiencies. In addition, there are considerably different situations across countries. Spanish adults with low literacy actually spending substantially less hours in non-formal education than higher skilled adults, while in Norway, Flanders and Italy they are involved in much more intensive non-formal learning compared to adults with high proficiencies (Figure 5.8).

Figure 5.8. Adjusted differences between adults with low and high proficiencies in number of hours in non-formal education

Differences between adults at Level 1 or below and Level 4/5 in literacy and numeracy in number of training hours in non-formal AET after controlling for socio-demographic and employment characteristics



Notes:
1. See note 1 on page 20.

Countries are ranked in descending order of the difference in the number of training hours between adults with low and high literacy.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

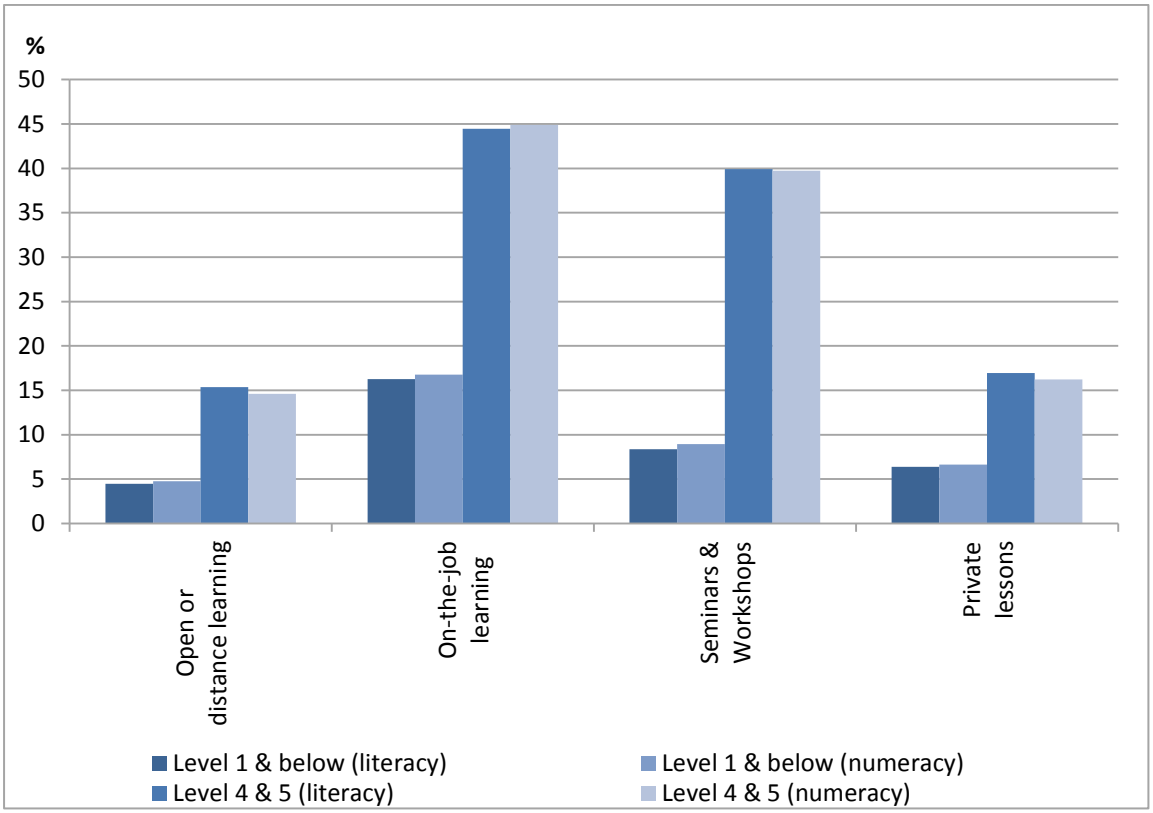
An explanation for these differences could be long-term course programmes provided by job agencies for the Level 1 population as well as the language programmes for recently arrived migrants. Likewise, it may be due to non-formal learning programmes provided by the education system or basic skill training programmes combined with work-related training. On the other hand, it may be seen as an indication that the programmes that involve adults with lower proficiencies tend to be of longer duration, at least in some of the countries.

5.4.1. Participation by Type of Non-Formal Education

The classification of non-formal learning activities used in PIAAC distinguishes four types of activity: courses conducted through open or distance education, organised sessions for on-the-job training or training by supervisors or co-workers seminars and workshops, seminars or workshops and courses and private lessons. The rates of participation in the various types of non-formal adult education differ widely, with on the job training and seminars or workshops being more attractive and accessible than e-learning or private lessons. As in the case of formal education, the rate of participation is considerably lower among adults with low proficiency in literacy or numeracy than among high performers (Figure 5.9).

Figure 5.9. Participation rates by literacy and numeracy level and type of non-formal AET

Percentage of adults (25-65) at Level 1 or below and Level 4/5 in literacy and numeracy involved in different types of Non-formal AET (International average)



Notes: Participation 12 months prior to the survey. Participation rates for adults aged 25-65.

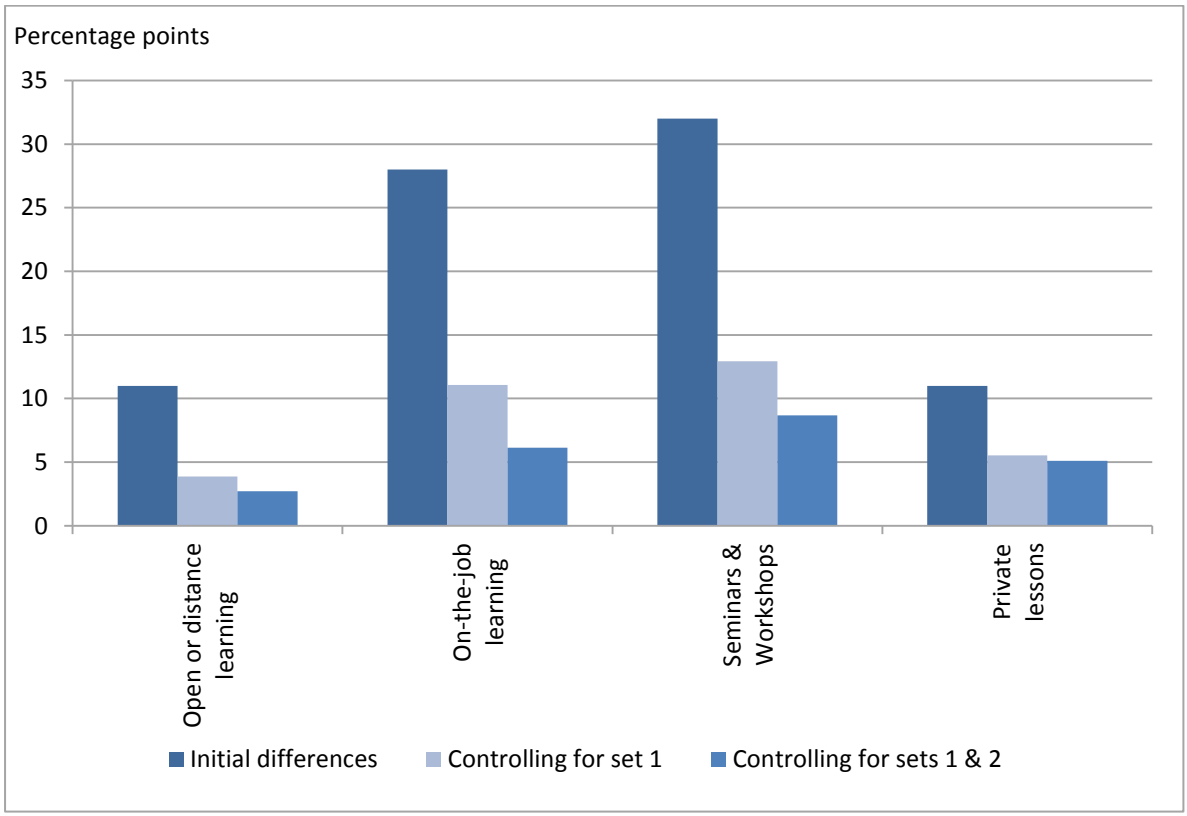
Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

As in the case of formal education, the gap between participation rates is substantially reduced once key socio-demographic and employment variables are taken into account (Figure 5.10). In particular, it

drops to around two percentage points in case of open or distance education to around nine percentage points in case of seminars and workshops. Differences in the socio-demographic characteristics between adults with low and high proficiencies are again shown to be the most important determinant of reduced participation of adults with lower proficiencies in the AET programmes. The importance of these factors is best illustrated in the case of on-the-job learning, which could be expected to be under stronger influence of job-related characteristics such as occupational status. Yet, in this form of learning as well, the main background characteristics account for around two thirds of the initial gap in the participation rates between low and high proficiency adults.

Figure 5.10. Differences between adults with low and high literacy in the rate of participation by type of Non-formal AET

Differences between adults at Level 1 or below and Level 4/5 in literacy in the rates of participation in different types of Non-formal AET before and after controlling for socio-demographic and employment characteristics (International average)



Notes:
Participation 12 months prior to the survey. Participation rates for adults aged 25-65.
Set 1 includes gender, age, parental education, education, the number of books at home at age 16 and whether mother language is the country language.
Set 2 includes employment status and occupation type.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

Considerable variations are observed across countries and proficiency levels, as can be seen in Figures 5.11-5.18 below, suggesting a large variety in provision and demand for non-formal education. Participation by type of non-formal education and training is discussed in more detail below.

5.4.1.1. Open or Distance Education

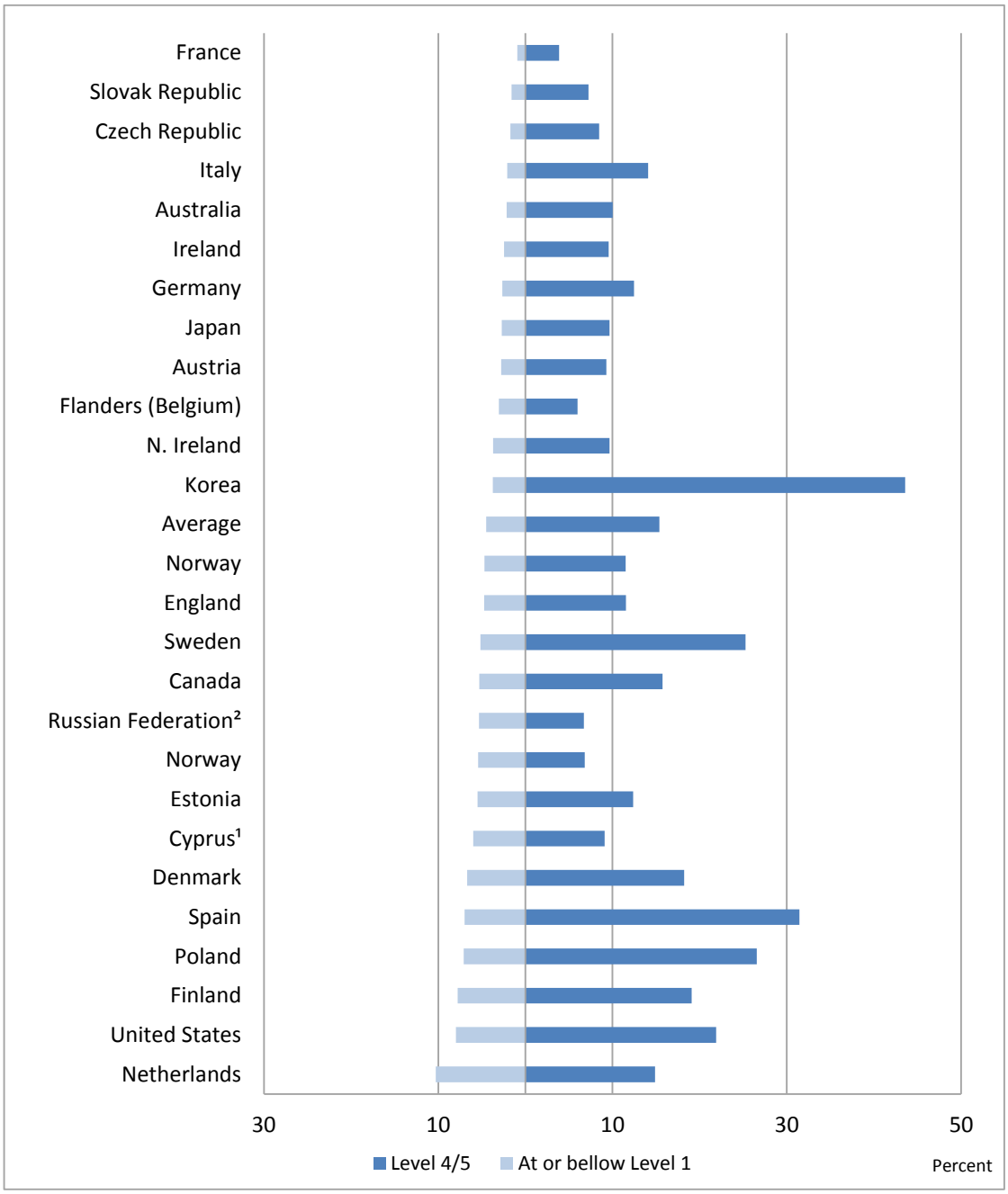
Online initial and further education programmes, often offered by universities, reach more non-traditional students than other programmes[19] (cf. Schulmeister 2006; Schaeper et al., 2006). This might explain the high participation rate in Spain, where high unemployment may motivate adults to upskill via online programmes. Differences between countries (Figure 5.11) may also be driven by the type of offers, as distance education is often academic in orientation. The offer of adult basic education via television (Ireland) or online with tutors (United States, Germany) does not seem to have a significant influence on the number of participants. The variety of online programmes offered in Korea (most of which are subsidized) seems to have attracted a substantial number of adults with high proficiencies, but much less so those with lower proficiencies. Recent data about the digital divide (Initiative D 21; ARD-ZDF-Onlinestudie.de) show that the increase in access to digital technologies and networks is not necessarily true for the overall population: the trend does not apply for the less educated, the elderly and the unemployed. The increase in the use of digital applications does not necessarily extend to learning (White and Selwyn, 2012).

