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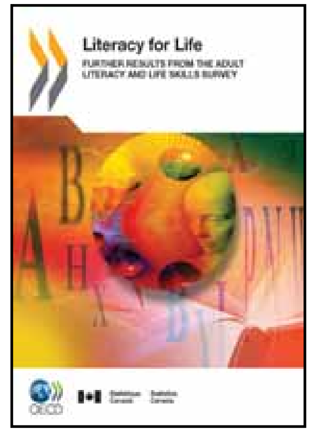
Culture, Tourism and the Centre for Education Statistics

Literacy for Life: Further Results from the Adult Literacy and Life Skills Survey

Second International ALL Report



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Literacy for Life

FURTHER RESULTS FROM THE ADULT LITERACY AND LIFE SKILLS SURVEY

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Introduction

Overview of the study

The Adult Literacy and Life Skills Survey (ALL) is a large-scale co-operative effort undertaken by governments, national statistics agencies, research institutions and multi-lateral agencies. The development and management of the study were co-ordinated by Statistics Canada and the Educational Testing Service (ETS) in collaboration with the National Center for Education Statistics (NCES) of the United States Department of Education, the Regional Office for Latin America and the Caribbean (OREALC) and the Institute for Statistics (UIS) of the United Nations Educational, Scientific and Cultural Organisation (UNESCO).

The survey instruments were developed by international teams of experts with financing provided by the Governments of Canada and the United States. A highly diverse group of countries and experts drawn from around the globe participated in the validation of the instruments. Participating governments absorbed the costs of national data collection and a share of the international overheads associated with implementation.

The ALL study builds on the International Adult Literacy Survey (IALS), the world's first internationally comparative survey of adult skills undertaken in three rounds of data collection between 1994 and 1998. The foundation skills measured in the ALL survey include prose literacy, document literacy, numeracy, and problem solving. Additional skills assessed indirectly include familiarity with and use of information and communication technologies.

This volume presents general findings for the complete group of eleven countries or regions that collected ALL data between 2002 and 2008 in two main waves of collection. In this report, countries that participated in the first wave of collection in 2002 and 2003 will be referenced to 2003 in figures and tables. This includes Bermuda, Canada, Italy, Norway, Switzerland, the United States and the Mexican State of Nuevo Leon. Similarly, the countries that participated in the second wave of collection between 2006 and 2008 will be referenced as 2008. These countries include Australia, Hungary, the Netherlands, and New Zealand.

Definitions of skill

Like IALS the ALL defines skills along a continuum of proficiency. There is no arbitrary standard distinguishing adults who have or do not have skills. For example, many previous studies have distinguished between adults who are either "literate" or "illiterate". Instead, the ALL study conceptualizes proficiency along a continuum and this is used to denote how well adults use information to function in society and the economy.

Four skill domains are conceptualized in ALL. Two of them, namely prose and document literacy are defined and measured in the same manner as in IALS. Numeracy and problem solving are new domains. The conceptualization and definitions of the four skill domains as well as examples of test items used for the assessment are described in detail in Annex A. The operational definition for each skill domain is summarized here in Box 1.

Box 1

Four skill assessment domains in ALL

- **Prose literacy –** the knowledge and skills needed to understand and use information from texts including editorials, news stories, brochures and instruction manuals.
- **Document literacy –** the knowledge and skills required to locate and use information contained in various formats, including job applications, payroll forms, transportation schedules, maps, tables and charts.
- **Numeracy –** the knowledge and skills required to effectively manage the mathematical demands of diverse situations.
- **Problem solving –** Problem solving involves goal-directed thinking and action in situations for which no routine solution procedure is available. The problem solver has a more or less well defined goal, but does not immediately know how to reach it. The incongruence of goals and admissible operators constitutes a problem. The understanding of the problem situation and its step-by-step transformation based on planning and reasoning, constitute the process of problem solving.

Measurement of skills

The ALL employed the same methodology as in IALS to measure skill proficiency. For each domain, proficiency is denoted on a scale ranging from 0 to 500 points. Each score denotes a point at which a person has an 80 per cent chance of successfully completing tasks that are associated with a similar level of difficulty. For the prose and document literacy domains as well as the numeracy domain, experts have defined five broad levels of difficulty, each corresponding to a range of scores. For the problem solving domain, experts have defined four broad levels of difficulty. See Tables I.1 and I.2 for a description of the levels. Also see Annex A for a more in depth presentation of each domain.

Table I.1

Five levels of difficulty for the prose, document and numeracy domains

	Prose	Document	Numeracy
Level 1 (0 to 225)	Most of the tasks in this level require the respondent to read relatively short text to locate a single piece of information which is identical to or synonymous with the information given in the question or directive. If plausible but incorrect information is present in the text, it tends not to be located near the correct information.	Tasks in this level tend to require the respondent either to locate a piece of information based on a literal match or to enter information from personal knowledge onto a document. Little, if any, distracting information is present.	Tasks in this level require the respondent to show an understanding of basic numerical ideas by completing simple tasks in concrete, familiar contexts where the mathematical content is explicit with little text. Tasks consist of simple, one-step operations such as counting, sorting dates, performing simple arithmetic operations or understanding common and simple percents such as 50%.
Level 2 (226 to 275)	Some tasks in this level require respondents to locate a single piece of information in the text; however, several distractors or plausible but incorrect pieces of information may be present, or low-level inferences may be required. Other tasks require the respondent to integrate two or more pieces of information or to compare and contrast easily identifiable information based on a criterion provided in the question or directive.	Tasks in this level are more varied than those in Level 1. Some require the respondents to match a single piece of information; however, several distractors may be present, or the match may require low-level inferences. Tasks in this level may also ask the respondent to cycle through information in a document or to integrate information from various parts of a document.	Tasks in this level are fairly simple and relate to identifying and understanding basic mathematical concepts embedded in a range of familiar contexts where the mathematical content is quite explicit and visual with few distractors. Tasks tend to include one-step or two-step processes and estimations involving whole numbers, benchmark percents and fractions, interpreting simple graphical or spatial representations, and performing simple measurements.
Level 3 (276 to 325)	Tasks in this level tend to require respondents to make literal or synonymous matches between the text and information given in the task, or to make matches that require low-level inferences. Other tasks ask respondents to integrate information from dense or lengthy text that contains no organizational aids such as headings. Respondents may also be asked to generate a response based on information that can be easily identified in the text. Distracting information is present, but is not located near the correct information.	Some tasks in this level require the respondent to integrate multiple pieces of information from one or more documents. Others ask respondents to cycle through rather complex tables or graphs which contain information that is irrelevant or inappropriate to the task.	Tasks in this level require the respondent to demonstrate understanding of mathematical information represented in a range of different forms, such as in numbers, symbols, maps, graphs, texts, and drawings. Skills required involve number and spatial sense, knowledge of mathematical patterns and relationships and the ability to interpret proportions, data and statistics embedded in relatively simple texts where there may be distractors. Tasks commonly involve undertaking a number of processes to solve problems.
Level 4 (326 to 375)	These tasks require respondents to perform multiple-feature matches and to integrate or synthesize information from complex or lengthy passages. More complex inferences are needed to perform successfully. Conditional information is frequently present in tasks at this level and must be taken into consideration by the respondent.	Tasks in this level, like those at the previous levels, ask respondents to perform multiple-feature matches, cycle through documents, and integrate information; however, they require a greater degree of inferencing. Many of these tasks require respondents to provide numerous responses but do not designate how many responses are needed. Conditional information is also present in the document tasks at this level and must be taken into account by the respondent.	Tasks at this level require respondents to understand a broad range of mathematical information of a more abstract nature represented in diverse ways, including in texts of increasing complexity or in unfamiliar contexts. These tasks involve undertaking multiple steps to find solutions to problems and require more complex reasoning and interpretation skills, including comprehending and working with proportions and formulas or offering explanations for answers.
Level 5 (376 to 500)	Some tasks in this level require the respondent to search for information in dense text which contains a number of plausible distractors. Others ask respondents to make high-level inferences or use specialized background knowledge. Some tasks ask respondents to contrast complex information.	Tasks in this level require the respondent to search through complex displays that contain multiple distractors, to make high-level text-based inferences, and to use specialized knowledge.	Tasks in this level require respondents to understand complex representations and abstract and formal mathematical and statistical ideas, possibly embedded in complex texts. Respondents may have to integrate multiple types of mathematical information, draw inferences, or generate mathematical justification for answers.

Table I.2

Four levels of difficulty for the problem solving domain

	Problem Solving
Level 1 (0 to 250)	Tasks in this level typically require the respondent to make simple inferences, based on limited information stemming from a familiar context. Tasks in this level are rather concrete with a limited scope of reasoning. They require the respondent to make simple connections, without having to check systematically any constraints. The respondent has to draw direct consequences, based on the information given and on his/her previous knowledge about a familiar context.
Level 2 (251 to 300)	Tasks in this level often require the respondent to evaluate certain alternatives with regard to well-defined, transparent, explicitly stated criteria. The reasoning however may be done step by step, in a linear process, without loops or backtracking. Successful problem solving may require to combine information from different sources, as e.g. from the question section and the information section of the test booklet.
Level 3 (301 to 350)	Some tasks in this level require the respondent to order several objects according to given criteria. Other tasks require him/her to determine a sequence of actions/events or to construct a solution by taking non-transparent or multiple interdependent constraints into account. The reasoning process goes back and forth in a non-linear manner, requiring a good deal of self-regulation. At this level respondents often have to cope with multi-dimensional or ill-defined goals.
Level 4 (351 to 500)	Items in this level require the respondent to judge the completeness, consistency and/or dependency among multiple criteria. In many cases, he/she has to explain how the solution was reached and why it is correct. The respondent has to reason from a meta-perspective, taking into account an entire system of problem solving states and possible solutions. Often the criteria and the goals have to be inferred from the given information before actually starting the solution process.

Data collection

The ALL assessment was administered in homes by experienced interviewers. The study design combined educational testing techniques with those of household survey research. Respondents were first asked a series of questions to obtain background information on a range of variables thought to influence the formation of skill and in turn impact on a range of educational, social and health outcomes. Annex B describes in more detail the survey design used for ALL, including details about survey methods, coverage, sample sizes and key indicators of quality.

Once this background questionnaire was completed the interviewer presented a booklet containing six simple tasks. If the respondent failed to complete two of these tasks correctly, the interview was adjourned. Respondents who completed two or more tasks correctly were then given a much larger variety of tasks drawn from a pool of 170 items, printed in one of eight test booklets. Test booklets were randomly assigned to respondents to ensure good representation of the domains of interest. The assessment was not timed and respondents were given maximum opportunity to demonstrate their skill proficiency.

Organization of the report

The main goal of this ALL report is to present initial findings on the level and distribution of skills, and the relationships between skills and important background variables. The findings are presented in 7 chapters.

Chapter 1 presents a historical overview of the ALL study, including its most significant knowledge contributions in the adult literacy field, as well as some unresolved knowledge gaps and how the new Programme for the International Assessment of Adult Competencies (PIAAC) project might address some of those needs.

Chapter 2 compares the basic distributions of skill by country, age, gender, immigration and language status. The chapter also presents evidence on how rapidly skill profiles have changed over time for those countries where such analyses could be conducted1.

Chapter 3 explores the relationship between adult skills and valued economic and social outcomes namely; labour market participation, earnings premiums and participation in community groups and voluntary activities.

Chapter 4 focuses on numeracy skills, as defined by ALL, which is increasingly important to everyday life. The chapter explores the relationships between numeracy and key socio-demographic factors as well as labour market outcomes and earnings.

Chapter 5 highlights the importance of problem solving skills by first defining this foundational skill and comparing the country skill levels and distributions. The chapter also explores determinants of problem solving skill as well as its relative role in influencing important labour market outcomes.

Chapter 6 explores performance across multiple skill domains. The data analyses investigate the skill profiles of various population groups defined in terms of the demographic and socioeconomic characteristics of those who score at levels deemed to be low in one or more skill domains. The chapter also explores the consequences of having poor skills in one or more skill domain.

Chapter 7 investigates the issue of skill mismatch in the labour market and its relationship to adult learning. The extent and distribution of mismatch between the day to day literacy related requirements of workers and the literacy skills they have obtained is an important issue that is being explored in this chapter.

Annex A provides a detailed overview of the ALL proficiency scales – how they are defined, how they were measured, how proficiency was summarized and how proficiency estimates should be interpreted. Readers requiring additional technical information on the psychometric aspects of the study are referred to The Adult Literacy and Life Skills Survey: Aspects of Design, Development and Validation (Statistics Canada, 2004), The International Adult Literacy Survey: A Technical Report (NCES, 1997) and The Adult Literacy and Life Skills Survey: A Technical Report (Statistics Canada, 2005).

Annex B documents key aspects of survey administration, response and data quality.

Annex C describes in very broad terms, the scaling and conditioning procedures used for the production of prose and document literacy, numeracy and problem solving scores in both IALS and ALL.

Annex D identifies the experts, researchers and analysts who were involved in developing the ALL instruments, in implementing the national data collections, and in the writing, analytical and editorial work that made publication of this report possible.

Endnote

1. Comparable prose literacy and document literacy scores are available from the 1994-1998 IALS study for Australia, Canada, Hungary, the Netherlands, New Zealand, Norway, Switzerland and the United States, The data sets thus allow for the analysis of changes in skill profiles over time.

References

NCES (1997), *The International Adult Literacy Survey: A Technical Report*, National Centre for Educational Statistics, Washington, D.C.:

OECD and Statistics Canada (2005), *Learning a Living: First Results of the Adult Literacy and Life Skills Survey*, Ottawa and Paris.

Statistics Canada (2004), *The Adult Literacy and Life Skills Survey: Aspects of Design, Development and Validation*, Ottawa: Author.

Statistics Canada (2005), *The Adult Literacy and Life Skills Survey: A Technical Report*, Ottawa: Author.

Note to Readers

> Throughout this report graphs are employed to convey study results to a broad non-technical audience and to provide a source of informative displays that readers may use for their own purposes. To satisfy the more technical reader data tables for all displays are provided in a statistical annex at the end of each corresponding chapter.

The skill proficiency results from the ALL study are reported separately for four scales – prose literacy, document literacy, numeracy, and problem solving – rather than on a single scale. Although it is desirable to maintain separate scales for the majority of more complex analyses, the theoretical and empirical properties also allow for creating composite skill scales. The prose and document literacy scales are combined into a composite literacy scale for some analyses in this book.

Multiple sources of uncertainty and error are a fact of life in social science research. Given the comparative nature of the ALL study, those responsible for the design of the study and its implementation went to great lengths to establish the validity, reliability, comparability and interpretability of estimates, and to control and quantify errors that might interfere with or bias interpretation. Statistics Canada, the Educational Testing Service and the national study teams have performed comprehensive analyses to understand the nature and extent of errors associated with subtle differences in design and implementation. Notes to figures and tables are used to alert readers whenever errors have been detected that might affect interpretation.

The data values presented in this volume are estimated from representative but complex samples of adults from each country. Consequently there is a degree of sampling error that must be taken into account. Additionally, there is a degree of error associated with the measurement of skills because they are estimated on the basis of responses to samples of test items. Thus a statistic, called the standard error, is used to express the degree of uncertainty associated with both sampling and measurement error.

Country abbreviations used in this report

OECD countries		Non-OECD countries	
Australia	AUS	Bermuda	BER
Canada	CAN	Nuevo Leon	NL
Hungary	HUN		
Italy	ITA		
Netherlands	NLD		
New Zealand	NZL		
Norway	NOR		
Switzerland	CHE		
United States	USA		

Acronyms

The following acronyms are used in this publication:

ALL	Adult Literacy and Life Skills Survey
BIB	Balanced Incomplete Block
CDs	Collection Districts
CERI	Centre for Educational Research and Innovation
CMA/CA	Census Metropolitan Area / Census Agglomeration
ETS	Educational Testing Service (USA)
GArDS	Generalised Area Delineation System
HRDC	Human Resources Development Canada
HRSDC	Human Resources and Skills Development Canada
IALS	International Adult Literacy Survey
ICT	Information and Communication Technologies
INES	Indicators of National Education Systems (OECD)
IRT	Item Response Theory
IRF	Item Response Function
ISCED	International Standard Classification of Education
ISCO	International Standard Classification for Occupation
ISIC	International Standard Industrial Classification
JRA	Job Requirement Assessment (PIAAC)
LSUDA	Literacy Skills Used in Daily Activities
NAEP	National Assessment of Educational Progress (USA)
NALS	National Adult Literacy Survey (USA)
NCES	National Center for Education Statistics (USA)
OECD	Organisation for Economic Co-operation and Development
PIAAC	Programme for the International Assessment of Adult Competencies
PISA	Programme for International Student Assessment
PPS	Proportional to Population Size
PSUs	Primary Sampling Units
TRE	Technology Rich Environment (PIAAC)
UNESCO	United Nations Educational, Scientific and Cultural Organisation
YALS	Young Adult Literacy Survey (USA, 1985)

Chapter 1

Antecedents and Objectives of the ALL Survey

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Antecedents and Objectives of the ALL Survey

1.1 Goals of the ALL Survey

The purpose of this brief chapter is to describe the origins of the ALL survey and to recapitulate the main objectives of the survey as agreed with the participating countries at the outset. The main objectives have remained unchanged since the data for the first countries were collected in 2003.

For over two decades Statistics Canada has provided international leadership for the promotion, design and implementation of the International Adult Literacy Survey (IALS) and its successor, the Adult Literacy and Life Skills Survey (ALL). These surveys were undertaken in partnership with the participating countries and other international and national agencies including, first and foremost, the Centre for Educational Research and Innovation (CERI) of the Organisation for Economic Co-operation and Development (OECD), the National Center for Education Statistics (NCES) of the United States Department of Education, the Educational Testing Service (ETS) of Princeton, United States, and Human Resources and Skills Development Canada (HRSDC).

Experts at Statistics Canada have also directed much of the analytical work performed to this day on the data sets resulting from the surveys, producing five international comparative reports jointly with the OECD, including the current one, as well as numerous research papers and monographs. Some of the main publications resulting from IALS and ALL are listed at the end of this chapter.

1.2 Antecedents of the ALL Survey

Going back in history it is worth noting that by the mid-1980s policy makers in North America had become dissatisfied with the use of educational attainment as a proxy measure of what workers and students knew and could do (Niece and Adset, 1992). This dissatisfaction manifested itself in a desire to measure foundation skills such as reading literacy more directly, through the administration of actual proficiency tests.

Canada conducted its first literacy survey in 1987. This survey, entitled 'Broken Words', was conducted by Southam Inc. It discovered that there were more than five million functionally illiterate adults in Canada, or 24 per cent of the adult population. Already at that time it was determined that the correlation between literacy proficiency and educational attainment was pronounced but far from perfect. Many adults were found to have strong literacy skills despite low levels of schooling whereas others with advanced levels of education only had modestly strong skills. This finding raised doubts and disbelief amongst policy makers and the general population at the time. It was the first time a study had gone to such lengths in illustrating the presence of functional illiteracy as a 'hidden problem' in Canada.

Following the Southam survey, Statistics Canada conducted three national literacy surveys of the adult population — the first one in 1989 commissioned by HRSDC. Like the Southam survey, Statistics Canada's 1989 survey, known as the "Literacy Skills Used in Daily Activities" (LSUDA), was modeled on the 1985 US survey of young adults (YALS). It represented a first attempt in Canada to produce skill measures deemed comparable across languages. That set the stage for the launch of international surveys on the subject.

The IALS survey was built on a skills model, which relied on explicit theories of item difficulty to support generalisation beyond the items selected for inclusion in the test (Kirsch and Mosenthal, 1993; Mosenthal, 1998). In particular, it was built upon the theoretical and methodological insights offered by four large-scale North American surveys that embodied skill models: (i) the Functional Reading Study conducted in the United States by the Educational Testing Service in the early 1970s; (ii) the Young Adult Literacy Study conducted in the United States by the Educational Testing Service in 1985; (iii) the Survey of Literacy Skills Used in Daily Activities conducted in Canada by Statistics Canada in 1989; and (iv) the National Adult Literacy Survey (NALS) conducted in the United States by the Educational Testing Service in 1990 (Montigny, Kelly and Jones, 1991; Kirsch, Jungeblut, Jenkins and Kolstad, 1993).

International interest in the results of these national literacy surveys was sufficiently great for a consortium consisting of Statistics Canada, the US National Center for Education Statistics and the Educational Testing Service to decide to develop and subsequently field the IALS in collaboration with the OECD, Eurostat and the UNESCO Institute for Education.

The knowledge and experience cumulated in the United States with the National Assessment of Educational Progress (NAEP) surveys, the YALS and the subsequent NALS, and in Canada particularly with the LSUDA survey, was heavily drawn on in the design of the IALS (Murray, Kirsch and Jenkins, 1998). The idea to undertake a large scale international survey of adult literacy was first discussed at a meeting called by the UNESCO Institute for Education in Hamburg, Germany in 1990. Discussions about the technical viability of launching an international survey continued over the next few years in Network B, a forum of experts on education and labour market destinations associated with the larger OECD project on Indicators of National Education Systems (INES), managed by staff at CERI.

The IALS represented, at the time, a further refinement of the original test design that existed, modelled on the NALS. However, it utilised greater scoring complexity and incorporated a wider range of demographic profiling than any previous survey had done before. It also incorporated a significant writing component for the first time. The first collections of pilot data occurred in 1993 and the full survey was fielded in the following year. Subsequent rounds of data collection in additional countries occurred in 1996 and 1998.

The IALS findings replicated the results from the North American surveys in that a large proportion of the adult population was found to have low tested literacy proficiency in all countries. This result was received not without controversy in some countries. While the OECD focused its priorities on the development of the Programme for International Student Assessment, a small group of countries, including Canada and the United States, remained committed to the development of a successor to the IALS survey. Consequently the development of the measurement protocols for the ALL survey was managed not through the INES networks but by a small expert group funded, in the main, by North America.

Despite the many financial and managerial difficulties and the large measurement challenges arising from the task to develop new internationally valid and reliable assessment frameworks for additional skill domains, including numeracy and problem solving, the ALL survey was eventually launched and comparable data were collected by a small group of committed countries in 2003. A few additional countries collected data in 2007 and 2008. The majority of the OECD countries adopted a 'wait and see' attitude, and most now work collaboratively on the OECD Programme for the International Assessment of Adult Competencies (PIAAC), which is expected to produce new comparative skill profiles in a few years' time. Figure 1.1 lists the countries where the IALS and ALL surveys were administered.

Figure 1.1

IALS and ALL participating countries

IALS 1994 to 1995

- Canada
- Germany
- Ireland
- The Netherlands
- Poland
- Sweden
- Switzerland
- United States

IALS 1996

- Australia
- The Flemish community of Belgium
- Great Britain
- New Zealand
- Northern Ireland

IALS 1998

- Chile
- Czech Republic
- Denmark
- Finland
- Hungary
- Italy
- Norway
- Portugal
- Slovenia

ALL 2003

- Bermuda
- Canada
- Italy
- Norway
- Nuevo Leon (Northern of Mexico)
- Switzerland
- United States

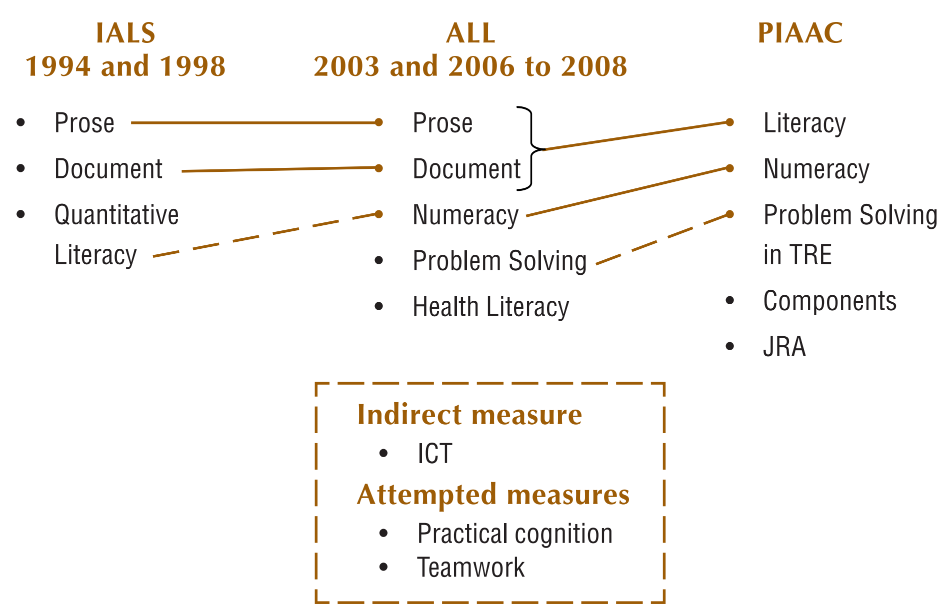
ALL 2006 to 2008

- Australia
- Hungary
- New Zealand
- The Netherlands

Figure 1.2 shows the evolution of the international assessment of skills and their improvement over time. This merits consideration as it shows the pioneering efforts expended in arriving at today's more refined surveys, such as the one to be undertaken by PIAAC. Improvements introduced in ALL included the modified numeracy instrument, which did not allow for direct comparison with the quantitative literacy scale fielded in IALS, and the first international measure of problem solving skill.

Figure 1.2

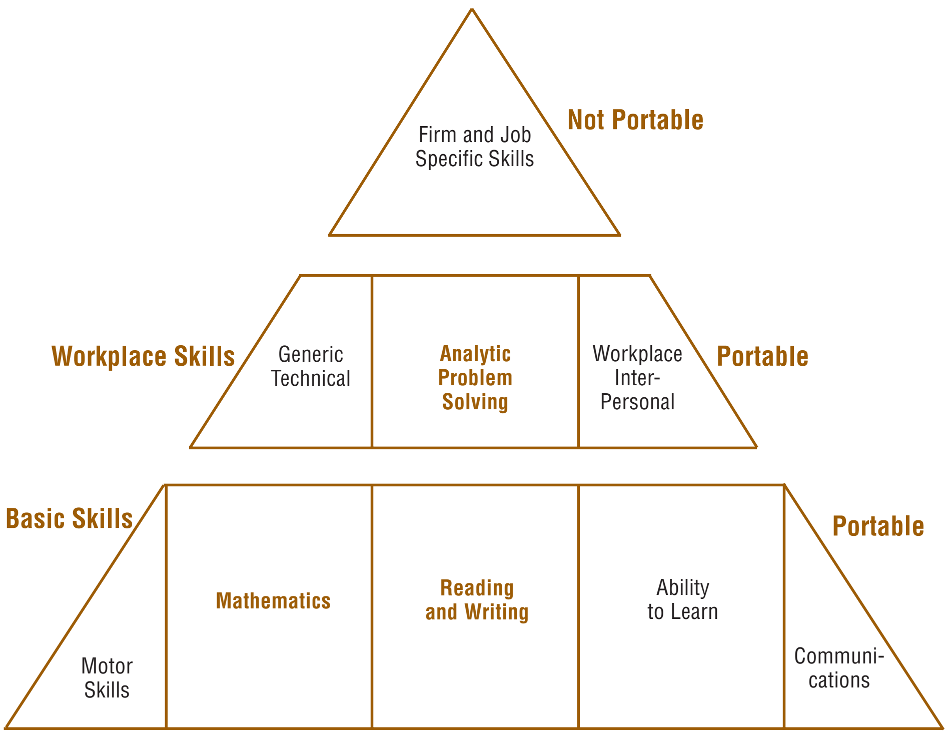
IALS, ALL and PIAAC an evolution



The development of the analytical and measurement frameworks for the skills domains assessed in IALS and ALL took account of empirical observations of skills made in the workplace. Figure 1.3 illustrates one of many models that were developed in attempting to understand what skills matter economically (Tuijnman, Kirsch and Wagner, 1997). The triangle identifies three levels of skill in a hierarchical way – from basic skills that are thought to be required by all occupations and hence are considered to be portable between jobs and employers. According to this model both literacy and numeracy fall in this category. The second layer of the triangle identifies a set of skills that are used in the workplace, are still portable, but which vary across broad industry and occupational groups. Problem solving skills are positioned in this level. The third level concerns skills specific to a particular job or even firm and that are not portable.

Figure 1.3

Skills triangle (from the Premier's of Ontario council report)



Source: Developed by Canada Consulting.

1.3 Objectives of the ALL Survey

The main objectives of the survey have not changed since data for the first countries were collected.

The first objective was to profile the distribution of skills in the areas of prose literacy, document literacy, numeracy, problem solving and, for some countries, health literacy. Prose and document literacy had been measured in a similar way in IALS and hence could support trend analysis, another major objective of the survey.

The numeracy and problem solving instruments were entirely new and had been developed by expert groups funded and managed by Statistics Canada and the US National Center for Education Statistics specifically for use in ALL. The ALL assessment replaced the quantitative literacy domain used in IALS with a broader and more robust numeracy measure that reflects better the range of numerate behaviours that confront adults in their daily lives. In this publication Chapter 4 is entirely devoted to the numeracy domain and its determinants and outcomes.

A substantive effort was made to also develop measures for team work skills, practical cognition, and information and communication technology (ICT) skills, but only the new problem solving domain was shown to meet the high measurement standards set for the direct assessment of skills in ALL. Problem solving is a major focus of this report, in which Chapter 5 is dedicated to this skill domain.

An indirect measure of ICT skills was nevertheless retained in the final design of ALL. The inclusion of this indirect measure of ICT skills was a compromise because direct assessment proved too technically challenging and too costly in the context of a household survey.

Another objective was to document the incidence, intensity and distribution of participation in formal adult education and training as well as informal and non-formal learning in other settings, particularly the workplace, knowing from IALS that this has a discernible impact on literacy proficiency.

The further objective of the ALL survey was to collect empirical data about the antecedents of the skills measured, allowing for an analysis of the social and economic determinants of education and skills, including individual background characteristics.

A module measuring literacy and numeracy practices at work and in daily life was included in the background questionnaire. Variables measuring frequency in reading and writing activities, frequency of using public libraries or visiting bookstores, and frequency in viewing television were also collected.

Other objectives pursued in the ALL survey were to explore the social, economic and health consequences associated with different skill levels.

To understand how skill levels in different domains interact – how they relate to each other and what impact these interactions may have on economic, labour and social outcomes – was another objective. The "outcomes" dimension of the markets for skills could be studied at three conceptual levels – the micro, meso and macro. The idea was to study the consequences of having skills at particular levels for individuals, for families and workplaces, and at the macro level on the impact of skills for aggregate outcomes such as economic growth and labour productivity.

1.4 Changes in skill from IALS to ALL

Finally, for the countries which had previously participated in IALS the objective was to estimate how skill profiles evolved with time and identify the key factors underlying these changes, if any, or find the causes in the case of no change.

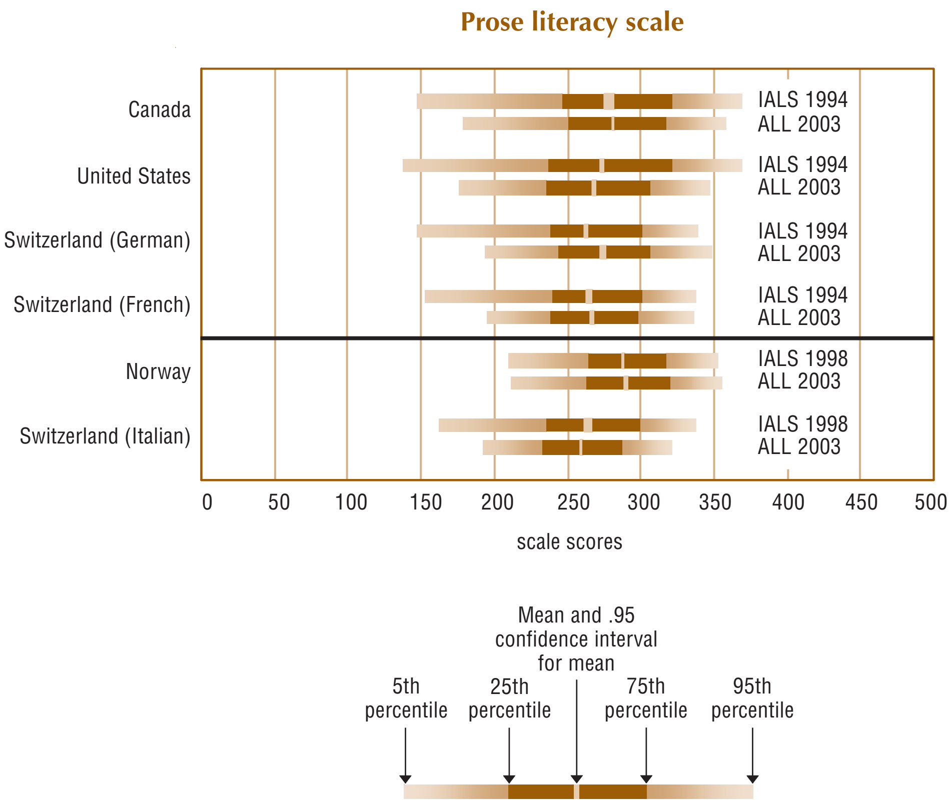
An important finding in comparing IALS and ALL data concerns the generally weak or altogether nonexistent improvement of skills over time for most countries. It is worth noting that between the IALS and ALL – nine years apart – the average scores and the distributions by levels of assessed prose and document literacy skills using identical methods and metrics did not change significantly in any country assessed.

Figure 1.4 compares the ALL gradation bars with similar bars derived from IALS data. In general, changes in country mean performance are not substantial. But the comparatively higher 5th percentile scores in ALL than in IALS indicate some improvements among the lowest scoring adults in almost every country. There has also been a decline in the 95th percentiles scores. This striking result attracted much attention among policy makers in Canada. In Canada 42 per cent of the working age population did not reach Level 3 in 2003. That percentage was unchanged from the one observed in 1994.

Figure 1.4

Changes in distributions of skills scores

Mean scores with .95 confidence interval and scores at the 5th, 25th, 75th and 95th percentiles on prose literacy ranging from 0 to 500 points, populations aged 16 to 65, IALS 1994 and 1998 and ALL 2003



Sources: International Adult Literacy Survey, 1994 and 1998.
Adult Literacy and Life Skills Survey, 2003.

In general one would expect the retirement of older cohorts with lower average levels of education and the arrival of incoming age groups with more years of education to increase the skill mean scores and shift the distributions. Skill supply could also increase with time as a consequence of improved education quality as well as adult learning. Both IALS and ALL data confirm this expectation — the aggregate supply of skill is determined by a host of factors that influence the rate of skill acquisition over the life course, education and learning being foremost among them. But education and experiential learning do not determine a person's skill level entirely. Personal choices and other factors also lead to skill gain and loss in adulthood. Particularly skill loss presents a large problem for people, institutions and governments because it hampers productivity, reduces economic and social returns to human capital investment, and leads to sub-optimal economic growth. The ALL data enables the exploration in a synthetic manner of the mechanics and consequences of skill gain and loss. The results are presented in the chapters that follow.