Some countries have high rates of Open and Distance Education among their high proficiency population (Korea, Spain and Poland), while other countries have very low rates even among their best educated population (France and Flanders). Adults with low proficiency in literacy or numeracy have by far lower participation rates in Open and Distance Education than those proficient at Level 4 or 5. The average rate of participation of the low proficiency population is 4.5% as compared to 15.4% for the adults with high literacy proficiencies. The participation rates among the adults with low proficiencies are especially low in France, the Slovak Republic and the Czech Republic, where it is less than 2%. On the other hand, they are highest in the Netherlands (10%), Finland (8%), and the United Kingdom (8%).

The strong reliance of this form of AET on the ICT skills would imply that it is most appropriate for better educated and younger adults. Indeed, after controlling for a range of relevant socio-economic and employment variables, the differences between participation rates across countries drops quite substantially. The drop is especially large in Korea, where this type of adult learning may be much more used and appropriate for younger and more educated populations.

Figure 5.11. Participation rates in Open or distance learning by country

Percentage of adults (25-65) at the Level 1 of below and Level 4/5 in literacy involved in Open or distance learning



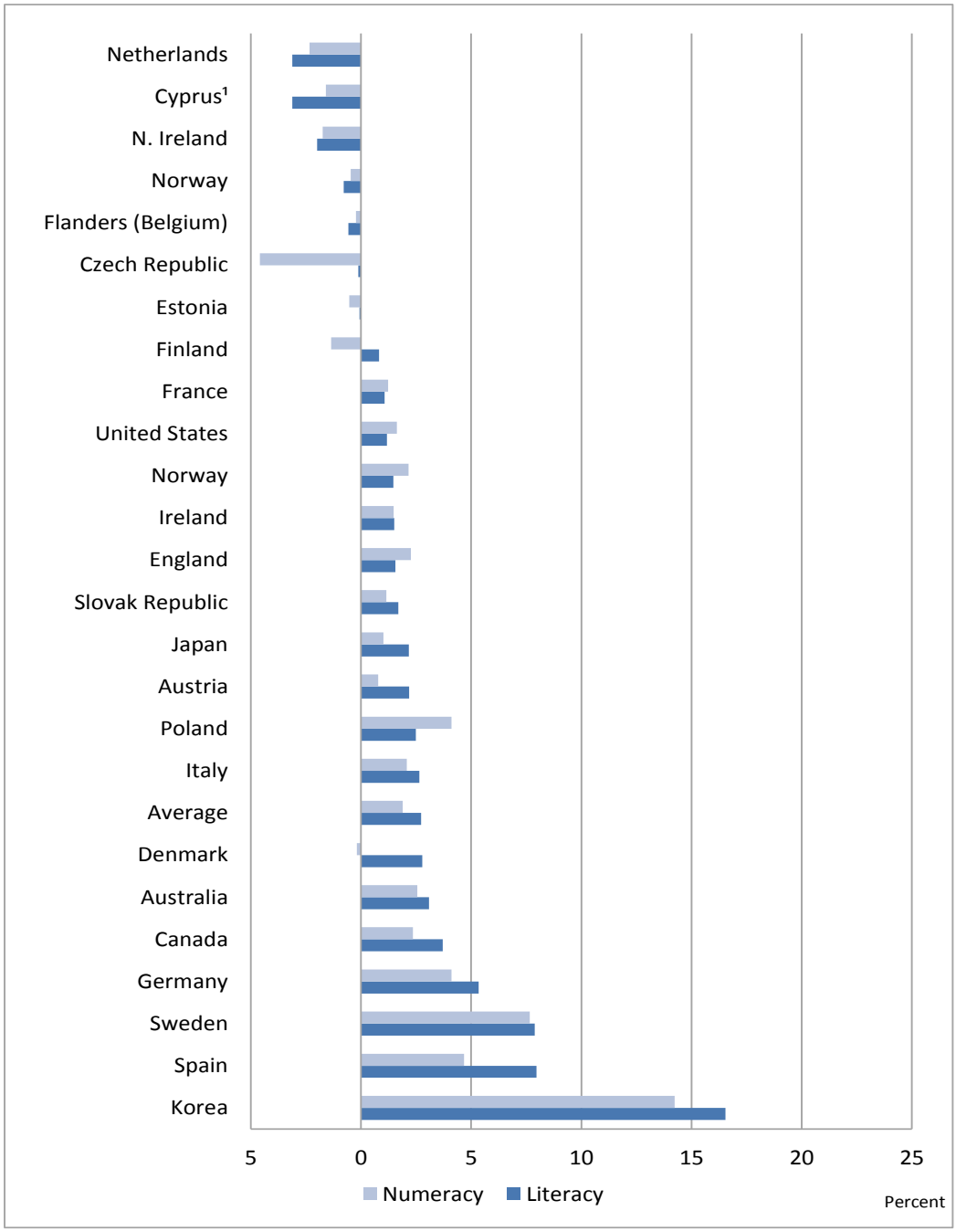
Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.

Countries are ranked in ascending order of the participation rate for low literacy proficiencies.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

Figure 5.12. Adjusted differences between adults with low and high literacy in the rate of participation in Open or distance learning

Differences between adults at Level 1 or below and Level 4/5 in literacy in the rate of participation in Open or distance learning after controlling for socio-demographic and employment characteristics



Notes:
1. See note 1 on page 20.

Countries are ranked in descending order of the difference between adults with low and high literacy.

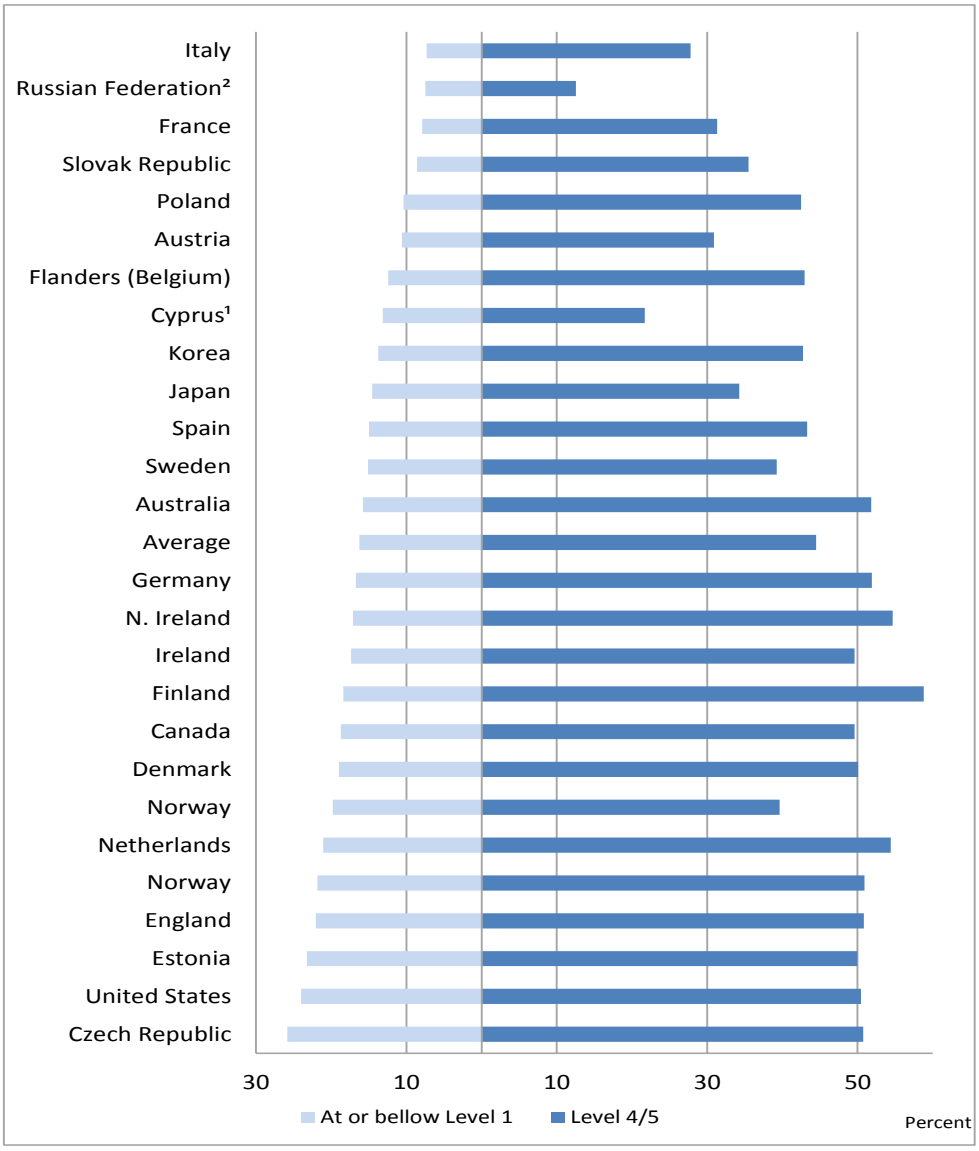
Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

5.4.1.2. On-the-job training

The reasons for undertaking organised 'on-the-job' training lie in the requirements of the job itself. Training by supervisors may be necessary if the jobs in the sector are complex and require skills that cannot be learned simply by copying what colleagues do. On-the-job training can also be organised for more routine jobs, for recently hired or transferred employees. Countries with large primary sectors and branches such as construction and tourism may have more workplaces where supervisors or colleagues do not have a reason to train their staff, because *learning by doing* is enough to meet the requirements.

Figure 5.13. Participation rates in On-the-job learning by country

Percentage of adults (25-65) at the Level 1 or below and Level 4/5 in literacy involved in On-the-job learning



Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.

Countries are ranked in ascending order of the participation rate for low literacy proficiencies.

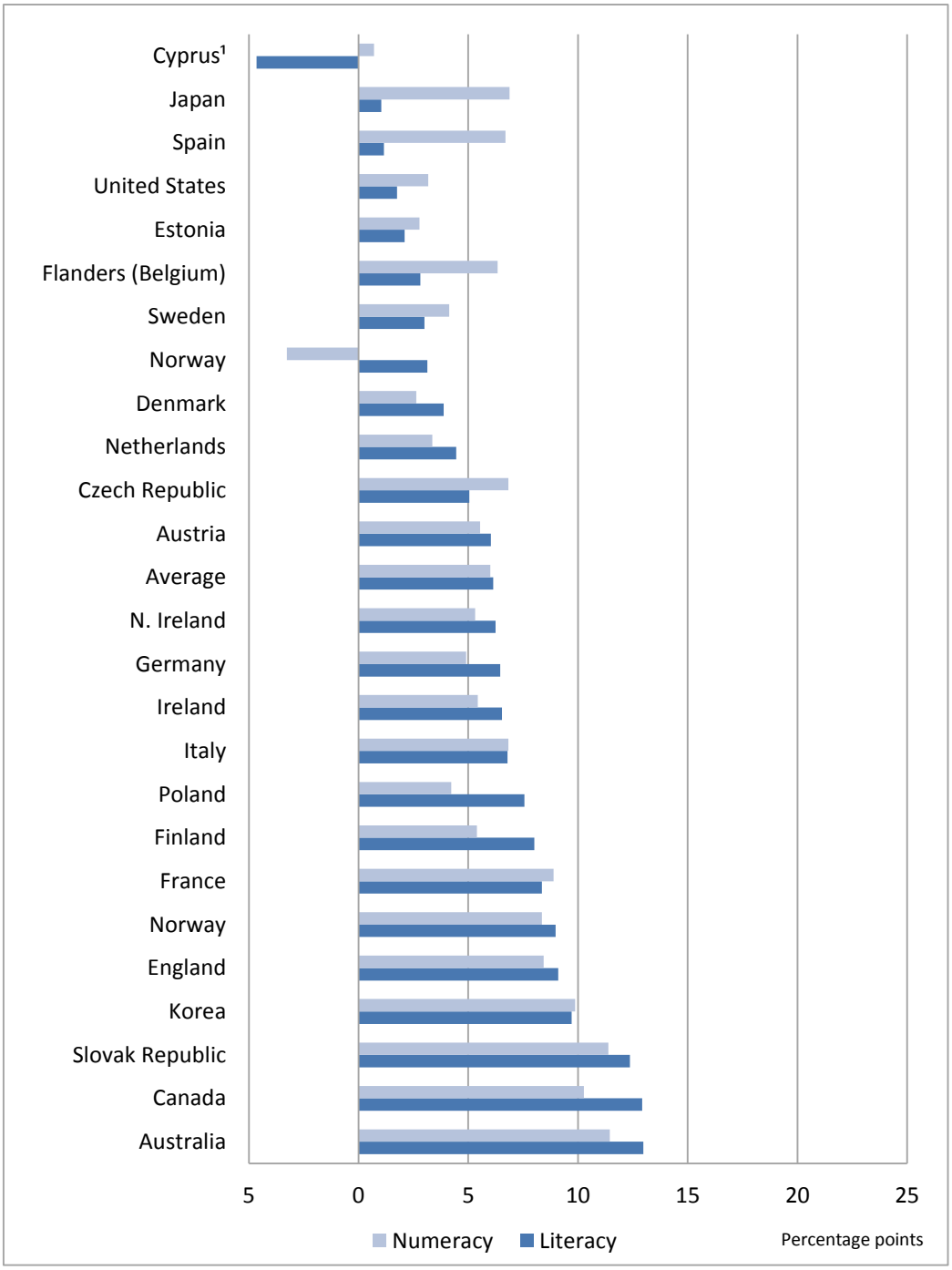
Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

In the Czech Republic, the United States, Estonia, England/N.Ireland (UK), and the Netherlands, more than 20% of adults with low literacy received on the job training in the previous 12 months while in France, Italy and the Slovak Republic, less than 10% of the adults with low literacy proficiency received on the job training during working hours. In most countries, participation rates among those highly literate adults exceeded 40% and in a number of countries more than 50% of highly literate adults participated in on–the-job training.

The situation is very different when differences in the socio-demographic and employment characteristics between adults with low and high proficiencies are taken into account. In particular, three quarters of the initial gap between adults with low and high literacy and numeracy proficiencies disappears (from 25 to 6 percentage points for both literacy and numeracy). Considerable variation is present across countries, with substantial gap remaining in some of the countries such as Austria, Canada, Slovakia and Korea, and a rather low gap in Estonia, the United States, Denmark and Sweden. In addition, in Spain, Japan, and Flanders, access to the on-the-job training may be conditioned on certain level of numeracy skills, as indicated by somewhat larger gap across numeracy levels.

Figure 5.14. Adjusted differences between adults with low and high literacy in the rate of participation in On-the-job learning

Differences between adults at Level 1 or below and Level 4/5 in the rate of participation On-the-job learning after controlling for socio-demographic and employment characteristics



Notes:
1. See note 1 on page 20.

Countries are ranked in ascending order of the difference between literacy levels.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

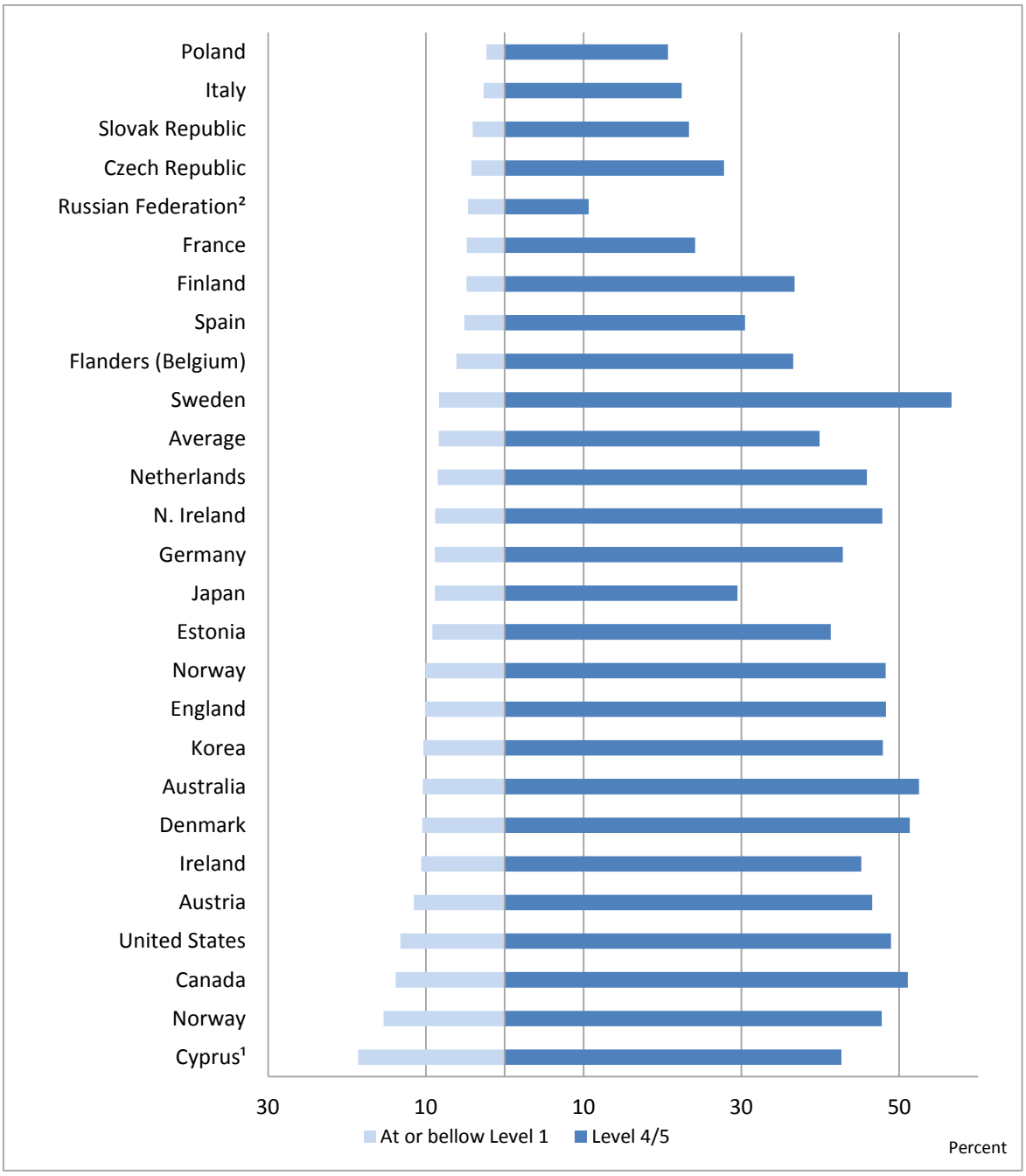
5.4.1.3. Seminars and Workshops

Only 9% of adults with lower proficiencies participate in seminars or workshops during previous 12 months, compared to almost 30% of adults with high proficiency. In Cyprus,[20] Norway, Canada and the United States between 14 to 19% of the adults with low proficiency participate in workshops and seminars, but the majority of countries report participation rates below 10% among their low proficiency population. The wide gap in participation in seminars or workshops between the two groups may be due to the fact seminars or workshops are usually organised for adults working in high skilled white collar jobs. Considering the fact that 51.8% of employed adults who scored at Level 1 or below in literacy have semi-skilled or elementary blue-collar jobs compared to 12.3% of adults performing at Level 4 or 5 in literacy that have such occupations among, such a large gap is not very surprising (see Chapter 2).

After controlling for employment and occupational status, as well as for other relevant socio-demographic characteristics (see above), the gap between adults with low and high proficiencies is reduced – to 8.7 and 7.9 percentage points for literacy and numeracy proficiency respectively. There is a considerable variation in size of the gap across countries with England, Sweden, Canada, Denmark and Australia having a particularly large gap, indicating that the content of this learning form in these countries, as well as selection mechanisms, may be too difficult or skewed to the needs of higher proficiency population.

Figure 5.15. Participation rates in Seminars and Workshops by country

Percentage of adults (25-65) at the Level 1 or below and Level 4/5 in literacy involved in Seminars and Workshops



Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.

Countries are ranked in ascending order of the participation rate for low literacy proficiencies.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

Figure 5.16. Adjusted differences between adults with low and high literacy in the rate of participation in Seminars and Workshops

Differences between adults at Level 1 or below and Level 4/5 in the rate of participation in Seminars and Workshops after controlling for socio-demographic and employment characteristics

Notes:
1. See note 1 on page 20.

Countries are ranked in descending order of the difference between literacy levels.

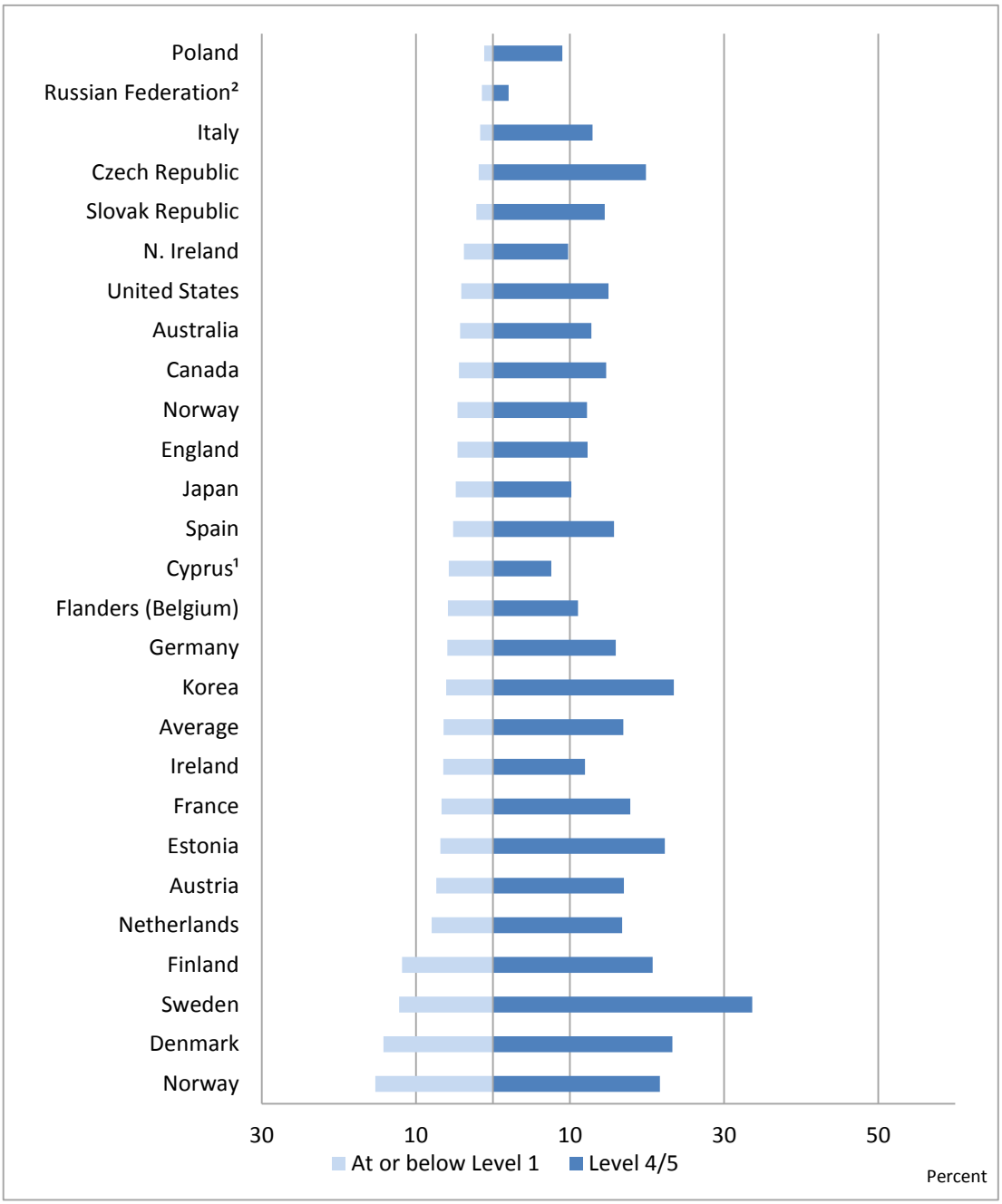
Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

5.4.1.4. Private Lessons

Courses and private lessons may include a range of learning activities involving a student teacher relationship including cultural and leisure activities as well as educationally oriented activities such as tutoring or computer classes. The Scandinavian countries (Denmark, Norway and Sweden) are the only ones in which more than 12% of adults with low literacy or numeracy participate in such activities. As in the case of other types of learning activity, much higher rates of participation are observed among adults with high proficiency than among adults with low proficiency. In Sweden, Korea and Denmark around 25% or more of adults with high proficiency in literacy participate in such activities.

Figure 5.17. Participation rates in private lessons by country

Percentage of adults (25-65) at the Level 1 or below and Level 4/5 in literacy involved in private lessons



Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.

Countries are ranked in ascending order of the participation rate for low literacy proficiencies.

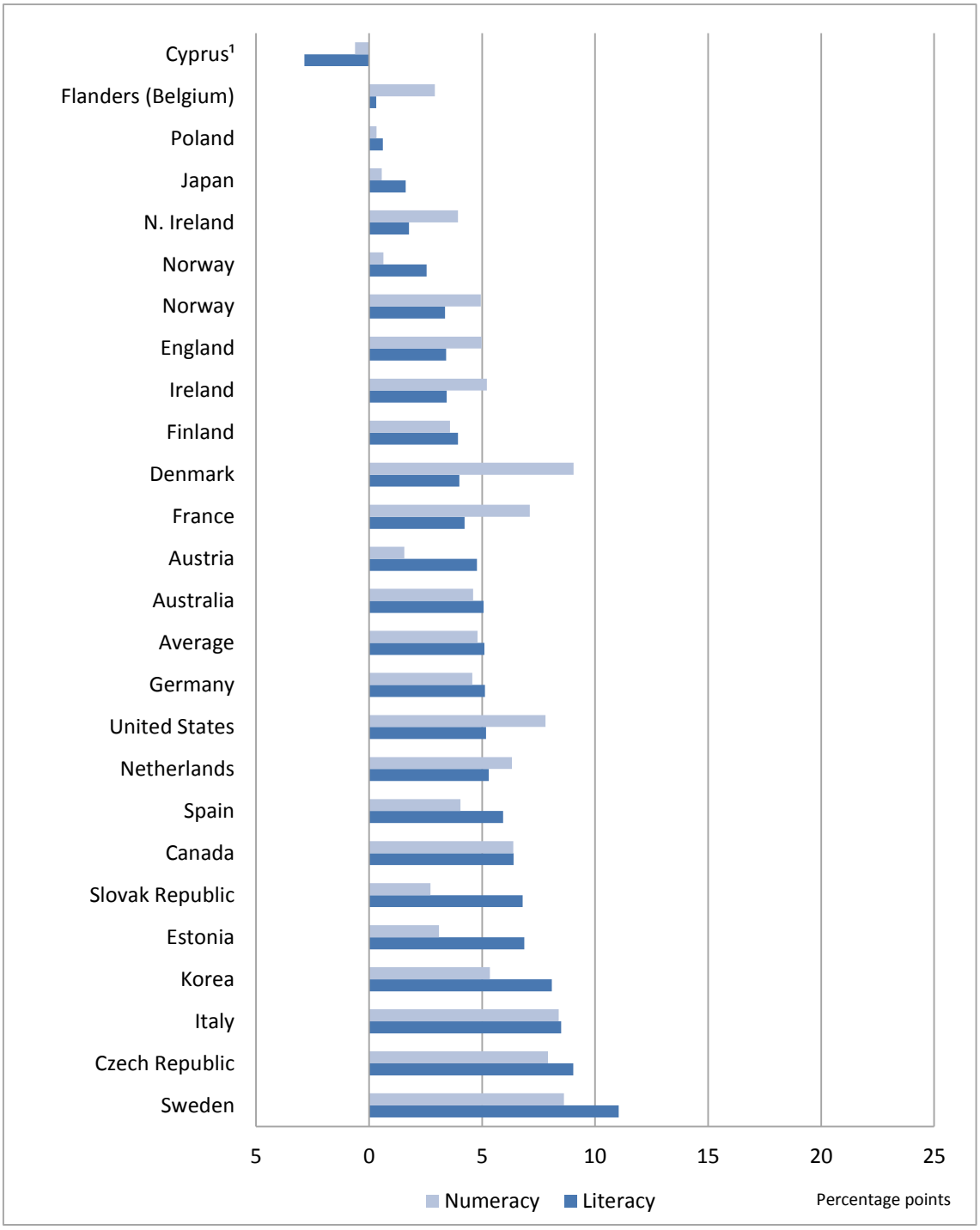
Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

Here again, after controlling for socio-demographic and employment characteristics, on average only half of the initial gap remains – 5.1 and 4.8 percentage points in case of literacy and numeracy

respectively. However, proficiency remains to be important correlate of the likelihood of taking private lessons in a number of countries such as Sweden, the Czech Republic and Italy. In addition, in Denmark, France, Flanders and the United States, numeracy proficiency seems to play more important role than literacy in relation with rates of private lessons.