To the extent PIAAC will collect data using scales that can link to IALS and ALL the new survey will open up interesting possibilities to examine trend data for more countries and over an extended time period. Whether this will replicate the 'no change' finding from IALS and ALL remains to be seen. What determines gains and losses in the skills of the adult population over time is a key issue for policy.

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Chapter 2

Comparative Profiles of Adult Skills

Summary

This chapter provides comparisons on the levels and distributions of adult skills in four domains – prose literacy, document literacy, numeracy and problem solving. For the first time, the analyses compare results for countries from the first and second waves of the ALL survey. The first part of the chapter displays the basic country distributions for each skill domain. The second section tracks changes over time by comparing the prose and document skill distributions for the countries which participated in both the ALL and IALS. Finally, the analysis focuses on how skill distributions vary across key demographic variables such as age, gender and immigration status.

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Comparative Profiles of Adult Skills

2.1 Overview and highlights

This chapter provides comparisons on the levels and distributions of adult skills in four domains – prose literacy, document literacy, numeracy and problem solving. For the first time, the analyses compare results for countries from the first and second waves of the ALL survey. The first part of the chapter displays the basic country distributions for each skill domain. The second section tracks changes over time by comparing the prose and document skill distributions for the countries which participated in both the ALL and IALS. Finally, the analysis focuses on how skill distributions vary across key demographic variables such as age, gender and immigration status.

Key findings presented in this chapter are:

- Skill proficiencies vary across countries and skill domains. Some countries perform well on most domains (Norway, the Netherlands), while others offer consistent but average results (Canada, New Zealand, Australia). Bermuda and Switzerland perform well on some domains and below average in others. Hungary, Italy and the United States consistently rank lower on most skill domains.
- Most countries improved their prose population mean scores between the administrations of the IALS and ALL. These increases, however, were not significant for Australia, Canada, New Zealand, Norway, as well as the German and French speaking populations in Switzerland. Hungary showed the highest increase in mean prose performance (27 points).
- Several countries significantly reduced their *ranges* of population proficiency scores, also known as the "degree of inequality" between ALL and IALS administrations. For the most part, the decline in inequality resulted from improvements made at the lower end of the skill distributions.

- Consistent across all four skill domains, the smallest ranges emerge for Hungary, Switzerland, the Netherlands and Norway. Bermuda, Canada and the United States exhibit medium to wide ranges across all four skill domains. Australia, Italy and Nuevo Leon (Mexico) show the most diversity within their respective national population skill levels.
- In most countries, the population mean scores are lower for older age groups. One exception to this trend can be seen in New Zealand, where scores for the younger population (16 to 25) are equivalent to those of the eldest age groups (45 to 65).
- For the population aged 16 to 65, the greatest gender differences occur on the numeracy scale, with men scoring higher than women in all countries except Hungary. Consistent with the results obtained in previous studies, women score higher on the prose domain in most countries.
- In many countries, and for most domains, women aged 16 to 25 outperform their male counterparts. While young men continue to score higher on the numeracy scale, the differences are smaller in some countries when compared to older cohorts.
- Overall, the patterns with respect to recent and established immigrant groups are mixed. Only in Bermuda do recent *and* established immigrants perform better than native-born populations. More recent immigration policy seems to have impacted countries like Australia, Canada, Switzerland, and the United-States where the recent immigrants outperform the established immigrants in all skill domains.

2.2 Comparative distributions of adult skills

This chapter presents comparative distributions of the literacy proficiencies of the adult populations of countries participating in the first (2003) and second (2006-2008) rounds of data collected through the Adult Literacy and Life Skills survey (ALL). Population mean scores and distributions by levels are presented for each of the four literacy skill domains measured – prose, document, numeracy and problem solving – before these results are linked to population characteristics. The chapter is divided into three sections. In the first, the average population distributions for the four skill domains are presented for all countries. The second section presents trends in prose and document literacy scores for those countries where data were collected for both ALL (2003 and 2006-2008) and its predecessor, the International Adult Literacy Survey (IALS, 1994 and 1998). The third section explores the relationships between literacy proficiencies and population characteristics such as age, gender, immigration and language status – factors known from previous analytical work to influence the comparative distributions of adult skills (OECD and Statistics Canada, 1995, 2000; OECD and HRDC, 1997).[1] Throughout the chapter, findings are highlighted particularly for the second round ALL countries – Australia, Hungary, the Netherlands and New Zealand – as detailed analyses of data for the first round countries are available from the previous international comparative report, Learning a Living: First Results of the Adult Literacy and Life Skills Survey (OECD and Statistics Canada, 2005).

Figure 2.1

Multiple comparisons of skills proficiencies

Comparisons of countries based on average scores, population aged 16 to 65, 2003, 2006 and 2008

A. Prose literacy scale

Country	Norway	Bermuda	Canada	Netherlands	Australia	New Zealand	Switzerland	Hungary	United States	Italy
Norway		●	▲	▲	▲	▲	▲	▲	▲	▲
Bermuda	●		▲	▲	▲	▲	▲	▲	▲	▲
Canada	▼	▼		●	●	▲	▲	▲	▲	▲
Netherlands	▼	▼	●		●	●	▲	▲	▲	▲
Australia	▼	▼	●	●		●	▲	▲	▲	▲
New Zealand	▼	▼	▼	●	●		▲	▲	▲	▲
Switzerland	▼	▼	▼	▼	▼	▼		●	●	▲
Hungary	▼	▼	▼	▼	▼	▼	●		●	▲
United States	▼	▼	▼	▼	▼	▼	●	●		▲
Italy	▼	▼	▼	▼	▼	▼	▼	▼	▼	

B. Document literacy scale

Country	Norway	Netherlands	Canada	Bermuda	New Zealand	Australia	Switzerland	United States	Hungary	Italy
Norway		▲	▲	▲	▲	▲	▲	▲	▲	▲
Netherlands	▼		▲	●	▲	▲	▲	▲	▲	▲
Canada	▼	▼		●	●	●	▲	▲	▲	▲
Bermuda	▼	●	●		●	●	●	▲	▲	▲
New Zealand	▼	▼	●	●		●	●	▲	▲	▲
Australia	▼	▼	●	●	●		●	▲	▲	▲
Switzerland	▼	▼	▼	●	●	●		▲	▲	▲
United States	▼	▼	▼	▼	▼	▼	▼		●	▲
Hungary	▼	▼	▼	▼	▼	▼	▼	●		▲
Italy	▼	▼	▼	▼	▼	▼	▼	▼	▼	

▼ Mean proficiency is significantly lower ($p<0.05$) than comparison country

▲ Mean proficiency is significantly higher ($p<0.05$) than comparison country

● No statistically significant difference

Figure 2.1 (concluded)

Multiple comparisons of skills proficiencies

Comparisons of countries based on average scores, population aged 16 to 65, 2003 and 2008

Country	C. Numeracy scale									
	Switzerland	Netherlands	Norway	Hungary	Canada	Australia	New Zealand	Bermuda	United States	Italy
Switzerland		●	▲	▲	▲	▲	▲	▲	▲	▲
Netherlands	●		▲	▲	▲	▲	▲	▲	▲	▲
Norway	▼	▼		▲	▲	▲	▲	▲	▲	▲
Hungary	▼	▼	▼		●	●	●	●	▲	▲
Canada	▼	▼	▼	●		●	●	●	▲	▲
Australia	▼	▼	▼	●	●		●	●	▲	▲
New Zealand	▼	▼	▼	●	●	●		●	▲	▲
Bermuda	▼	▼	▼	●	●	●	●		▲	▲
United States	▼	▼	▼	▼	▼	▼	▼	▼		▲
Italy	▼	▼	▼	▼	▼	▼	▼	▼	▼	

Country	D. Problem solving scale								
	Netherlands	Norway	Switzerland	New Zealand	Canada	Bermuda	Australia	Hungary	Italy
Netherlands		●	▲	▲	▲	▲	▲	▲	▲
Norway	●		●	▲	▲	▲	▲	▲	▲
Switzerland	▼	●		▲	▲	▲	▲	▲	▲
New Zealand	▼	▼	▼		●	●	▲	▲	▲
Canada	▼	▼	▼	●		●	●	▲	▲
Bermuda	▼	▼	▼	●	●		●	▲	▲
Australia	▼	▼	▼	▼	●	●		▲	▲
Hungary	▼	▼	▼	▼	▼	▼	▼		▲
Italy	▼	▼	▼	▼	▼	▼	▼	▼	

▼	Mean proficiency is significantly lower (p<0.05) than comparison country
▲	Mean proficiency is significantly higher (p<0.05) than comparison country
●	No statistically significant difference

* Statistically significant at the 0.05 level, adjusted for multiple comparisons

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Population mean skill scores are presented for all ALL countries in Figures 2.1 A to 2.1 D. Differences in scores are based on sample data and hence tests for statistical significance are used to compare country mean scores. Countries with significantly higher population mean scores compared with others are marked with '▲' in the Figures. Conversely, countries with significantly lower mean scores than others are marked with '▼'. The symbol '•' is used if the mean score difference between two countries is not statistically significant.

Figures 2.1 A to 2.1 D present evidence about the population mean score differences between countries across the four skill domains measured in ALL. While Norway ranks highest on the prose and document literacy scales, Switzerland and the Netherlands score significantly higher on the numeracy scale. On the problem solving scale, the Netherlands appears to outperform Norway, but the mean score difference is not statistically significant. Bermuda shows the most variation across the skill domains, scoring near the top on prose literacy, around average on document literacy and near the bottom on the numeracy and problem solving scales. Australia, Canada and New Zealand consistently score about average on all four scales. Hungary performs about as well as the United States on the prose and document literacy scales. Hungary also performs as well as Canada, Australia, New Zealand and Bermuda on the numeracy scale, and scores just above Italy on the problem solving scale.

Figure 2.2

Comparative distributions of skills scores

Mean scores with .95 confidence interval and scores at the 5th, 25th, 75th and 95th percentiles on skills scales ranging from 0 to 500 points, population aged 16 to 65, 2003 and 2008

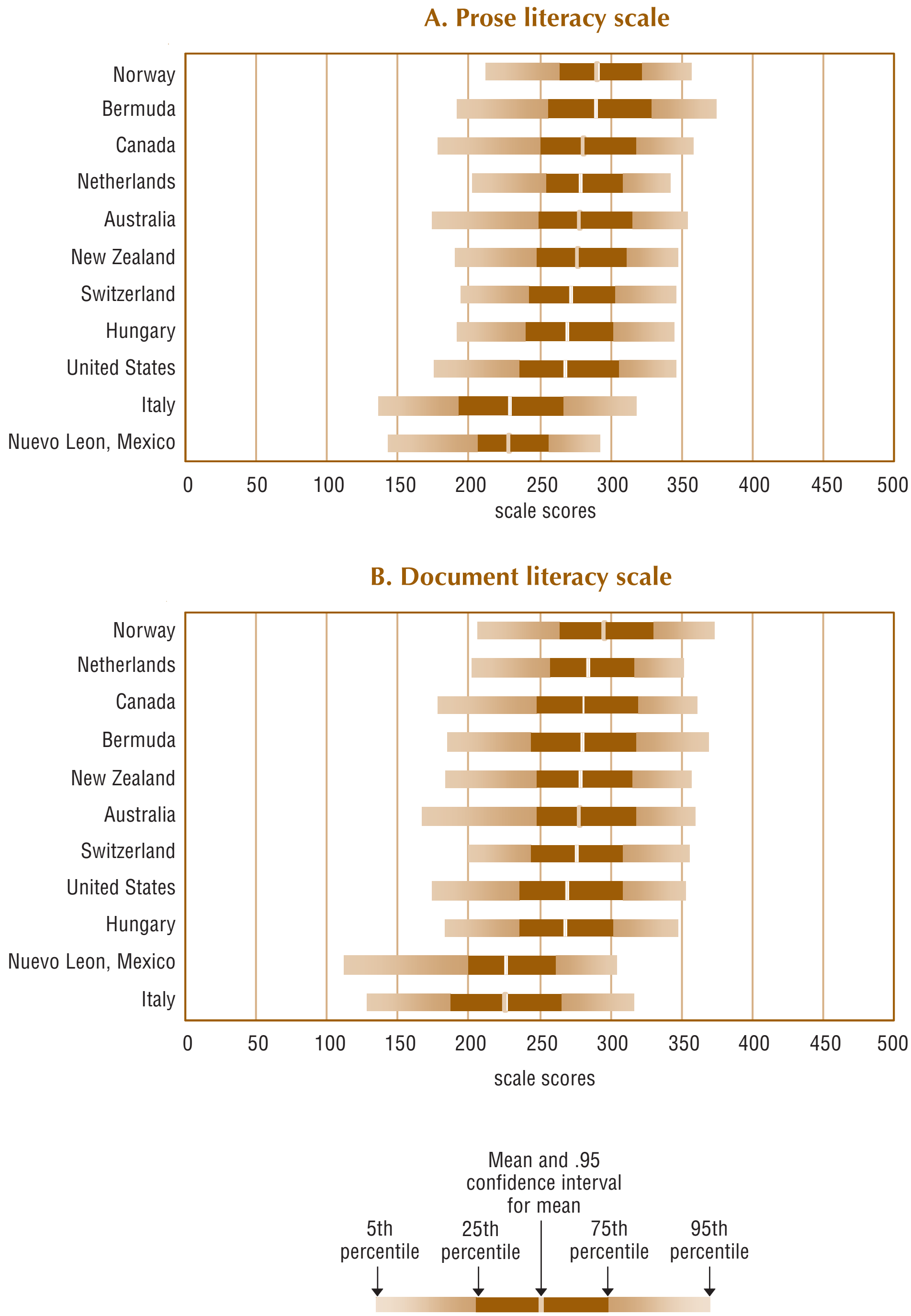
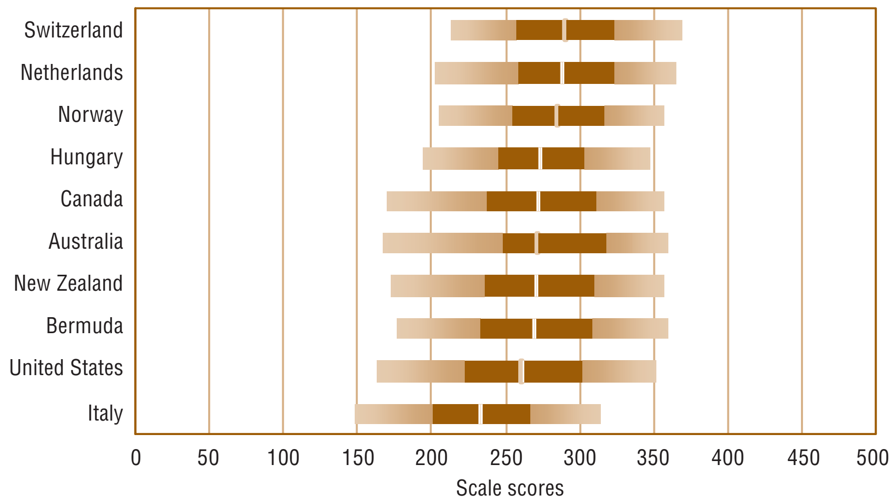


Figure 2.2 (concluded)

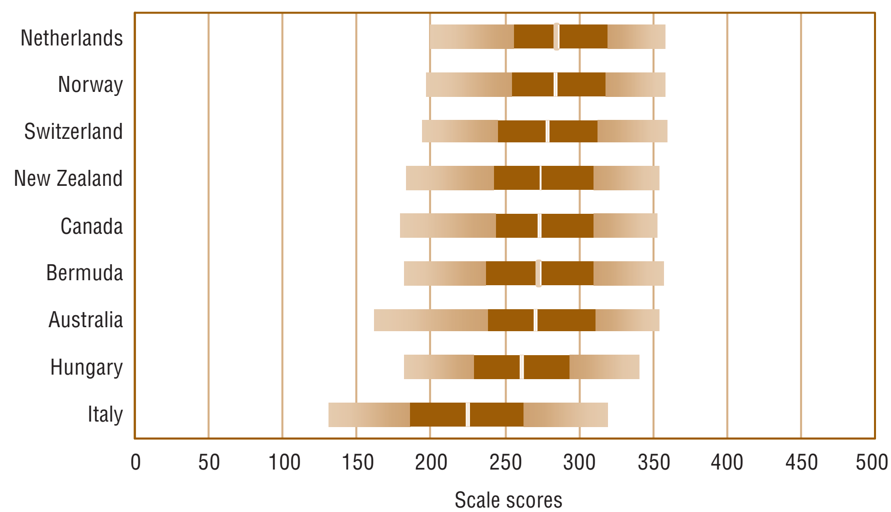
Comparative distributions of skills scores

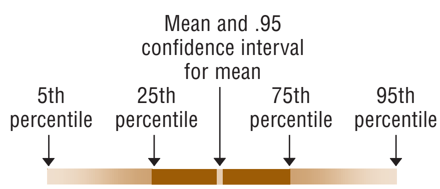
Mean scores with .95 confidence interval and scores at the 5th, 25th, 75th and 95th percentiles on skills scales ranging from 0 to 500 points, population aged 16 to 65, 2003 and 2008

C. Numeracy scale



D. Problem solving scale





Countries are ranked by mean scores.

Note: The state of Nuevo Leon in Mexico did not field the numeracy skills domain.
Switzerland (Italian), the United States, and the state of Nuevo Leon in Mexico did not field the problem solving skills domain.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Figures 2.2 A to 2.2 D display the population mean scores surrounded by 95 per cent confidence intervals and the 5th, 25th, 75th, and 95th percentile scores for each skill domain. The population distributions are summarised using gradation bars. A small range of scores indicates few skill differences among the population while a large range indicates a country with a more variable distribution of skills.

The Netherlands has the narrowest distribution on the prose scale (139 points) and the document scale (150 points), and ties with Hungary on the problem solving scale (159 points). Norway (153 points) and Hungary (154 points) exhibit a similarly small range of numeracy scores. Across all four skill domains the smallest ranges are consistently observed for Hungary, Switzerland, the Netherlands and Norway. New Zealand displays medium levels of spread for prose (158 points), document (174 points), numeracy (184 points) and problem solving (170 points). Australia, Italy and Nuevo Leon (Mexico) show the largest ranges for the prose, document, numeracy and problem solving domains. Bermuda, Canada and the United States exhibit medium to wide ranges across all four skill domains.

The findings for the Netherlands are similar to those for Norway. Both countries display high mean scores as well as low levels of skill differences in their populations. New Zealand's comparatively moderate ranges match its rather average scores. The findings of the data analysis confirm the pattern observed in the first ALL report, namely the absence of a consistent relationship between the population mean scores and the range denoting population skill differences (OECD and Statistics Canada, 2005). Australia, Bermuda and Canada have moderate to high mean scores and rather high ranges of skill differences among their populations. Conversely, Hungary and Nuevo Leon (Mexico) show comparatively low mean literacy scores combined with narrow proficiency distributions for most skill domains.

Figure 2.3

Comparative distributions of skill levels

Per cent of population aged 16 and 65 years at each skill level, 2003 and 2008

A. Prose literacy scale

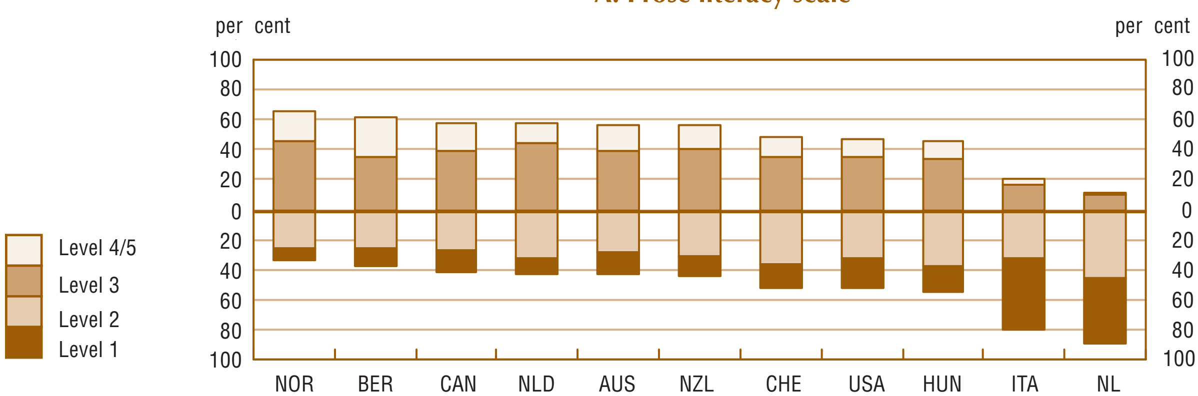
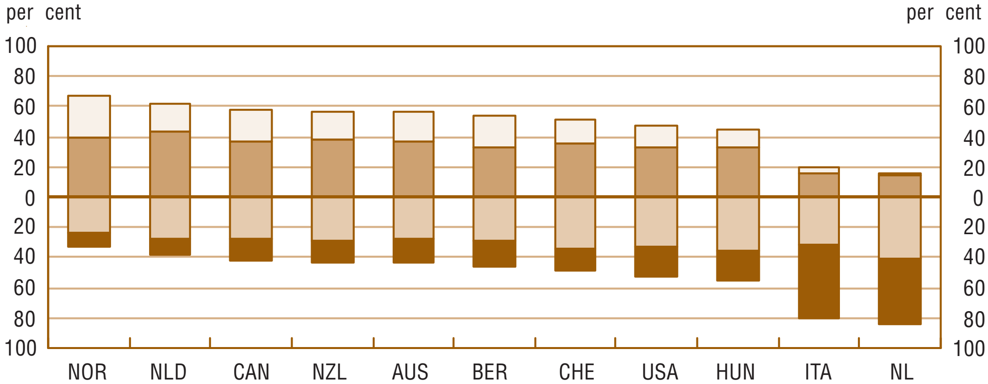


Figure 2.3 (concluded)

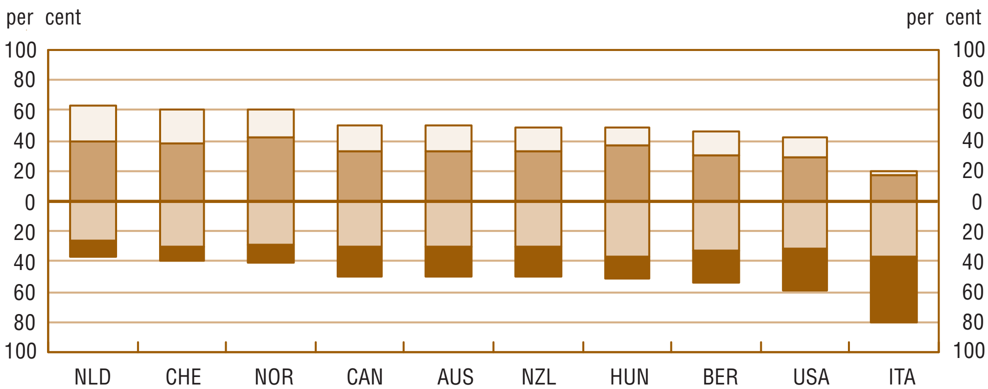
Comparative distributions of skill levels

Per cent of population aged 16 and 65 years at each skill level, 2003 and 2008

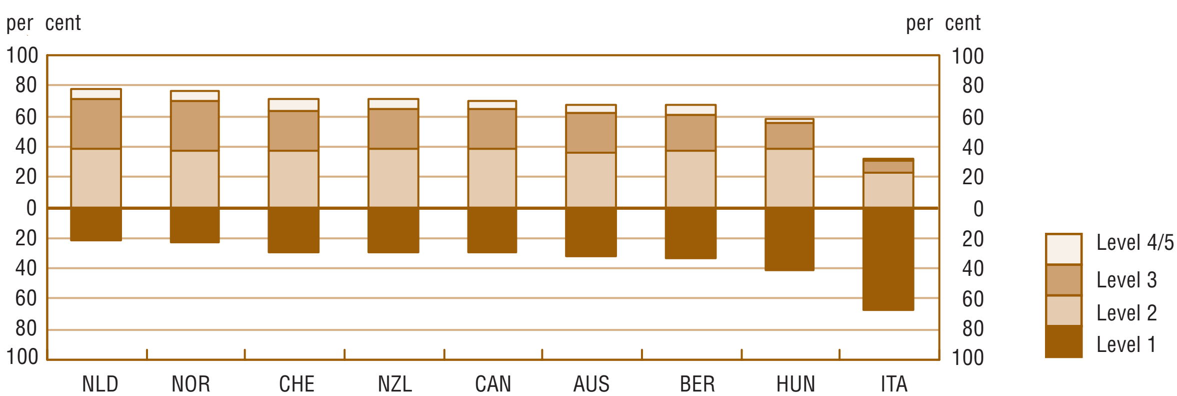
B. Document literacy scale



C. Numeracy scale



D. Problem solving scale



Countries are ranked by the proportions in Levels 2, 3 and 4.

Note: Switzerland (Italian), the United States, and the province of Nuevo Leon in Mexico did not field the problem solving skills domain.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Previous research suggests that people generally require at least Level 3 skill proficiency if they are to have good chances of participating fully and productively in today's knowledge-intensive economies (OECD and Statistics Canada, 2005)[1]. Figures 2.3 A to 2.3 D show the proportions of the adult population aged 16 to 65 years scoring at different levels of proficiency on the prose literacy scale across countries. Several important findings emerge from these analyses of data. Norway (66%) and Bermuda (62%) have the highest proportions of their adult populations scoring at Levels 3 and 4/5 on the prose literacy scale (Figure 2.3a). Australia (57%) and New Zealand (56%) rank just below Canada (58%) and the Netherlands (58%) on this measure. However, Australia (18%), the Netherlands (13%) and New Zealand (15%) all have smaller proportions of the population scoring at Level 4/5 than Canada (20%). Hungary (45%) exhibits combined Levels 3 and 4/5 proportions that closely resemble those of Switzerland (48%) and the United States (47%).

The findings are somewhat different for document literacy (Figure 2.3 B). Norway (68%) and the Netherlands (62%) have the highest proportions of respondents scoring at Levels 3 and 4/5, followed by Australia, Canada and New Zealand (all at 57%). The proportion of the adult population scoring at Level 4/5 is a little lower in the Netherlands (18%) than in Canada (21%), and is similar to that in New Zealand (19%). As with the prose literacy scale Hungary (45%) has a slightly smaller proportion of its population scoring at the highest levels on the document scale than the United States (48%).

Figure 2.3 C displays the comparative distributions of numeracy skills by levels across the participating countries. Interestingly, the Netherlands (63%) has the highest proportion of respondents scoring at Levels 3 and 4/5, with nearly a quarter achieving scores at Level 4/5. Norway (60%) and Switzerland (61%) have similar results, albeit somewhat lower than the Netherlands. Australia (50%), Bermuda (46%), Canada (50%), Hungary (49%) and New Zealand (49%) all show similar proportions of respondents scoring at Levels 3 and above. Still, Hungary shows the smallest relative proportion (12% versus approximately 16% for other countries) of highly numerate individuals scoring at Level 4/5.

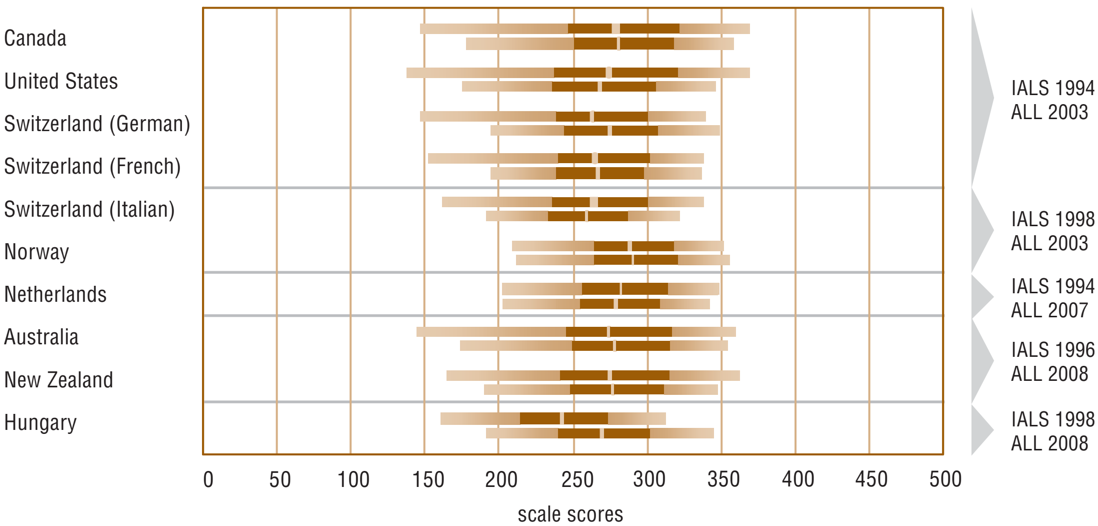
Figure 2.3 D compares the distributions of problem solving proficiencies by levels across the countries where this skill domain was administered. The Netherlands (78%) and Norway (77%) rank highest in terms of the proportions of respondents scoring at Levels 2 and above[3]. Canada (70%), Switzerland (71%) and New Zealand (71%) occupy the middle ground with Australia (68%) and Bermuda (67%), while Hungary (59%) has the second smallest proportion scoring at Levels 2 and above. The proportions of the adult population with high problem solving proficiencies (Levels 2, 3 and 4) are on average about 20 percentage points higher than for the other three skill domains.

Figure 2.4

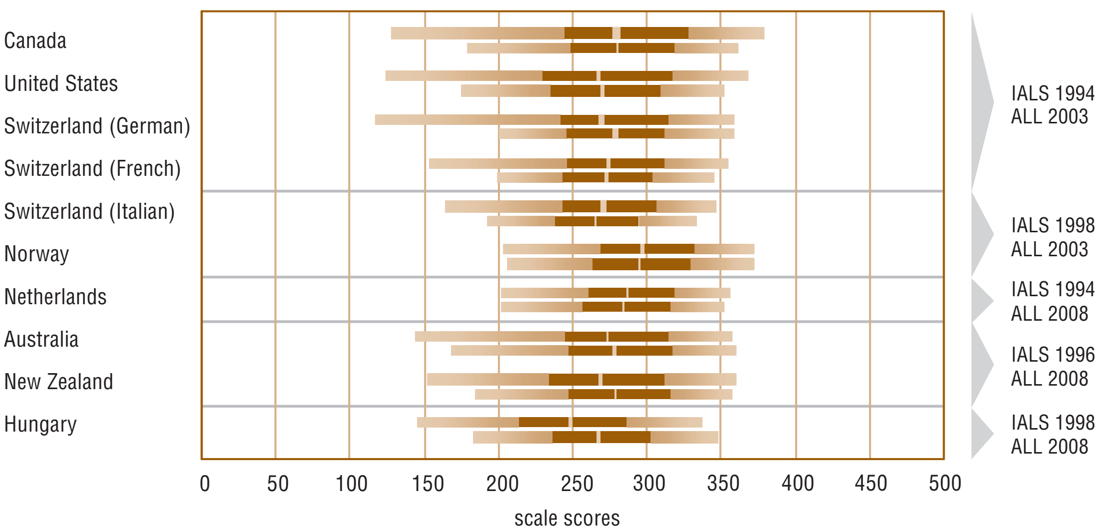
Changes in distributions of skills scores

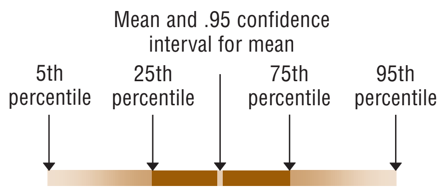
Mean scores with .95 confidence interval and scores at the 5th, 25th, 75th and 95th percentiles on skills scales ranging from 0 to 500 points, population aged 16 to 65, IALS 1994 and 1998 and ALL 2003 and 2008

A. Prose literacy scale



B. Document literacy scale





Sources: International Adult Literacy Survey, 1994 and 1998.
Adult Literacy and Life Skills Survey, 2003 and 2008.

2.3 Changes in skill profiles from IALS 1994 and 1998 to ALL 2003 and 2008

The IALS and ALL contain identical measures for assessing the prose and document literacy proficiencies of populations. This facilitates, therefore, the comparative analysis of skill proficiencies within and between countries and over time. International comparisons of trends should be made with caution, since the time between the administration of the IALS and ALL ranges from five years (IALS 1998 and ALL 2003) to 14 years (IALS 1994 and ALL 2008), depending on the country. On the prose literacy scale most countries improved their population mean scores between IALS and ALL. As noted in the previous report on ALL (OECD and Statistics Canada, 2005), Canada, Norway and Switzerland (German and French speaking populations) scored higher in ALL than in IALS, while population mean scores for Switzerland (Italian speaking population) and the United States decreased slightly. Few countries improved their scores on the document literacy scale. Improvements were observed for Canada, Switzerland (German speaking population) and the United States but scores for the Norwegians and the French- and Italian-speaking Swiss decreased.

Moreover, the data for the additional ALL 2003 countries indicate significant declines in the ranges of the population proficiency scores. This evidence indicates that, since the time the IALS data were collected in 1994 and 1998, several countries have reduced the degree of inequality in the distribution of population proficiency scores. Much of this decline in inequality results from improvements made at the lower end of the skill distributions.

The main trends remain the same with the addition of the ALL 2008 countries. Australia, Hungary and New Zealand all increased their mean prose and document literacy scores, while the scores for the Netherlands dropped slightly in ALL compared with IALS. For Hungary no meaningful changes in the ranges of scores across the two surveys are apparent, indicating that the level of literacy inequality remained relatively moderate and stable from 1998 to 2008. For Australia the ranges of scores indicating the degree of inequality in skills remained larger than for most comparison countries, but did decrease in the ALL. Despite the minor declines in population mean scores observed for the Netherlands, as noted above, the ranges of scores on both skill domains also decreased between 1994 and 2008, indicating the country's population skill distributions became more equal over the intervening period.