Figure 5.18. Adjusted differences between adults with low and high proficiencies in the rate of participation in private lessons

Differences between adults at Level 1 or below and Level 4/5 in literacy in the rate of participation in private lessons after controlling for socio-demographic and employment characteristics



Notes:
1. See note 1 on page 20.
Countries are ranked in descending order of the difference between literacy levels.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

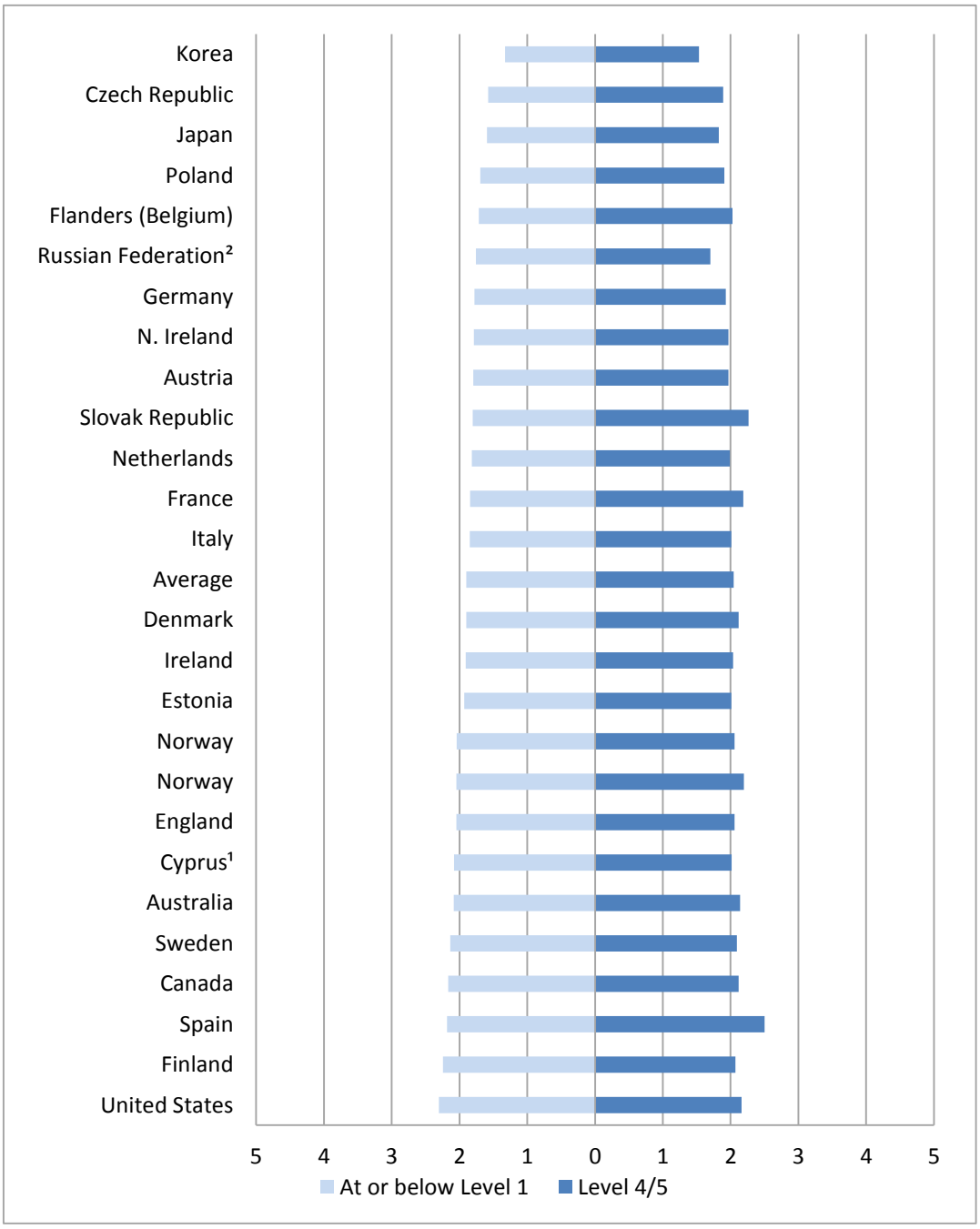
5.5. Informal Learning at Work

Some useful information regarding participation in informal learning at work is provided by the "Learning at Work" index. It combines information from three questions regarding the frequency with which workers report that they learn new things from colleagues, learn through experience and have to keep up to date with new products and services. Higher values of the index can be interpreted as indicating a greater intensity of 'informal' learning at work. Interestingly, workers with low (Level 1 and below) literacy (36%) are as likely as those with high (Level 4 or 5) literacy (36.9%) to have a high level of engagement in informal learning activities as measured by the top two quintiles of the index. At the same time, the proportion of workers with low literacy who report never engaging in any of the three types of learning activity is much higher than the proportion of high skilled adults, leading to the lower average of 'learning at work' index for adults with lower proficiencies – 1.90 compared to 2.05 for higher skilled adults.

The involvement of adults with low literacy proficiencies into informal learning in the work settings (i.e. 'Learning at work') varies considerably across countries with especially high rates in the United States, Finland, Spain and Canada. On the other hand, the rates are much smaller in Korea, and somewhat smaller in the Czech Republic and Japan. The rates are rather similar between adults with low and high literacy proficiencies, with exceptions of Slovakia, Spain, France, and the Czech Republic, where higher skilled adults are slightly more involved in informal learning.

Figure 5.19. 'Learning at work' scores by proficiency level and country

Mean values of the 'Learning at work' index for adults at the Level 1 or below and Level 4/5 in literacy



Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.

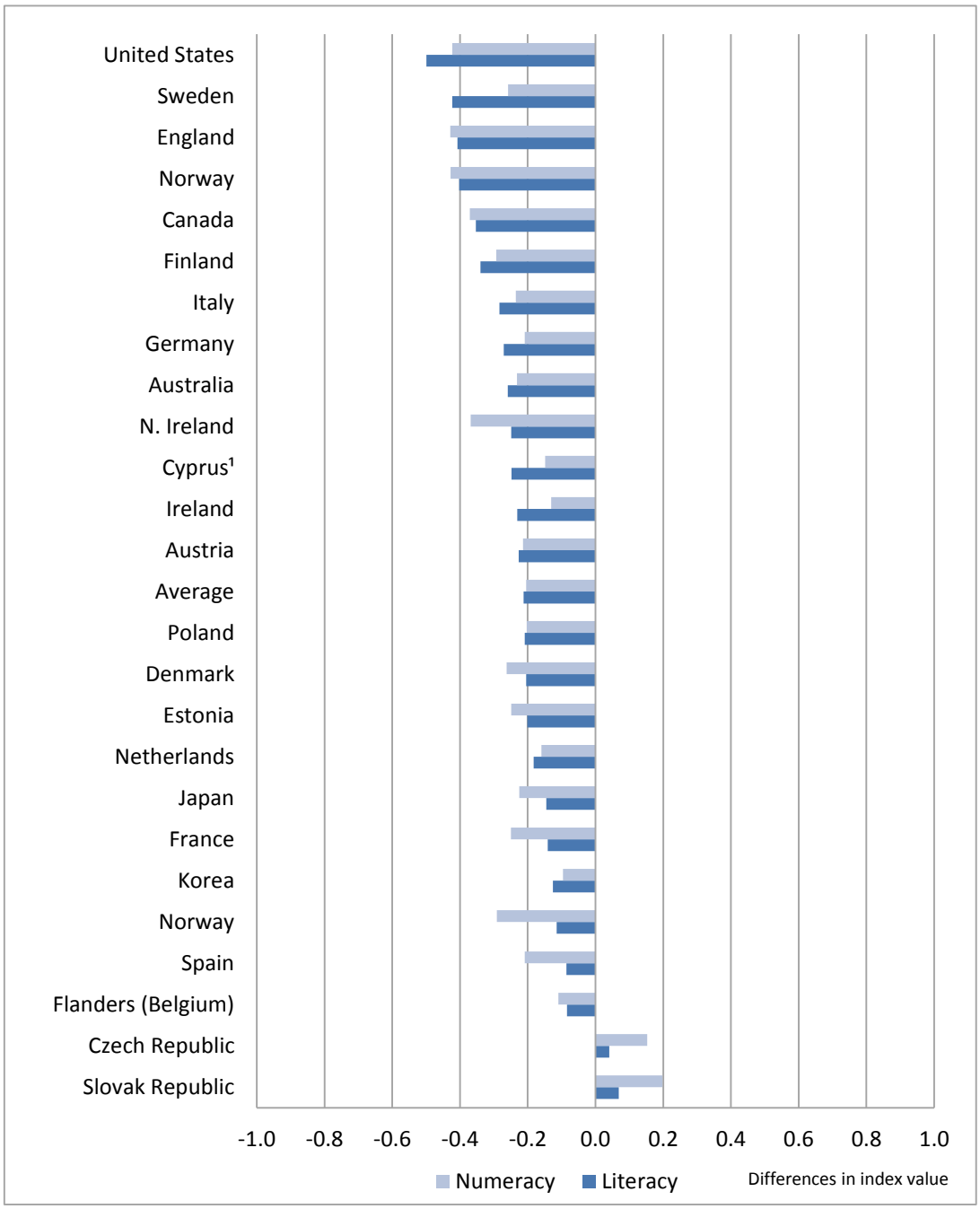
Countries are ranked in ascending order of the index mean for low literacy proficiencies.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

However, after taking into account both sets of background variables, adults with low literacy proficiencies (Level 1 and below) are actually significantly more likely to participate in this form of learning than higher skilled adults – differences in averages changes from 0.15 points of the index in favour of high skilled to 0.21 in favour of the adults with low proficiency. The picture across countries is nuanced, with the Slovak Republic and the Czech Republic having fewer adults with lower proficiencies (especially numeracy) in informal education while in the United States, England, Sweden and Canada the situation is reversed – when controlling for socio-demographic and employment variables, adults with lower proficiencies in these countries are more likely to participate in informal learning (at work). However, it is important to note that these results apply to a subset of the activities that can be defined as informal learning. Inclusion of a wider range of self-directed learning activities could change the picture. However, this impact on estimated participation in informal learning activities among adults with low and high literacy is an object of speculation.

Figure 5.20. Adjusted differences between adults with low or high proficiencies in 'Learning at work' index

Differences between adults at Level 1 or below and Level 4/5 in literacy and numeracy in mean values of the 'Learning at work' index after controlling for socio-demographic and employment characteristics



Notes:
1. See note 1 on page 20.

Countries are ranked in descending order of the difference between adults with different literacy levels.
Negative values indicate higher scores of adults with lower proficiencies while positive values indicate higher scores of adults with higher proficiencies.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

It is interesting to see that, while the gaps between the rates of participation of workers with low and high levels of proficiency in literacy are large, the intensity with which these two groups engage in learning at work is similar. The relatively high proportion of workers with low literacy who engage in informal learning at work may indicate that, at least for this group, this type of informal training is a substitute for formal and non-formal training that has more selective entry procedures.

At the same time, the relatively high intensity of participation in learning at work may hide considerable differences in terms of the content and the complexity of learning material. For example, given that the majority of adults with lower proficiencies work in routine jobs with lower level of autonomy and task complexity, it may be assumed that the type of informal learning is less complex and demanding that that in which adults with high proficiencies are involved. It is also necessary to note that only informal learning at work is assessed and that overall conclusions regarding the level of informal learning in a country are not possible in the absence of information about informal learning activities outside of work.

5.6. Learning intentions and reasons for participation in formal and non-formal AET

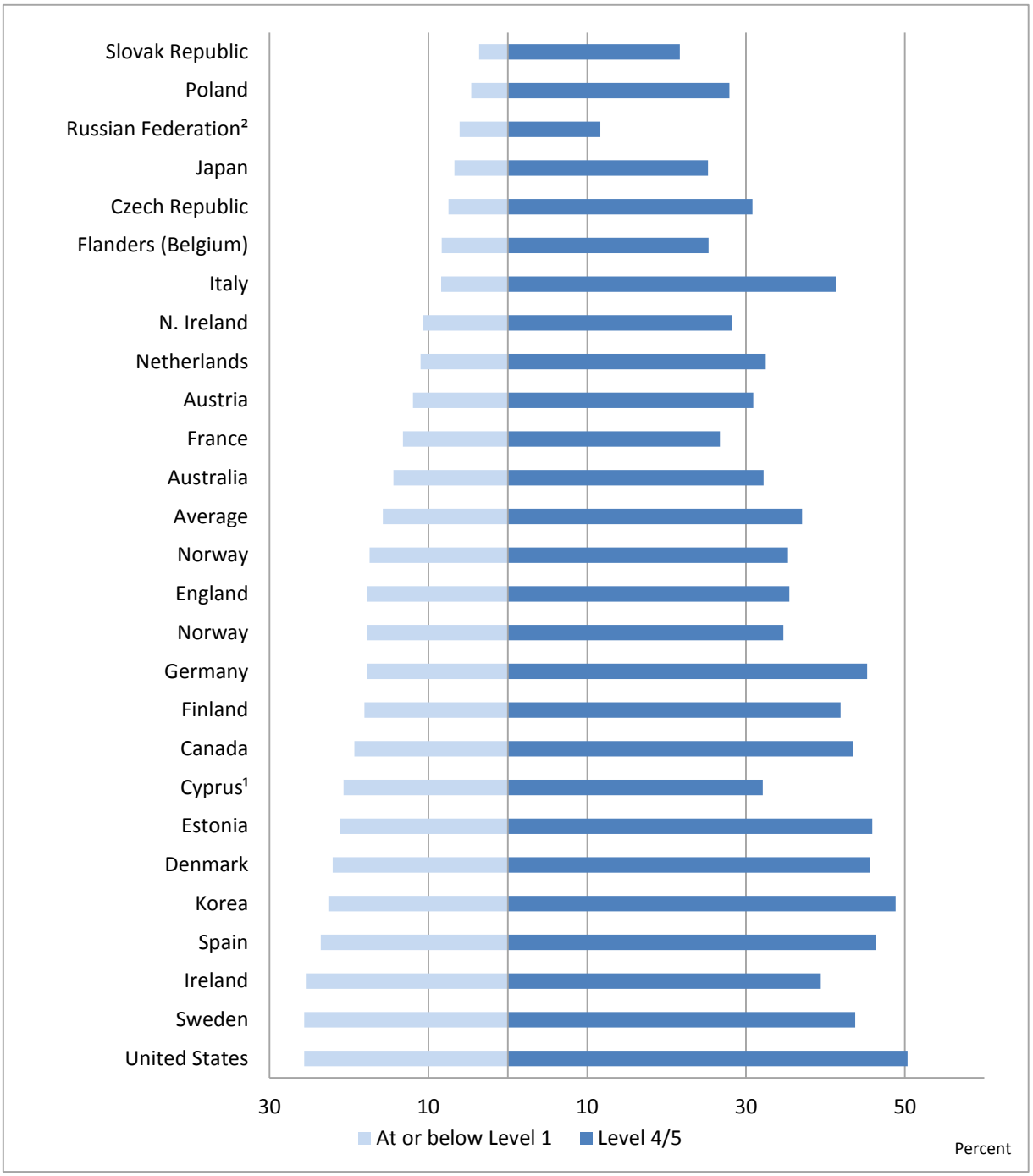
Evaluating the learning intentions of persons with lower proficiencies and identifying and understanding their reasons for choosing to participate or not participate in formal or non-formal AET is an important prerequisite for designing more effective and targeted policy actions. In PIAAC, respondents who reported involvement in job-related non-formal training activities were asked about the main reason for participation. Furthermore, all respondents were asked if they wanted to participate in more (or any, if they did not participate) formal or non-formal learning activities but did not in the end. Those expressing learning intentions were asked about the reasons that prevented them to start AET activity.

5.6.1. Training Wanted, but not Started

Among adults with low proficiency in literacy, 15.7%, on average, wanted to participate in a formal or non-formal learning activity but did not do so in the previous 12 months, as compared to 37.1% of adults with high literacy skills. The proportion of adults with lower proficiencies that wanted to but did not start training is varying between 4.5% in Slovakia to 25.6% in the United States (Figure 5.21). Among adults with low proficiency in numeracy, the proportion is 16.7% compared to 35.2% for high skilled adults. At least a quarter of adults with low proficiency in numeracy wanted to but did not participate in some form of learning activity in the United States (28.1%), Sweden (25.8%), Denmark (25%) and Ireland (24.5%). In nearly all countries, the proportion of the highly literate adults who reported wanting training but not starting falls in the range from 25% to50% with the highest proportion observed in the United States.

Figure 5.21. Percentage of adults with learning intentions by literacy level and country

Percentage of adults (25-65) at the Level 1 or below and Level 4/5 in literacy with learning intentions



Notes:
1. See note 1 on page 20.
2. See note 2 on page 20.

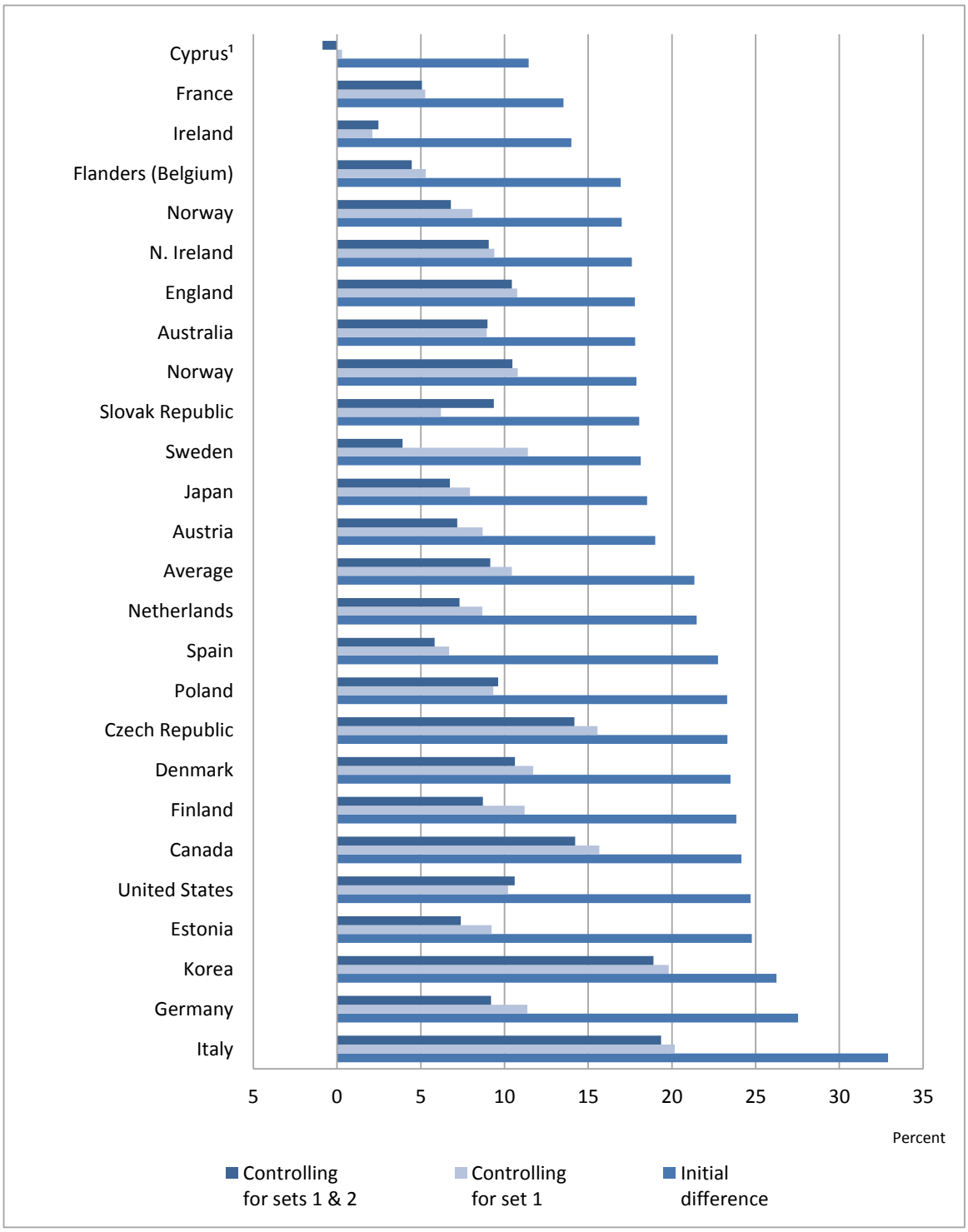
Countries are ranked in ascending order of the proportion of adults in Level 1 or bellow with learning intentions.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

The large differences between the proportions of adults with the low and high proficiency show that the interest in undertaking more training is more than the effect of social desirability. In order to see to which degree differences in socio-demographic and employment characteristics contribute to this motivational gap, we have examined these differences when controlling for these background variables (Figure 5.22). The results indicate that the varying degree of motivation for further training are to a great degree determined by the existing differences in the socio-economic circumstances of adults with low and high literacy proficiencies. Once these differences are taken into account, employment and occupational status have little influence on the willingness to participate in training (except in case of Sweden). However, it is important to note that even after accounting for differences in these background characteristics, proficiency is still an important correlate of the learning motivation. Furthermore, the role of proficiency differences as compared to influence of socio-demographic factors varies quite substantially across countries. In particular, in Ireland and Cyprus[21] socio-demographics account for almost all of initial differences in learning intentions while in Germany, Spain, Estonia, the Netherlands, Flanders and the United States they are responsible for major part of the initial motivational gap. On the other hand, in Korea, Canada, the Czech Republic, England, Northern Ireland and Italy, proficiency differences are more strongly correlated to the learning motivation than socio-demographic variables.

Figure 5.22. Differences between adults with low and high literacy in learning intentions

Differences between adults at the Level 1 or below and Level 4/5 in literacy in learning before and after controlling for socio-demographic and employment characteristics



Notes:
1. See note on page 20.
Countries are ranked in ascending order of the initial differences between literacy levels.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

5.6.2. Reasons for non-participation

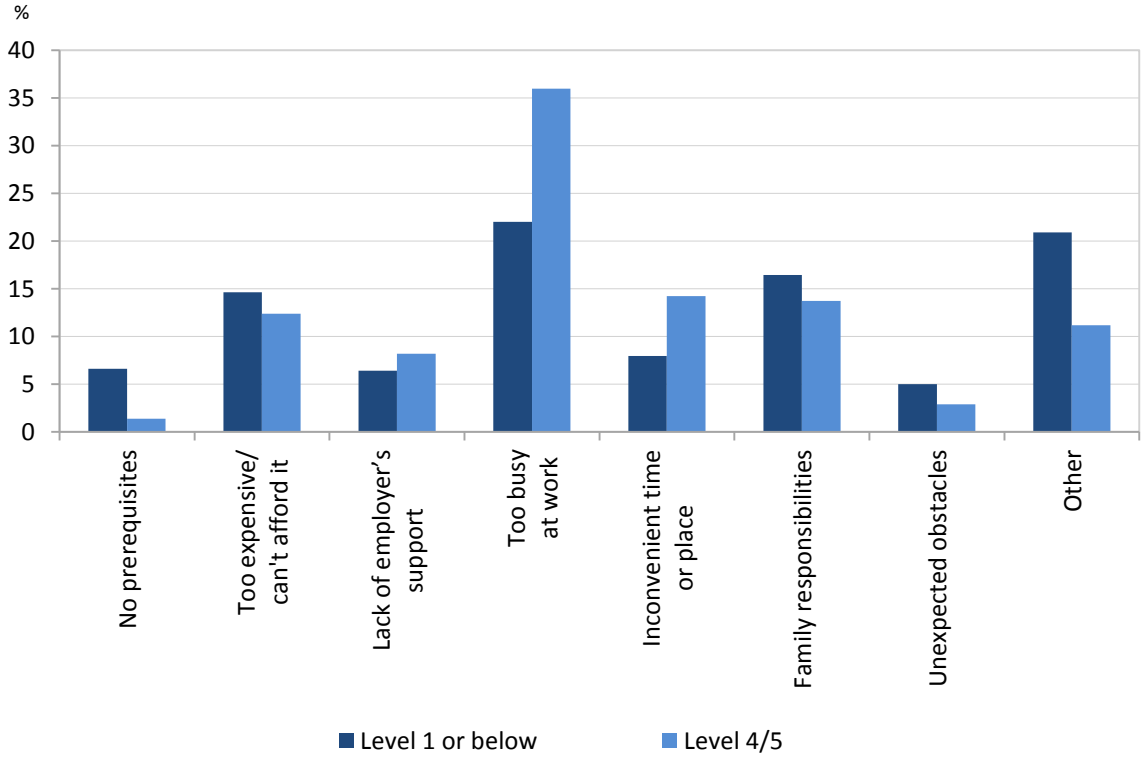
Among those who wanted to but did not undertake learning activities in formal or non-formal AET programmes, adults with lower proficiencies report work, family and numerous non-specified reasons (other) as the most frequent reasons hindering their participation, followed by financial issues, structural barriers, not having the required prerequisites and unforeseen circumstances. The relative importance of the main reasons for not participating reported by adults with high and low literacy is broadly similar. However adults with low literacy are more likely than those with high literacy to cite not having the prerequisites and 'other' reasons as the main reason for non-participation and less likely to cite being too busy at work or the fact that training takes place at an inconvenient time or location. Some care should be taken in interpreting these results. For example, it should not be concluded that the working arrangements of adults with low proficiency are less of an obstacle to participation than they are for highly proficient adults: 'being too busy at work' is simply cited less often as the 'main' obstacle. This may be because other obstacles are even more important or also because of the lower employment rates of adults with low proficiency compared to those with high proficiency.

Time constraints are mentioned as an important barrier by many adults. However, as is known from qualitative research, this can be an escape category, i.e. lack of time can be sited as an excuse for not participating even when it is not a real obstacle. Also, people tend to report time issues when the real reason is that they see no thematic relation between the training and their everyday challenges (Grotlüschen, 2003; Schiersmann, 2006).

Around 15% of adults with lower proficiencies face or anticipate financial problems in connection with adult education and training. This is only slightly higher than in case of highly skilled persons. Even in situations when a course is free of charge, people often assume it costs something, because they are used to having to pay for services (cf. Heinemann, 2014).

Figure 5.23. Reasons for not participating by literacy level

Percentage of adults (25-65) at the Level 1 or below and Level 4/5 in literacy reporting selected reasons for non-participation in AET (International average)



Notes: Participation 12 months prior to the survey. Participation rates for adults aged 25-65.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

Some 20% of adults with low proficiency in literacy indicated unspecified reasons to not participate in the training. This is almost twice as high as in the case of adults with high skills. This could mean that either people could not tell what kept them from starting or they could not find an answer choice matching their reasons for not participating in the training. Social desirability might also play a role, with people being reluctant to state their lack of prerequisites or financial means. For example, one might expect lack of prerequisites to be mentioned much more often among the adults with low proficiency, given that the majority of AET programmes are not geared towards this population and as such their pre-requirements may be too demanding for them. Previous research has found that *time, money and lack of connections* were the most common reasons for not participating in education programmes in the 1960s (Strzelewicz et al., 1966). The fear of being too old or too unprepared is also reported (Barz andTippelt 2004; Bremer 2007; Schröder et al., 2004).