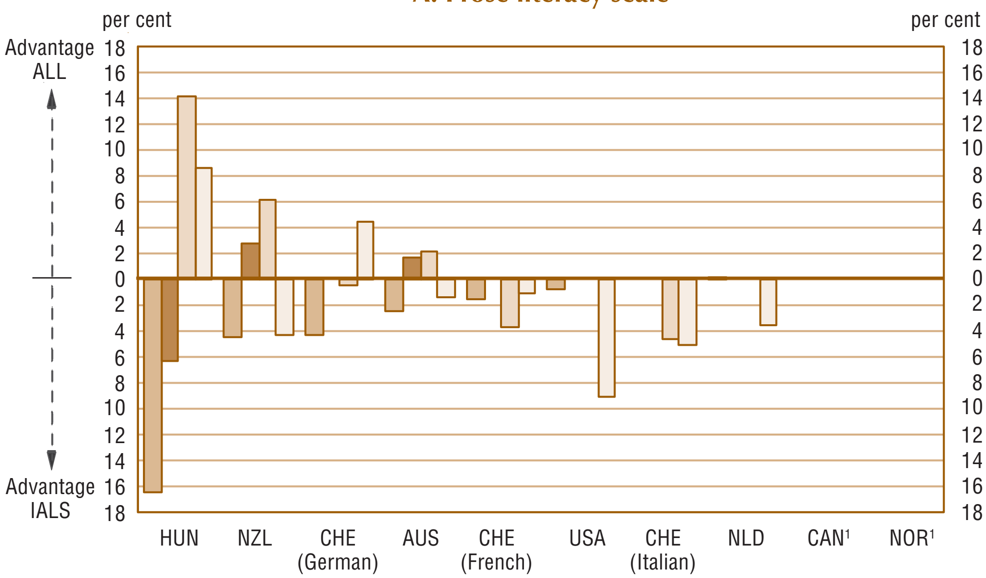
For New Zealand, the overall increase in population mean scores may be attributable to improvement in the scores of the less skilled. While the proportions scoring at the highest level appear to have declined somewhat, the comparatively smaller ranges in the distribution of the scores suggest that population skill proficiencies have increased, especially at the lower ends of the distributions.

Figure 2.5

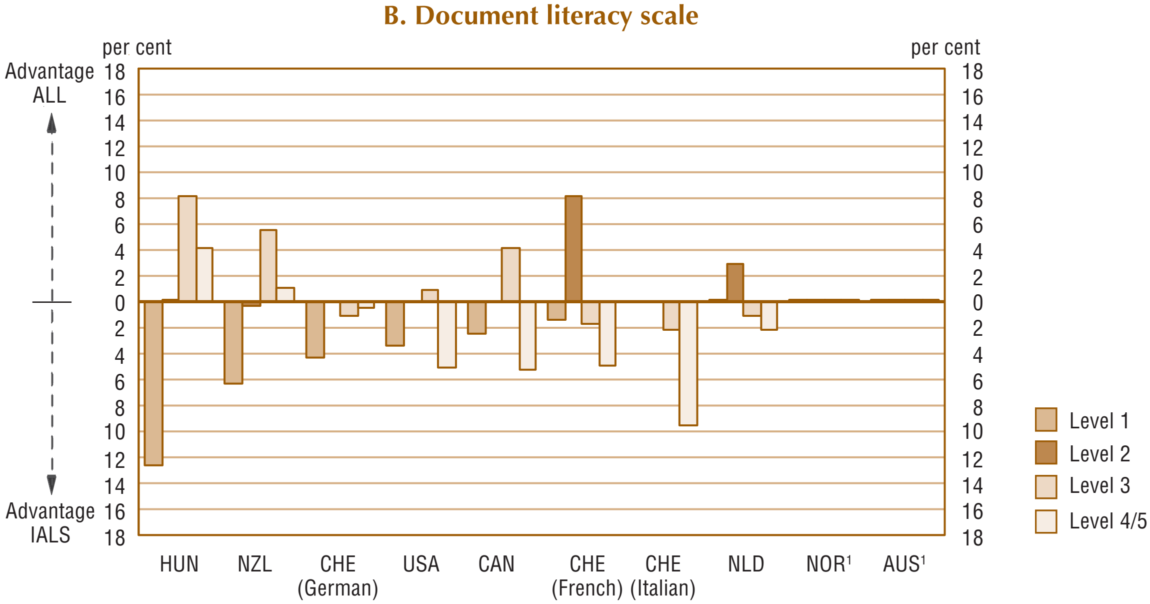
Changes in distributions of skill levels

Differences between IALS 1994 and 1998 and ALL 2003 and 2008 in the per cent of adults aged 16 to 65 years at each skill level

A. Prose literacy scale



B. Document literacy scale



Countries are ranked by the difference in per cent in the advantage of IALS at level 1.

1. For countries that do not have statistically significant changes observed at any level, there are no changes reported in the graphic. But if the change is statistically significant for at least one level in a country, changes for all levels are reported in the figure.

Note: For Switzerland, the IALS survey was administered at different points in time, and therefore the results are reported separately for each language.

Sources: International Adult Literacy Survey, 1994 and 1998.
Adult Literacy and Life Skills Survey, 2003 and 2008.

Figure 2.5 (see also Table 2.5) displays differences in the distribution of population skill profiles by levels.[3] Bars that fall below the horizontal axis represent higher population percentages in the IALS, whereas bars that sit above represent an increase in such percentages in the ALL. If no significant differences are found for any level then no changes are plotted in the figure. Most of the ALL 2003-2008 countries show declines in the proportions of the population scoring at Level 1 and an increase at Level 2. However, the proportions of the population scoring at the highest proficiency level (Level 4/5) declined for most of these countries, while the trend for Level 3 appears mixed. Most notably, among the comparison countries, Hungary, New Zealand and the German speaking population of Switzerland show the greatest declines in the percentages of adults scoring at Level 1 on both the prose and document literacy scales. In Hungary, between IALS 1998 and ALL 2008, about 14 percentage points more of the adult population scored at Level 3 proficiency and an additional eight percentage points achieved scores at Level 4/5 on the prose scale. For document literacy, the gains in Hungary were about eight percentage points at Level 3 and four percentage points at Level 4/5. In New Zealand the biggest gains occurred in the middle of the range, at Levels 2 and 3 on the prose scale, while the proportions scoring at the lowest and highest levels decreased between the two surveys. In New Zealand, on the document scale, the proportion of the population scoring at Levels 3 and 4/5 increased between the two surveys, by about six and one per cent respectively.

German speaking Switzerland displays the most success in reducing the proportion of adults at Level 1 (-4.3 per cent) on both the prose and document scales. But while this percentage shifts into Level 2 on the document scale, a broader change occurs on the prose scale, where the net increase is primarily in the proportion at Levels 4/5. The latter result implies an upward shift in the entire distribution, whereas the former implies an improvement at the lower end of the distribution only. Accordingly, German speaking Switzerland has significantly increased the proportion of adults at prose literacy Levels 4/5 (+4.4 per cent). The net change between low (Levels 1 and 2) and medium to high (Levels 3 and 4/5) skilled adults remains unchanged on the document scale.

Gains for the German speaking population of Switzerland are concentrated in Level 4/5 on the prose literacy scale, where they represent about four per cent, about equivalent to the reduction in the proportion of the population scoring at Level 1. The distributions of skills in the Netherlands are similar to those of the Italian speaking population of Switzerland, where the proportions scoring at Levels 1 and 2 increase relative to Levels 3 and 4/5. Finally, in Australia, the pattern on the prose scale resembles that of New Zealand, as the proportion of the population with moderate levels of skill (Levels 2 and 3) increased significantly in the ALL while the proportion at both low and high skills levels decreased. On the document scale no statistically significant differences were observed across surveys. On the prose literacy scale no significantly different results are observed at any level for both Canada and Norway, whereas Australia and Norway do not show any significant increase or decrease in scores on the document literacy scale.

Table 2.0

Rankings of countries by mean scores across the IALS 1994 and 1998 and the ALL 2003, 2006 and 2008

A. Prose[1] literacy scale

IALS 1994 and 1998	Rank	ALL 2003, 2006 and 2008	Rank
Sweden	…	**Norway**	**1**
Finland	…	Bermuda	…
Norway	**1**	**Canada**	**2**
Netherlands	**2**	**Netherlands**	**3**
Canada	**3**	**Australia**	**4**
Germany	…	**New Zealand**	**5**
New Zealand	**4**	**Switzerland**	**6**
Denmark	…	**Hungary**	**7**
Australia	**5**	**United States**	**8**
United States	**6**	Italy	…
Belgium (Flanders)	…	Nuevo Leon, Mexico	…
Czech Republic	…		
United Kingdom	…		
Ireland	…		
Switzerland	**7**		
Hungary	**8**		
Slovenia	…		
Poland	…		
Portugal	…		
Chile	…		

B. Document[2] literacy scale

IALS 1994 and 1998	Rank	ALL 2003, 2006 and 2008	Rank
Sweden	…	**Norway**	**1**
Norway	**1**	**Netherlands**	**2**
Denmark	…	**Canada**	**3**
Finland	…	Bermuda	…
Netherlands	**2**	**New Zealand**	**4**
Germany	…	**Australia**	**5**
Czech Republic	…	**Switzerland**	**6**
Canada	**3**	**United States**	**7**
Belgium (Flanders)	…	**Hungary**	**8**
Australia	**4**	Nuevo Leon, Mexico	…
Switzerland[3]	**5**	Italy	…
New Zealand	**6**		
United States	**7**		
United Kingdom	…		
Ireland	…		
Hungary	**8**		
Slovenia	…		
Poland	…		
Portugal	…		
Chile	…		

… not applicable
1. Countries are ranked by their mean prose scores.
2. Countries are ranked by their mean document scores.
3. Switzerland (French) had a higher mean document score than Australia.

Despite the changes observed in both mean scores and proficiency ranges within countries, their overall rank remained notably stable across the two surveys. Table 2.0 A and 2.0 B display the countries that participated in both IALS and ALL ranked by their mean proficiency scores. Countries shown in bold face participated in both IALS and ALL, and the number in brackets beside the country names indicates their relative rank. In terms of mean prose literacy scores Norway scored higher than all other countries, Canada and the Netherlands switched places, Australia and New Zealand reversed their positions at fourth and fifth places, Hungary and Switzerland remained in about the same relative position, while the United States dropped slightly relative to the other countries. On the document literacy scale the relative position of the countries in ALL remained nearly identical to that in IALS. One notable exception is the higher rank of New Zealand compared with Australia and Switzerland.

2.4 Skills and demographic characteristics

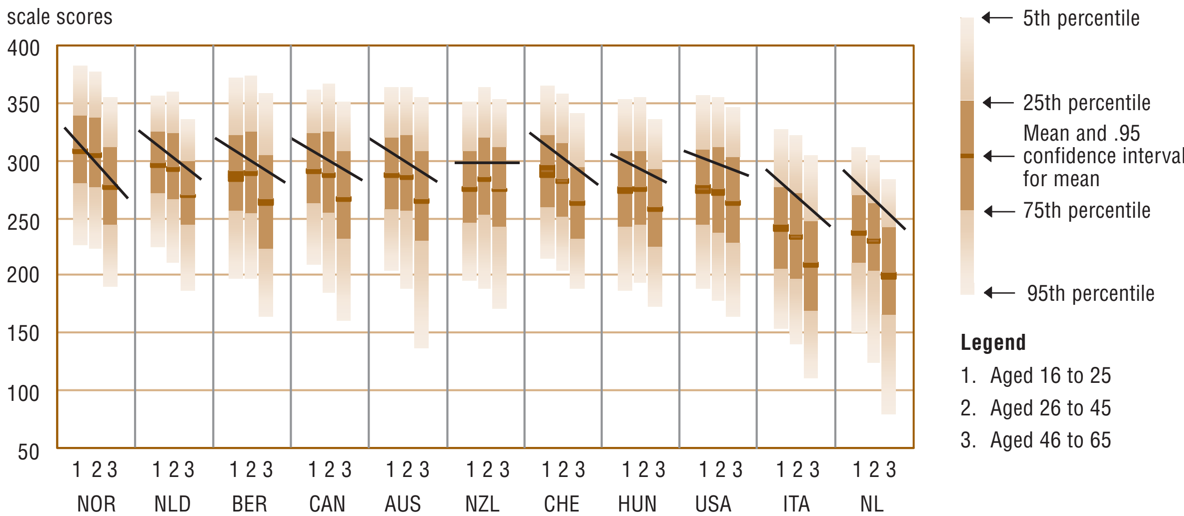
Previous international reports on IALS and the first wave countries in ALL have studied and reported on the relationships between key demographic factors and population literacy scores (OECD and Statistics Canada, 1995, 2000, 2005; OECD and HRDC, 1997). The findings consistently point to age, gender, immigration and language status as key determinants of population skill proficiencies across all countries. This third section considers each of these factors in turn and examines the relationships using a comparative perspective.

Skills are acquired, developed or lost over the entire life course (Desjardins, 2004). Some people acquire high reading and writing skills and critical thinking abilities through initial formal education but, for a variety of reasons, fail to maintain or develop this human capital through informal means later on. The more time spent beyond the initial education system the greater their skill sets diminish. In contrast, however, others who engage in lifelong learning at home, at work and in the community can compensate for low levels of initial schooling and acquire higher levels of human capital throughout the life course. Although the differences across age groups vary substantially between countries, the previous reports on IALS and ALL consistently show age to be negatively associated with literacy proficiency (OECD and Statistics Canada, 2000, 2005).

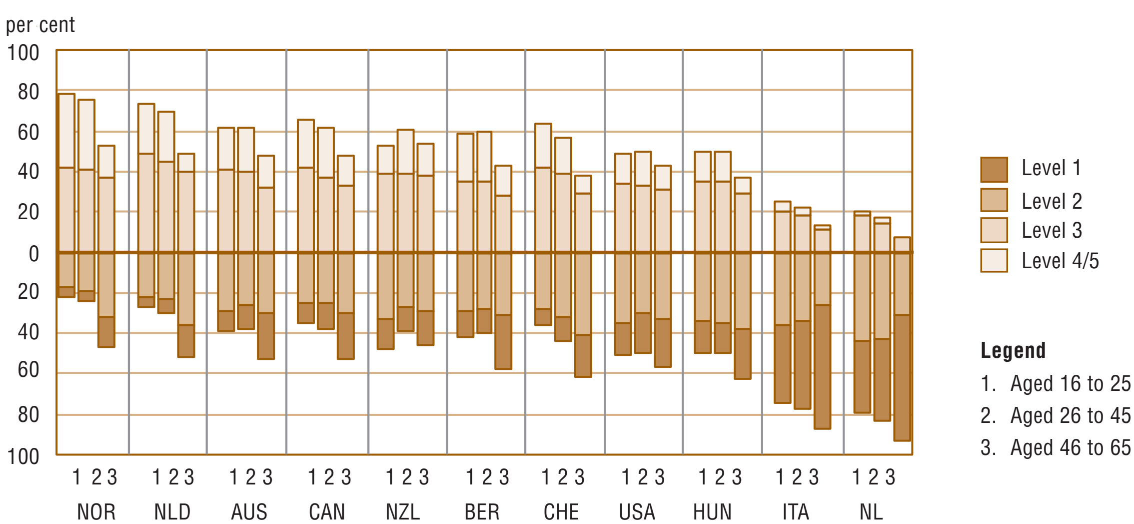
Figure 2.6

Age and adult skills

A. Mean scores with 0.95 confidence interval and scores at 5th, 25th, 75th, and 95th percentiles on the document scale, population aged 16 to 25, 26 to 45 and 46 to 65, 2003 and 2008



B. Per cent of populations aged 16 to 25, 26 to 45 and 46 to 65 at each level on the document scale, 2003, 2006 and 2008



A. Countries are ranked by the mean of age group 26 to 45.

B. Countries are ranked by the proportions in Levels 3 and 4/5 in age 26 to 45.

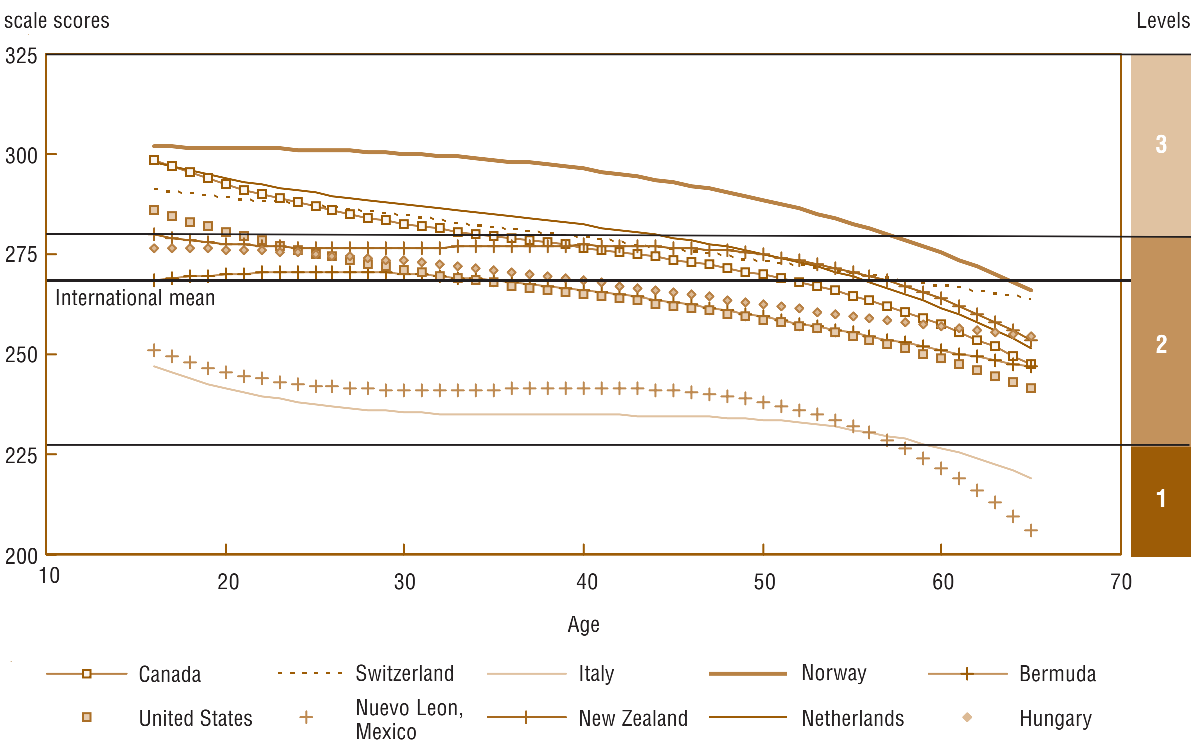
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Figure 2.6 A shows the population mean scores and the 5th, 25th, 75th and 95th percentile scores on the document literacy scale across countries. For most of them the population mean scores are lower for older age groups than for younger ones. Moreover, the steepest decline in proficiency occurs for the oldest age group. In several countries the mean score for the group aged 46 to 65 years is close to the 25th percentile score of the group aged 26 to 45 years. Interestingly, the results for New Zealand tell a somewhat different story, because the mean document scores for the youngest age group (16 to 25 years) and the eldest age group (46 to 65 years) are almost equivalent and are both significantly lower than those of respondents aged 26 to 45 years. Skill scores for respondents aged 46 to 65 years are similarly lower on average than the other two age groups.

Figure 2.7

Skills-age profiles controlling for education and language status

Relationship between age and literacy scores on the document literacy scale, controlling for education and language status, 2003 and 2008



Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

The results displayed in Figures 2.6 A and 2.6 B indicate that age is related to skill levels in all countries. It is important also to measure the extent to which age has an impact on skills when holding variation in educational attainment constant. It is known from previous research studies that among a large number of explanatory background variables educational attainment is the single most important determinant of literacy proficiency. Since younger age cohorts are more likely to have attained higher levels of education than older age cohorts, it is necessary to also examine the partial relationships between age, education and skills.

In Figure 2.7, the fitted values for a linear regression predicting document literacy scores are plotted across the range of age groups sampled. The models predict population literacy proficiency while controlling for level of education and language status. The results indicate that age is still negatively associated with literacy proficiency even when variation in educational attainment is held constant in the model. Although the direction of the relationship is similar for all countries, some countries show more accelerated skill loss for older individuals than others. While there are certainly other factors at play as well, some of these international differences may stem from country-unique policies on investment in adult learning opportunities (OECD, 2005).

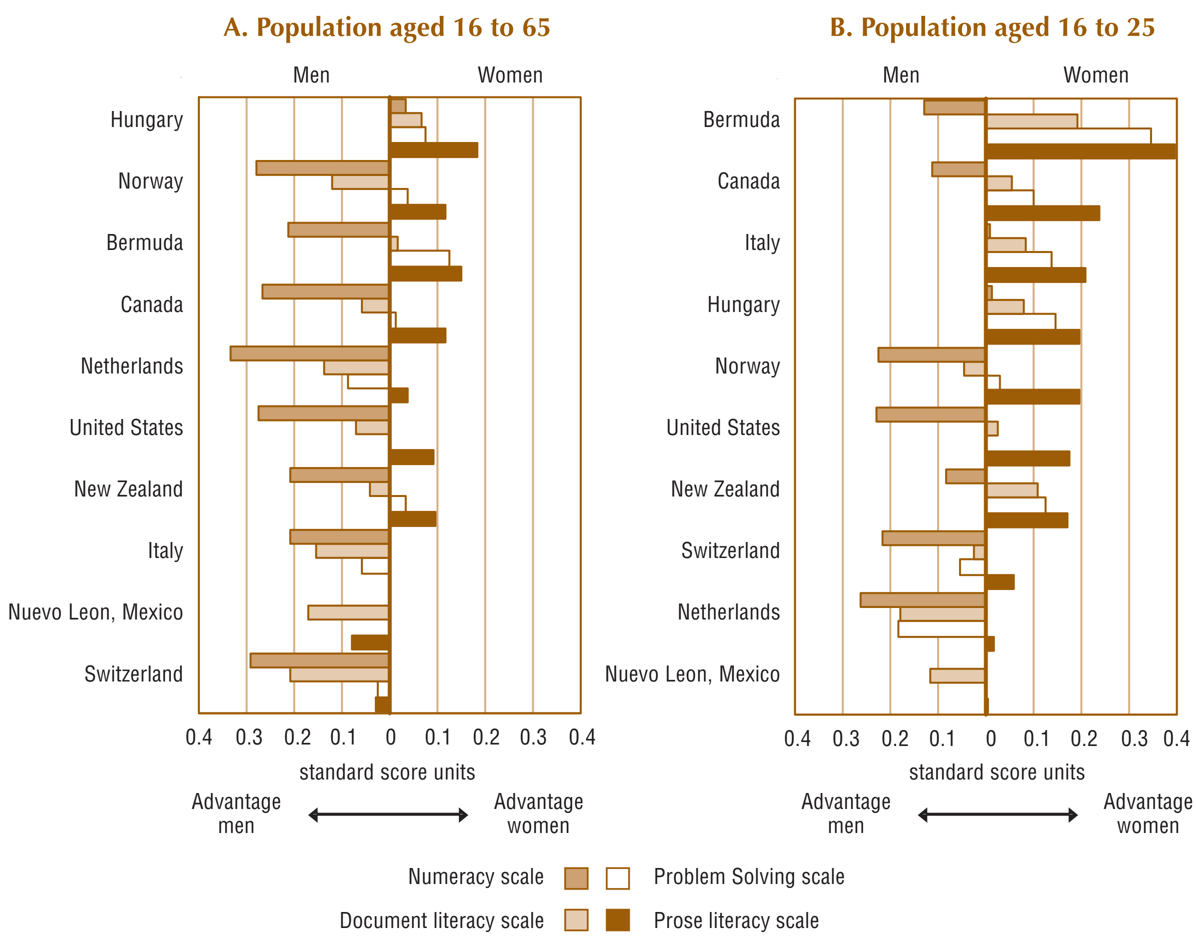
Previous studies have also pointed to gender as a key determinant of literacy proficiency. Figures 2.8 A and B compare standard score differences in mean skills proficiencies by gender. Three groups of countries emerge from the findings for the population aged 16 to 65 years. In most countries women outperform men on some skill domains whereas men score higher on average on other domains. In Hungary, however, a different pattern holds, as women outperform men on all four skill domains. In contrast, in Italy, Neuvo Leon (Mexico) and Switzerland, men on average score higher than women on most skill domains. Overall, the greatest gender differences occur on the numeracy scale, with men scoring higher than women in all countries except Hungary. Consistent with the results obtained in previous studies, women score higher on the prose domain in most countries.

A somewhat different pattern emerges when the analysis is limited to the population aged 16 to 25 years (Figure 2.8 B). In many countries and for most domains young women perform better compared to young men. While young men continue to score higher on the numeracy scale than young women, the differences are smaller in some countries than for the population as a whole. On the document scale young women outperform men in Canada, New Zealand and the United States. In Italy, however, the situation is reversed, as young women outperform young men in all four skill domains.

Figure 2.8

Gender differences in skills

Standard score differences in mean skills proficiencies between men and women on the prose, document, numeracy and problem solving scales, 2003 and 2008



Countries are ranked by the difference in standard score units on the prose scale in panel B.

Notes: The province of Nuevo Leon in Mexico did not field the numeracy skills domain.
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Interestingly, these patterns observed for young men and women in the prose literacy and numeracy domains in ALL mirror the findings with respect to reading and mathematical literacy obtained in PISA 2006. Recent results indicate that young women continue to have higher reading performance than young men in all OECD countries. Moreover, the differences in reading performance between 15-year-old boys and girls increased from PISA 2000 to PISA 2006, largely due to a decline in the performance of boys. At the same time, however, boys continued to outperform girls on the combined mathematical literacy scale (OECD, 2009).

Figures 2.9 A to 2.9 D show the distributions of skill levels by immigration status. Overall, the patterns with respect to recent and established immigrant groups are mixed. In Bermuda, for example, recent and established immigrants perform better than the native-born population on all scales, whereas in the Netherlands, the native-born population greatly outperforms both recent and established immigrants. The results for New Zealand closely resemble those for Norway, where greater proportions of native-born respondents score at Level 3 or higher, compared to immigrants, while more established immigrants outperform recent immigrants. With the exception of the problem solving domain, Australia, Canada, Switzerland and the United States all show the native-born population as having the highest proportion of highly skilled, followed by recent immigrants and established immigrants.

Figure 2.9

Recent versus established immigrant status by skill level

Percent of populations aged 16 to 65 at each skill level, by recent versus established immigrant status, 2003 and 2008

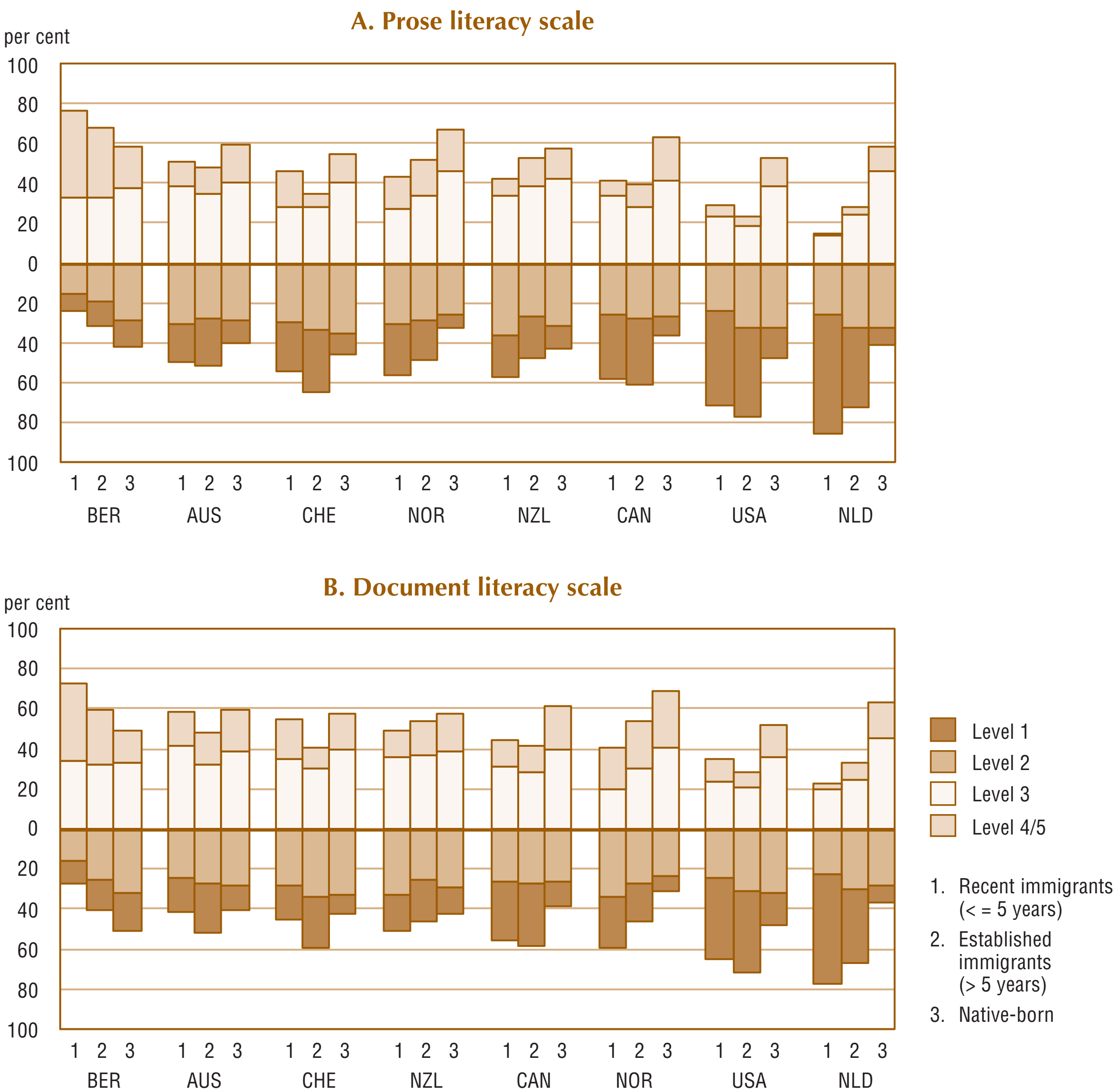
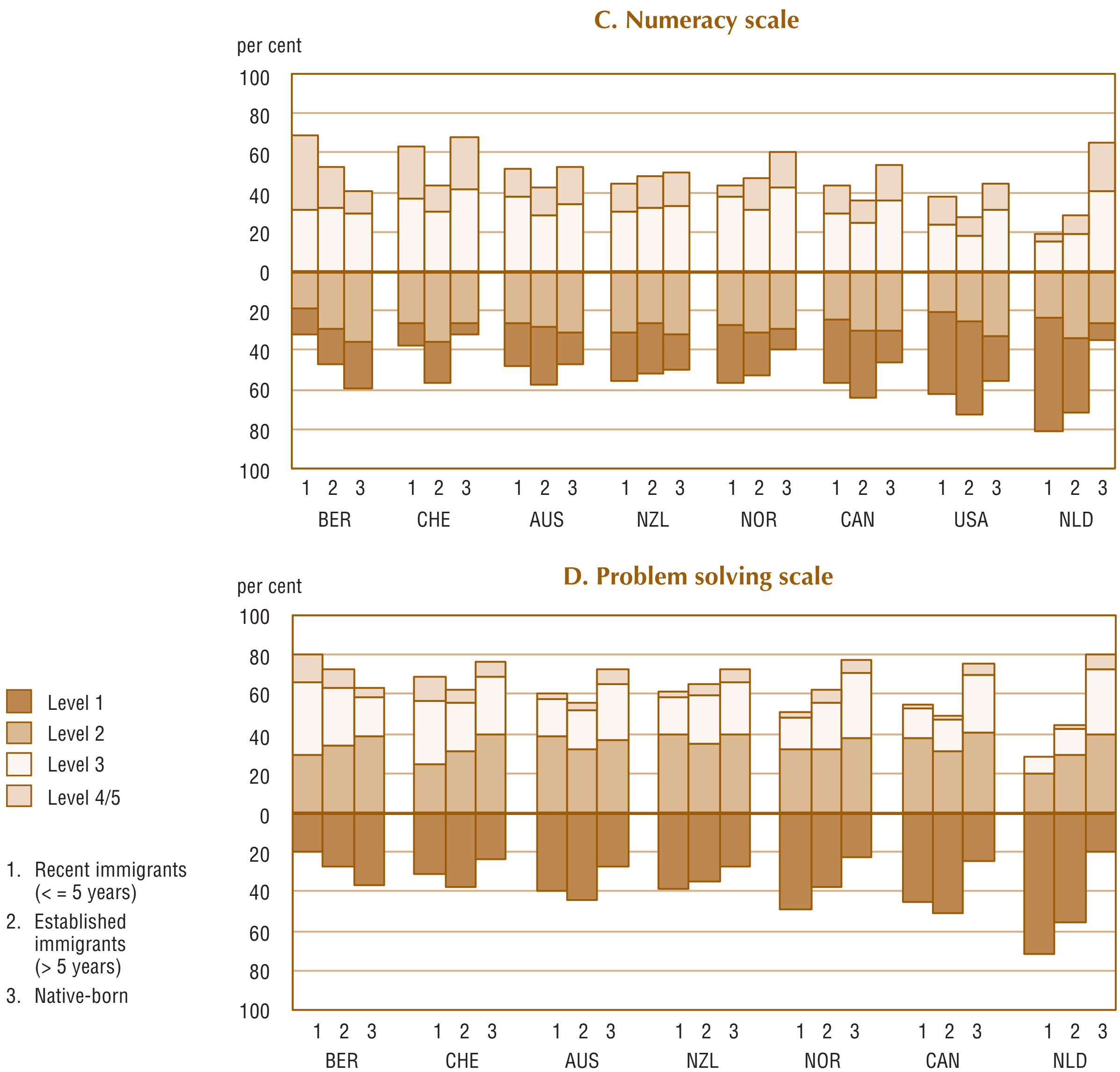


Figure 2.9 (concluded)

Recent versus established immigrant status by skill level

Percent of populations aged 16 to 65 at each skill level, by recent versus established immigrant status, 2003 and 2008



Countries are ranked by the per cent of recent immigrants at Levels 3 and 4/5.

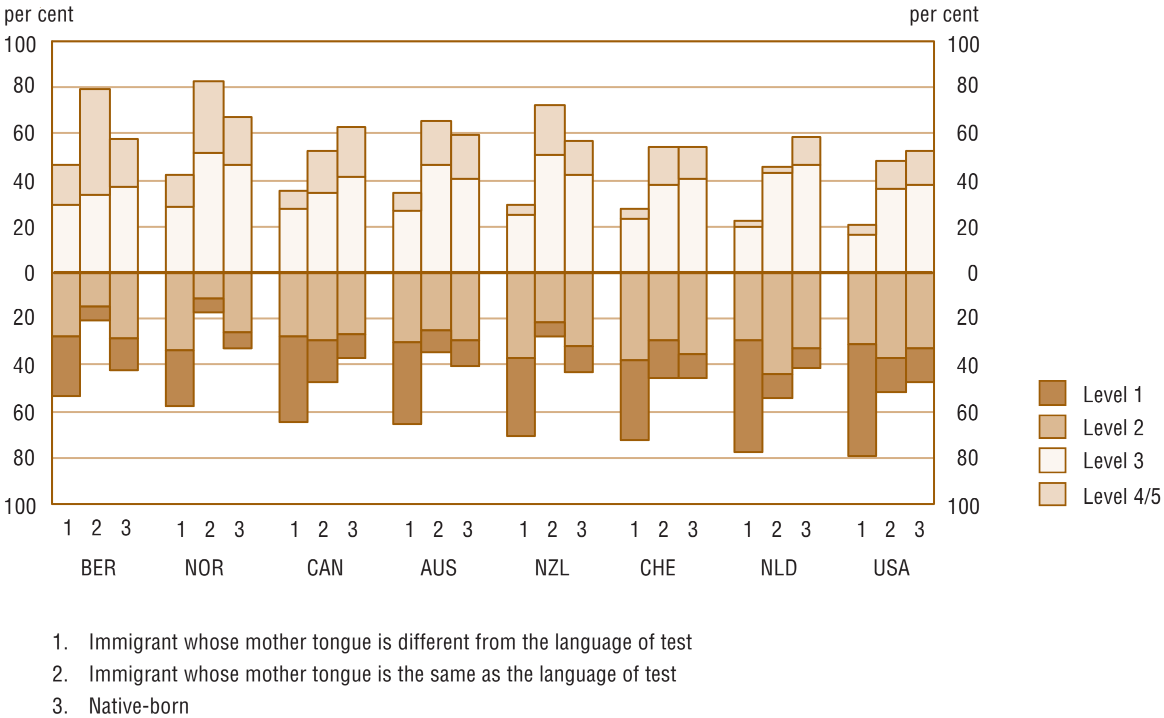
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Finally, language status has also been shown to influence literacy proficiency (Desjardins, 2004). Figure 2.10 presents the interaction between knowledge of the official language (measured by the mother tongue of the immigrant) and immigration status. Indeed, as already observed for the IALS countries (OECD and Statistics Canada, 2000) and the 2003 ALL countries (OECD and Statistics Canada, 2005), the results suggest that immigrants whose mother tongue is different from the language of the test have a higher proportion scoring at Levels 1 and 2.

Figure 2.10

Native versus foreign language status of immigrants by skill level

Percent of adults 16 to 65 at each literacy level on the prose scale, by whether their native tongue is the same or different from the official language(s) of host country, 2003 and 2008



Countries are ranked by the per cent of immigrants whose native tongue is different from the language of the test who score at Levels 3 and 4/5.

Notes: Data for immigrants in Italy and Hungary are not reported due to low sample sizes for this indicator.
For the purposes of this analysis, the Danish and Swedish languages are considered similar to the Norwegian language.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Several interesting findings emerge for the 2008 ALL countries. The distributions of scores by immigration and language status for Australia and New Zealand are similar to those for Bermuda and Norway. Immigrants whose mother tongue is the same as the language of the test show even higher proportions at Level 3 and above than native-born individuals. For the Netherlands and the other remaining countries, the proportions at Level 3 and above are largest for native-born respondents, followed by immigrants whose mother tongue is the same as the test language, and immigrants whose mother tongue differed.

The next chapter will examine the relationships between the levels and ranges of proficiency scores on the four skill domains and a range of valued economic and social outcome variables, including employment rates, income premiums, and the likelihood of participating in voluntary community activities.

Endnotes

1. Educational attainment and background characteristics such as parental education and socio-economic status are also important predictors of literacy proficiencies and day-to-day literacy practices. For a discussion of these relationships, see Chapters 3 ("Education and Skills") and 10 ("Skills, Parental Education and Literacy Practice in Everyday Life") in the first report on the ALL survey (Statistics Canada and OECD, 2005).
2. See the introductory chapter of this report for a description of the cognitive tasks and abilities associated with a particular level of skill.
3. There are no theoritical thresholds in problem solving levels which correspond to a minimum set of skills required to cope in everyday life. In this publication, level 2 and above was set empirically as a working assumption.
4. Tests for statistical significance were performed to examine percentage differences between population scores on the IALS and ALL. The test statistics and approximate standard errors (*SE*) of the difference between two estimates were calculated as follows: $\frac{|x-y|}{SE(x-y)}$, where $SE(x-y)=\sqrt{([SE(x)]^2+[SE(y)]^2)}$

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Annex 2

Data Values for the Figures

Table 2.1 For data values of Figure 2.1 see Table 2.2

Table 2.2

Mean scores with .95 confidence interval and scores at the 5th, 25th, 75th and 95th percentiles on skills scales ranging from 0 to 500 points, population aged 16 to 65, 2003 and 2008

	5th percentile		25th percentile		Mean		75th percentile		95th percentile	
	scores	standard error	scores	standard error	scores	standard error	scores	standard error	scores	standard error
A. Prose literacy scale										
Australia	173.6	(4.4)	249.5	(1.3)	278.4	(1.0)	315.2	(1.2)	354.7	(1.6)
Bermuda	192.0	(4.4)	255.6	(2.7)	289.8	(1.3)	328.4	(1.8)	374.1	(2.5)
Canada	178.1	(2.1)	250.6	(1.3)	280.8	(0.7)	318.0	(0.7)	358.7	(1.2)
Hungary	191.3	(2.5)	239.5	(1.4)	269.5	(1.1)	301.4	(1.6)	344.7	(1.8)
Italy	135.8	(3.9)	192.3	(2.8)	229.1	(1.7)	267.2	(1.9)	318.7	(2.2)
Netherlands	202.4	(2.6)	254.4	(1.5)	278.7	(1.0)	308.1	(1.3)	341.8	(1.5)
New Zealand	190.6	(3.4)	247.9	(1.4)	277.0	(0.8)	310.8	(1.1)	348.2	(1.3)
Norway	211.5	(3.4)	263.5	(1.4)	290.1	(1.0)	320.5	(0.8)	355.8	(1.0)
Nuevo Leon, Mexico	143.3	(4.2)	206.1	(0.9)	228.3	(0.7)	255.8	(0.9)	292.0	(1.7)
Switzerland	193.8	(2.7)	242.1	(2.2)	272.1	(1.3)	303.7	(1.5)	346.0	(4.0)
United States	175.9	(3.5)	235.5	(1.6)	268.6	(1.3)	306.1	(1.9)	346.9	(2.2)
B. Document literacy scale										
Australia	167.7	(4.5)	247.4	(2.0)	278.5	(1.1)	317.4	(1.2)	360.5	(1.3)
Bermuda	185.1	(3.5)	243.9	(2.4)	280.0	(1.5)	318.3	(1.8)	369.9	(2.2)
Canada	178.3	(2.1)	248.1	(1.0)	280.6	(0.6)	318.8	(0.8)	361.5	(1.7)
Hungary	183.1	(2.3)	236.1	(1.8)	267.9	(1.3)	302.0	(1.7)	348.4	(1.9)
Italy	127.9	(3.4)	187.9	(2.3)	225.8	(1.7)	265.6	(2.2)	317.1	(2.9)
Netherlands	202.1	(2.5)	256.9	(1.1)	284.1	(1.1)	316.1	(1.2)	352.3	(1.6)
New Zealand	183.8	(4.5)	247.4	(1.3)	278.8	(0.9)	315.4	(1.2)	357.4	(1.9)
Norway	205.8	(3.1)	264.0	(1.6)	295.1	(0.9)	329.7	(1.0)	372.3	(1.9)
Nuevo Leon, Mexico	111.6	(5.0)	199.6	(1.4)	226.2	(1.1)	261.9	(1.0)	304.6	(2.2)
Switzerland	198.8	(2.3)	244.3	(2.3)	276.6	(1.6)	309.1	(2.4)	355.3	(3.1)
United States	174.3	(3.6)	235.5	(1.7)	269.8	(1.5)	308.7	(2.2)	352.5	(2.4)

Table 2.2 (concluded)

Mean scores with .95 confidence interval and scores at the 5th, 25th, 75th and 95th percentiles on skills scales ranging from 0 to 500 points, population aged 16 to 65, 2003 and 2008

	5th percentile		25th percentile		Mean		75th percentile		95th percentile	
	scores	standard error	scores	standard error	scores	standard error	scores	standard error	scores	standard error
C. Numeracy scale										
Australia	157.1	(4.9)	236.8	(1.6)	271.5	(1.2)	312.7	(1.2)	360.8	(2.0)
Bermuda	176.8	(2.5)	233.3	(2.4)	269.7	(1.6)	308.5	(2.0)	359.4	(2.8)
Canada	170.4	(2.5)	237.2	(1.3)	272.3	(0.7)	311.9	(1.2)	357.7	(2.0)
Hungary	194.2	(2.3)	244.8	(1.6)	273.2	(1.2)	303.8	(1.4)	347.7	(1.8)
Italy	148.8	(3.9)	200.4	(2.1)	233.3	(1.4)	267.1	(1.6)	313.9	(2.0)
Netherlands	202.0	(3.4)	258.4	(1.6)	288.6	(1.2)	324.0	(1.5)	365.6	(2.0)
New Zealand	173.1	(3.7)	235.3	(1.3)	270.9	(1.0)	310.2	(1.3)	357.6	(1.7)
Norway	204.9	(3.0)	255.2	(1.5)	284.9	(1.0)	316.2	(1.4)	357.8	(2.5)
Switzerland	212.4	(3.0)	257.8	(1.8)	289.8	(1.0)	322.2	(2.0)	368.9	(4.1)
United States	162.8	(2.6)	222.4	(2.1)	260.9	(1.5)	302.2	(2.1)	351.5	(3.0)
D. Problem solving scale										
Australia	162.2	(3.9)	239.0	(1.5)	271.2	(1.1)	311.1	(1.3)	355.0	(1.5)
Bermuda	182.3	(3.3)	237.8	(2.2)	272.8	(1.4)	309.6	(2.2)	356.7	(2.4)
Canada	178.8	(2.2)	243.3	(1.5)	273.8	(1.1)	309.5	(1.5)	352.8	(2.4)
Hungary	182.1	(2.8)	229.4	(1.4)	261.5	(1.2)	294.1	(1.3)	340.9	(2.5)
Italy	130.7	(4.1)	186.1	(2.4)	224.9	(1.5)	263.4	(1.5)	319.5	(3.2)
Netherlands	199.4	(3.0)	255.5	(1.3)	284.6	(1.0)	318.3	(1.3)	358.1	(2.5)
New Zealand	183.9	(2.9)	243.3	(1.1)	274.7	(0.9)	310.3	(1.4)	354.3	(1.6)
Norway	197.0	(3.8)	254.2	(2.6)	284.2	(1.7)	318.3	(1.4)	358.6	(1.5)
Switzerland	194.6	(5.3)	244.8	(2.4)	279.0	(1.2)	313.0	(1.6)	360.5	(2.7)

Notes: The state of Nuevo Leon in Mexico did not field the numeracy skills domain.
Switzerland (Italian), the United States, and the state of Nuevo Leon in Mexico did not field the problem solving skills domain.
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 2.3

Per cent of population aged 16 to 65 at each skill level, 2003, 2006 and 2008

	Level 1		Level 2		Level 3		Level 4/5	
	per cent	standard error	per cent	standard error	per cent	standard error	per cent	standard error
A. Prose literacy scale								
Australia	14.5	(0.6)	29.0	(0.7)	38.8	(1.0)	17.7	(0.8)
Bermuda	12.5	(0.8)	25.6	(1.4)	35.6	(1.4)	26.3	(1.1)
Canada	14.6	(0.4)	27.3	(0.7)	38.6	(0.9)	19.5	(0.8)
Hungary	17.0	(0.7)	37.8	(1.0)	34.1	(0.7)	11.1	(0.7)
Italy	47.0	(1.5)	32.5	(1.1)	17.0	(0.8)	3.5	(0.4)
Netherlands	10.3	(0.7)	32.3	(1.0)	45.0	(1.2)	12.5	(0.9)
New Zealand	13.4	(0.6)	30.9	(0.8)	40.7	(1.1)	15.0	(0.8)
Norway	7.9	(0.7)	26.2	(1.1)	45.3	(1.4)	20.6	(0.7)
Nuevo Leon, Mexico	43.2	(1.2)	45.8	(1.4)	10.3	(0.5)	0.7 [1]	(0.2)
Switzerland	15.9	(1.2)	36.3	(1.1)	35.7	(1.9)	12.1	(0.9)
United States	20.0	(0.8)	32.6	(1.1)	34.6	(1.2)	12.8	(1.0)
B. Document literacy scale								
Australia	15.5	(0.6)	28.0	(0.9)	37.1	(1.1)	19.4	(0.9)
Bermuda	16.6	(1.0)	29.5	(1.7)	32.7	(1.7)	21.1	(0.9)
Canada	15.6	(0.4)	27.0	(0.7)	36.9	(1.0)	20.5	(0.6)
Hungary	19.4	(1.0)	35.8	(1.3)	32.9	(1.1)	11.9	(0.7)
Italy	49.2	(1.4)	31.4	(1.2)	15.8	(1.0)	3.6	(0.4)
Netherlands	10.2	(0.6)	27.9	(0.9)	43.6	(0.8)	18.3	(0.9)
New Zealand	14.4	(0.7)	28.9	(0.8)	38.2	(0.9)	18.5	(0.8)
Norway	8.9	(0.5)	23.5	(1.1)	39.7	(1.1)	27.9	(0.8)
Nuevo Leon, Mexico	43.8	(0.9)	40.3	(0.9)	14.2	(0.8)	1.7	(0.2)
Switzerland	14.5	(0.9)	34.5	(1.5)	35.8	(1.8)	15.1	(1.4)
United States	20.2	(1.0)	32.3	(1.4)	32.6	(1.1)	15.0	(1.0)
C. Numeracy scale								
Australia	19.7	(0.7)	30.0	(1.0)	32.8	(1.2)	17.5	(0.7)
Bermuda	21.4	(1.0)	32.7	(1.7)	29.9	(1.5)	16.0	(0.9)
Canada	19.5	(0.5)	30.3	(0.7)	33.4	(0.9)	16.9	(0.6)
Hungary	14.6	(0.8)	36.5	(1.1)	36.8	(1.0)	12.1	(0.7)
Italy	43.5	(1.2)	36.7	(1.1)	16.8	(0.8)	3.0	(0.4)
Netherlands	10.0	(0.7)	26.4	(0.7)	39.2	(1.0)	23.6	(1.0)
New Zealand	19.8	(0.7)	30.8	(1.4)	32.6	(1.2)	16.3	(0.5)
Norway	10.6	(0.6)	29.6	(1.0)	41.5	(1.5)	18.4	(0.9)
Switzerland	8.6	(0.7)	30.7	(1.5)	37.8	(1.3)	22.9	(1.2)
United States	26.8	(0.9)	31.8	(1.1)	28.8	(1.0)	12.7	(1.1)
D. Problem solving scale								
Australia	32.1	(0.9)	35.7	(0.7)	26.3	(0.8)	5.9	(0.4)
Bermuda	33.1	(1.4)	36.8	(2.0)	23.6	(1.3)	6.5	(0.6)
Canada	29.7	(0.8)	38.8	(0.9)	26.2	(0.8)	5.4	(0.5)
Hungary	41.1	(1.1)	38.1	(1.0)	17.6	(0.8)	3.1	(0.5)
Italy	67.8	(0.9)	22.8	(0.8)	8.1	(0.6)	1.2	(0.2)
Netherlands	21.6	(0.9)	38.7	(1.3)	32.2	(1.1)	7.4	(0.7)
New Zealand	29.2	(0.8)	38.5	(1.0)	26.3	(1.1)	6.0	(0.5)
Norway	23.3	(1.3)	37.5	(1.0)	32.0	(1.2)	7.2	(0.5)
Switzerland	28.8	(1.3)	37.3	(1.5)	26.5	(1.0)	7.3	(0.7)

1. Unreliable estimate - where the number of cases is less than 30.

Notes: The state of Nuevo Leon in Mexico did not field the numeracy skills domain.

Switzerland (Italian), the United States, and the state of Nuevo Leon in Mexico did not field the problem solving skills domain.

Source: Adult Literacy and Life Skills Survey, 2003, 2006 and 2008.

Table 2.4

Mean scores with .95 confidence interval and scores at the 5th, 25th, 75th and 95th percentiles on skills scales ranging from 0 to 500 points, population aged 16 to 65, IALS 1994 and 1998 and ALL 2003 and 2008

	5th percentile		25th percentile		Mean		75th percentile		95th percentile	
	scores	standard error	scores	standard error	scores	standard error	scores	standard error	scores	standard error
A. Prose literacy scale										
Canada										
IALS 1994	146.9	(15.3)	246.5	(5.9)	278.8	(3.1)	321.7	(3.9)	369.0	(6.3)
ALL 2003	178.1	(2.1)	250.6	(1.3)	280.8	(0.7)	318.0	(0.7)	358.7	(1.2)
United States										
IALS 1994	137.9	(5.5)	236.8	(2.4)	274.1	(1.6)	321.3	(2.2)	369.8	(3.2)
ALL 2003	175.9	(3.5)	235.5	(1.6)	268.6	(1.3)	306.1	(1.9)	346.9	(2.2)
Switzerland (German)										
IALS 1994	147.2	(5.4)	238.9	(1.7)	263.3	(1.4)	300.5	(2.0)	339.7	(3.4)
ALL 2003	193.8	(3.7)	244.3	(2.7)	274.5	(1.6)	306.9	(2.0)	349.1	(4.4)
Switzerland (French)										
IALS 1994	152.5	(7.5)	239.6	(3.3)	264.8	(1.7)	301.7	(1.6)	338.3	(1.6)
ALL 2003	194.2	(5.8)	237.9	(2.5)	267.1	(1.5)	297.9	(2.1)	336.5	(2.2)
Switzerland (Italian)										
IALS 1998	161.7	(5.7)	235.6	(2.5)	264.3	(2.1)	300.2	(2.4)	338.0	(3.8)
ALL 2003	192.0	(4.3)	232.8	(1.8)	259.5	(1.0)	286.8	(1.5)	322.0	(3.1)
Norway										
IALS 1998	209.4	(3.5)	264.6	(1.9)	288.5	(1.0)	317.8	(0.9)	352.4	(1.1)
ALL 2003	211.5	(3.4)	263.5	(1.4)	290.1	(1.0)	320.5	(0.8)	355.8	(1.0)
Netherlands										
IALS 1994	201.7	(3.5)	256.6	(1.3)	282.7	(0.8)	313.4	(1.4)	349.1	(1.5)
ALL 2008	202.4	(2.6)	254.4	(1.5)	278.7	(1.0)	308.1	(1.3)	341.8	(1.5)
Australia										
IALS 1996	143.8	(6.7)	245.4	(1.3)	274.2	(1.0)	316.1	(0.9)	359.8	(1.3)
ALL 2008	173.6	(4.4)	249.5	(1.3)	278.4	(1.0)	315.2	(1.2)	354.7	(1.6)
New Zealand										
IALS 1996	164.3	(4.8)	241.3	(1.8)	275.2	(1.3)	315.5	(1.1)	362.4	(2.2)
ALL 2008	190.6	(3.4)	247.9	(1.4)	277.0	(0.8)	310.8	(1.1)	348.2	(1.3)
Hungary										
IALS 1998	161.0	(3.0)	214.4	(1.7)	242.4	(1.1)	273.0	(2.0)	312.9	(2.8)
ALL 2008	191.3	(2.5)	239.5	(1.4)	269.5	(1.1)	301.4	(1.6)	344.7	(1.8)

Table 2.4 (concluded)

Mean scores with .95 confidence interval and scores at the 5th, 25th, 75th and 95th percentiles on skills scales ranging from 0 to 500 points, population aged 16 to 65, IALS 1994 and 1998 and ALL 2003 and 2008

	5th percentile		25th percentile		Mean		75th percentile		95th percentile	
	scores	standard error	scores	standard error	scores	standard error	scores	standard error	scores	standard error
B. Document literacy scale										
Canada										
IALS 1994	127.4	(20.4)	244.1	(5.5)	279.3	(2.9)	327.4	(3.2)	379.6	(5.2)
ALL 2003	178.3	(2.1)	248.1	(1.0)	280.6	(0.6)	318.8	(0.8)	361.5	(1.7)
United States										
IALS 1994	124.3	(3.9)	230.0	(2.5)	267.8	(1.6)	317.5	(2.1)	367.8	(3.0)
ALL 2003	174.3	(3.6)	235.5	(1.7)	269.8	(1.5)	308.7	(2.2)	352.5	(2.4)
Switzerland (German)										
IALS 1994	117.1	(4.4)	242.3	(2.2)	269.7	(1.9)	314.0	(1.7)	358.3	(5.7)
ALL 2003	199.7	(3.7)	245.4	(3.4)	278.6	(2.1)	312.4	(2.6)	358.9	(3.6)
Switzerland (French)										
IALS 1994	153.7	(7.8)	245.5	(2.5)	274.1	(1.7)	311.5	(2.7)	355.1	(3.6)
ALL 2003	198.7	(3.3)	243.0	(2.4)	272.6	(1.5)	303.5	(1.5)	345.7	(4.3)
Switzerland (Italian)										
IALS 1998	164.6	(8.9)	243.5	(2.8)	271.0	(2.2)	307.0	(2.3)	347.2	(3.8)
ALL 2003	192.6	(5.4)	238.5	(2.2)	265.7	(1.1)	294.5	(1.8)	332.8	(2.3)
Norway										
IALS 1998	203.3	(4.1)	268.4	(2.4)	296.9	(1.2)	332.1	(1.5)	371.9	(2.6)
ALL 2003	205.8	(3.1)	264.0	(1.6)	295.1	(0.9)	329.7	(1.0)	372.3	(1.9)
Netherlands										
IALS 1994	202.0	(2.6)	260.2	(1.5)	286.9	(0.8)	319.0	(1.5)	355.6	(2.2)
ALL 2008	202.1	(2.5)	256.9	(1.1)	284.1	(1.1)	316.1	(1.2)	352.3	(1.6)
Australia										
IALS 1996	143.4	(6.5)	245.1	(1.3)	273.3	(1.0)	314.5	(0.9)	358.1	(1.1)
ALL 2008	167.7	(4.5)	247.4	(2.0)	278.5	(1.1)	317.4	(1.2)	360.5	(1.3)
New Zealand										
IALS 1996	152.5	(6.0)	234.4	(1.8)	269.1	(1.3)	311.2	(1.6)	359.7	(2.2)
ALL 2008	183.8	(4.5)	247.4	(1.3)	278.8	(0.9)	315.4	(1.2)	357.4	(1.9)
Hungary										
IALS 1998	145.5	(5.0)	214.1	(1.8)	249.0	(1.2)	286.9	(1.7)	338.0	(3.8)
ALL 2008	183.1	(2.3)	236.1	(1.8)	267.9	(1.3)	302.0	(1.7)	348.4	(1.9)

Sources: International Adult Literacy Survey, 1994 and 1998.
Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 2.5

Differences between IALS 1994 and 1998 and ALL 2003 and 2008 in the percent of adults aged 16 to 65 at each skills level

	Level 1	Level 2	Level 3	Level 4/5	Levels 1 and 2	Levels 3 and 4/5
	per cent					
A. Prose literacy scale						
Canada	-2.0	+2.5	+2.2	-2.8	+0.5	-0.6
United States	-0.8	+8.1*	+1.8	-9.1*	+7.3*	-7.3*
Switzerland (German)	-4.3*	+0.4	-0.5	+4.4*	-3.9	+3.9
Switzerland (French)	-1.6	+6.1*	-3.7	-1.0	+4.5	-4.7
Switzerland (Italian)	+0.3*	+9.3*	-4.6	-5.1*	+9.6*	-9.7*
Norway	-0.6*	+1.4	-2.9	+2.1	+0.8	-0.8
Australia	-2.5*	+1.7	+2.2	-1.4	-0.8	+0.8
New Zealand	-4.4*	+2.7	+6.1*	-4.3*	-1.7	+1.8
Netherlands	+0.2	+3.5*	+0.0	-3.6*	+3.7*	-3.6
Hungary	-16.4*	-6.3*	+14.1*	+8.6*	-22.7*	+22.7*
B. Document literacy scale						
Canada	-2.4	+3.3	+4.2	-5.2*	+0.9	-1.0
United States	-3.4*	+7.5*	+1.0	-5.0*	+4.1	-4.0
Switzerland (German)	-4.3*	+5.7*	-1.0	-0.4	+1.4	-1.4
Switzerland (French)	-1.4	+8.1*	-1.7	-4.9*	+6.7*	-6.6*
Switzerland (Italian)	+0.6	+11.2*	-2.2	-9.6*	+11.8*	-11.8*
Norway	+0.2	+2.4	-0.8	-1.8	+2.6	-2.6
Australia	-1.5	+0.1	+0.0	+1.5	-1.4	+1.5
New Zealand	-6.3*	-0.3	+5.6*	+1.1	-6.6*	+6.7*
Netherlands	+0.1	+2.9*	-1.0	-2.1	+3.0	-3.1
Hungary	-12.6*	+0.2	+8.2*	+4.2*	-12.4*	+12.4*

* p<.05 statistically significant

Sources: International Adult Literacy Survey, 1994 and 1998.
Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 2.6.1

Mean scores with 0.95 confidence interval and scores at 5th, 25th, 75th, and 95th percentiles on the document scale, population aged 16 to 25, 26 to 45 and 46 to 65, 2003 and 2008

	5th percentile		25th percentile		Mean		75th percentile		95th percentile	
Age	scores	standard error	scores	standard error	scores	standard error	scores	standard error	scores	standard error
Australia										
16 to 25	205.1	(6.4)	258.2	(2.7)	287.1	(1.7)	319.7	(3.2)	363.9	(4.5)
26 to 45	189.0	(6.6)	256.1	(1.8)	285.9	(1.3)	322.4	(1.4)	363.2	(2.1)
46 to 65	137.2	(5.1)	230.9	(2.6)	265.0	(1.9)	308.8	(1.8)	354.4	(2.5)
Bermuda										
16 to 25	197.0	(10.6)	255.5	(8.5)	286.9	(4.6)	322.3	(6.7)	372.1	(10.3)
26 to 45	198.0	(4.5)	254.2	(1.9)	288.4	(1.8)	324.7	(2.5)	374.1	(3.4)
46 to 65	164.6	(4.8)	223.6	(4.2)	263.5	(2.7)	304.9	(5.1)	358.3	(5.9)
Canada										
16 to 25	208.8	(4.3)	262.6	(2.4)	290.7	(1.6)	323.3	(1.6)	361.8	(3.2)
26 to 45	184.6	(3.7)	255.2	(1.5)	287.0	(1.3)	325.3	(1.4)	366.8	(2.6)
46 to 65	160.5	(4.1)	231.9	(2.8)	266.9	(1.4)	307.6	(1.5)	351.7	(2.0)
Hungary										
16 to 25	187.0	(5.2)	241.5	(2.4)	273.9	(2.4)	308.0	(4.2)	354.1	(4.1)
26 to 45	194.4	(4.2)	243.7	(1.6)	275.0	(1.4)	308.3	(2.0)	354.2	(2.7)
46 to 65	173.7	(5.4)	225.4	(2.0)	257.5	(1.7)	291.8	(2.4)	336.7	(2.8)
Italy										
16 to 25	153.4	(5.5)	205.2	(3.5)	240.9	(2.6)	276.5	(3.2)	326.6	(5.8)
26 to 45	139.3	(4.5)	197.0	(2.4)	233.7	(2.1)	271.8	(3.6)	322.9	(4.0)
46 to 65	110.5	(4.3)	170.4	(3.8)	209.2	(2.3)	248.2	(2.9)	304.3	(3.7)
Netherlands										
16 to 25	224.6	(6.0)	272.3	(3.6)	296.4	(2.1)	324.6	(3.6)	355.9	(7.0)
26 to 45	211.3	(4.0)	267.0	(1.6)	292.9	(1.6)	324.5	(2.0)	360.4	(2.3)
46 to 65	187.7	(7.2)	243.9	(1.7)	269.3	(1.5)	300.4	(2.0)	335.9	(2.6)
Neuvo Leon, Mexico										
16 to 25	150.1	(9.9)	210.7	(2.1)	237.3	(1.8)	269.3	(2.4)	311.6	(4.7)
26 to 45	124.9	(7.2)	204.6	(2.0)	230.3	(1.5)	263.0	(1.8)	305.3	(3.1)
46 to 65	78.7	(5.6)	166.9	(5.1)	200.3	(2.7)	242.3	(2.5)	284.7	(4.2)
New Zealand										
16 to 25	194.8	(5.7)	245.4	(3.3)	275.5	(1.9)	308.5	(3.2)	350.6	(4.8)
26 to 45	188.0	(6.8)	252.2	(1.8)	284.1	(1.5)	321.1	(2.1)	362.9	(2.7)
46 to 65	171.4	(6.0)	242.7	(1.7)	274.1	(1.4)	311.9	(2.1)	353.0	(3.2)
Norway										
16 to 25	226.2	(7.6)	281.1	(5.0)	308.4	(2.3)	338.8	(3.1)	382.2	(6.7)
26 to 45	223.8	(4.4)	276.6	(2.0)	305.0	(1.7)	337.2	(2.5)	377.0	(3.5)
46 to 65	189.8	(6.4)	244.9	(2.0)	276.8	(1.4)	312.0	(2.3)	355.0	(3.1)
Switzerland										
16 to 25	214.3	(18.3)	259.7	(5.8)	291.0	(4.6)	321.3	(7.8)	365.3	(9.1)
26 to 45	204.1	(5.6)	250.6	(3.0)	282.1	(1.9)	314.3	(2.9)	357.6	(3.8)
46 to 65	188.2	(4.2)	232.4	(2.2)	263.4	(2.1)	294.4	(2.7)	341.8	(6.0)
United States										
16 to 25	189.4	(6.0)	244.5	(2.8)	275.3	(2.8)	310.5	(3.8)	356.8	(5.9)
26 to 45	178.5	(4.8)	236.9	(1.9)	272.7	(2.0)	311.8	(2.4)	355.3	(4.5)
46 to 65	164.0	(6.1)	228.0	(3.0)	262.8	(2.2)	302.6	(3.4)	345.7	(3.5)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 2.6.2

Per cent of populations aged 16 to 25, 26 to 45 and 46 to 65 at each level on the document scale, 2003 and 2008

	Level 1		Level 2		Level 3		Level 4/5	
Age	per cent	standard error	per cent	standard error	per cent	standard error	per cent	standard error
Australia								
16 to 25	9.5	(1.1)	29.1	(2.2)	40.5	(2.1)	20.9	(2.2)
26 to 45	12.0	(0.8)	26.0	(1.0)	39.6	(1.5)	22.4	(1.1)
46 to 65	22.9	(1.0)	29.7	(1.3)	32.3	(1.3)	15.1	(1.1)
Bermuda								
16 to 25	12.3	(3.3)	29.3	(4.9)	34.8	(4.3)	23.6	(3.3)
26 to 45	11.8	(1.4)	28.5	(2.0)	35.2	(2.1)	24.5	(1.3)
46 to 65	26.3	(1.8)	31.2	(2.1)	27.7	(2.6)	14.7	(2.1)
Canada								
16 to 25	9.5	(1.1)	25.4	(2.0)	42.1	(2.0)	23.0	(1.5)
26 to 45	13.0	(0.7)	25.1	(0.9)	37.4	(1.4)	24.5	(1.0)
46 to 65	22.2	(1.1)	30.4	(1.2)	33.3	(1.5)	14.1	(0.8)
Hungary								
16 to 25	16.2	(1.8)	33.7	(2.2)	35.4	(2.4)	14.7	(1.6)
26 to 45	15.1	(1.3)	35.1	(1.5)	35.2	(2.0)	14.6	(1.3)
46 to 65	25.4	(1.4)	37.5	(1.8)	29.3	(1.6)	7.8	(0.8)
Italy								
16 to 25	38.5	(2.4)	36.2	(2.5)	20.2	(1.8)	5.1	(1.0)
26 to 45	43.7	(1.7)	33.9	(2.2)	17.9	(1.9)	4.5	(0.7)
46 to 65	60.9	(1.6)	26.1	(1.6)	11.2	(1.1)	1.8	(0.5)
Netherlands								
16 to 25	4.9	(1.3)	22.1	(2.3)	48.5	(2.9)	24.5	(3.0)
26 to 45	7.6	(0.8)	22.7	(1.4)	45.2	(1.7)	24.6	(1.5)
46 to 65	15.3	(1.1)	36.1	(1.3)	39.6	(1.3)	8.9	(0.9)
New Zealand								
16 to 25	14.1	(1.1)	33.3	(2.2)	38.8	(2.4)	13.8	(1.6)
26 to 45	12.5	(1.0)	26.7	(1.2)	38.5	(1.8)	22.3	(1.5)
46 to 65	17.0	(1.1)	28.9	(1.3)	37.5	(1.5)	16.6	(1.4)
Norway								
16 to 25	5.0	(1.1)	17.0	(2.3)	42.3	(2.7)	35.7	(2.2)
26 to 45	5.4	(0.6)	19.1	(1.3)	41.2	(2.0)	34.3	(1.5)
46 to 65	15.0	(1.0)	31.8	(2.3)	36.7	(2.1)	16.5	(1.0)
Nuevo Leon, Mexico								
16 to 25	36.2	(1.7)	43.6	(2.1)	18.3	(1.9)	1.9	(0.5)
26 to 45	40.9	(1.6)	42.4	(1.6)	14.7	(1.1)	2.1	(0.3)
46 to 65	61.8	(2.1)	30.9	(2.2)	7.0	(1.0)	0.4	(0.3)
Switzerland								
16 to 25	8.5	(2.6)	27.6	(4.3)	42.0	(3.9)	22.0	(4.0)
26 to 45	11.6	(1.3)	31.9	(1.7)	38.8	(2.4)	17.7	(1.8)
46 to 65	20.9	(1.1)	41.0	(1.8)	29.3	(2.2)	8.9	(1.6)
United States								
16 to 25	15.7	(2.2)	35.0	(2.3)	33.6	(2.4)	15.6	(2.0)
26 to 45	19.5	(1.1)	30.4	(1.4)	33.3	(1.4)	16.8	(1.5)
46 to 65	23.7	(1.8)	33.0	(2.4)	31.0	(1.6)	12.3	(1.1)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 2.7

Relationship between age and literacy scores on the document literacy scale, controlling for education and language status, 2003 and 2008

	Unstandardized coefficients	
	β	Standard error
Bermuda		
(Constant)	-0.13***	(0.04)
Age (40 years = 0)		
Linear	-0.01***	(0.00)
Quadratic	-0.25	(0.18)
Cubic	3.87	(8.24)
Years of education (Grade 12 = 0)	0.15***	(0.01)
Test language (Same as mother tongue = 0)	-0.14 *	(0.08)
R square	0.31	
Canada		
(Constant)	0.06***	(0.02)
Age (40 years = 0)		
Linear	-0.01***	(0.00)
Quadratic	-0.08	(0.08)
Cubic	-14.28***	(4.49)
Years of education (Grade 12 = 0)	0.13***	(0.00)
Test language (Same as mother tongue = 0)	-0.49***	(0.03)
R square	0.23	
Hungary		
(Constant)	-0.09***	(0.03)
Age (40 years = 0)		
Linear	-0.01***	(0.00)
Quadratic	-0.08	(0.09)
Cubic	3.44	(6.94)
Years of education (Grade 12 = 0)	0.10***	(0.01)
Test language (Same as mother tongue = 0)	-0.12	(0.10)
R square	0.23	
Italy		
(Constant)	-0.69***	(0.04)
Age (40 years = 0)		
Linear	0.00	(0.00)
Quadratic	-0.03	(0.10)
Cubic	-16.78**	(8.17)
Years of education (Grade 12 = 0)	0.11***	(0.01)
Test language (Same as mother tongue = 0)	-0.14	(0.19)
R square	0.24	
Netherlands		
(Constant)	0.16***	(0.03)
Age (40 years = 0)		
Linear	-0.01***	(0.00)
Quadratic	-0.20***	(0.07)
Cubic	-11.18	(6.68)
Years of education (Grade 12 = 0)	0.09***	(0.00)
Test language (Same as mother tongue = 0)	-0.49***	(0.08)
R square	0.29	