5.6.3. Reasons for Participation in the Job-Related AET

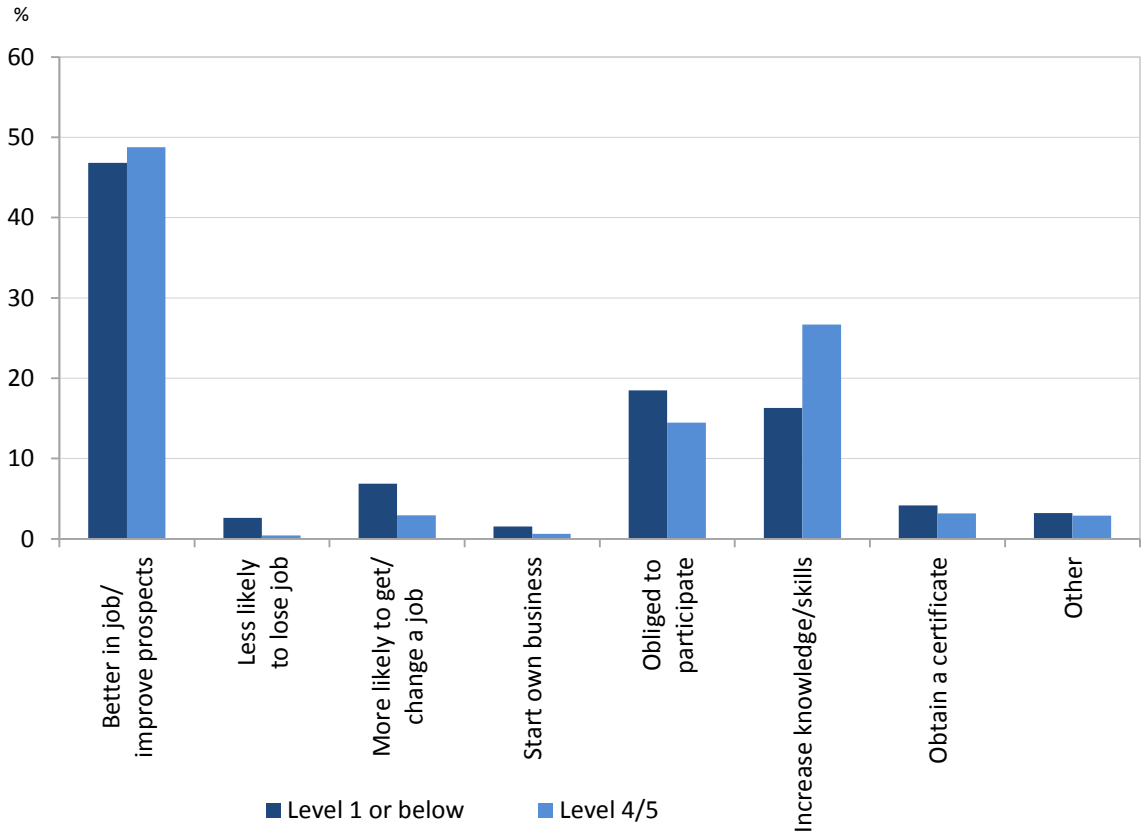
Those respondents that reported participation in on-the-job training or job-related non-formal learning activities were asked to indicate their reasons for joining these programmes. Overall, a desire to 'do one's job better' and to 'improve career prospects' is cited as a main reason for participating in job-related learning activities by more than 45% of adults with low literacy who participated in this type of adult education. Other main reasons for participation are the obligation to participate (18%) and improving

knowledge and skills (16%). The threat of losing the one's job does not seem to be an issue. This might mean that the respondents' jobs are secure or that adult education would not affect the job situation much. The later argument is common among adults with no or low qualifications (Grotlüschen and Brauchle, 2004; Schiersmann, 2006).

There are few differences in reported reasons for participation in job-related training between adults with low and high literacy proficiencies (a similar situation is observed in the case of numeracy proficiency). Higher skilled adults are only somewhat more likely to state that they wish to 'increase knowledge/skills' as their main reason for participation while adults with low literacy are slightly more likely than those with high proficiency to participate out of obligation. These small differences indicate that the motivation for participation in job-related activities is not strongly related to proficiencies. This can be seen as a promising result, creating conditions for easier access and involvement of this population in the job-related AET programmes. However, it should also be emphasized that these reasons are related to specific on-the-job and job-related learning activities and that different (patterns of) reasons may be present in the case of other types of adult learning and training programmes.

Figure 5.24. Main reasons for participation in job-related training

Percentage of adults (25-65) at Level 1 or below and Level 4/5 in literacy reporting selected reasons for participation in job-related AET (International average)



Notes: Participation 12 months prior to the survey. Participation rates for adults aged 25-65.

Source: Survey of Adult Skills (PIAAC) (2012). See web annex to access supporting data.

5.7. Summary

Adult education and training (AET) represents an important opportunity for adults with low literacy and numeracy proficiencies to improve their competences and consequently their chances for better integration in the economic and social life and overall personal wellbeing. In this chapter, we have examined the participation rates of adults aged 25-65 with low proficiency (Level 1 or below in literacy or numeracy) in formal, non-formal and informal types of AET. In doing so, we have compared these rates with adults with high skills (Level 4/5) in order to determine the size of the participation gap between the two groups. Furthermore, we have investigated to which degree the lower participation rates of adults with lower proficiencies are determined by their observed demographic characteristics and lower of socio-economic status as well as their lower employment and occupational status. Finally, we have evaluated their learning intentions and overviewed the main reasons for participation and non-participation in the AET, while taking into account their differing socio-demographic background.

The participation rates of adults with low literacy proficiency in formal and non-formal AET are much lower than those of highly proficiency adults as well as those of the general population. In absolute terms, the gap in participation rates is much higher in the case of non-formal AET, where the difference between rates of adults with low and high literacy proficiency is on average 44 percentage points (29.7% compared to 73.6% respectively). In the case of formal education, this difference is 12 percentage points (5.9% compared to 18.1%). However, in relative terms, the difference in rates is even greater in the case of formal education, where highly proficient adults are three times more likely to participate compared to the adults with low proficiency. Furthermore, adults with low literacy proficiency are substantially less likely to participate in any form of non-formal learning – open or distant learning, on-the-job learning, seminars and workshops, and private lessons. Similar results are found when comparing adults with low (Level 1 and below) and high (Level 4/5) numeracy proficiencies.

The large gaps in the rate of participation in different forms of AET between adults with different proficiency levels are the consequence of a number of factors among which the most important seem to be differences in socio-demographic characteristics, such as age, parental educational attainment, cultural background and migration status. In particular, after taking into account these differences between adults with low and high literacy, the difference in the participation rates of adults with low and high proficiency in literacy drops to less than half of the initial values - to 4 and 18 percentage points in the cases of formal and non-formal learning respectively. In addition to socio-demographic characteristics, differences in employment and occupational status between persons with low and high proficiencies were also found to affect participation gaps. When adults with low and high proficiencies with the same employment and occupational status are compared, the gap in the rate of participation in non-formal education and training falls further – to 13 percentage points. However, in the case of formal education, employment and occupational status do not influence participation. Thus, after taking into account both socio-demographic and employment characteristics differences in participation rates between adults with low and high literacy fell from initial 12 to 4 percentage point in the case of formal AET and from 44 to 13 percentage points in case of non-formal AET. In other words, socio-demographic and employment characteristics account for about 70%-75% of the initial differences in participation rates in formal or non-formal AET between adults with low and high literacy. Put another way, literacy-related factors accounts for 25%-30% of the differences. Similar effects are observed across the four types of non-formal learning – open or distance learning, on-the-job training, seminars and workshops, and private lessons.

Once socio-demographic characteristics and employment and occupations status have been taken into account, the gap between the participation in AET between adults with low and high proficiency, although much smaller is still substantial, especially in the case of non-formal AET. The cross-sectional nature of PIAAC data does not permit a close examination of the causal effects of proficiency on participation in learning activities. However, it could be expected that the relationship observed between proficiency and

adult education, after taking into account the effects of socio-demographic and employment characteristics, may partly reflects two complementary mechanisms. On the one hand, PIAAC data confirms the phenomenon, sometimes called the 'Matthew Effect', i.e. that the better educated and more highly skilled persons access training more often than do the less educated and adults with low proficiency (selectivity). It should be noted, however, that the effects of selectivity may be more related to the educational status than the skill level which is more difficult to assess and incorporate into selection procedures. Likewise, it could be expected that the participation in AET improves skills to a certain degree (efficacy), although recent reports indicate that the effects of AET programmes are insufficient to produce substantial and lasting improvements in literacy proficiency (Eurydice, 2015)

Interestingly, workers with low literacy (36%) are as likely as those with high literacy (36.9%) to have a high level of engagement in informal learning activities as measured by the top two quintiles of the 'learning at work' index. Moreover, after taking into account differences in socio-demographic and employment characteristics, adults with low literacy proficiencies are actually significantly more likely to participate in this form of learning than their highly proficient peers. These results can be seen as evidence for selectivity effects, i.e. that existence of entrance requirement for formal and non-formal AET prevent higher rates of participation of adults with lower proficiencies in these programmes, while the absence of these requirements in the case of more informal 'learning at work' improves their participation rates. Moreover, these results indicate that in the case of adults with lower proficiencies informal learning can be representing a partial substitute for more formal types of AET. Likewise, the much higher rates of participation in non-formal compared to formal AET among adults with low literacy can be also seen as an illustration of the difficulties adults with lower proficiencies face in accessing formal AET programmes that may have entrance requirements related to prior formal studies. In addition, adults with lower proficiencies that participate in non-formal education and training undertake more training hours, on average, than other training participants. In other words, although their enrolment rates are substantially smaller, once adults with low proficiency gain access to a programme, they tend to undertake the same number of training hours as adults with high proficiency. Here again, selective entrance procedures may be one of the factors behind the results.

Selectivity effects are also visible when the reasons for non-participation in non-formal AET are examined. Adults with low literacy are more likely than higher skilled adults to report that they lacked prerequisites (7% compared to 1% respectively), that a course was too expensive (15% compared to 12%), that they faced unexpected obstacles (5% compared to 3%) or that other reasons prevented them from participating (21% compared to 11%). On the other hand, lack of time seems to be much less of a problem for adults with low literacy proficiency than for adults with high proficiency – only 30% of the former group cited being too busy or inconvenient time and place, compared to 50% of the latter as the main reasons for non-participation.

Among adults with low proficiency in literacy, on average 15.7% wanted to participate in a learning activity but did not in the previous 12 months, as compared to 37.1% of adults with high literacy skills. However, differences in the socio-demographic and employment circumstances of adults with low and high literacy proficiencies are taken into account, the gap in learning intentions is substantially decreased. Nevertheless, proficiency remains an important correlate of the learning motivation with the size of its effect varying quite substantially across countries.

As the supply of different forms of AET – formal, non-formal, informal – varies between countries, rates of participation among adults with lower proficiencies also differ widely across countries. In general, there is a clear relationship between the overall participation rates and the participation rates of adults with lower proficiencies – countries with higher general rates of AET also have higher participation rates of adult with lower proficiencies in AET, and vice versa. This could be seen as an indication of the need for targeted programmes that would place more emphasis specifically to this population in need.

Practitioners from companies and training institutions also state that the target groups under consideration do not necessarily show a large demand for training (with the exception of language training for recent migrants). The results presented indicate that a large part of the reason lies in the disadvantaged socio-economical background of these people. At the same time, the lower demand for training among adults with lower proficiencies is also related to other factors, such as the anticipation of real or perceived pre-requirements or obstacles, as indicated to some extend by the reported reasons for non-participation. In addition, adults with lower proficiencies may also be less interested in the subject matter (especially if it does not have direct real-life relevance), remember more negative educational experiences, feel less encouraged from their environment, etc. Another reason may be the real or perceived lack of need for continuous updating of skills in many jobs occupied by adults with lower proficiencies, especially when taking into account that their occupational status is much lower than that of higher skilled adults.

Taken together, the results indicate that adults with lower proficiencies have low rates of access to AET both in absolute and relative terms. This is related to their disadvantaged socio-demographic status and, to a lesser degree, to their lower economic and occupational status. On top of these factors, differences in proficiency in literacy and numeracy also play an important role. It seems likely that adults with low literacy have lower chances of access to AET (selectivity) and, at the same time, lower rates of involvement do not allow them to improve their skills. This vicious cycle represents a considerable policy challenge as it could be argued that AET represent one of the most important avenues for support and alleviation of disadvantages and difficulties these persons face in their work and everyday life. The dominant role of the socio-demographic factors indicates that specific characteristics of this population need to be taken into account when designing AET programmes. For example, they should take into account the limitations and challenges related to older age, lower levels of formal education, lower socio-economic status, possible difficulties with native language, unease and inexperience with educational settings and tools, etc.

Furthermore, the presence of selectivity effects points to the need for a careful consideration of the entrance requirements to and the evaluation criteria those AET programmes that are run by public authorities. In those cases where it exist, the evaluation of the programmes designed for adults with low literacy or numeracy could place greater emphasis on the learning progress of the participants, i.e. comparison of the final with initial skill levels, rather than on the outcome levels alone. However, most of AET programmes are work-related and company-provided (AES, 2012) and in these cases entrance requirement are less often an issue and very few of these are evaluated at all (Eurydice, 2015). Thus, in these cases the role of employers in organising AET programmes and selecting employees for them is crucial. Finally, the results show that the lower socio-demographic and occupational statuses as well as lower skill levels of these adults are negatively associated with their interest in and willingness to participate in learning activities and create additional difficulties in participation in the AET. It is thus clear that a general approach towards an improvement of the AET infrastructure in a country cannot solve the persistent problem of participation gap between adults with low and high skill. In order to address this issue and reduce skill inequality in the adult population, policy efforts need to be targeted to the specific needs and specific characteristics of this population.

Notes

[8] The International Adult Literacy Survey (IALS) survey was the first comprehensive assessment of the adult literacy skills. It was developed by the Organisation for Economic Co-operation and Development (OECD) and was carried out from 1994 to 1998 in 20 countries. More information available at: http://www5.statcan.gc.ca/olc-cel/olc.action?ObjId=89M0014X&ObjType=2&lang=en&limit=0

[9] The Adult Literacy and Lifeskills (ALL) Survey was an international study of the adult literacy and numeracy skills. It was conducted in two rounds; first, in 2003 and then again between 2006 and 2008 in 10 countries. More details are available at: https://nces.ed.gov/surveys/all/.

[10] LEO stands for Level-One Survey. It is a German survey of people who are at the lower end of the educational scale. To find out more: http://blogs.epb.uni-hamburg.de/leo/?p=197. The dataset is available for secondary analyses: www.leibniz-education.de/lern.html?seite=11&fdid=31&lang=en

[11] IVQ stands for Information and Daily Life Survey conducted by Insee. Direction des statistiques démographiques et sociales (DSDS).

[12] After a successful start, with about 78.000 entrances until June 2015, Germany is planning to continue and further develop such support, for example, with measures to promote basic skills, assistance during retraining and financial premiums upon successful completion of interim and final exams.

[13] Adult Education Survey is a survey on education and lifelong learning activities of adult population, carried out by 29 European Union (EU), EFTA and candidate countries. The most recent wave of the survey was conducted between 2011-2012 (2011 AES).

[14] The German government wants 50% of the population to participate in adult education and training and wants the low educated to reach participation rates of some 30%. Adult Education Survey, which is carried out every three to five years is used as a reference survey to monitor the progress.

[15] Thus, although this definition inevitably excludes some adults younger than 25 that are in AET programmes, it prevents inclusion of young adults who are in initial formal education rather than in AET, a distinction that is not easy to make and equally reliable across countries.

[16] While the average is increasing, participation rates in some countries have actually decreased. For example, in UK the rate dropped from 20.1% in 2009 to 15.8% in 2014.

[17] In the case of comparisons across adults with low and high numeracy skills, these proportions are 30.6% and 72.6%.