Table 2.7 (concluded)

Relationship between age and literacy scores on the document literacy scale, controlling for education and language status, 2003 and 2008

	Unstandardized coefficients	
	β	Standard error
Neuvo Leon		
(Constant)	-0.57***	(0.03)
Age (40 years = 0)		
Linear	0.00	(0.00)
Quadratic	-0.35***	(0.09)
Cubic	-26.71***	(7.68)
Years of education (Grade 12 = 0)	0.13***	(0.00)
Test language (Same as mother tongue = 0)	-0.29	(1.16)
R square	0.34	
New Zealand		
(Constant)	0.07**	(0.03)
Age (40 years = 0)		
Linear	0.00	(0.00)
Quadratic	-0.29***	(0.09)
Cubic	-15.44**	(6.17)
Years of education (Grade 12 = 0)	0.14***	(0.01)
Test language (Same as mother tongue = 0)	-0.78***	(0.05)
R square	0.28	
Norway		
(Constant)	0.41***	(0.03)
Age (40 years = 0)		
Linear	-0.01***	(0.00)
Quadratic	-0.35***	(0.10)
Cubic	-4.45	(5.71)
Years of education (Grade 12 = 0)	0.11***	(0.01)
Test language (Same as mother tongue = 0)	-0.52***	(0.07)
R square	0.28	
Switzerland		
(Constant)	0.1***	(0.03)
Age (40 years = 0)		
Linear	-0.01***	(0.00)
Quadratic	-0.04	(0.15)
Cubic	0.16	(9.76)
Years of education (Grade 12 = 0)	0.09***	(0.01)
Test language (Same as mother tongue = 0)	-0.41***	(0.06)
R square	0.20	
United States		
(Constant)	-0.15***	(0.03)
Age (40 years = 0)		
Linear	-0.01**	(0.00)
Quadratic	-0.01	(0.10)
Cubic	-10.49	(6.73)
Years of education (Grade 12 = 0)	0.15***	(0.01)
Test language (Same as mother tongue = 0)	-0.68***	(0.08)
R square	0.37	

* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 2.8.1

Standard score differences in mean skills proficiencies between men and women on the prose, document, numeracy and problem solving scales, 2003 and 2008

	A. Population aged 16 to 65				
	Men		Women		
	mean	standard error	mean	standard error	standard deviation
Prose literacy scale					
Bermuda	285.7	(1.6)	293.6	(2.1)	52.7
Canada	277.7	(1.3)	283.8	(1.0)	52.7
Hungary	264.6	(1.3)	274.2	(1.4)	52.7
Italy	229.2	(2.2)	229.1	(1.7)	52.7
Netherlands	277.7	(1.4)	279.7	(1.2)	52.7
New Zealand	274.4	(1.2)	279.5	(1.1)	52.7
Norway	287.1	(1.2)	293.3	(1.5)	52.7
Nuevo Leon, Mexico	230.4	(1.1)	226.1	(1.0)	52.7
Switzerland	272.9	(1.1)	271.3	(2.0)	52.7
United States	266.1	(1.8)	271.0	(1.6)	52.7
Document literacy scale					
Bermuda	279.5	(1.7)	280.5	(2.3)	55.9
Canada	282.2	(1.3)	279.0	(0.9)	55.9
Hungary	265.9	(1.5)	269.8	(1.5)	55.9
Italy	230.1	(2.2)	221.5	(1.8)	55.9
Netherlands	288.0	(1.5)	280.2	(1.1)	55.9
New Zealand	280.0	(1.3)	277.6	(1.1)	55.9
Norway	298.4	(1.5)	291.7	(1.3)	55.9
Nuevo Leon, Mexico	231.0	(1.7)	221.5	(1.4)	55.9
Switzerland	282.5	(1.8)	270.8	(2.1)	55.9
United States	271.8	(2.1)	267.9	(1.6)	55.9
Numeracy scale					
Bermuda	275.7	(1.5)	264.1	(2.5)	54.8
Canada	279.6	(1.5)	265.0	(0.8)	54.8
Hungary	272.3	(1.6)	274.0	(1.2)	54.8
Italy	239.0	(1.6)	227.6	(1.8)	54.8
Netherlands	297.7	(1.6)	279.5	(1.4)	54.8
New Zealand	276.8	(1.6)	265.3	(1.2)	54.8
Norway	292.4	(1.5)	277.1	(1.3)	54.8
Switzerland	297.8	(1.1)	281.8	(1.5)	54.8
United States	268.6	(2.0)	253.5	(1.9)	54.8
Problem solving scale					
Bermuda	269.4	(2.0)	276.1	(2.2)	54.8
Canada	273.4	(1.4)	274.1	(1.3)	54.8
Hungary	259.4	(1.4)	263.5	(1.5)	54.8
Italy	226.5	(2.1)	223.4	(2.2)	54.8
Netherlands	287.0	(1.6)	282.2	(1.3)	54.8
New Zealand	273.8	(1.3)	275.6	(1.4)	54.8
Norway	283.2	(2.6)	285.2	(1.6)	54.8
Switzerland	279.7	(1.3)	278.2	(2.3)	54.8

Notes: The state of Nuevo Leon in Mexico did not field the numeracy skills domain.
Switzerland (Italian), the United States, and the state of Nuevo Leon in Mexico did not field the problem solving skills domain.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 2.8.2

Standard score differences in mean skills proficiencies between men and women on the prose, document, numeracy and problem solving scales, 2003 and 2008

	B. Population aged 16 to 25				
	Men		Women		
	mean	standard error	mean	standard error	standard deviation
Prose literacy scale					
Bermuda	284.0	(6.0)	304.7	(6.1)	52.7
Canada	281.9	(2.0)	294.4	(2.8)	52.7
Hungary	270.7	(3.0)	281.1	(2.8)	52.7
Italy	238.1	(3.2)	249.0	(3.0)	52.7
Netherlands	285.8	(3.0)	286.8	(1.9)	52.7
New Zealand	266.6	(2.8)	275.5	(2.2)	52.7
Norway	296.4	(2.8)	306.6	(3.8)	52.7
Nuevo Leon, Mexico	236.8	(1.8)	237.0	(2.1)	52.7
Switzerland	281.3	(3.3)	284.3	(5.0)	52.7
United States	266.3	(3.3)	275.5	(3.1)	52.7
Document literacy scale					
Bermuda	281.4	(5.6)	292.1	(7.0)	55.9
Canada	289.2	(2.1)	292.3	(2.7)	55.9
Hungary	271.9	(3.0)	276.3	(3.1)	55.9
Italy	238.6	(3.0)	243.2	(3.2)	55.9
Netherlands	301.2	(3.3)	291.2	(2.3)	55.9
New Zealand	272.5	(2.9)	278.5	(2.3)	55.9
Norway	309.7	(2.9)	307.1	(3.4)	55.9
Nuevo Leon, Mexico	240.7	(2.5)	234.1	(2.6)	55.9
Switzerland	291.4	(5.4)	290.0	(7.1)	55.9
United States	275.2	(3.3)	276.6	(3.3)	55.9
Numeracy scale					
Bermuda	273.7	(5.3)	266.7	(8.1)	54.8
Canada	282.6	(2.6)	276.5	(2.6)	54.8
Hungary	276.1	(3.2)	276.7	(2.6)	54.8
Italy	240.8	(2.9)	241.4	(3.4)	54.8
Netherlands	303.2	(3.4)	288.9	(3.4)	54.8
New Zealand	267.3	(3.4)	262.7	(2.3)	54.8
Norway	296.2	(3.5)	283.8	(3.1)	54.8
Switzerland	306.7	(4.7)	294.7	(5.4)	54.8
United States	270.2	(3.9)	257.8	(4.3)	54.8
Problem solving scale					
Bermuda	263.6	(6.8)	282.5	(5.6)	54.8
Canada	282.0	(2.1)	287.4	(2.6)	54.8
Hungary	263.4	(2.7)	271.4	(2.7)	54.8
Italy	237.1	(4.1)	244.6	(3.0)	54.8
Netherlands	300.7	(3.6)	290.7	(2.6)	54.8
New Zealand	266.6	(3.6)	273.4	(3.2)	54.8
Norway	299.8	(3.2)	301.4	(2.7)	54.8
Switzerland	297.2	(5.7)	294.2	(5.4)	54.8

Notes: The state of Nuevo Leon in Mexico did not field the numeracy skills domain.
Switzerland (Italian), the United States, and the state of Nuevo Leon in Mexico did not field the problem solving skills domain.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 2.9.1

Per cent of population aged 16 to 65 at each skill level, by recent versus established immigrant status, 2003 and 2008

	A. Prose literacy scale							
	Level 1		Level 2		Level 3		Level 4/5	
	per cent	standard error	per cent	standard error	per cent	standard error	per cent	standard error
Australia								
Recent immigrants	18.5	(2.5)	31.1	(2.9)	38.5	(3.6)	11.9	(2.6)
Established immigrants	24.1	(1.5)	27.7	(1.9)	34.9	(2.0)	13.2	(1.2)
Native-born	11.2	(0.8)	29.2	(0.7)	40.1	(1.3)	19.5	(0.9)
Bermuda								
Recent immigrants	8.9	(2.2)	15.2	(3.4)	32.3	(4.7)	43.6	(4.3)
Established immigrants	12.2	(2.2)	19.9	(2.8)	32.5	(2.5)	35.3	(2.5)
Native-born	13.2	(1.1)	28.7	(1.6)	37.0	(1.6)	21.1	(1.3)
Canada								
Recent immigrants	32.1	(4.0)	26.3	(4.1)	34.1	(5.6)	7.6	(1.6)
Established immigrants	32.5	(1.5)	28.3	(1.6)	28.1	(1.7)	11.2	(0.9)
Native-born	9.9	(0.4)	27.0	(0.8)	41.2	(1.0)	21.8	(1.0)
Netherlands								
Recent immigrants	59.2	(10.5)	26.3	(9.2)	13.9	(5.9)	0.6	(1.5)
Established immigrants	40.0	(5.5)	32.4	(4.6)	24.5	(4.1)	3.2	(1.1)
Native-born	8.2	(0.5)	33.0	(1.2)	46.2	(1.1)	12.5	(0.8)
New Zealand								
Recent immigrants	21.0	(3.2)	36.5	(3.2)	33.7	(2.7)	8.8	(2.7)
Established immigrants	21.0	(1.4)	26.9	(1.5)	38.4	(2.5)	13.8	(1.7)
Native-born	11.2	(0.6)	31.5	(0.9)	41.9	(1.4)	15.4	(1.0)
Norway								
Recent immigrants	25.3	(11.4)	31.1	(11.9)	27.3	(11.2)	16.3	(7.3)
Established immigrants	19.8	(3.1)	28.6	(3.6)	33.9	(3.9)	17.7	(3.8)
Native-born	7.0	(0.7)	26.1	(1.2)	46.2	(1.4)	20.7	(0.7)
Switzerland								
Recent immigrants	24.4	(11.0)	29.9	(13.1)	27.6	(6.1)	18.1	(6.8)
Established immigrants	31.1	(3.2)	34.1	(2.9)	28.0	(3.7)	6.8	(1.9)
Native-born	10.1	(1.2)	35.5	(1.7)	40.2	(2.1)	14.3	(0.9)
United States								
Recent immigrants	47.0	(5.1)	24.4	(6.3)	23.6	(7.6)	4.9	(3.4)
Established immigrants	44.0	(3.3)	32.9	(3.3)	18.2	(2.8)	4.9	(1.2)
Native-born	15.0	(0.9)	32.4	(1.1)	38.1	(1.3)	14.5	(1.1)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 2.9.2

Per cent of population aged 16 to 65 at each skill level, by recent versus established immigrant status, 2003 and 2008

	B. Document literacy scale							
	Level 1		Level 2		Level 3		Level 4/5	
	per cent	standard error	per cent	standard error	per cent	standard error	per cent	standard error
Australia								
Recent immigrants	16.8	(2.6)	24.7	(5.0)	41.7	(5.4)	16.9	(3.5)
Established immigrants	25.1	(1.7)	27.1	(1.8)	32.4	(2.3)	15.4	(1.3)
Native-born	12.3	(0.6)	28.5	(0.9)	38.4	(1.0)	20.8	(1.0)
Bermuda								
Recent immigrants	10.4	(3.1)	16.5	(3.4)	34.4	(3.4)	38.6	(3.5)
Established immigrants	15.1	(2.2)	25.8	(2.8)	31.8	(3.5)	27.3	(3.0)
Native-born	18.1	(1.0)	32.5	(2.1)	32.6	(2.2)	16.7	(1.1)
Canada								
Recent immigrants	29.9	(4.1)	26.2	(3.9)	31.0	(4.7)	12.9	(2.9)
Established immigrants	31.2	(1.2)	27.7	(1.6)	28.3	(1.6)	12.9	(1.1)
Native-born	11.5	(0.4)	26.8	(0.8)	39.2	(1.1)	22.5	(0.7)
Netherlands								
Recent immigrants	55.5	(11.1)	22.3	(8.9)	19.6	(8.0)	2.6	(2.7)
Established immigrants	36.9	(5.2)	30.4	(3.7)	24.6	(4.5)	8.1	(3.2)
Native-born	8.3	(0.6)	28.4	(1.0)	44.9	(0.9)	18.3	(0.9)
New Zealand								
Recent immigrants	18.5	(3.0)	32.6	(3.5)	35.9	(3.0)	12.9	(2.9)
Established immigrants	20.7	(1.8)	25.9	(1.9)	36.6	(2.4)	16.8	(2.1)
Native-born	12.9	(0.7)	29.7	(0.9)	38.7	(1.0)	18.8	(0.8)
Norway								
Recent immigrants	26.2	(11.6)	33.5	(14.2)	19.5	(9.2)	20.8	(7.8)
Established immigrants	18.6	(4.0)	27.8	(5.0)	30.1	(4.4)	23.5	(3.9)
Native-born	8.2	(0.5)	23.2	(1.1)	40.4	(1.1)	28.2	(1.0)
Switzerland								
Recent immigrants	16.9	(7.8)	28.7	(11.5)	34.9	(10.4)	19.5	(6.1)
Established immigrants	25.7	(2.7)	34.0	(2.9)	29.9	(4.0)	10.4	(3.5)
Native-born	9.6	(0.9)	33.3	(1.8)	39.6	(2.0)	17.5	(1.9)
United States								
Recent immigrants	40.4	(5.9)	24.9	(7.8)	23.3	(6.6)	11.4	(3.5)
Established immigrants	41.0	(4.0)	31.1	(3.9)	20.7	(2.9)	7.2	(1.9)
Native-born	16.0	(1.0)	32.1	(1.5)	35.4	(1.3)	16.6	(1.0)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 2.9.3

Per cent of population aged 16 to 65 at each skill level, by recent versus established immigrant status, 2003 and 2008

	C. Numeracy scale							
	Level 1		Level 2		Level 3		Level 4/5	
	per cent	standard error	per cent	standard error	per cent	standard error	per cent	standard error
Australia								
Recent immigrants	21.9	(3.2)	26.0	(4.4)	38.0	(4.4)	14.2	(3.3)
Established immigrants	29.8	(1.6)	27.9	(1.6)	28.1	(2.5)	14.2	(1.8)
Native-born	16.3	(0.9)	31.0	(1.2)	34.0	(1.1)	18.8	(0.7)
Bermuda								
Recent immigrants	12.4	(3.6)	19.3	(3.1)	31.5	(3.8)	36.9	(3.2)
Established immigrants	18.1	(2.2)	28.8	(3.3)	31.8	(2.5)	21.4	(1.6)
Native-born	23.8	(1.5)	35.7	(1.8)	29.2	(1.6)	11.3	(1.0)
Canada								
Recent immigrants	32.4	(4.7)	24.4	(3.6)	29.6	(4.6)	13.5	(4.6)
Established immigrants	34.2	(1.7)	29.9	(1.8)	24.6	(1.7)	11.4	(1.2)
Native-born	15.6	(0.5)	30.6	(0.8)	35.6	(1.1)	18.3	(0.8)
Netherlands								
Recent immigrants	57.7	(13.4)	23.9	(12.1)	14.9	(7.5)	3.5	(2.7)
Established immigrants	37.1	(4.6)	34.4	(4.6)	19.0	(3.5)	9.5	(3.9)
Native-born	8.2	(0.7)	26.4	(0.9)	40.7	(0.9)	24.6	(1.1)
New Zealand								
Recent immigrants	24.5	(3.3)	30.9	(4.5)	30.4	(3.7)	14.1	(2.8)
Established immigrants	25.7	(1.9)	26.1	(2.2)	32.2	(1.7)	16.0	(1.3)
Native-born	18.5	(0.9)	31.9	(1.7)	33.0	(1.2)	16.6	(0.7)
Norway								
Recent immigrants	29.7	(12.8)	27.1	(19.0)	37.4	(15.3)	5.8	(4.9)
Established immigrants	21.6	(4.4)	31.2	(5.2)	31.2	(5.6)	16.0	(2.6)
Native-born	9.8	(0.5)	29.5	(1.1)	42.1	(1.6)	18.6	(1.1)
Switzerland								
Recent immigrants	11.0	(6.8)	26.3	(13.1)	37.1	(18.0)	25.7	(9.9)
Established immigrants	20.5	(2.1)	36.3	(3.8)	30.2	(3.2)	12.9	(3.1)
Native-born	5.6	(0.9)	26.3	(1.7)	41.1	(1.4)	27.1	(1.5)
United States								
Recent immigrants	41.5	(4.9)	20.5	(6.7)	23.5	(5.7)	14.5	(5.2)
Established immigrants	47.2	(3.2)	25.4	(3.1)	17.8	(3.2)	9.6	(2.3)
Native-born	22.7	(0.8)	32.8	(1.1)	31.1	(1.2)	13.4	(1.3)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 2.9.4

Per cent of populations aged 16 to 65 at each skill level, by recent versus established immigrant status, 2003 and 2008

	D. Problem solving[1] scale							
	Level 1		Level 2		Level 3		Level 4/5	
	per cent	standard error	per cent	standard error	per cent	standard error	per cent	standard error
Australia								
Recent immigrants	39.3	(4.4)	38.3	(4.7)	19.6	(2.8)	2.8	(0.9)
Established immigrants	44.6	(1.9)	32.0	(1.6)	20.1	(1.7)	3.3	(0.8)
Native-born	27.7	(0.9)	36.7	(0.8)	28.6	(1.1)	6.9	(0.5)
Bermuda								
Recent immigrants	19.9	(3.3)	28.9	(5.2)	36.9	(5.0)	14.2	(2.9)
Established immigrants	27.2	(2.0)	34.1	(2.3)	29.0	(2.8)	9.6	(2.1)
Native-born	36.7	(2.0)	38.7	(2.4)	20.2	(1.6)	4.3	(0.7)
Canada								
Recent immigrants	45.6	(5.8)	37.4	(5.4)	15.5	(2.6)	1.6	(0.9)
Established immigrants	51.1	(1.9)	30.7	(1.9)	16.1	(1.2)	2.1	(0.6)
Native-born	24.2	(0.9)	40.6	(0.7)	29.0	(1.1)	6.2	(0.7)
Netherlands								
Recent immigrants	72.0	(9.4)	19.8	(7.3)	8.2	(6.1)	0.0	(0.0)
Established immigrants	55.5	(5.3)	29.4	(5.8)	13.5	(3.0)	1.6	(1.9)
Native-born	19.6	(0.8)	39.9	(1.1)	33.0	(1.0)	7.5	(0.8)
New Zealand								
Recent immigrants	39.0	(4.4)	39.5	(3.8)	18.6	(4.0)	2.8	(0.9)
Established immigrants	35.1	(2.0)	35.2	(2.1)	24.7	(2.3)	5.0	(1.3)
Native-born	27.4	(1.0)	39.2	(1.2)	27.1	(1.2)	6.3	(0.5)
Norway								
Recent immigrants	48.9	(15.4)	32.5	(15.4)	15.6	(9.5)	3.0	(3.0)
Established immigrants	37.4	(4.9)	32.4	(3.2)	23.3	(3.9)	7.0	(2.2)
Native-born	22.3	(1.3)	37.8	(1.0)	32.6	(1.2)	7.2	(0.5)
Switzerland								
Recent immigrants	30.8	(11.7)	25.0	(11.0)	31.4	(10.0)	12.8	(11.8)
Established immigrants	37.4	(2.2)	31.6	(4.2)	23.9	(3.2)	7.1	(2.9)
Native-born	23.3	(1.7)	39.4	(1.6)	29.3	(1.4)	8.1	(0.9)

1. Switzerland (Italian) and United States did not field the problem solving skills domain.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 2.10

Per cent of adults aged 16 to 65 at each literacy level on the prose scale, by whether their native tongue is the same or different from the official language(s) of host country, 2003 and 2008

	Level 1		Level 2		Level 3		Level 4/5	
	per cent	standard error	per cent	standard error	per cent	standard error	per cent	standard error
Australia								
Immigrants whose native tongue is different from test language	34.6	(2.0)	30.6	(2.2)	26.3	(2.2)	8.5	(1.4)
Immigrants whose native tongue is same as test language	9.1	(1.1)	25.4	(2.1)	46.9	(2.5)	18.6	(2.1)
Native-born	11.2	(0.8)	29.2	(0.7)	40.1	(1.3)	19.5	(0.9)
Bermuda								
Immigrants whose native tongue is different from test language	25.7	(3.9)	27.6	(3.0)	29.6	(4.2)	17.2	(2.5)
Immigrants whose native tongue is same as test language	5.8	(1.4)	15.0	(2.3)	33.5	(2.6)	45.7	(2.8)
Native-born	13.2	(1.1)	28.7	(1.6)	37.0	(1.6)	21.1	(1.3)
Canada								
Immigrants whose native tongue is different from test language	37.4	(1.7)	27.5	(1.7)	27.2	(1.8)	7.9	(0.9)
Immigrants whose native tongue is same as test language	18.0	(2.8)	29.2	(3.0)	34.5	(2.6)	18.4	(2.1)
Native-born	9.9	(0.4)	27.0	(0.8)	41.2	(1.0)	21.8	(1.0)
Hungary								
Immigrants whose native tongue is different from test language	11.5	(7.3)	33.4	(14.7)	32.0	(15.4)	23.1	(9.9)
Immigrants whose native tongue is same as test language	11.2	(5.0)	31.5	(10.0)	39.9	(8.1)	17.5	(4.8)
Native-born	17.0	(0.7)	37.9	(1.0)	34.0	(0.8)	11.0	(0.7)
Netherlands								
Immigrants whose native tongue is different from test language	47.9	(4.6)	29.4	(4.1)	19.7	(3.8)	2.9	(1.3)
Immigrants whose native tongue is same as test language	10.1	(13.1)	44.0	(17.6)	43.0	(16.6)	2.9	(3.2)
Native-born	8.2	(0.5)	33.0	(1.2)	46.2	(1.1)	12.5	(0.8)
New Zealand								
Immigrants whose native tongue is different from test language	33.6	(2.3)	37.4	(2.3)	25.2	(2.3)	3.8	(1.2)
Immigrants whose native tongue is same as test language	5.6	(1.7)	21.7	(2.3)	50.7	(3.5)	22.0	(2.8)
Native-born	11.2	(0.6)	31.5	(0.9)	41.9	(1.4)	15.4	(1.0)
Norway[1]								
Immigrants whose native tongue is different from test language	23.8	(3.7)	34.0	(4.1)	28.3	(4.8)	13.9	(4.2)
Immigrants whose native tongue is same as test language	6.5	(4.1)	10.8	(4.6)	51.5	(8.3)	31.2	(6.8)
Native-born	7.0	(0.7)	26.1	(1.2)	46.2	(1.4)	20.7	(0.7)

Table 2.10 (concluded)

Per cent of adults aged 16 to 65 at each literacy level on the prose scale, by whether their native tongue is the same or different from the official language(s) of host country, 2003 and 2008

	Level 1		Level 2		Level 3		Level 4/5	
	per cent	standard error	per cent	standard error	per cent	standard error	per cent	standard error
Switzerland								
Immigrants whose native tongue is different from test language	35.0	(4.0)	37.7	(3.8)	23.7	(3.4)	3.7	(1.2)
Immigrants whose native tongue is same as test language	16.6	(4.2)	29.5	(7.0)	38.3	(6.4)	15.7	(5.0)
Native-born	10.0	(1.2)	35.5	(1.7)	40.2	(2.1)	14.3	(0.9)
United States								
Immigrants whose native tongue is different from test language	48.8	(3.8)	30.8	(3.7)	16.6	(2.3)	3.8	(1.6)
Immigrants whose native tongue is same as test language	14.8	(6.0)	37.0	(8.5)	36.6	(9.4)	11.6	(4.6)
Native-born	14.8	(0.9)	32.4	(1.1)	38.3	(1.3)	14.5	(1.2)

1. For the purposes of this analysis, the Danish and Swedish languages are considered similar to the Norwegian language.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Chapter 3

Skills and Valued Economic and Social Outcomes

Summary

This chapter examines the relationships between adult skills and valued economic and social outcomes. Researchers have often explored the link between educational attainment and labour market outcomes, but fewer studies have looked at the role skills play in determining labour market experiences. The evidence presented in this chapter goes along with a growing number of studies which have found that literacy and numeracy skills can have a positive influence on earnings and access to full-time employment, even when taking into account the effects of education and experience. Skills may also be important in predicting a variety of social outcomes. Results on participation in community groups and voluntary activities are presented with particular attention given to the relative effects of skill on these important social outcomes.

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Skills and Valued Economic and Social Outcomes

3.1 Overview and highlights

This chapter examines the relationships between adult skills and valued economic and social outcomes. It consists of three sections. The first describes the importance of considering labour market outcomes and their relationships with educational attainment and skill proficiencies. This section also examines the distributions of skills and education levels across all countries and domains. The second section examines the earnings premiums associated with having high levels of skill and education, and compares these premiums across countries. This section also explores the relationships between skills and earnings levels, complementing recent research studies that have uncovered a high education, low earnings phenomenon. In addition, the relationship between skills and the likelihood of being employed full-time is examined. Finally, results on participation in community groups and voluntary activities are presented with particular attention given to the relative effects of skill on these important social outcomes.

The main findings presented in this chapter are:

- On average, individuals with medium to high prose or document literacy proficiencies (levels 3 and 4/5) in Bermuda, Canada, Hungary, the Netherlands, New Zealand, Norway and the United States, earn significantly more than individuals with lower skills.
- With respect to numeracy, highly skilled respondents in Bermuda, Canada, Hungary, Italy, the Netherlands, New Zealand, Norway and the United States also earn significantly more on average than those with low numeracy skills.
- Educational attainment also has a significant and positive effect on earnings in all countries. The earnings premium experienced by highly educated workers is largest for those who access at least some post-secondary education.
- For most of the countries, skills significantly decrease one's chances of earning less than half the median earnings, even when controlling for experience, gender, community size, immigrant status, parents' education and level of education.

- For most of the countries, individuals with high levels of skill have a better chance of securing stable, full-time employment. Adults in Canada, Hungary, New Zealand, Norway and the United States with higher prose skills are on average 1.2 to 1.5 times more likely to have secured full-time employment over the year prior to the survey, when compared to their counterparts with low skill levels.
- In all countries, higher skilled individuals are significantly more likely than those with low skills to engage in community groups or organisations, even when controlling for level of education, age, community size, gender, children present in the home, income, and parents' education.
- Overall, skills have strong and consistent effects across all skill domains and in all countries on the likelihood of individuals engaging in unpaid voluntary activities.

3.2 Skills and valued economic and social outcomes

This chapter examines the relationships between adult skills and valued economic and social outcomes. It consists of three sections. The first describes the importance of considering labour market outcomes and their relationships with educational attainment and skill proficiencies. This section also examines the distributions of skills and education levels across all countries and domains. The second section examines the earnings premiums associated with having high levels of skill and education, and compares these premiums across countries. This section also explores the relationships between skills and earnings levels, complementing recent research studies that have uncovered a high education, low earnings phenomenon. In addition, the relationship between skills and the likelihood of being employed full-time is examined. Finally, results on participation in community groups and voluntary activities are presented with particular attention given to the relative effects of skill on these important social outcomes.

3.3 Using skills to predict economic and social outcomes

As 'knowledge-based' economies emerge worldwide, workers are increasingly expected to acquire high levels of education and skill to enjoy labour market success. Those lacking the knowledge and competencies to satisfy the increasingly technical demands of the new economy may find themselves in part-time, less lucrative employment or trapped in longer bouts of unemployment. Researchers have often explored the link between educational attainment and labour market outcomes, but fewer studies have looked at the role skills play in determining labour market experiences, largely because of the scarcity of surveys collecting data on direct measures of skill.

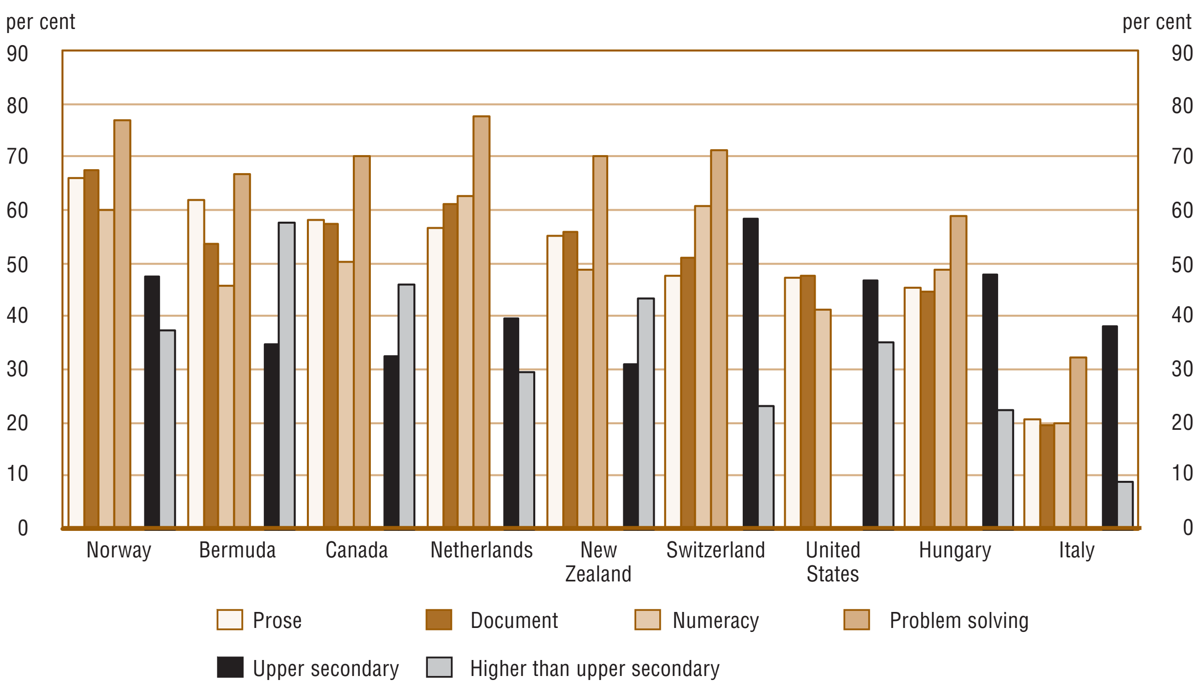
Formal education plays an important role in the development of skills and, in most countries, has been shown to be the strongest predictor of literacy proficiency among a large number of antecedent variables (Desjardins, 2004; OECD and Statistics Canada, 2000; OECD and Statistics Canada, 2005; Raudenbush and Kasim, 1998). Yet it should be recognised that although education and skills are interdependent, this relationship is not perfect. Attaining a high level of education does not necessarily guarantee having a high level of skill, nor does it ensure a given skill proficiency for the duration of one's life career. Unlike educational attainment, which can only improve as one gets older, an individual's skill set can deteriorate over the life course.

Before examining how skills are related to valued outcome variables, it is important to take a first look at how skills and education are distributed within each country. Figure 3.1 shows the percentage of the populations aged 16 to 65 years with moderate to high skill levels and the percentage of populations with moderate to high education for each country in the ALL survey (2003 and 2008). The education variable is based on respondents' highest level of formal education and is derived from the ISCED 1997 categories. Respondents are classified into three categories – having less than upper secondary education, having completed upper secondary education, and having at least some post-secondary education – while the skill variable is dichotomised into those with moderate to high skill (Levels 3 and 4/5) and those with low skill (Levels 1 and 2).[1] Attaining higher levels of formal education as well as achieving higher levels of skill have been formally and informally deemed as benchmarks for securing a good job and having the abilities to successfully carry out the tasks required of 'knowledge workers' (Statistics Canada and OECD, 2005).

Figure 3.1

Distribution of the highly skilled and highly educated

Percentage distribution of the population aged 16 to 65 years by high prose, document, numeracy and problem solving skills, and high level of education, ALL 2003 and 2008



Countries are ranked by the per cent of their population with medium to high prose skills.

Notes: For prose, document and numeracy skills, medium to high skill refers to levels 3 and 4/5.
For problem solving skills, medium to high skill refers to levels 2, 3 and 4.
United States did not field the problem solving skills domain.
The problem solving skills scores for Switzerland apply to the German and French speaking communities only since they did not field the problem solving skills domain in the Italian speaking community.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Overall, in terms of the proportions of moderate to highly skilled respondents in the adult population aged 16 to 65 years, the Netherlands and Norway consistently rank higher than most other countries across all skill domains. Canada consistently ranks third on prose and document literacy but drops to fourth place on numeracy and problem solving. Bermuda ranks well on the prose literacy scale but drops relative to the other countries on the other three domains. New Zealand consistently scores in a middle position on all skill domains. Switzerland has relatively elevated proportions of moderate to highly skilled respondents on the numeracy and problem solving scales but does less well in terms of prose and document literacy. Italy, Hungary and the United States typically show lower proportions of highly skilled individuals on all domains. Hungary is an exception in that its highly skilled respondents perform about average on the numeracy scale.

Figure 3.1 also shows how the distribution of formal education varies from country to country. Some have higher proportions of secondary graduates than others. The percentage of respondents aged 16 to 65 years with at least some post-secondary education in the ALL ranges from only nine per cent in Italy to just over 57 per cent in Bermuda. In addition to Bermuda, Canada (46%), New Zealand (44%), Norway (38%) and the United States (35%) also have relatively high proportions of highly educated respondents. A middle group consisting of Hungary, the Netherlands and Switzerland shows moderate levels of highly educated individuals, ranging from 23 to 30 per cent.

3.4 The earnings and employment advantage

Educational attainment and experience in the labour force are typically used in social science research as indirect measures of human capital in explaining earnings differences between population groups. However, a growing number of studies have found that literacy and numeracy skills also have a strong, positive influence on earnings, over and above the effects of education and experience (Finnie and Meng, 2006; Green and Riddell, 2001; Murnane *et al.*, 1995; OECD and Statistics Canada, 2005; Osberg, 2000). In fact, skills may more closely approximate productivity differences by providing a more direct measure of one's knowledge and competencies (Stern and Tuijnman, 1994). Some economists and sociologists have noted that the effect of education on earnings is less tangible and direct than often assumed — claiming that educational credentials send signals to prospective employers about the potential productivity or competence of a job applicant (e.g., Arrow, 1973; Spence, 1974) or messages about socio-economic status and cultural capital (e.g., Bourdieu and Passeron, 1977; Collins, 1979) rather than provide a direct indication of cognitive abilities per se.

This section examines how much of an earnings advantage higher skilled (Levels 3 and 4/5) individuals experience over those with low skills (Levels 1 and 2), and whether the relative earnings advantage of high skilled individuals changes across countries and/or varies across skill domains. Consistent with previous research studies using IALS data and first round ALL countries (Green and Riddell, 2001; OECD and Statistics Canada, 2005; Osberg, 2000), the evidence indicates that literacy skills also explain a part of the differences in earnings, even when controlling for level of education and years of experience.

In terms of the prose and document literacy domains, Figures 3.2.1 and Figure 3.2.2 show that individuals with at least Level 3 skills in Bermuda, Canada, Hungary, the Netherlands, New Zealand, Norway and the United States, on average, earn significantly more than individuals with low skills. This relationship holds even when controlling for experience, gender, community size, employment status, immigrant status, parents' education, and level of education – other well-established factors that have been shown in previous studies to influence earnings. Only two countries, Italy and Switzerland, do not show statistically significant effects on earnings of having high levels of literacy skills.[2]

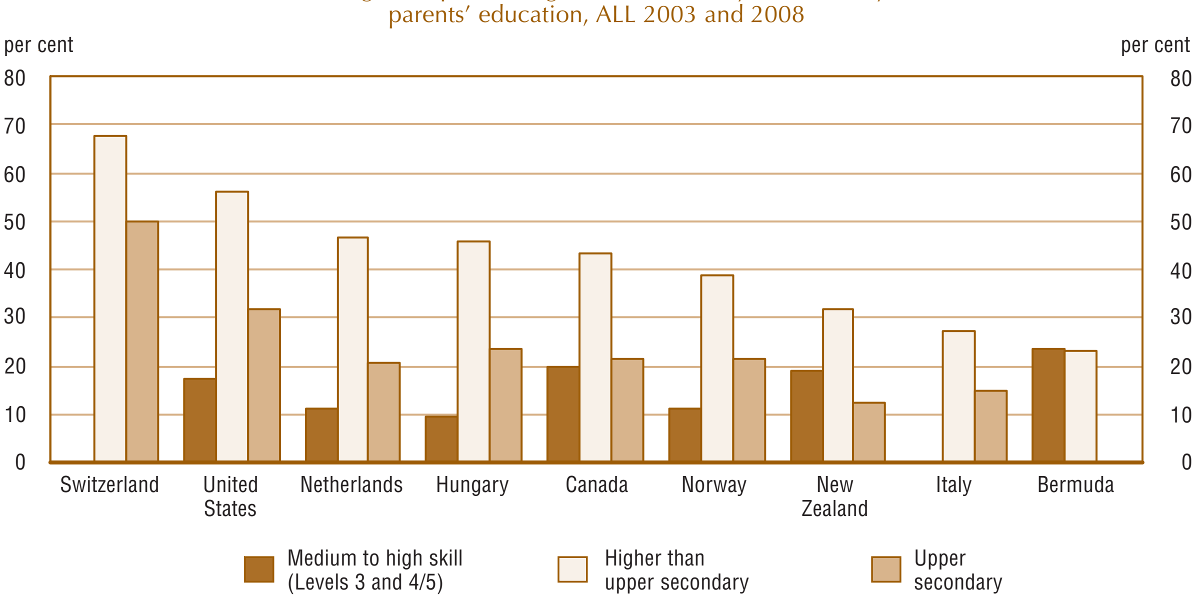
With respect to numeracy, highly skilled respondents in Bermuda, Canada, Hungary, the Netherlands, New Zealand, Norway and the United States earn significantly more on average than those with low numeracy skills (see Figure 3.2.3). In Italy, unlike the prose and document literacy domains, there is evidence of an earnings premium for having high numeracy skills.

Figure 3.2.4 presents the results of a regression analysis of an earnings model that specifies a measure of problem solving skill. Much like the results for the other domains, significant and positive effects on annual earnings for respondents with high levels of skill are found in most countries.

Figure 3.2.1

Earnings premiums for holding medium to high levels of education and skill

Regressions of the log of annual earnings on education and prose skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008



Notes: The values presented are calculated using the estimated regression equations from each country. Fitted values for earnings were calculated for skill and education levels, substituting sample means and proportions for all other variables in the model.

The earnings premiums for the education levels represent the percentage difference from individuals with less than upper secondary education.

The earnings premiums for medium to high skill represent the percentage difference from individuals with low skill (Levels 1 and 2).

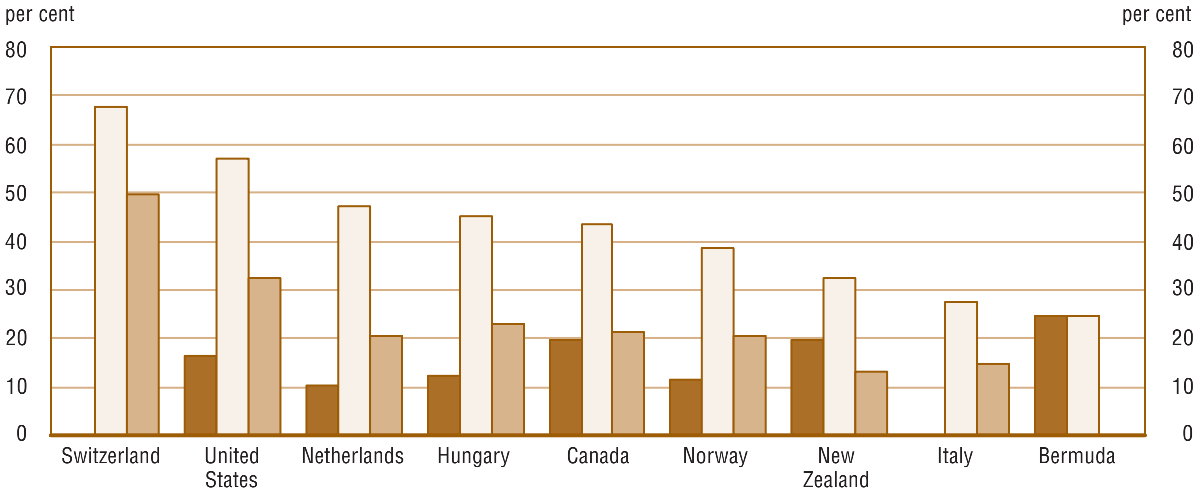
Skill and education effects that were not statistically significant at conventional levels were set to zero.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

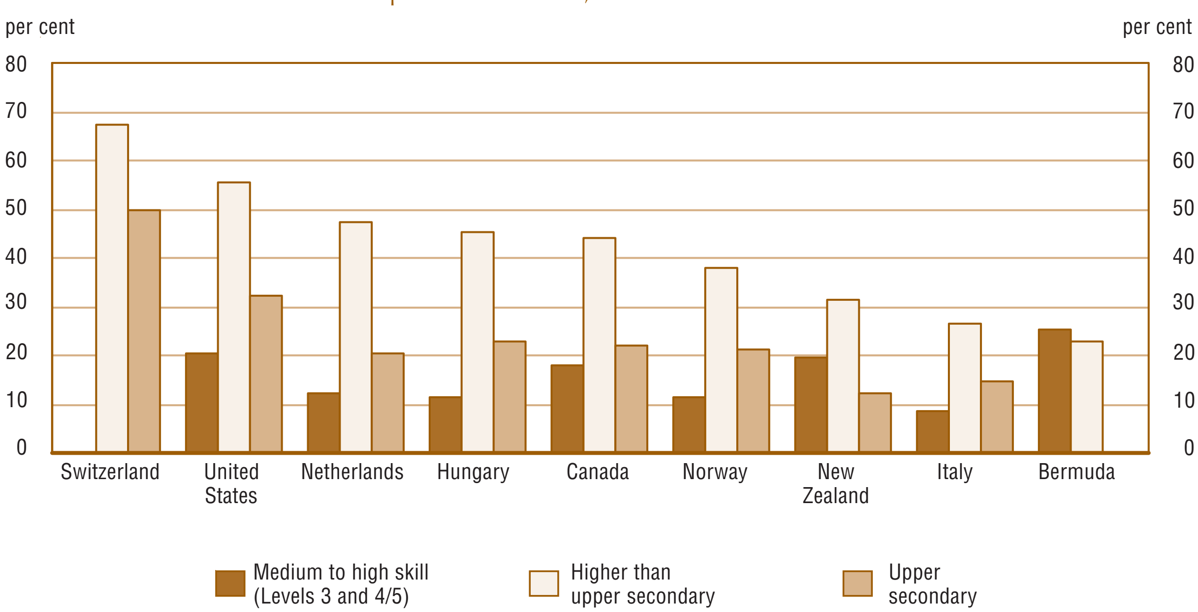
Figure 3.2.2 and 3.2.3

Earnings premiums for holding medium to high levels of education and skill

Regressions of the log of annual earnings on education and document skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008



Regressions of the log of annual earnings on education and numeracy skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008



Notes: The values presented are calculated using the estimated regression equations from each country. Fitted values for earnings were calculated for skill and education levels, substituting sample means and proportions for all other variables in the model.

The earnings premiums for the education levels represent the percentage difference from individuals with less than upper secondary education.

The earnings premiums for medium to high skill represent the percentage difference from individuals with low skill (Levels 1 and 2).

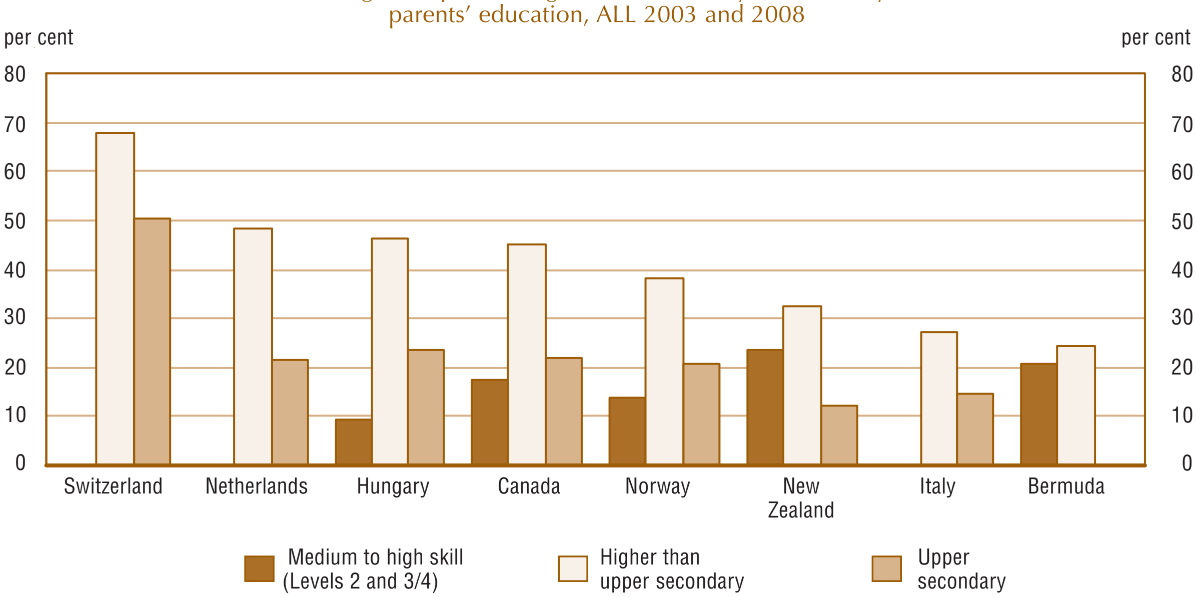
Skill and education effects that were not statistically significant at conventional levels were set to zero.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Figure 3.2.4

Earnings premiums for holding medium to high levels of education and skill

Regressions of the log of annual earnings on education and problem solving skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008



Note: The values presented are calculated using the estimated regression equations from each country. Fitted values for earnings were calculated for skill and education levels, substituting sample means and proportions for all other variables in the model.

The earnings premiums for the education levels represent the percentage difference from individuals with less than upper secondary education.

The earnings premiums for medium to high skill represent the percentage difference from individuals with low skill (Levels 1 and 2).

Skill and education effects that were not statistically significant at conventional levels were set to zero.

The estimates for Switzerland apply to the German and French speaking communities only, since they did not field the problem solving skills domain in the Italian speaking community.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

As expected, the results shown in Figures 3.2.1 to Figures 3.2.4 indicate that educational attainment has a significant and positive effect on earnings in all countries.[3] The earnings premium experienced by highly educated workers is largest for those who obtained some post-secondary education. All other variables held constant in the model, respondents who attained post-secondary education earned on average nearly 23 per cent more in Bermuda, to just over 67 per cent more in Switzerland than those who did not graduate from upper secondary school. This wide range likely reflects the relative supply of educated workers in each country and may point to differing cultural values and perceived usefulness of educational credentials and/or varied labour market demands across countries.

In many countries, skills also account for part of the differences in earnings, even when controlling for level of education and other important factors. Contrary to the wide range of premiums associated with education level, earnings premiums related to skills proficiencies are smaller and vary much less across countries. On the prose scale, for example, Figure 3.2.1 shows that workers with higher skills on average earn about 10 or 11 per cent more in Hungary, Norway and the

Netherlands, about 17 per cent more in the United States, about 20 per cent more in Canada and New Zealand, and nearly 24 per cent more in Bermuda. For document skills (see Figure 3.2.2), the premiums are slightly higher in Bermuda, Hungary and the United States, and remain about the same in the other countries.

In terms of numeracy, Figure 3.2.3 shows that workers with Level 3 or 4/5 skills in Italy earn about nine per cent more on average. The earnings premium for highly skilled workers in New Zealand and the United States increases to just over 20 per cent, while Canada's earnings premium is about 18 per cent. For the other countries the findings are similar to those noted above for the prose and document literacy domains.

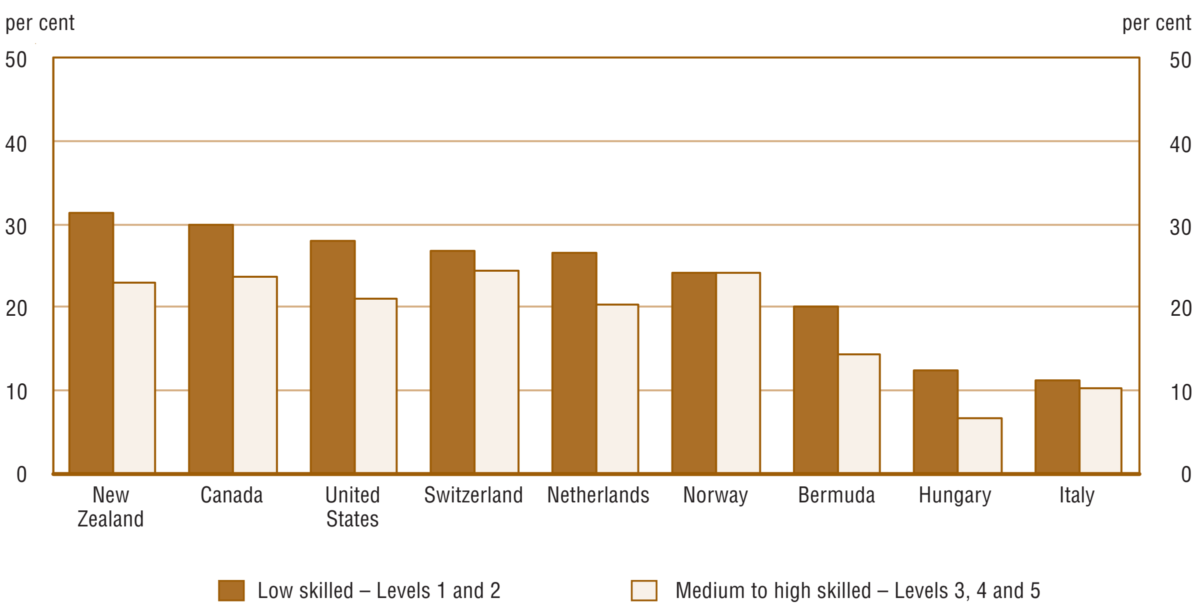
Finally, a similar fact emerges when examining the earnings premiums associated with medium to high problem solving skills (see Figure 3.2.4). However, in New Zealand and Norway, the earnings premium associated with high problem solving skills is greater relative to the other skills domains. For Bermuda, the opposite is true, as the earnings premium decreases slightly to just over 20 per cent.

Although it is typically the case that obtaining higher levels of education leads to higher earnings, some well educated individuals earn significantly less than their country's median earnings. The ALL survey provides an opportunity to explore the relative distribution of functional skills across high and low earnings categories.

Figure 3.3.1

Distribution of the population earning half the median earnings or less by skill

Percentage distribution of the labour force populations aged 16 to 65 years earning half the median earnings or less by prose skills, ALL 2003 and 2008



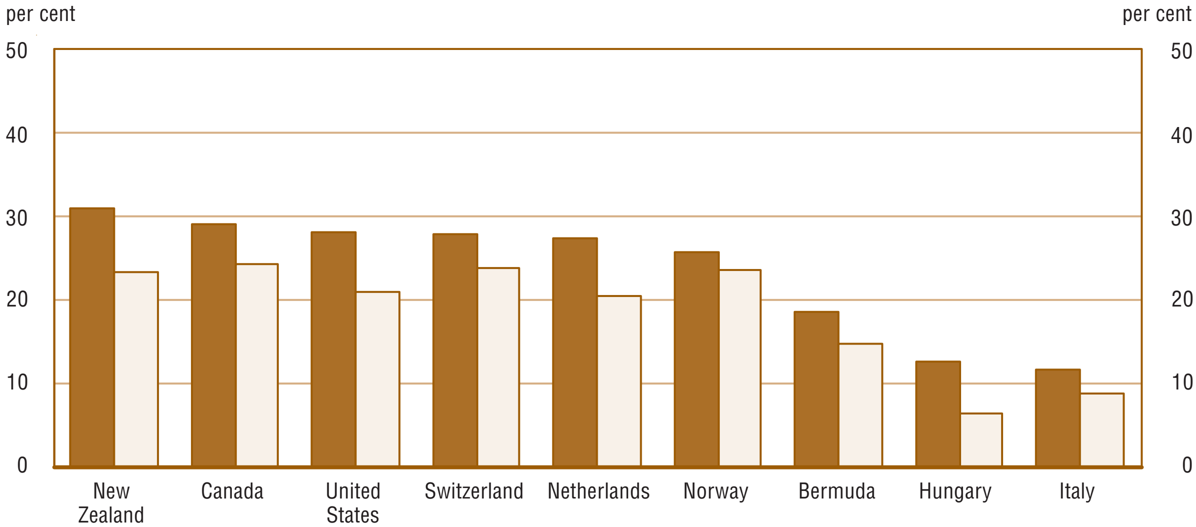
Countries are ranked by the per cent of low skilled earning half the median or less.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

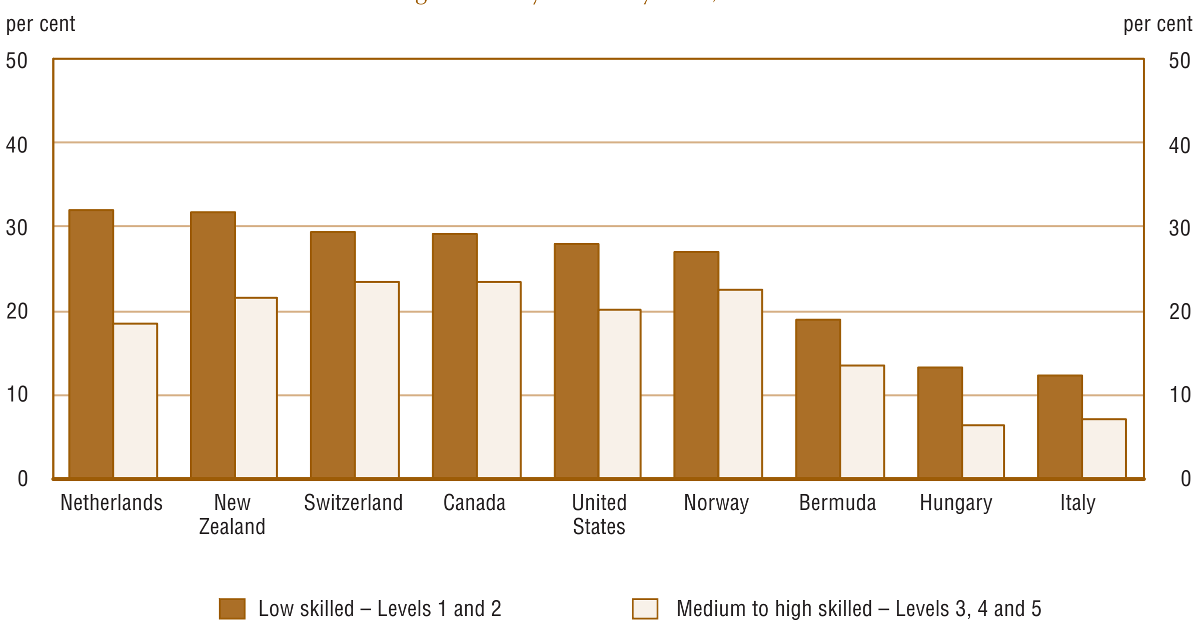
Figure 3.3.2 and 3.3.3

Distribution of the population earning half the median earnings or less by skill

Percentage distribution of the labour force populations aged 16 to 65 years earning half the median earnings or less by document skills, ALL 2003 and 2008



Percentage distribution of the labour force populations aged 16 to 65 years earning half the median earnings or less by numeracy skills, ALL 2003 and 2008



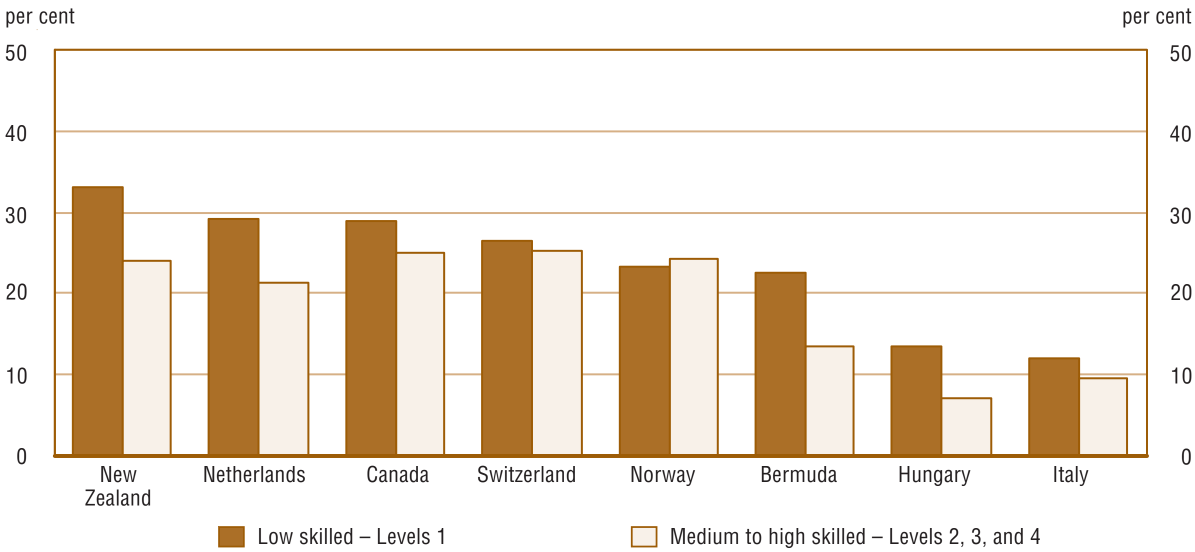
Countries are ranked by the per cent of low skilled earning half the median or less.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

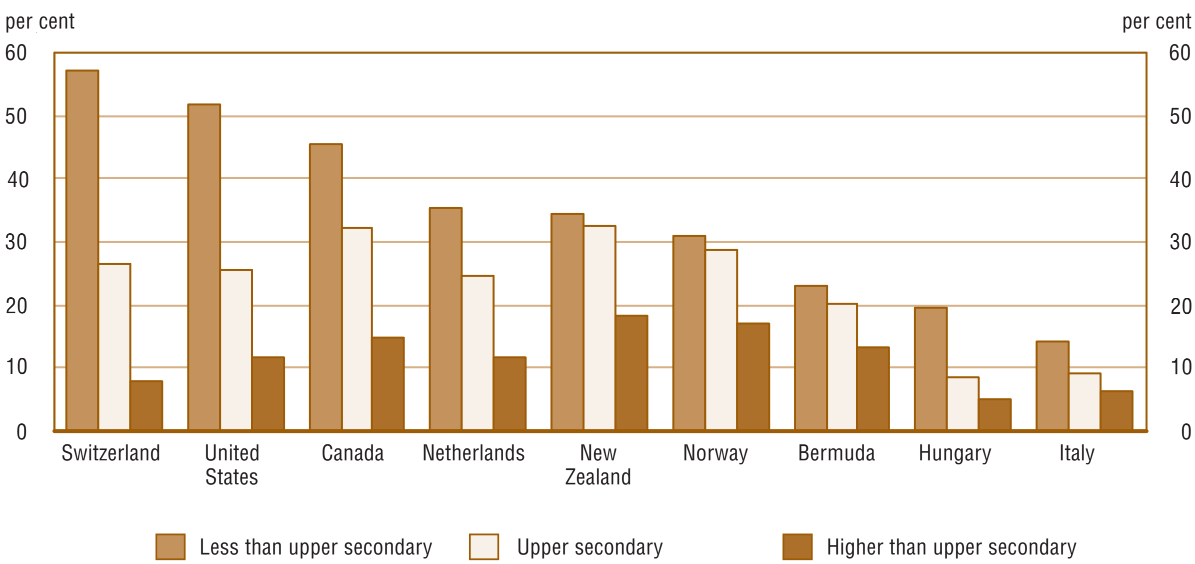
Figure 3.3.4 and 3.3.5

Distribution of the population earning half the median earnings or less by skill

Percentage distribution of the labour force populations aged 16 to 65 years earning half the median earnings or less by problem solving skills, ALL 2003 and 2008



Percentage distribution of the labour force populations aged 16 to 65 years earning half the median earnings or less by education level, ALL 2003 and 2008



Countries are ranked by the per cent of low skilled earning half the median or less.

Notes: United States did not field the problem solving skills domain.

The problem solving skills scores for Switzerland apply to the German and French speaking communities only since they did not field the problem solving skills domain in the Italian speaking community.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

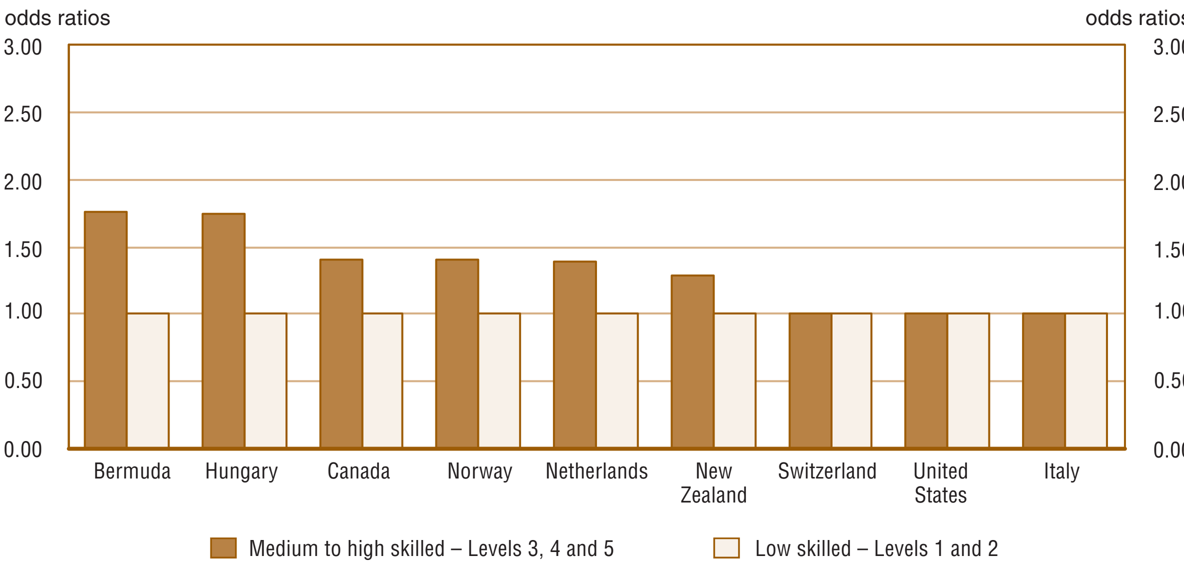
Figures 3.3.1 to Figures 3.3.4 and Tables 3.3.1 to Tables 3.3.4 show the per cent of the labour force populations by skill and earnings level.[4] There is some evidence to suggest that having higher skills decreases one's chances of earning substantially less than the median country earnings. Figure 3.3.1 compares the percentage of low and medium to highly skilled workers who earn half the median earnings or less on the prose scale. Overall, in most countries, between 20 and 25 per cent of the highly skilled population earns half the median earnings or less. The exceptions are Bermuda at 14 per cent, Italy at 10 per cent and Hungary at seven per cent. The variation between the two skill groups ranges from no significant difference in Norway to about an eight per cent difference in New Zealand, suggesting that skill level may have a marginal effect on entering this low earnings category. These patterns also hold for the other three skill domains, although most countries show higher percentages of those with advanced problem solving skills having low earnings.

Figure 3.3.5 shows the differences by education level across the same earnings categories. Three broad groups emerge from the findings. New Zealand and Norway show the highest percentage of highly educated respondents with low earnings, with 18 and 17 per cent respectively. Bermuda, Canada, the Netherlands and the United States have smaller relative proportions (about 11 to 15 per cent), while Hungary, Italy and Switzerland have the smallest percentage of highly educated, low earners. Having a high level of education appears to have a strong marginal effect on earnings at or less than half the median earnings in all countries.

Figure 3.4.1

Likelihood of medium to high skilled adults earning more than half the median earnings

Adjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 3, 4 and 5) earning more than half the median earnings, prose skills, populations aged 16 to 65, ALL 2003 and 2008



Notes: Odds estimates that are not statistically significant from one at conventional levels of significance are reported as one in the figure.

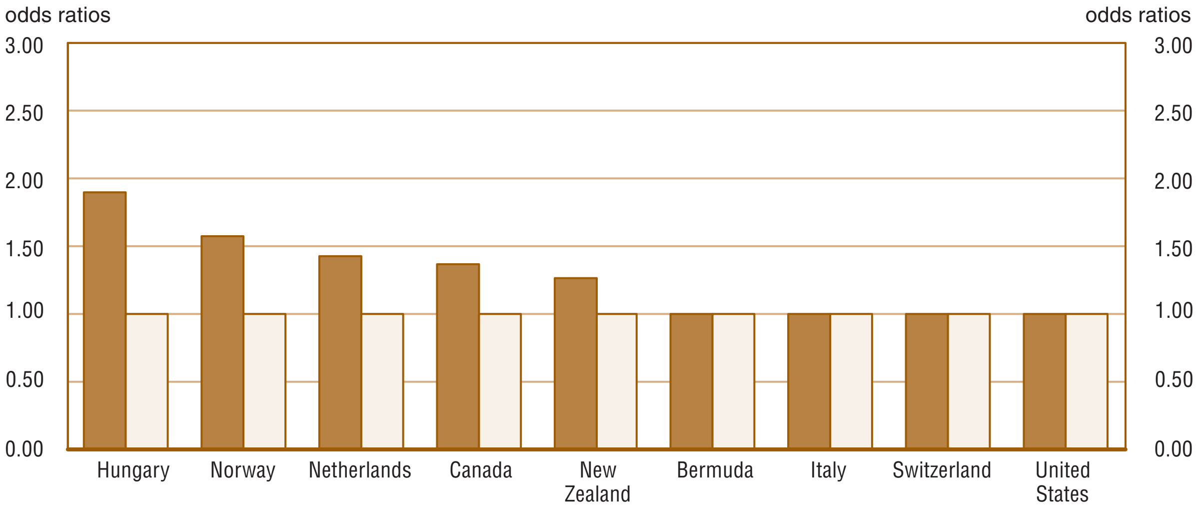
For the actual estimates and corresponding significance values, see Table 3.4.1 in the annex to this chapter.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

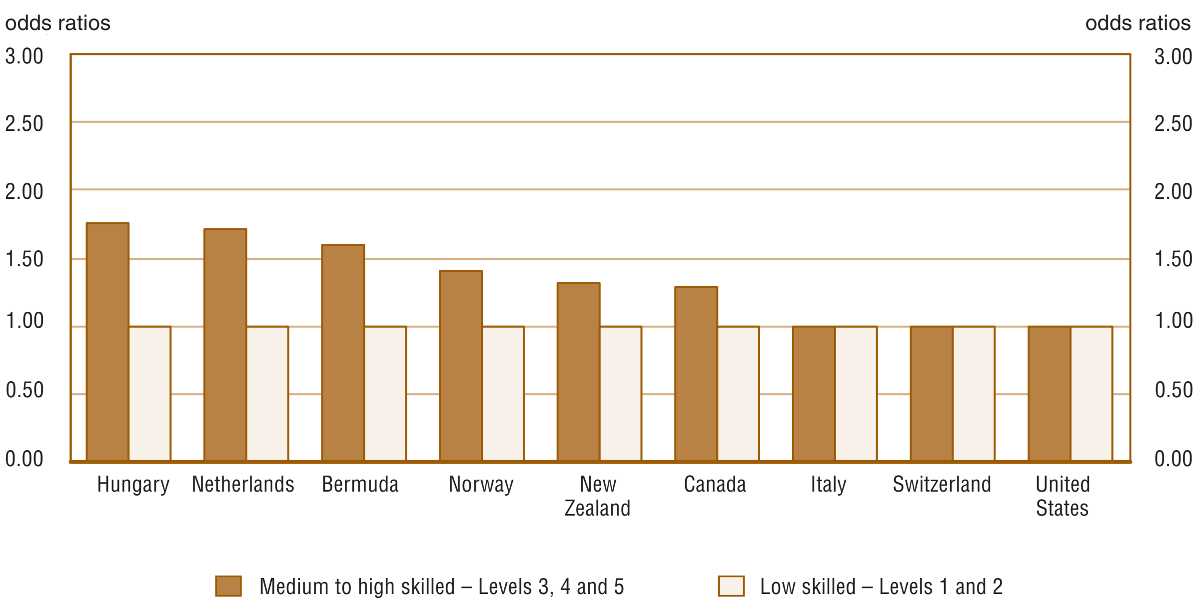
Figure 3.4.2 and 3.4.3

Likelihood of medium to high skilled adults earning more than half the median earnings

Adjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 3, 4 and 5) earning more than half the median earnings, document skills, populations aged 16 to 65, ALL 2003 and 2008



Adjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 3, 4 and 5) earning more than half the median earnings, numeracy skills, populations aged 16 to 65, ALL 2003 and 2008



Notes: Odds estimates that are not statistically significant from one at conventional levels of significance are reported as one in the figure.