[18] After controlling for the two sets of control variables, the participation gap between adults with low and high numeracy is 12, 1, and 12 percentage points, in case of overall, formal, and non-formal education respectively.

[19] It should be noted that apart from non-formal AET, online education programmes can also belong to the regular formal education, in cases where formal credentials are earned through online education. However, these cases are not mapped in PIAAC.

[20] See note 1 on page 20.

[21] See note 1 on page 20.

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CHAPTER 6: CONCLUSIONS

This chapter draws the analysis from the preceding chapters to highlight what can be concluded about the group of adults with low proficiency in literacy or numeracy.

6.1. Who scored at or below Level 1?

PIAAC does not reveal a homogenous group of adults with low literacy or numeracy skills providing a simple, clear target for policy makers to aim at. Instead, it reveals great variation in the characteristics of this group, both within and across participating countries. While this underlines the challenges faced by countries in improving the literacy and numeracy levels of their adult population, it also suggests that understanding the specific target group for such policies within countries is a vital first step and one that is greatly facilitated by the survey of adult skills.

The proportion of adults who scored at or below Level 1 in literacy and/or numeracy within each country differs. At one end of the scale Japan (4.9%) has the lowest proportion of adults at this level in literacy and, at the other, Italy (27.7%) and Spain (27.5%) have the largest shares. However, in all countries a significant proportion of the adult population appears to have poor literacy and/or numeracy. To take one example, the Netherlands has a population of roughly 16.8 million people, of which 67% are aged 16-65 years (the target age group for PIAAC). Some 11.7% of the sample in the Netherlands scored at or below Level 1 in literacy, giving a total of 1.3 million adults of working age with poor literacy. This is a country in which the average proficiency in literacy of the adult population was the 4th highest among the 24 countries in the first round of PIAAC. All countries have a sizeable adult population with literacy and/or numeracy needs. Policymakers should be less concerned with the relative size of their own population of adults with weak literacy and numeracy, or with their country's average performance, and instead focus on understanding the particular characteristics of those in their country who performed poorly in the survey.

While there are broad similarities across countries between the characteristics of adults who scored at or below Level 1 in literacy and/or numeracy, some differences are found between countries. Broadly speaking, adults with low proficiency in literacy or numeracy are more likely than the rest of the adult population to exhibit certain characteristics. For example, they are more likely than the rest of the adult population to have not completed upper secondary level education and they are also more likely to have been born in a country other than the country in which they took the test. However, what is perhaps more noteworthy is that, while they are more likely than the rest of the adult population to exhibit these characteristics, the majority of them do not. Indeed, 65% completed upper secondary (and 9% completed tertiary); 62% were born in the country in which they took the test, and 56% are in employment.

Our understanding of those with poor literacy and numeracy is often informed by two sources: analysis of cohort data and other large population surveys that show correlations between levels of these skills and poor life outcomes in areas such as employment, wages, health and many others;[22] and our knowledge of adults who join adult basic skills classes. However, the data from PIAAC suggest that, in many cases, our understanding of the low-proficiency population may be less than accurate, pointing to the danger that stereotypes may inform policy in this area – for example, the view that adults with low literacy and numeracy are predominantly unemployed, poorly educated or from immigrant or low socio-economic status backgrounds. This may be true of participants in adult literacy and numeracy classes, but not to the majority of adults with low-proficiency in literacy and/or numeracy. Again, one small example: only 10% of those who scored at or below Level 1 in PIAAC are unemployed. The equivalent figures for Level 2 and Levels 4/5 are 8% and 3%. While adults proficient at Level 1 and below are more likely than adults at

higher levels to be unemployed, they are, nevertheless, much more likely to be employed than unemployed. Governments may legitimately target literacy and numeracy training at adults within the most at-risk groups such as migrants, the unemployed or those without secondary education. However, this risks ignoring the needs of large numbers of adults who also need to improve their skills.

We may question how adults can survive and even prosper in modern society if they have poor literacy and numeracy skills. The results of the PIAAC reading components assessments, analysed in Chapter 4 of this report, provide some clues, by highlighting that the vast majority of adults who scored at or below Level 1 in literacy are not illiterate. They may have poor literacy skills, but they can still function in a limited way with text.

As we saw in Chapter 4, the reading components assessment was taken by all respondents who took the assessment in pencil and paper format. This assessed Print Vocabulary, Sentence Processing and Passage Comprehension. While there remains significant variation among countries, even in low performing countries, the average performance of adults proficient at below Level 1 on the Print Vocabulary test is well above chance performance. The international average for percent correct for Print Vocabulary tasks among this group was 90% (as compared to above 95% for adults at Level 1 and 97% at Level 2). This demonstrates that even adults with very low-proficiency in literacy can recognise printed forms of words associated with common objects such as animals, furniture, and shapes.

In addition, many adults proficient at below Level 1 in literacy can understand short sentences and evaluate whether they are factually correct. The international average percent correct for Sentence Processing tasks was 74% among adults proficient at below Level 1 compared to above 85% for adults at Level 1 and 93% at Level 2 well in excess of chance performance at about 50%.

However, these adults do have significant difficulty with processing complex sentences and reading extended passages for basic meaning. Their performance on Passage Comprehension tasks was much closer to chance levels (63% correct on average as compared to 85% for adults at Level 1 and 94% at Level 2) and the gap between their performance and that of more proficient adults was greater than for either the print vocabulary or sentence processing tasks. The performance gap between adults scoring below Level 1 and those scoring at Level 1 on the reading components is larger than the gap between Level 1 and Level 2. This suggests that a primary target for policy interventions should be the group of adults scoring below Level 1. It should be noted that this group represents on average only 3% across the countries participating in PIAAC.

The wide variability within and across countries on the three reading component task sets is counter evidence to the assumption that all adults at or below Level 1 lack any reading skills, and is also counter to the assumption that all are homogeneous with regard to reading skill profiles. This reaffirms that policymakers should focus on understanding the particular characteristics of those in their country with poor literacy skills.

6.2. Adults' literacy and numeracy practices

The Survey of Adult Skills provides rich data on how adults make use of their skills. From this data we learn that large numbers of low-proficiency adults have limited engagement with reading, writing, and numeracy practices at work and outside work. There is broad cross-national variation in levels of engagement in various information-processing practices among adults with low-proficiency in literacy and/or numeracy. However, it is possible to discern patterns in the data. As literacy and numeracy proficiency levels rise, average levels of engagement in reading, writing and numeracy practices increase steadily. In addition to proficiency, educational attainment and demographic characteristics systematically shape individuals' engagements with reading, writing and numeracy practices, both at work and outside of

work. We also see that adults' uses of a given skill are highly correlated between work and outside of work. Engagement with each domain of practice – reading, writing or numeracy – is positively correlated between work and outside of work settings, at both the level of individuals and countries. These correlations are found in both the low-proficiency and the broader adult populations. Engagement with reading and writing practices is strongly correlated in work settings as well as in outside of work settings for those who score at or below Level 1.

In Chapter 3 we defined a specific pattern of predictive statistical association between a measure of skill use and an economic or social indicator of interest, a pattern called embedding. In low-proficiency populations, reading, writing, and numeracy practices – whether at work or outside of work– are embedded in workers' earnings, and are stronger predictors of earnings than proficiency. Reading, writing and numeracy practices at work are each embedded in workers' earnings, whereas only numeracy practices outside of work are embedded in workers' earnings, and reading and writing practices are not. So, for those who scored at or below Level 1 practices outside of work appear to be of more importance. As they are less likely to be in jobs that require use of reading, writing and numeracy skills, what they do outside work is of crucial importance in order to maintain and develop their skills.

Adults' literacy and numeracy practices are not just of importance for earnings. Reading, writing and numeracy practices are also embedded in a number of important social outcomes, including social trust, volunteerism, political efficacy and general health, for both those who scored at or below Level 1, and for the general adult population, with the single exception that numeracy practices are not significantly embedded in social trust within the former group. What is more, increased engagement in reading, writing and numeracy practices outside of work is positively associated with better social outcomes for those who scored at or below Level 1, even after controlling for demographic, education and proficiency variables.

Further research is needed to clarify and deepen our understanding of the relationship between proficiencies and practices, and how they interact with each other, with education and training, and with the demand characteristics of work environments to produce large economic returns to workers.

6.3. Participation in adult education

Stereotypes about adults with low proficiency in literacy and/or numeracy contain assumptions about how willing and capable this group is with regard to engaging in further adult education and training. In particular, it is assumed that, perhaps due to poor prior experiences of education or through lack of confidence, they are less likely to participate. In Chapter 5 we saw that the overall average participation rate in some form of adult education is 46% among the whole population. Compared to roughly one in two of the whole population and up to seventy percent of those who scored at Level 4 and above in literacy, only one in three of those who scored at or below Level 1 in literacy had participated in adult education in the 12 months prior to the survey. While adults proficient at or below Level 1 do participate, their participation lags behind other groups.

However, while adults with low literacy or numeracy are less likely than their more proficient peers to participate in adult education or training, over 30% of adult with low proficiency participated in adult education and training. This provides opportunities for education providers to engage this group in improving their literacy and numeracy skills. To support those with poor skills in literacy and/or numeracy governments have launched a number of programs or strategies, with adult education as a central component. These often have improvement in the foundational skills of literacy and numeracy as a focus, or an outcome and may include ICT as an additional component. Encouraging more adults with poor literacy and numeracy to participate in adult education should be a key priority for policymakers.

Chapter 5 identified a distinct picture of differences in participation in adult education and training based on factors such as immigrant background, age, socio-economic status, gender and educational background. However, the overall picture shows that as societies accept and strive for equality for these groups in wider society, the gaps in their participation rates decrease.

Closing such gaps would first of all require a focus on closing the gap in non-formal education. Participation in non-formal training is strongly correlated with employment and progression to formal education. Yet, while one third of those who scored at or below Level 1 participate in non-formal education, fewer than one in ten participants continues onto formal adult education.

As a first step policymakers should establish what the current gaps in participation are and set targets for these to be reduced. Subsequently, setting targets for participation in adult education and training among adults with low levels of literacy and numeracy may be a useful strategy for policy makers to follow.

The PIAAC data allow us to look at the distribution of skills amongst workers in the public and private sectors. On average 78% of those who scored at or below Level 1 in literacy work in the private sector and 18% in the public sector (with similar patterns for numeracy). However, in some countries there appears to be a higher proportion at or below Level 1 in the public sector (Sweden: 35%; Norway: 32%; Denmark: 29%).

The prevalence of this group in public sector employment in certain countries suggests that there is an opportunity for those countries to target their public sector workers and facilitate an increase in training opportunities. Traditionally we think of public sector employers as more likely to provide training opportunities for their staff than private sector employers, particularly for those with poor skills who are less likely to receive training in the private sector. However, the modern, post-credit crunch public sector may be leaner and less inclined to invest in its staff. Likewise, the amount and nature of training opportunities are likely to differ among different areas the public sector.

The quality, flexibility and security of employment are related to participation rates in adult education and training among those who scored at or below Level 1 in literacy. The demands of the workplace can drive people to improve their skills, but at the same time being busy in the workplace prevents people from finding the time to do so. This paradox holds across domains and levels.

The conclusion for practitioners and policy makers is that the ongoing claim that the target group does not search for training is not confirmed by the data. Instead, the findings point at a large demand for training that is hindered by time constraints and costliness. If more than thirty percent of the subgroup participates in adult learning and another eighteen percent wanted but didn’t start, the range between those two figures is the area where benchmarks could be placed.

6.4. Adult learning guidance

The provision of adult education is often fragmented and there is a lack of coordination between the different providers making it difficult for low-proficiency adults to access learning opportunities. Guidance services are one of the most important organisational components in programs aimed at meeting the needs of adults with literacy and/or numeracy needs. As part of their existing data collection, guidance providers should collect information on whether those with low levels of literacy and numeracy benefit from their services. In this context guidance plays an important role in specifying the individual level of competences, learning interests and learning objectives in order to develop individual learning paths.

Many countries already have some form of guidance to adult learners or specific policy strategies that focus on educational guidance and orientation. However, the existing services, or the structures on which

these services rely, are often not equipped to reach the adults most in need of education. In developing adult learning guidance services policy makers should make a particular effort to ensure effective communication with the target group, outlining available pathways following initial formal education, describing where they may lead and what kind of support structures exist.

Indeed, the provision of information about lifelong learning opportunities at the end of compulsory education could be of vital importance as this is the last stage where 'the hard to reach' can be reached systematically. This might also mean that teachers should be equipped with knowledge about lifelong learning opportunities and/or guidance services should work with schools to inform young adults of the opportunities available to them beyond school.

There are also useful social strategies employed by adults with poor skills to enable them to address the need to improve their literacy or numeracy, such as admitting their need and asking for or seeking help. These are not covered in the PIAAC background questionnaire. Coaching and training for family members and colleagues of those with low-proficiency in literacy and/or numeracy may have a positive role to play in encouraging adults to employ such strategies and thus take the first step in improving their literacy and numeracy skills.

New combinations of informal access and pathways to more formal, longer-term and accredited further education would appear to be needed, giving access via informal learning, and efficacy via non-formal and formal learning. For this to be successful there is a need for systems that facilitate improved access to non-formal and formal learning via informal learning routes for this target group.

6.5. Designing learning provision

The question of whether adult education and training provision can influence proficiency in literacy and numeracy has to be addressed with longitudinal data. Countries should look carefully at their training provision and continue to improve the quality as well as the access to formal and non-formal training. And as we have seen in the preceding chapters, careful analysis of PIAAC data can usefully inform our understanding of the design and content of learning programs aimed at those with low levels of literacy and numeracy.

The reading components have also demonstrated that adults at Level one are relatively stronger in passage level performance compared to adults below Level one. Practice and engagement in continuous text reading, as early as possible in learning programs, would appear to be a positive strategy, with improved performance on simple passage reading tasks serving as an early indicator/milestone of learning progress.

Furthermore, the strong, consistent association between increases in accuracy with decreases in processing speed across the entire ability distribution apparent within the reading components data, implies that instructional or training programs should strongly encourage extended practice and engagement with text to enhance the ease, speed, and efficiency that adults process written text. This conclusion is consistent with and supported by a large body of cognitive psychological and learning science research on building fluency, automaticity, and expertise in a domain. For such approaches to be successful it will be necessary for adults to have available rich and stimulating reading material at a level that is appropriate for them.