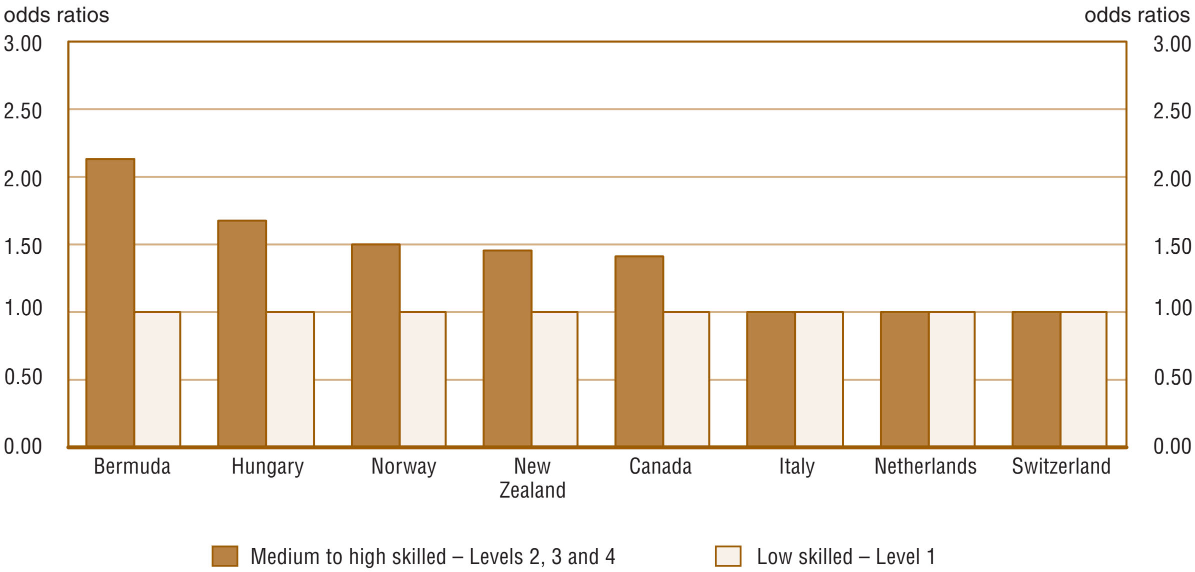
For the actual estimates and corresponding significance values, see Tables 3.4.2 and 3.4.3 in the annex to this chapter.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Figure 3.4.4

Likelihood of medium to high skilled adults earning more than half the median earnings

Adjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 2, 3 and 4) earning more than half the median earnings, problem solving skills, populations aged 16 to 65, ALL 2003 and 2008



Notes: Odds estimates that are not statistically significant from one at conventional levels of significance are reported as one in the figure.

For the actual estimates and corresponding significance values, see Table 3.4.4 in the annex to this chapter.

The models for Switzerland apply to the German and French speaking communities only, since they did not field the problem solving skills domain in the Italian speaking community.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

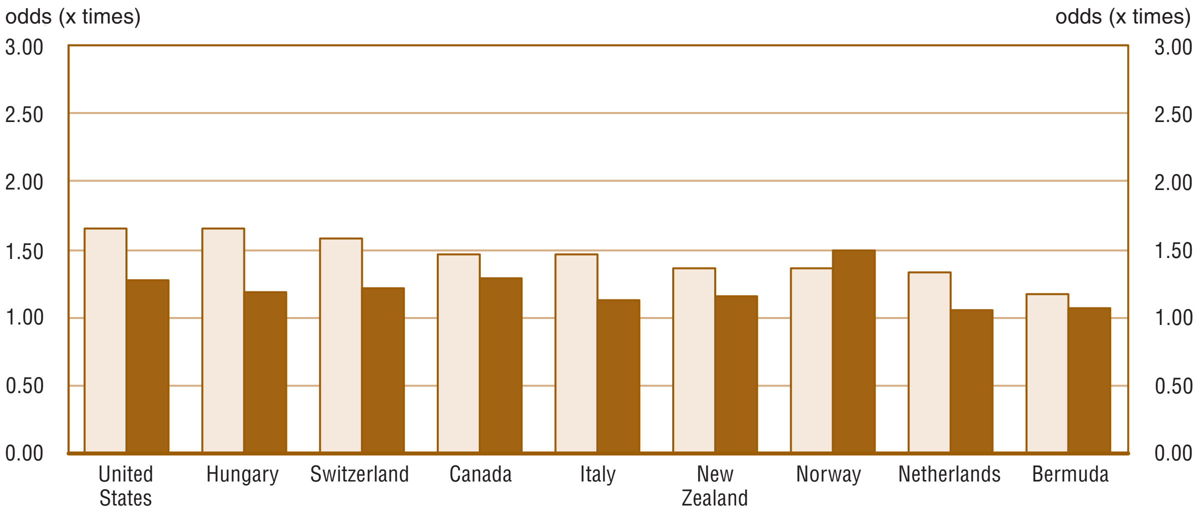
While having a high level of education consistently reduces the likelihood of earning half the median income or less, there is weak evidence to suggest that having high skills produces similar advantages. Tables 3.4.1 to Tables 3.4.4 and Figures 3.4.1 to Figures 3.4.4 reveal that for most countries, skills significantly decrease one's chances of earning less than half the median earnings, even when holding variation associated with variables such as experience, gender, community size, immigrant status, parents' education and level of education constant in the model.[5] For example, on the prose literacy scale, workers with higher skills are on average about 1.3 to 1.8 times less likely to earn less than half the median earnings.

On the problem solving scale, the differences between groups are slightly larger for most countries, and in Bermuda, workers with Level 2, 3 or 4 skills are more than twice as likely to earn more than half the median. In other words, highly skilled workers in Bermuda are about 50 per cent as likely to earn less than half the median. There are some exceptions, however. Most notably, in Italy, Switzerland and the United States, no significant advantages for highly skilled problem solvers emerge across all domains.

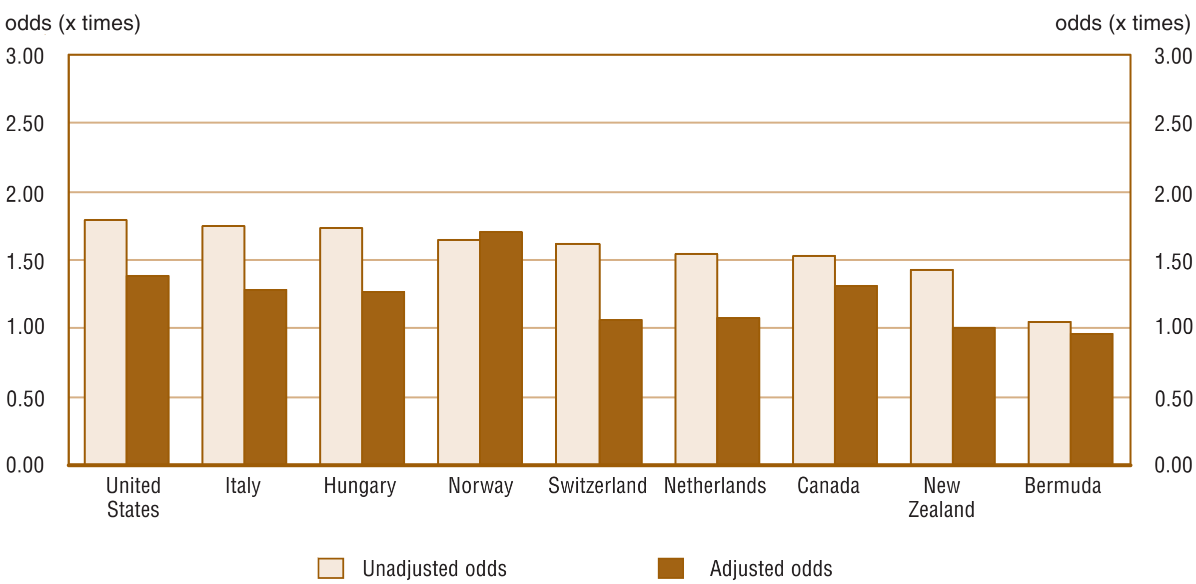
Figure 3.5.1 and 3.5.2

Likelihood of medium to high skilled adults being employed full-time for the previous year

Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 3, 4 and 5) being employed full-time in the previous 52 weeks, prose skills, populations aged 16 to 65, ALL 2003 and 2008



Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 3, 4 and 5) being employed full-time in the previous 52 weeks, document skills, populations aged 16 to 65, ALL 2003 and 2008



Notes: Odds estimates that are not statistically significant from one at conventional levels of significance are reported as one in the figure.

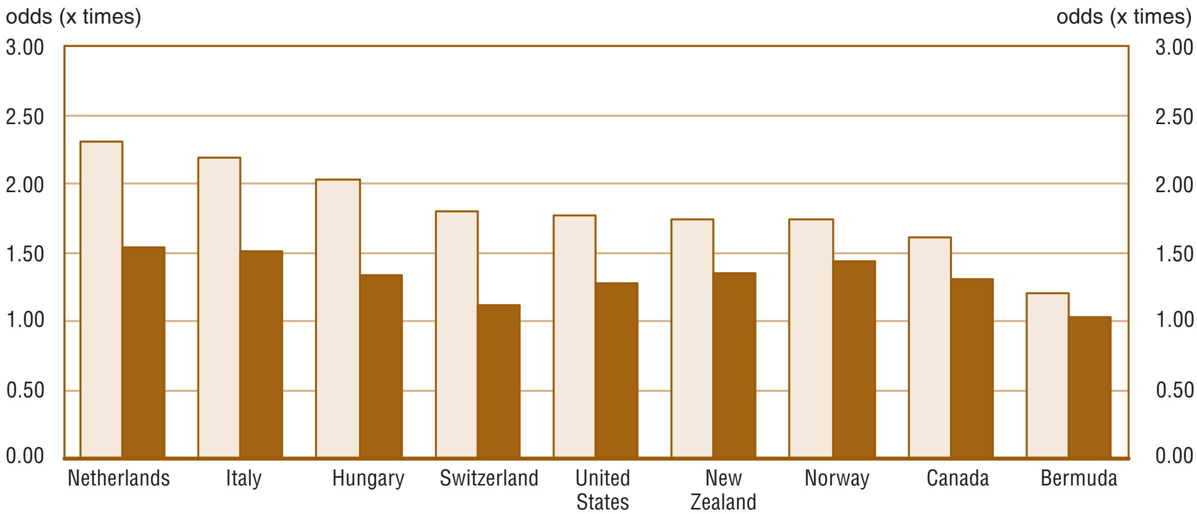
For the actual estimates and corresponding significance values, see Table 3.5 in the annex to this chapter.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

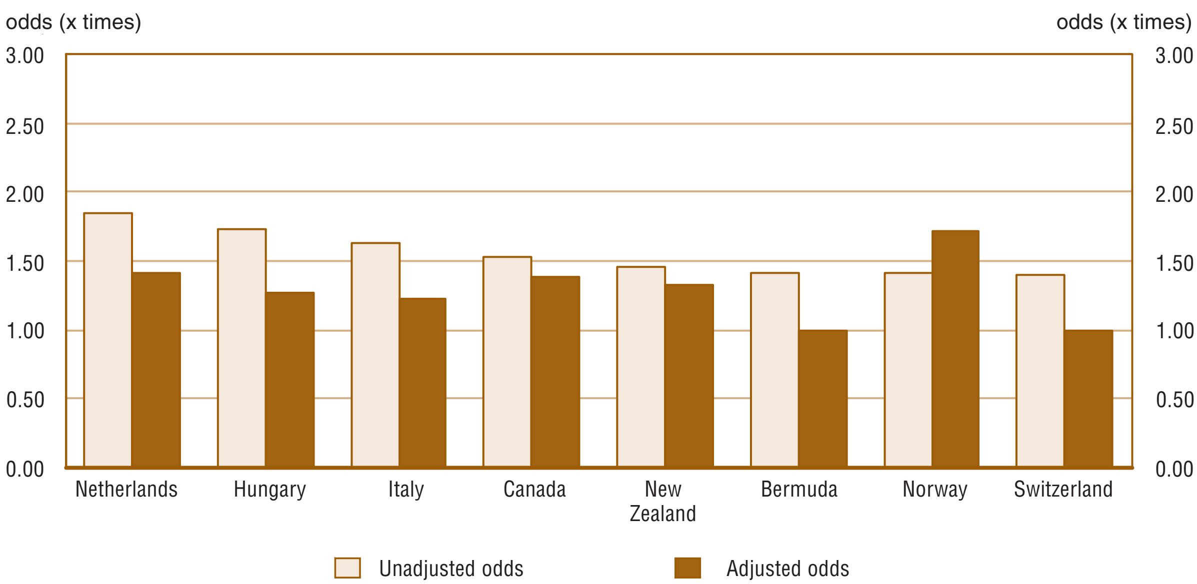
Figure 3.5.3 and 3.5.4

Likelihood of medium to high skilled adults being employed full-time for the previous year

Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 3, 4 and 5) being employed full-time in the previous 52 weeks, numeracy skills, populations aged 16 to 65, ALL 2003 and 2008



Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 2, 3 and 4) being employed full-time in the previous 52 weeks, problem solving skills, populations aged 16 to 65, ALL 2003 and 2008



Notes: Odds estimates that are not statistically significant from one at conventional levels of significance are reported as one in the figure.

For the actual estimates and corresponding significance values, see Table 3.5 in the annex to this chapter.

The models for Switzerland apply to the German and French speaking communities only, since they did not field the problem solving skills domain in the Italian speaking community. This note apply to Figure 3.5.4.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

The final charts in this section explore the relationship between skill and full-time employment status. Figures 3.5.1 to Figures 3.5.4 present the likelihood of highly skilled workers being employed on a full-time basis over the 52 weeks preceding the interview. For the prose, document and numeracy skill domains the findings generally are the same. For most of the countries in ALL 2003 and 2008, population groups having high levels of skill have higher chances of securing stable, full-time employment. For example, Figure 3.5.1 shows that even after controlling for age, gender, children present in the home, and education level, adults in Canada, Hungary, New Zealand, Norway and the United States with higher prose skills are on average about 1.2 to 1.5 times more likely to have secured full-time employment over the year prior to the survey, compared to their counterparts with Levels 1 or 2 skills. Although the general patterns hold, the differences between low and moderate to high numeracy skill groups in countries like Hungary, Italy, the Netherlands and New Zealand are greater than for the other three domains, while in Canada, the likelihood of securing full-time employment changes relatively little across the prose, document and numeracy domains. For problem solving, the group differences are slightly smaller than for numeracy skills for most countries (as indicated by the smaller odds ratios). However, both Bermuda and Switzerland show no statistically significant differences across skill groups on each of the scales.

3.5 Skills and participation in community activities

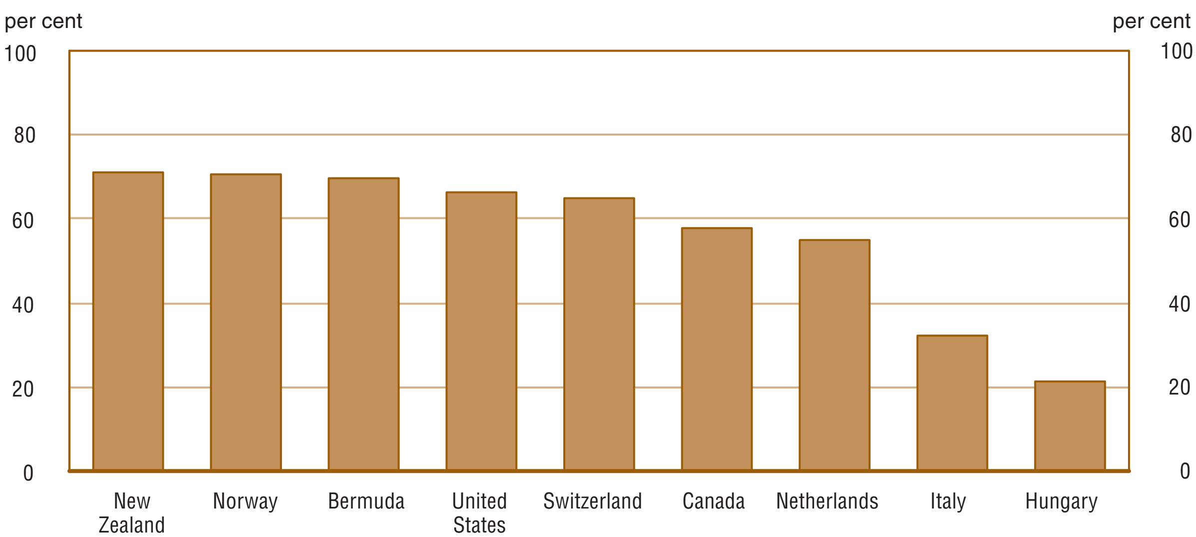
Social capital theorists have long argued that engaging in community activities outside the workplace is important for the quality of life in democratic societies. A high level of social capital manifests itself in greater social trust, social cohesion, norms of reciprocity, higher civic and political participation, more organisational involvement, and volunteerism (Putnam, 2000). Although many factors contribute to varying levels of civic and social engagement, educational attainment has been consistently shown to be the most important determinant (Huang et al., 2009; OECD, 2009; Putnam, 2000; Schellenberg, 2004; Schuller and Desjardins, 2007). For example, in all 32 countries participating in the 1991 World Values Survey, Schofer and Fourcade-Gourinchas (2001) found education as well as employment status to be particularly strong indicators of voluntary association membership. Strong education effects are perhaps not surprising, since schools play a formative role in the establishment of social networks, beliefs, attitudes and social norms (Coleman, 1988).

Skills may also be important in predicting a variety of social outcomes. A study using the IALS 1994 data alluded to this possibility, as highly skilled individuals in most countries were found to be more likely to participate in voluntary community activities (OECD and HRDC, 1997). This section examines the relationship between the skill domains and two measures in the ALL survey that serve as indicators of social capital: participation in community groups and organisations, and participation in unpaid voluntary activities.

Figure 3.6

Distribution of the population engaged in community groups or organizations

Percentage of the population aged 16 to 65 years engaged in community groups or organizations in the previous 12 months, ALL 2003 and 2008



Countries are ranked by the per cent of the total population engaged in community groups or organizations.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

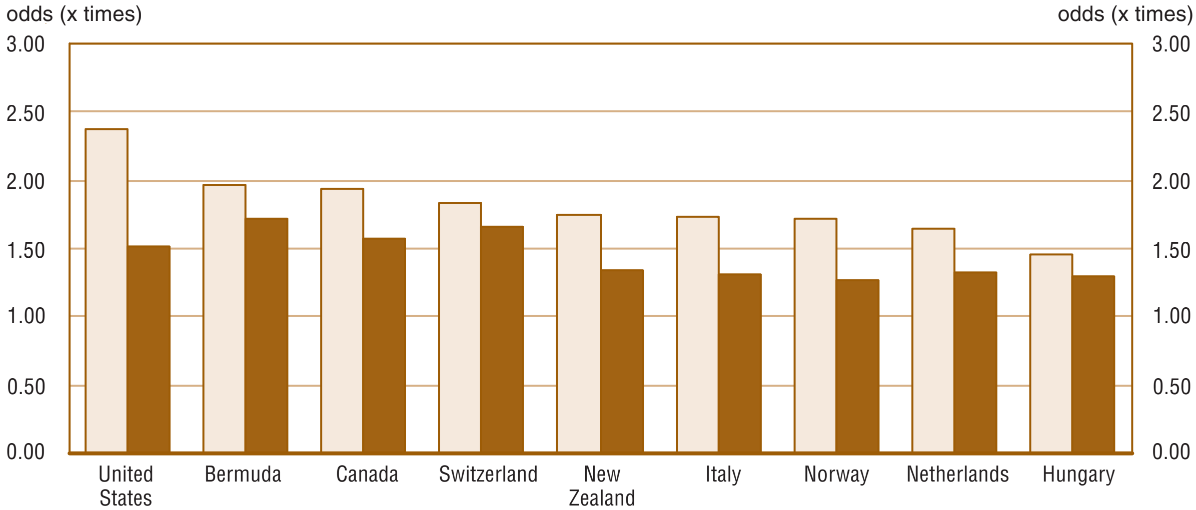
Before examining the impact of skills on social outcomes, it is important to first examine how the distribution of social capital, measured by the two variables mentioned above, varies across the ALL countries. Figure 3.6 shows the percentage of the population aged 16 to 65 years, by country, engaging in community groups or organisations in the 12 months preceding the interview.[6] Overall, the results for Bermuda, New Zealand, Norway, Switzerland and the United States show between 65 and 70 per cent of their populations engaged in community groups or organisations in the previous 12 months. In Canada and the Netherlands, around 55 to 58 per cent participated, while in Hungary and Italy significantly smaller proportions of the population engaged in these types of activities.

Figures 3.7.1 to Figures 3.7.4 and Table 3.7 show the unadjusted and adjusted odds ratios obtained from logistic regression models predicting the probability of engaging in community groups or organisations for medium to highly skilled adults. In all countries, skills show strong marginal effects. Moreover, even when controlling for level of education, age, community size, gender, children present in the home, income, and parents' education, higher skilled individuals are significantly more likely than those with low skills to engage in community groups or organisations. This strong, positive relationship holds for all countries on the prose, document and problem solving scales, and for all countries except for Italy on the numeracy scale.

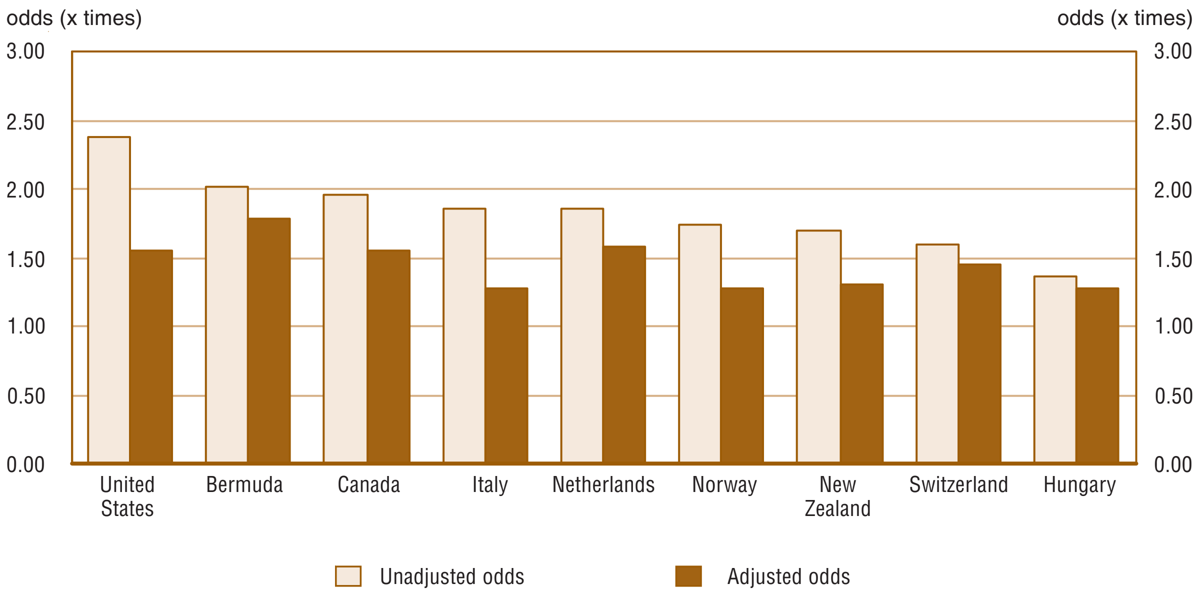
Figure 3.7.1 and 3.7.2

Likelihood of medium to high skilled adults engaging in community groups or organizations in the previous 12 months

Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 3, 4 and 5) engaging in community groups or organizations in the previous 12 months, prose skills, populations aged 16 to 65, ALL 2003 and 2008



Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 3, 4 and 5) engaging in community groups or organizations in the previous 12 months, document skills, populations aged 16 to 65, ALL 2003 and 2008



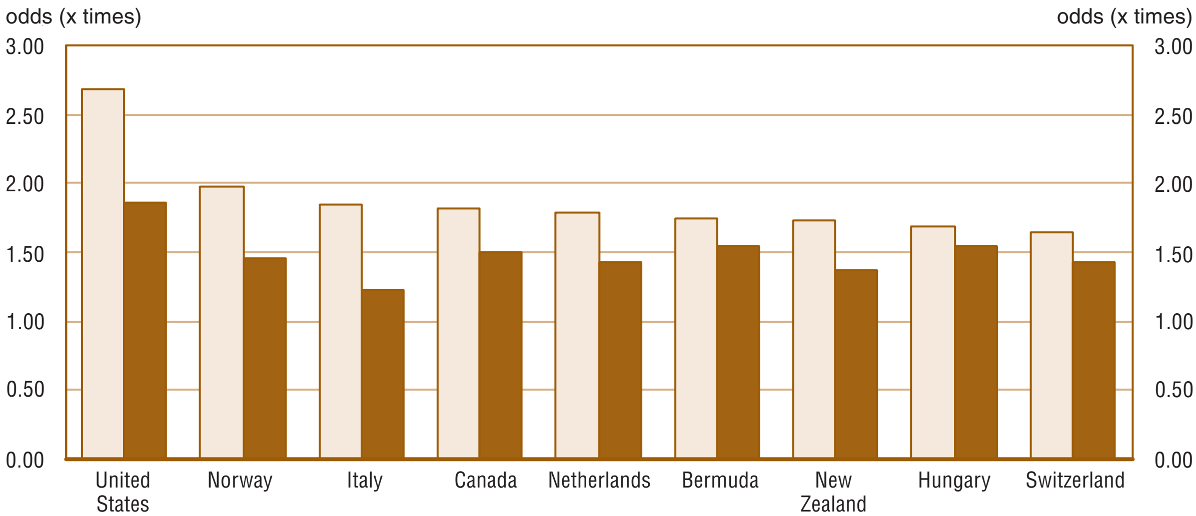
Notes: Odds estimates that are not statistically significant from one at conventional levels of significance are reported as one in the figure.
For the actual estimates and corresponding significance values, see Table 3.7 in the annex to this chapter.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

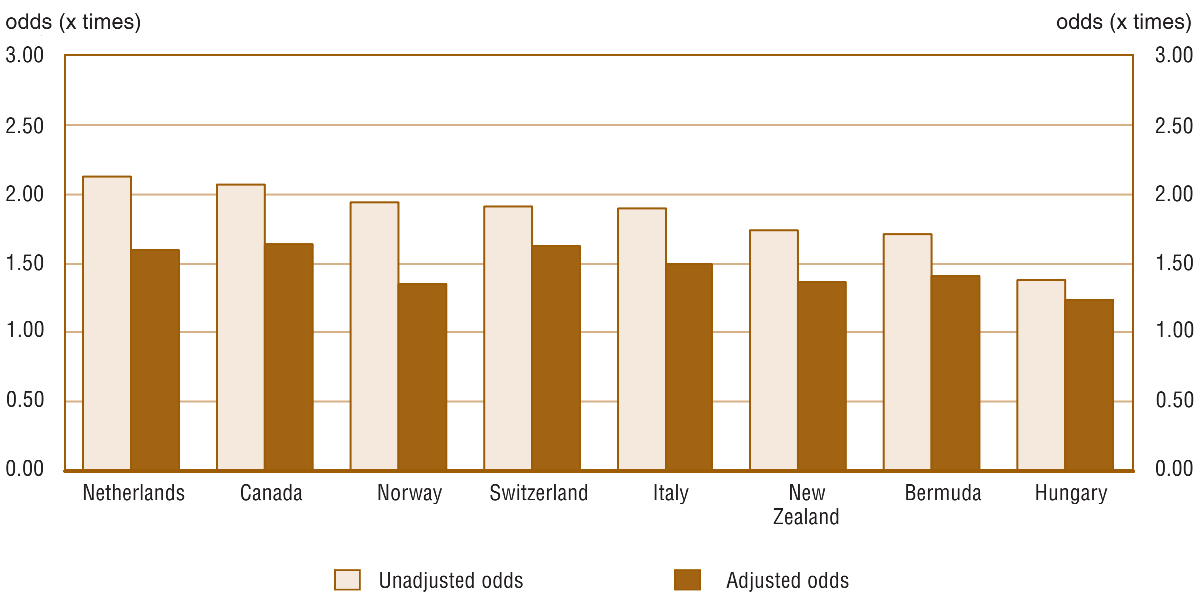
Figure 3.7.3 and 3.7.4

Likelihood of medium to high skilled adults engaging in community groups or organizations in the previous 12 months

Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 3, 4 and 5) engaging in community groups or organizations in the previous 12 months, numeracy skills, populations aged 16 to 65, ALL 2003 and 2008



Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 2, 3 and 4) engaging in community groups or organizations in the previous 12 months, problem solving skills, populations aged 16 to 65, ALL 2003 and 2008



Notes: Odds estimates that are not statistically significant from one at conventional levels of significance are reported as one in the figure.

For the actual estimates and corresponding significance values, see Table 3.7 in the annex to this chapter.

The models for Switzerland apply to the German and French speaking communities only, since they did not field the problem solving skills domain in the Italian speaking community.

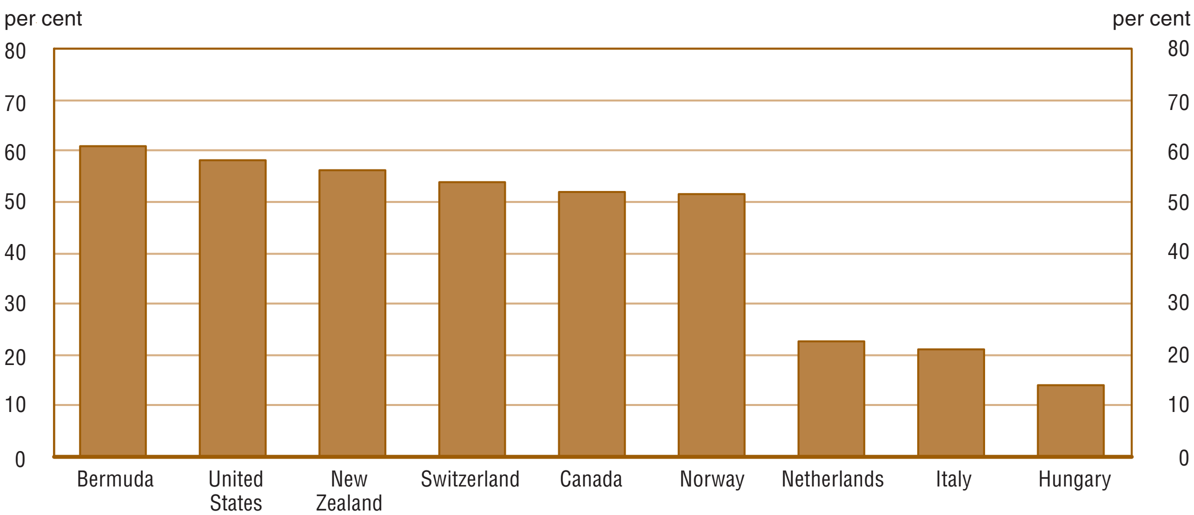
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Figure 3.7.1 displays the odds ratios for high and low skill groups on the prose scale. It is quite evident that the magnitudes of the differences across skill level vary from country to country. While the effects are statistically significant ($p<0.10$) for all countries, the adjusted odds ratios range from as low as 1.3 for Hungary to just over 1.7 for Switzerland. In other words, individuals with Level 3 or 4/5 prose literacy skills are nearly 1.7 times more likely than those with Level 1 and 2 skills to engage in community groups or organisations, even when holding a number of other factors constant. Although the strength of the effects varies across countries (as indicated by the different odds ratios), the findings provide some evidence that skills play an important role in predicting participation in civic, non-political activities.

Figure 3.8

Distribution of the population engaged in unpaid volunteer activities

Percentage of the population aged 16 to 65 years engaged in unpaid volunteer activities in the previous 12 months, ALL 2003 and 2008



Countries are ranked by the per cent of the total population engaged in unpaid volunteer activities.

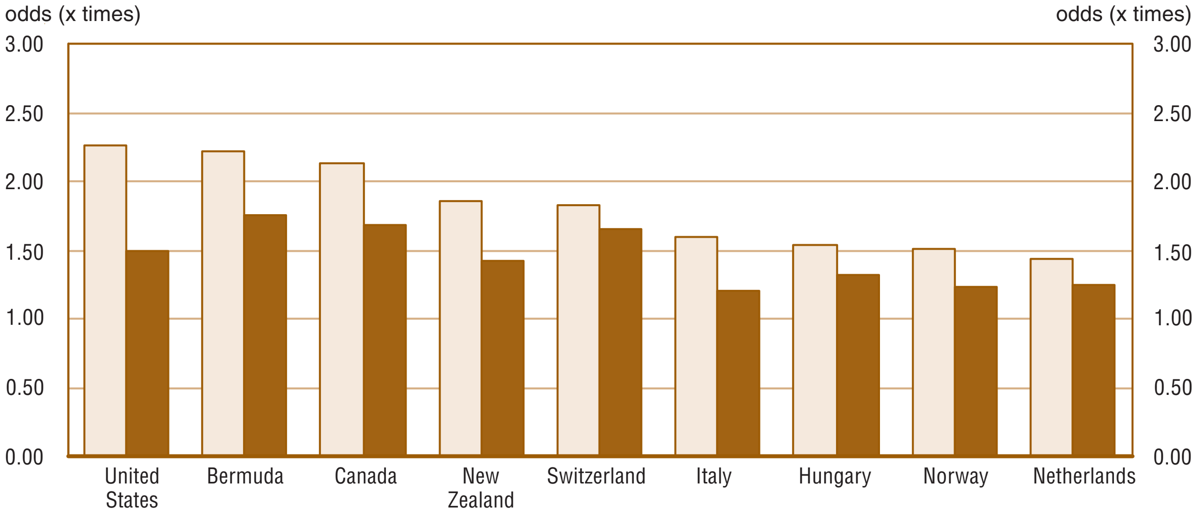
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Figure 3.8 shows the country distributions on the indicator measuring participation in unpaid voluntary activities.[7] Between 50 and 60 per cent of respondents in Bermuda, Canada, Switzerland, New Zealand, Norway and the United States participated in such activities, while the percentages of those who participated in the Netherlands (23 per cent), Italy (21 per cent) and Hungary (14 per cent) were significantly lower than in the comparison countries.