Analysis of the Reading Components assessments suggests that fluency or automaticity of component skill processing is part of the underlying foundation of literacy for most adults. That is, adults below Level 1 need more time to achieve their levels of performance than those at Level 1, who themselves need more time than those at Level 2, and so on across Levels 3, 4, and 5. Speed reduces with proficiency – those at lower levels need more time to complete the tasks.

In multiple regression models, all three reading components are significant predictors of literacy proficiency and the rate variable adds additional variance to predictions over and above accuracy on the component tasks. This further confirms the pattern of association between accuracy and rate/fluency of performance and underscores the importance of automaticity of basic processes in reading.

Therefore, more attention should be given to assessments of foundational reading component skills in adults at or below Level one, to better understand and align instructional and training programs to the strengths and weaknesses adults have in reading printed text.

Computer usage is strongly related to performance. In general, those adults who had never used a computer scored lower than those who answered that they had, although there were a few country-level exceptions to this pattern. The pattern was much more mixed for Level 1 adults across countries, and nearly disappears at Level 2. Providing access to and training with and on computers seems a sensible policy position. This is particularly so when we consider that so much personal, workplace, and commercial reading literacy takes place on, or is migrating to, electronic devices (e.g. smartphones, tablets) and computers.

PIAAC data provide a strong case for investment in high-quality family learning programs, and other policy interventions at the family level. The background questionnaire contained a number of questions about the family life of respondents, including the educational attainment of their parents, and how many children they had. The data reveal a strong link between parental education and proficiency and also show that adults at or below Level 1 are more likely to have children and when they have them, to have more than those who achieved higher scores. This suggests that a key element of a country's policy response to PIAAC should include an increased focus on the family. Family literacy and numeracy programs focus on developing parents' ability to support the literacy and numeracy development of their children, by increasing their understanding of what their children are learning in school and improving their own skills, and those of their children, at the same. Family learning programs may also bring about positive changes in the home learning environment, increasing the chances of sustainability of any gains made within the programs.

In many countries there is an urgent need to improve educational provision for recently arrived migrants and refugees, particularly those whose home language is different to the official language of their new country. The PIAAC data show that those for whom the test language was not the same as their home language were more likely than those who spoke the language of the test at home to score at or below Level 1 in literacy only. Furthermore, those whose parents were both foreign born were also more likely to score at or below Level 1 in literacy only. This suggests that even when migrants have adopted the language of their new country as the language they use at home, they are more likely to have poor literacy skills in the test language than those who were educated in the test language from childhood. It may be that the relative importance of native and language used at home can be explained by time spent in the country, as migrants are likely to become more comfortable working in their adopted, or home language, over time and that oral fluency may mask underlying literacy issues highlighting the need for enhanced literacy support for second generation migrants.

As we have seen in Chapter 3, what adults do with their literacy and numeracy skills appears to be of great significance. Accordingly, more attention should be given in skills and training policies to fostering engagement in literacy and numeracy practices for this group, as well as for the general population, to support skills development and guard against skills loss. Instructional programs for adult literacy and numeracy should be designed to increase engagement in literacy and numeracy practices in specified domains. This does not preclude a focus on increasing specific sub-skills and broad proficiencies, but consideration should be given to the delivery of these within the context of relevant literacy and numeracy practices.

6.6. The literate environment

Evidence suggests that encouraging more intense engagement in literate practices is an important mechanism through which literacy is improved and developed. PIAAC data show that adults with literacy and/or numeracy at or below Level 1 are much more likely than the general population to report never engaging in literate and numerate practices such as reading writing and using numeracy at home or at work. Many are working in jobs that demand little in terms of their literacy or numeracy skills and they therefore run the risk of losing the skills that they have by not using them. It is also interesting that those individuals in England, Spain, Ireland, Finland, Denmark, Canada and Australia who had completed upper secondary education or higher, but were working in low skilled jobs, were more likely to be among adults who has low literacy proficiency compared to those with similar education, but working in skilled occupations, supporting the hypothesis that skills use in the workplace is of great importance for skills development.

In their final report the European Commission High Level Group of Experts on Literacy (2012) concluded that adults should be encouraged to read and to write more often and to be supported in doing so with greater confidence and enjoyment. They suggest that adults' skills respond to and are shaped by the 'literate environment' in which they act. The literate environment constitutes the demands on and supports for adults' literacy and numeracy in any particular domain. Consideration of the literate environment is one of three central recommendations that the High Level Group made. The PIAAC data on skills use provide strong support for the High Level Group's emphasis on policy proactively fostering a more literate environment – that is, creating more, and better, opportunities and supports for literacy engagement in all areas of individuals' and families' lives, including the workplace. The High Level Group considered only literacy, but the concept of the numerate environment is of equal relevance and importance implying that not only should learning lead to more confident engagement with the literate and numerate environment, but that policymakers should be proactive in understanding and developing the literate and numerate environment in their countries.

PIAAC provides a rich source of information on the supply of skills. Policy makers need to be active in developing systems to ensure the supply of literacy and numeracy skills among the population. The supply system includes education provision, teachers, their training, curricula, materials, progression routes, and assessment and accreditation. However, in order to find ways to motivate adults with low-proficiency in literacy and/or numeracy to engage in learning we also need to know about the demand for literacy and numeracy. What are adults required to do with their literacy and numeracy skills? What demands does the literate and numerate environment in which they work place on their literacy and numeracy skills? Understanding demand would allow policy makers to design learning, and accreditation of that learning, that will help adults to meet those demands as well as credibly demonstrate to employers, and others that they can meet those demands. Policymakers should encourage employers to enrich their workplaces, and ensure that there are requirements for the use of literacy and numeracy. Exposure to demanding tasks would then act as motivation to engage in both informal and non-formal learning as well as promoting skills maintenance. Policymakers should also invest in the general literate environment to compensate for the lack of engagement that adults with low literacy and / or /numeracy may have at work. Better understanding of adults' use of literacy and numeracy in the workplace would also be of benefit to policymakers and efforts should be undertaken to improve the measurement of skill use in work and other settings.

Note

[22] See for example: Bynner, J. and S. Parsons (2006) and Parsons, S. and J. Bynner (2007).

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ANNEX

Table A2.1a. Proportion of low and high skills individual across demographics characteristics

	Literacy proficiency				Numeracy proficiency				Total population	
	Level 1 or Below		Level 4 or 5		Level 1 or Below		Level 4 or 5			
	(%)	S.E.	(%)	S.E.	(%)	S.E	(%)	S.E.	(%)	S.E
Total population	**15.5**	**(0.1)**	**11.8**	**(0.1)**	**19.0**	**(0.1)**	**12.4**	**(0.1)**		
Demographics										
Age										
16-24 year-olds	11.7	(0.3)	18.4	(0.5)	14.3	(0.3)	15.6	(0.4)	16.7	(0.0)
Currently studying for a formal qualification	5.6	(0.2)	14.1	(0.5)	7.6	(0.2)	11.9	(0.4)	10.7	(0.1)
Currently not studying for a formal qualification	6.1	(0.2)	4.4	(0.2)	6.7	(0.2)	3.6	(0.2)	5.9	(0.1)
25-34 year-olds	14.2	(0.3)	30.3	(0.5)	15.0	(0.3)	28.4	(0.5)	20.1	(0.1)
35-44 year-olds	17.3	(0.4)	26.6	(0.5)	17.7	(0.4)	26.5	(0.5)	21.4	(0.1)
45-54 year-olds	23.7	(0.4)	16.5	(0.4)	22.7	(0.3)	19.0	(0.5)	21.2	(0.1)
55-65 year-olds	33.1	(0.4)	8.1	(0.3)	30.3	(0.4)	10.5	(0.3)	20.5	(0.0)
Gender										
Men	50.1	(0.5)	54.8	(0.6)	44.2	(0.4)	64.1	(0.5)	49.9	(0.0)
Women	49.9	(0.5)	45.2	(0.6)	55.8	(0.4)	35.9	(0.5)	50.1	(0.0)
Education attainment										
Lower than upper secondary	49.0	(0.5)	6.7	(0.4)	48.7	(0.4)	5.8	(0.4)	24.0	(0.1)
Upper secondary	41.0	(0.5)	32.9	(0.6)	41.1	(0.4)	33.1	(0.6)	44.6	(0.1)
Tertiary	9.8	(0.3)	60.4	(0.6)	10.1	(0.2)	61.0	(0.6)	30.1	(0.1)
Immigration Status										
Not born in country	24.1	(0.4)	7.1	(0.3)	22.0	(0.3)	7.9	(0.3)	11.7	(0.1)
Born in country	75.8	(0.4)	92.8	(0.3)	77.8	(0.3)	92.1	(0.3)	87.0	(0.1)
Test language										
Not the same as native language	21.7	(0.4)	5.4	(0.3)	19.8	(0.3)	5.9	(0.3)	9.3	(0.1)
The same as native language	78.2	(0.4)	95.0	(0.3)	80.1	(0.3)	94.5	(0.3)	89.2	(0.1)
Not the same as home language	18.0	(0.3)	3.7	(0.2)	16.3	(0.3)	4.3	(0.2)	6.7	(0.1)
The same as home language	82.4	(0.4)	96.7	(0.2)	84.1	(0.3)	96.2	(0.2)	91.7	(0.1)
Self reported health										
Excellent health	12.7	(0.3)	21.7	(0.5)	13.1	(0.3)	21.0	(0.5)	17.0	(0.1)
Very good health	20.6	(0.4)	40.5	(0.6)	21.6	(0.4)	39.1	(0.6)	30.3	(0.1)
Good health	34.8	(0.5)	28.1	(0.6)	34.1	(0.4)	29.9	(0.6)	32.7	(0.2)
Fair health	21.8	(0.4)	8.4	(0.3)	21.7	(0.4)	8.7	(0.3)	14.5	(0.1)
Poor health	9.9	(0.3)	1.7	(0.1)	9.3	(0.3)	1.5	(0.1)	4.1	(0.1)

Table A2.1b. Proportion of low and high skills individual across labour market status and family characteristics

	Literacy proficiency				Numeracy proficiency				Total population	
	Level 1 or Below		Level 4 or 5		Level 1 or Below		Level 4 or 5			
	(%)	S.E.	(%)	S.E.	(%)	S.E	(%)	S.E.	(%)	S.E
Labour Market Status										
Labour force participation										
Employed	56.4	(0.5)	78.8	(0.5)	54.7	(0.4)	81.5	(0.5)	68.4	(0.1)
Unemployed	7.5	(0.2)	3.8	(0.2)	8.1	(0.2)	3.3	(0.2)	5.5	(0.1)
Out of the labour force	36.3	(0.5)	17.4	(0.5)	37.3	(0.4)	15.2	(0.4)	24.8	(0.1)
Income percentile rank										
Less than 25	41.9	(0.7)	19.7	(0.6)	42.0	(0.7)	16.7	(0.5)	29.1	(0.2)
Between 25 to 75	47.0	(0.7)	39.9	(0.8)	47.0	(0.7)	38.5	(0.7)	46.7	(0.2)
Between 75 to 90+	11.6	(0.4)	40.5	(0.4)	11.5	(0.4)	44.8	(0.4)	24.2	(0.2)
Economic Sector										
The private sector	78.4	(0.5)	68.5	(0.6)	76.3	(0.5)	71.5	(0.6)	73.8	(0.2)
The public sector	18.5	(0.5)	27.9	(0.6)	20.3	(0.5)	25.5	(0.6)	23.1	(0.2)
Contract Type										
An indefinite contract	57.3	(0.7)	66.6	(0.6)	59.0	(0.6)	67.2	(0.6)	63.4	(0.2)
A fixed term contract	11.5	(0.4)	11.8	(0.4)	12.1	(0.4)	10.4	(0.4)	10.9	(0.1)
No Contract	10.6	(0.3)	6.4	(0.3)	10.0	(0.3)	5.9	(0.3)	6.5	(0.1)
Family										
Parents' level of educational attainment										
Neither parent attained upper secondary	52.2	(0.5)	15.9	(0.4)	49.8	(0.4)	17.8	(0.4)	33.3	(0.1)
At least one parent attained upper secondary	27.5	(0.4)	37.3	(0.6)	29.2	(0.4)	37.3	(0.6)	36.7	(0.2)
At least one parent attained tertiary	9.6	(0.3)	44.3	(0.6)	10.5	(0.3)	42.6	(0.5)	23.8	(0.1)
Parents' immigration status										
Both parents foreign-born	26.3	(0.4)	9.9	(0.3)	24.6	(0.3)	10.0	(0.3)	13.6	(0.1)
One parent foreign-born	6.2	(0.2)	7.3	(0.3)	6.3	(0.2)	7.0	(0.3)	6.5	(0.1)
Both parents native-born	67.6	(0.4)	84.9	(0.4)	69.1	(0.4)	84.3	(0.4)	78.8	(0.1)
The number of books in the household when the respondent was age 16										
Less than 25 books	55.0	(0.5)	9.9	(0.4)	53.4	(0.4)	10.3	(0.4)	29.8	(0.1)
Between 25 to 200 books	37.5	(0.5)	48.5	(0.6)	38.4	(0.4)	49.8	(0.6)	49.2	(0.2)
More than 201 books	7.5	(0.3)	41.7	(0.6)	8.2	(0.3)	40.0	(0.5)	21.0	(0.1)
Adults with/without children										
Have children	72.2	(0.4)	51.6	(0.6)	69.5	(0.4)	56.1	(0.6)	62.4	(0.1)
No children	27.6	(0.4)	48.4	(0.6)	30.3	(0.4)	43.8	(0.6)	36.3	(0.1)

PIAAC Methodology for Measuring AET

The European Commission/Eurostat (2006) classified learning activities as *formal education*, *non-formal education* and *informal learning*. These definitions are used for the European Adult Education Survey (AES). Eurostat also runs the Labor Force Survey with the ad hoc module 'Lifelong Learning'. The latter survey is used for the yearly OECD report "*Education at a Glance*" (EAG). The definitions used in PIAAC and in these surveys are similar for formal and non-formal learning. When referring to informal learning the PIAAC index *learning at work* is used. PIAAC does not systematically collect information on *informal learning activities*. However, some questions are asked to employed respondents about certain informal learning activities at work: learning from co-workers and supervisors, learning by doing and keeping up to date. Other surveys also include informal learning in everyday life, for example from neighbours or family members as well as learning by using print and digital media or by attending conferences and fairs. There is research that shows that the latter three types of activities are used by executives and highly educated employees while the first three types of activities are interesting for the adults with low proficiencies (Bundesministerium für Bildung und Forschung, 2006), (Grotlüschen und Brauchle, 2006). It is important to note these differences when interpreting presented results.