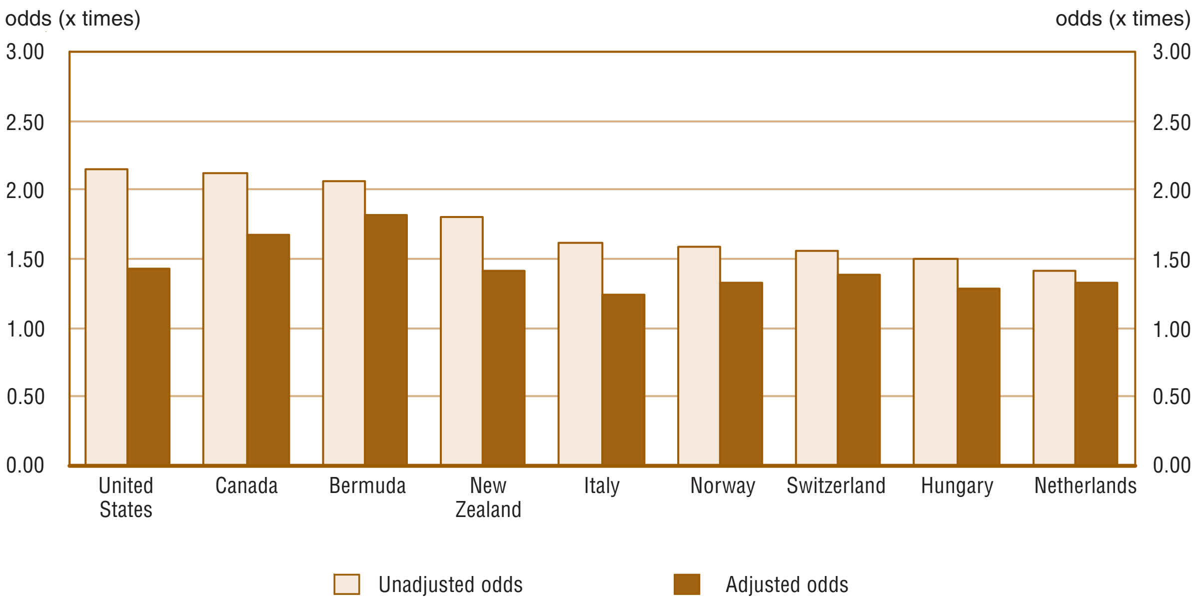
Figure 3.9.1 and 3.9.2

Likelihood of medium to high skilled adults engaging in unpaid volunteer activities in the previous 12 months

Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 3, 4 and 5) engaging in unpaid volunteer activities in the previous 12 months, prose skills, populations aged 16 to 65, ALL 2003 and 2008



Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 3, 4 and 5) engaging in unpaid volunteer activities in the previous 12 months, document skills, populations aged 16 to 65, ALL 2003 and 2008



Notes: Odds estimates that are not statistically significant from one at conventional levels of significance are reported as one in the figure.

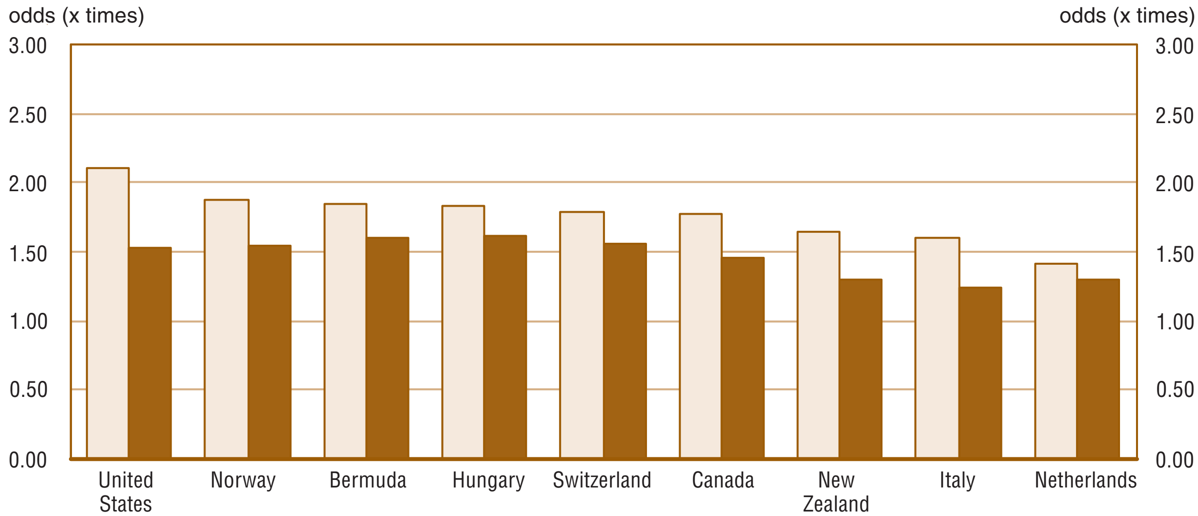
For the actual estimates and corresponding significance values, see Table 3.9 in the annex to this chapter.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

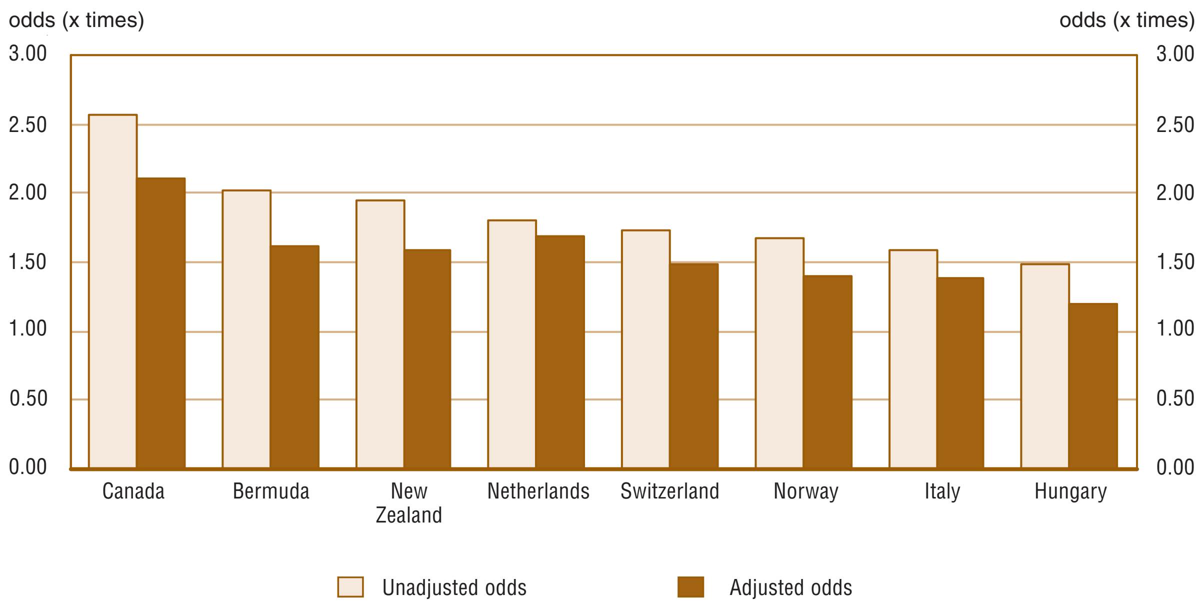
Figure 3.9.3 and 3.9.4

Likelihood of medium to high skilled adults engaging in unpaid volunteer activities in the previous 12 months

Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 3, 4 and 5) engaging in unpaid volunteer activities in the previous 12 months, numeracy skills, populations aged 16 to 65, ALL 2003 and 2008



Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults (Levels 2, 3 and 4) engaging in unpaid volunteer activities in the previous 12 months, problem solving skills, populations aged 16 to 65, ALL 2003 and 2008



Notes: Odds estimates that are not statistically significant from one at conventional levels of significance are reported as one in the figure.

For the actual estimates and corresponding significance values, see Table 3.9 in the annex to this chapter.

The models for Switzerland apply to the German and French speaking communities only, since they did not field the problem solving skills domain in the Italian speaking community.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Figures 3.9.1 to Figures 3.9.4 and Table 3.9 present the unadjusted and adjusted odds ratios obtained in logistic regression models predicting the effects of age, gender, level of education, community size, and number of children present in the home, income, parents' education and respondents' assessed skills on the probability of engaging in unpaid volunteer activities. Overall, skills have strong and consistent marginal effects across all skill domains and in all countries (as indicated by the unadjusted odds ratios). Moreover, the results indicate that, on average, medium to highly skilled individuals are significantly ($p<0.10$) more likely to engage in unpaid voluntary activities than those with low skills. When controlling for a number of factors, the effects of skill on voluntary participation remain strong and highly statistically significant for nearly all countries, even though the strength of the relationships varies by country and across skill domains. In Canada, for example, adults with high problem solving skills are more than twice as likely to engage in voluntary activities compared to those with low skills.

The next chapter will present the results of detailed analyses of data obtained through the numeracy skill assessment that was fielded in ALL for the first time. It will also describe the conceptual and measurement frameworks that underpin this particular assessment.

Endnotes

1. For problem solving, the low skill category includes respondents at Level 1, whereas the moderate to high skill category includes those at Levels 2, 3 and 4.
2. The R-squared values for the linear regression models range from 0.17 to 0.56, indicating that these models capture the antecedents of earnings more accurately in some countries than in others.
3. The percentages displayed in Figures 3.2.1 to Figures 3.2.4 are based on the fitted values of annual earnings for respondents with high skill compared to those with high education. Each of the percentages for these respondent groups is obtained by substituting the sample means and proportions for all except for the variable of interest in the estimated regression equations displayed in Figures 3.2.1 to 3.2.4.
4. The analyses were restricted to respondents who were in the labour force at the time of the survey.
5. Additional data analyses (not shown) reveal that when a control for occupation is included in the models, the skill effects weaken somewhat for most countries. This suggests that skills may be more closely tied to occupational outcomes, and may indirectly influence the likelihood of having low earnings.
6. This indicator is derived from a series of measures collected in the ALL survey that asked respondents to provide information on whether they participated in a political organisation, sports or recreation organisation (e.g. Baseball League, Tennis Club, etc.), cultural, education or hobby group (e.g. Theatre Group, Book Club, Bridge Club, etc.), a neighbourhood, civic or community association or a school group (e.g. Parent / Teachers Association, your neighbourhood community association), group associated with a community of worship (e.g. a youth group associated with a church), or any other group or organisation in the 12 months prior to the survey.
7. This measure is derived from a series of questions in the ALL that asked respondents to provide information on whether or not they participated in the following activities as an unpaid volunteer through a group or organisation: fundraising; serving as an unpaid member of a board; coaching, teaching or counseling; collecting food or other goods for charity; and any other activities such as organising / supervising events, office work or providing information on behalf of an organisation.

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Annex 3

Data Values for the Figures

Table 3.1.1

Percentage distribution of the population aged 16 to 65 years by skill levels, ALL 2003 and 2008

	Level of skill[1]			
	Low skilled (Levels 1 and 2)		Medium to high skilled (Levels 3, 4 and 5)	
	per cent	standard error	per cent	standard error
A. Prose literacy skills				
Bermuda	38.1	(1.3)	61.9	(1.3)
Canada	41.9	(0.8)	58.1	(0.8)
Hungary	54.8	(1.1)	45.2	(1.1)
Italy	79.5	(0.9)	20.5	(0.9)
Netherlands	43.5	(1.1)	56.5	(1.1)
New Zealand	45.0	(1.0)	55.0	(1.0)
Norway	34.1	(1.3)	65.9	(1.3)
Switzerland	52.2	(1.9)	47.8	(1.9)
United States	52.6	(1.3)	47.4	(1.3)
B. Document literacy skills				
Bermuda	46.2	(1.6)	53.8	(1.6)
Canada	42.6	(0.8)	57.4	(0.8)
Hungary	55.2	(1.3)	44.8	(1.3)
Italy	80.6	(1.1)	19.4	(1.1)
Netherlands	38.9	(1.1)	61.1	(1.1)
New Zealand	44.1	(0.6)	55.9	(0.6)
Norway	32.4	(1.0)	67.6	(1.0)
Switzerland	49.0	(1.8)	51.0	(1.8)
United States	52.4	(1.4)	47.6	(1.4)
C. Numeracy skills				
Bermuda	54.1	(1.7)	45.9	(1.7)
Canada	49.8	(0.6)	50.2	(0.6)
Hungary	51.1	(1.2)	48.9	(1.2)
Italy	80.2	(0.8)	19.8	(0.8)
Netherlands	37.2	(0.8)	62.8	(0.8)
New Zealand	51.1	(1.3)	48.9	(1.3)
Norway	40.1	(1.2)	59.9	(1.2)
Switzerland	39.3	(1.3)	60.7	(1.3)
United States	58.6	(1.3)	41.4	(1.3)

Table 3.1.1 (concluded)

Percentage distribution of the population aged 16 to 65 years by skill levels, ALL 2003 and 2008

	Level of skill[1]			
	Low skilled (Level 1)		Medium to high skilled (Levels 2, 3 and 4)	
	per cent	standard error	per cent	standard error
D. Problem solving skills[2]				
Bermuda	33.1	(1.4)	66.9	(1.4)
Canada	29.7	(0.8)	70.3	(0.8)
Hungary	41.1	(1.1)	58.9	(1.1)
Italy	67.8	(0.9)	32.2	(0.9)
Netherlands	22.2	(0.9)	77.8	(0.9)
New Zealand	29.8	(0.8)	70.2	(0.8)
Norway	23.3	(1.3)	76.7	(1.3)
Switzerland[3]	28.8	(1.3)	71.2	(1.3)

1. Comparisons for the problem solving domain are made between levels 1 and levels 2, 3 and 4.
2. United States did not field the problem solving skills domain.
3. The problem solving skills scores for Switzerland apply to the German and French speaking communities only since they did not field the problem solving skills domain in the Italian speaking community.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.1.2

Percentage distribution of the population aged 16 to 65 years by education level, ALL 2003 and 2008

	Level of education					
	Less than upper secondary		Upper secondary		Higher than upper secondary	
	per cent	standard error	per cent	standard error	per cent	standard error
Bermuda	7.6	(0.0)	34.8	(0.0)	57.6	(0.0)
Canada	21.0	(0.5)	32.8	(0.7)	46.1	(0.6)
Hungary	29.3	(0.0)	48.1	(0.4)	22.6	(0.4)
Italy	52.7	(0.0)	38.2	(0.0)	9.1	(0.0)
Netherlands	30.8	(0.0)	39.7	(0.3)	29.5	(0.3)
New Zealand	25.4	(0.7)	31.1	(0.5)	43.5	(0.8)
Norway	14.7	(0.2)	47.8	(0.4)	37.5	(0.5)
Switzerland	18.2	(0.1)	58.6	(0.1)	23.2	(0.1)
United States	18.0	(0.0)	46.8	(0.8)	35.2	(0.8)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.2.1

Regressions of the log of annual earnings on education and prose skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
Bermuda		
(Constant)	10.78***	(0.10)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.14***	(0.02)
Female	-0.25***	(0.05)
Urban resident[3]	…	…
Employed part-time[4]	-0.70***	(0.09)
Native-born	-0.16***	(0.05)
Parents' education		
Upper secondary	0.02	(0.05)
Higher than upper secondary	-0.04	(0.08)
Education		
Upper secondary	0.00	(0.09)
Higher than upper secondary	0.26***	(0.10)
Skill		
Levels 3, 4 and 5	0.27***	(0.04)
R square	0.34	
Canada		
(Constant)	9.75***	(0.05)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.11***	(0.01)
Female	-0.30***	(0.03)
Urban resident	0.12***	(0.03)
Employed part-time	-0.98***	(0.05)
Native-born	0.06	(0.04)
Parents' education		
Upper secondary	0.09***	(0.02)
Higher than upper secondary	0.07**	(0.04)
Education		
Upper secondary	0.24***	(0.04)
Higher than upper secondary	0.57***	(0.03)
Skill		
Levels 3, 4 and 5	0.22***	(0.04)
R square	0.48	
Hungary		
(Constant)	8.99***	(0.18)
Experience[1]	0.01***	(0.00)
Experience squared[2]	-0.07***	(0.02)
Female	-0.19***	(0.04)
Urban resident	0.10 *	(0.05)
Employed part-time	-0.68***	(0.11)
Native-born	-0.22	(0.19)
Parents' education		
Upper secondary	0.19***	(0.06)
Higher than upper secondary	0.38***	(0.08)

Table 3.2.1 (continued)

Regressions of the log of annual earnings on education and prose skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
Education		
Upper secondary	0.27***	(0.06)
Higher than upper secondary	0.61***	(0.08)
Skill		
Levels 3, 4 and 5	0.10**	(0.05)
R square	0.24	
Italy		
(Constant)	9.81***	(0.18)
Experience[1]	0.01***	(0.00)
Experience squared[2]	-0.02	(0.02)
Female	-0.17***	(0.04)
Urban resident	0.07 *	(0.05)
Employed part-time	-0.47***	(0.11)
Native-born	-0.10	(0.19)
Parents' education		
Upper secondary	0.06	(0.06)
Higher than upper secondary	0.08	(0.08)
Education		
Upper secondary	0.16***	(0.06)
Higher than upper secondary	0.32***	(0.08)
Skill		
Levels 3, 4 and 5	0.07	(0.05)
R square	0.17	
Netherlands		
(Constant)	10.03***	(0.09)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.13***	(0.01)
Female	-0.12**	(0.05)
Urban resident	0.05	(0.03)
Employed part-time	-0.90***	(0.05)
Native-born	0.23 *	(0.12)
Parents' education		
Upper secondary	0.05	(0.05)
Higher than upper secondary	-0.03	(0.05)
Education		
Upper secondary	0.23***	(0.06)
Higher than upper secondary	0.63***	(0.05)
Skill		
Levels 3, 4 and 5	0.12**	(0.06)
R square	0.50	

Table 3.2.1 (continued)

Regressions of the log of annual earnings on education and prose skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
New Zealand		
(Constant)	9.95***	(0.06)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.10***	(0.01)
Female	-0.25***	(0.03)
Urban resident	0.11***	(0.03)
Employed part-time	-1.22***	(0.03)
Native-born	0.05	(0.04)
Parents' education		
Upper secondary	0.03	(0.04)
Higher than upper secondary	0.02	(0.04)
Education		
Upper secondary	0.13**	(0.04)
Higher than upper secondary	0.38***	(0.04)
Skill		
Levels 3, 4 and 5	0.21***	(0.05)
R square	0.50	
Norway		
(Constant)	9.53***	(0.13)
Experience[1]	0.03***	(0.00)
Experience squared[2]	-0.15***	(0.01)
Female	-0.21***	(0.05)
Urban resident	0.21***	(0.05)
Employed part-time	-0.69***	(0.05)
Native-born	0.19 *	(0.11)
Parents' education		
Upper secondary	-0.03	(0.05)
Higher than upper secondary	-0.06	(0.06)
Education		
Upper secondary	0.24***	(0.07)
Higher than upper secondary	0.49***	(0.07)
Skill		
Levels 3, 4 and 5	0.12**	(0.05)
R square	0.39	
Switzerland		
(Constant)	9.71***	(0.10)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.13***	(0.01)
Female	-0.24***	(0.06)
Urban resident	0.13***	(0.04)
Employed part-time	-0.91***	(0.07)
Native-born	-0.03	(0.03)
Parents' education		
Upper secondary	0.04	(0.04)
Higher than upper secondary	0.03	(0.06)

Table 3.2.1 (concluded)

Regressions of the log of annual earnings on education and prose skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
Education		
Upper secondary	0.69***	(0.10)
Higher than upper secondary	1.13***	(0.11)
Skill		
Levels 3, 4 and 5	0.04	(0.07)
R square	0.56	
United States		
(Constant)	9.94***	(0.10)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.08***	(0.02)
Female	-0.40***	(0.05)
Urban resident	0.08	(0.06)
Employed part-time	-1.01***	(0.08)
Native-born	-0.03	(0.05)
Parents' education		
Upper secondary	-0.02	(0.06)
Higher than upper secondary	0.09	(0.06)
Education		
Upper secondary	0.38***	(0.07)
Higher than upper secondary	0.82***	(0.08)
Skill		
Levels 3, 4 and 5	0.19***	(0.07)
R square	0.37	

… not applicable
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
1. Experience was calculated as age minus years of education minus six.
2. Experience squared was divided by 100.
3. Bermuda's entire population resides in urban areas, and therefore this variable was omitted from these models.
4. Individuals who reported working part-time at some point during the previous year.

Notes: The response variable is the natural log of annual earnings for respondents who reported positive, non-zero earnings.
The experience variables were centred at their means to make the terms orthogonal.
The regressions were restricted to respondents in the labour force at the time of the survey.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.2.2

Regressions of the log of annual earnings on education and document skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
Bermuda		
(Constant)	10.79***	(0.10)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.14***	(0.02)
Female	-0.24***	(0.05)
Urban resident[3]	...	...
Employed part-time[4]	-0.71***	(0.08)
Native-born	-0.16***	(0.05)
Parents' education		
Upper secondary	0.00	(0.05)
Higher than upper secondary	-0.05	(0.08)
Education		
Upper secondary	0.02	(0.08)
Higher than upper secondary	0.28***	(0.09)
Skill		
Levels 3, 4 and 5	0.28***	(0.05)
R square	0.35	
Canada		
(Constant)	9.73***	(0.05)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.11***	(0.01)
Female	-0.28***	(0.03)
Urban resident	0.12***	(0.03)
Employed part-time	-0.98***	(0.05)
Native-born	0.06	(0.04)
Parents' education		
Upper secondary	0.09***	(0.02)
Higher than upper secondary	0.07**	(0.03)
Education		
Upper secondary	0.24***	(0.04)
Higher than upper secondary	0.57***	(0.03)
Skill		
Levels 3, 4 and 5	0.22***	(0.03)
R square	0.48	
Hungary		
(Constant)	8.97***	(0.16)
Experience[1]	0.01***	(0.00)
Experience squared[2]	-0.07***	(0.02)
Female	-0.19***	(0.04)
Urban resident	0.09 *	(0.05)
Employed part-time	-0.68***	(0.11)
Native-born	-0.21	(0.18)
Parents' education		
Upper secondary	0.18***	(0.06)
Higher than upper secondary	0.37***	(0.08)

Table 3.2.2 (continued)

Regressions of the log of annual earnings on education and document skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
Education		
Upper secondary	0.26***	(0.06)
Higher than upper secondary	0.60***	(0.08)
Skill		
Levels 3, 4 and 5	0.13**	(0.05)
R square	0.25	
Italy		
(Constant)	9.81***	(0.15)
Experience[1]	0.01***	(0.00)
Experience squared[2]	-0.02	(0.01)
Female	-0.17***	(0.03)
Urban resident	0.07 *	(0.04)
Employed part-time	-0.46***	(0.06)
Native-born	-0.10	(0.13)
Parents' education		
Upper secondary	0.06	(0.04)
Higher than upper secondary	0.09	(0.11)
Education		
Upper secondary	0.16***	(0.04)
Higher than upper secondary	0.32***	(0.05)
Skill		
Levels 3, 4 and 5	0.07	(0.05)
R square	0.17	
Netherlands		
(Constant)	10.01***	(0.08)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.13***	(0.01)
Female	-0.11**	(0.05)
Urban resident	0.05	(0.03)
Employed part-time	-0.90***	(0.05)
Native-born	0.23 *	(0.12)
Parents' education		
Upper secondary	0.05	(0.05)
Higher than upper secondary	-0.03	(0.05)
Education		
Upper secondary	0.23***	(0.05)
Higher than upper secondary	0.64***	(0.05)
Skill		
Levels 3, 4 and 5	0.11**	(0.05)
R square	0.50	

Table 3.2.2 (continued)

Regressions of the log of annual earnings on education and document skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
New Zealand		
(Constant)	9.94***	(0.05)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.10***	(0.01)
Female	-0.24***	(0.03)
Urban resident	0.10***	(0.03)
Employed part-time	-1.22***	(0.03)
Native-born	0.05	(0.04)
Parents' education		
Upper secondary	0.03	(0.04)
Higher than upper secondary	0.03	(0.04)
Education		
Upper secondary	0.14***	(0.04)
Higher than upper secondary	0.39***	(0.04)
Skill		
Levels 3, 4 and 5	0.22***	(0.04)
R square	0.50	
Norway		
(Constant)	9.52***	(0.13)
Experience[1]	0.03***	(0.00)
Experience squared[2]	-0.15***	(0.01)
Female	-0.20***	(0.04)
Urban resident	0.21***	(0.05)
Employed part-time	-0.68***	(0.05)
Native-born	0.19 *	(0.11)
Parents' education		
Upper secondary	-0.02	(0.05)
Higher than upper secondary	-0.06	(0.06)
Education		
Upper secondary	0.23***	(0.07)
Higher than upper secondary	0.49***	(0.07)
Skill		
Levels 3, 4 and 5	0.12**	(0.05)
R square	0.39	
Switzerland		
(Constant)	9.70***	(0.10)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.13***	(0.01)
Female	-0.24***	(0.06)
Urban resident	0.13***	(0.04)
Employed part-time	-0.91***	(0.07)
Native-born	-0.03	(0.03)
Parents' education		
Upper secondary	0.03	(0.03)
Higher than upper secondary	0.03	(0.05)

Table 3.2.2 (concluded)

Regressions of the log of annual earnings on education and document skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
Education		
Upper secondary	0.69***	(0.10)
Higher than upper secondary	1.13***	(0.11)
Skill		
Levels 3, 4 and 5	0.05	(0.05)
R square	0.56	
United States		
(Constant)	9.92***	(0.10)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.08***	(0.02)
Female	-0.39***	(0.05)
Urban resident	0.07	(0.06)
Employed part-time	-1.01***	(0.08)
Native-born	-0.02	(0.05)
Parents' education		
Upper secondary	-0.03	(0.05)
Higher than upper secondary	0.08	(0.06)
Education		
Upper secondary	0.39***	(0.07)
Higher than upper secondary	0.84***	(0.08)
Skill		
Levels 3, 4 and 5	0.18***	(0.06)
R square	0.37	

… not applicable
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
1. Experience was calculated as age minus years of education minus six.
2. Experience squared was divided by 100.
3. Bermuda's entire population resides in urban areas, and therefore this variable was omitted from these models.
4. Individuals who reported working part-time at some point during the previous year.

Notes: The response variable is the natural log of annual earnings for respondents who reported positive, non-zero earnings.
The experience variables were centred at their means to make the terms orthogonal.
The regressions were restricted to respondents in the labour force at the time of the survey.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.2.3

Regressions of the log of annual earnings on education and numeracy skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
Bermuda		
(Constant)	10.79***	(0.10)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.14***	(0.02)
Female	-0.22***	(0.05)
Urban resident[3]	…	…
Employed part-time[4]	-0.70***	(0.08)
Native-born	-0.14**	(0.05)
Parents' education		
Upper secondary	0.01	(0.05)
Higher than upper secondary	-0.06	(0.08)
Education		
Upper secondary	0.00	(0.08)
Higher than upper secondary	0.26***	(0.09)
Skill		
Levels 3, 4 and 5	0.29***	(0.05)
R square	0.35	
Canada		
(Constant)	9.74***	(0.05)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.11***	(0.01)
Female	-0.27***	(0.03)
Urban resident	0.12***	(0.03)
Employed part-time	-0.98***	(0.05)
Native-born	0.08	(0.04)
Parents' education		
Upper secondary	0.09***	(0.02)
Higher than upper secondary	0.08**	(0.03)
Education		
Upper secondary	0.25***	(0.04)
Higher than upper secondary	0.58***	(0.03)
Skill		
Levels 3, 4 and 5	0.20***	(0.04)
R square	0.48	
Hungary		
(Constant)	8.99***	(0.17)
Experience[1]	0.01***	(0.00)
Experience squared[2]	-0.06***	(0.02)
Female	-0.19***	(0.04)
Urban resident	0.09 *	(0.05)
Employed part-time	-0.68***	(0.11)
Native-born	-0.22	(0.18)
Parents' education		
Upper secondary	0.19***	(0.06)
Higher than upper secondary	0.37***	(0.08)

Table 3.2.3 (continued)

Regressions of the log of annual earnings on education and numeracy skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
Education		
Upper secondary	0.26***	(0.05)
Higher than upper secondary	0.60***	(0.07)
Skill		
Levels 3, 4 and 5	0.12***	(0.04)
R square	0.24	
Italy		
(Constant)	9.80***	(0.15)
Experience[1]	0.01***	(0.00)
Experience squared[2]	-0.02	(0.01)
Female	-0.17***	(0.03)
Urban resident	0.07 *	(0.04)
Employed part-time	-0.46***	(0.06)
Native-born	-0.09	(0.13)
Parents' education		
Upper secondary	0.07 *	(0.04)
Higher than upper secondary	0.08	(0.11)
Education		
Upper secondary	0.16***	(0.04)
Higher than upper secondary	0.31***	(0.05)
Skill		
Levels 3, 4 and 5	0.09 *	(0.05)
R square	0.17	
Netherlands		
(Constant)	10.01***	(0.09)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.13***	(0.01)
Female	-0.10**	(0.04)
Urban resident	0.06	(0.04)
Employed part-time	-0.89***	(0.05)
Native-born	0.22 *	(0.12)
Parents' education		
Upper secondary	0.05	(0.05)
Higher than upper secondary	-0.03	(0.05)
Education		
Upper secondary	0.23***	(0.05)
Higher than upper secondary	0.64***	(0.05)
Skill		
Levels 3, 4 and 5	0.13 *	(0.07)
R square	0.50	

Table 3.2.3 (continued)

Regressions of the log of annual earnings on education and numeracy skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
New Zealand		
(Constant)	9.94***	(0.05)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.10***	(0.01)
Female	-0.23***	(0.03)
Urban resident	0.11***	(0.03)
Employed part-time	-1.21***	(0.03)
Native-born	0.05	(0.04)
Parents' education		
Upper secondary	0.03	(0.04)
Higher than upper secondary	0.01	(0.04)
Education		
Upper secondary	0.13***	(0.05)
Higher than upper secondary	0.38***	(0.05)
Skill		
Levels 3, 4 and 5	0.22***	(0.04)
R square	0.50	
Norway		
(Constant)	9.53***	(0.14)
Experience[1]	0.03***	(0.00)
Experience squared[2]	-0.15***	(0.01)
Female	-0.19***	(0.05)
Urban resident	0.22***	(0.05)
Employed part-time	-0.68***	(0.05)
Native-born	0.19 *	(0.11)
Parents' education		
Upper secondary	-0.03	(0.05)
Higher than upper secondary	-0.07	(0.06)
Education		
Upper secondary	0.24***	(0.07)
Higher than upper secondary	0.48***	(0.07)
Skill		
Levels 3, 4 and 5	0.12**	(0.05)
R square	0.39	
Switzerland		
(Constant)	9.69***	(0.09)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.13***	(0.01)
Female	-0.23***	(0.06)
Urban resident	0.13***	(0.04)
Employed part-time	-0.91***	(0.07)
Native-born	-0.04	(0.04)
Parents' education		
Upper secondary	0.03	(0.04)
Higher than upper secondary	0.02	(0.05)

Table 3.2.3 (concluded)

Regressions of the log of annual earnings on education and numeracy skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients		
	β		standard error
Education			
Upper secondary	0.69***		(0.10)
Higher than upper secondary	1.12***		(0.12)
Skill			
Levels 3, 4 and 5	0.08		(0.07)
R square		0.56	
United States			
(Constant)	9.92***		(0.10)
Experience[1]	0.02***		(0.00)
Experience squared[2]	-0.08***		(0.02)
Female	-0.36***		(0.05)
Urban resident	0.08		(0.07)
Employed part-time	-1.02***		(0.08)
Native-born	-0.02		(0.05)
Parents' education			
Upper secondary	-0.03		(0.05)
Higher than upper secondary	0.07		(0.06)
Education			
Upper secondary	0.39***		(0.07)
Higher than upper secondary	0.81***		(0.08)
Skill			
Levels 3, 4 and 5	0.23***		(0.06)
R square		0.37	

… not applicable
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
1. Experience was calculated as age minus years of education minus six.
2. Experience squared was divided by 100.
3. Bermuda's entire population resides in urban areas, and therefore this variable was omitted from these models.
4. Individuals who reported working part-time at some point during the previous year.

Notes: The response variable is the natural log of annual earnings for respondents who reported positive, non-zero earnings.
The experience variables were centred at their means to make the terms orthogonal.
Experience*[2] was divided by 100.
The regressions were restricted to respondents in the labour force at the time of the survey.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.2.4

Regressions of the log of annual earnings on education and problem solving skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
Bermuda		
(Constant)	10.77***	(0.10)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.13***	(0.02)
Female	-0.25***	(0.05)
Urban resident[3]	…	…
Employed part-time[4]	-0.69***	(0.09)
Native-born	-0.15***	(0.05)
Parents' education		
Upper secondary	0.02	(0.05)
Higher than upper secondary	-0.02	(0.08)
Education		
Upper secondary	0.00	(0.08)
Higher than upper secondary	0.28***	(0.09)
Skill		
Levels 2, 3 and 4	0.23***	(0.05)
R square	0.34	
Canada		
(Constant)	9.71***	(0.05)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.11***	(0.01)
Female	-0.29***	(0.03)
Urban resident	0.12***	(0.03)
Employed part-time	-0.98***	(0.05)
Native-born	0.06	(0.04)
Parents' education		
Upper secondary	0.09***	(0.02)
Higher than upper secondary	0.08**	(0.03)
Education		
Upper secondary	0.25***	(0.04)
Higher than upper secondary	0.60***	(0.03)
Skill		
Levels 2, 3 and 4	0.19***	(0.03)
R square	0.47	
Hungary		
(Constant)	8.97***	(0.20)
Experience[1]	0.01***	(0.00)
Experience squared[2]	-0.07***	(0.02)
Female	-0.19***	(0.04)
Urban resident	0.09 *	(0.05)
Employed part-time	-0.68***	(0.11)
Native-born	-0.22	(0.20)
Parents' education		
Upper secondary	0.18***	(0.06)
Higher than upper secondary	0.37***	(0.08)

Table 3.2.4 (continued)

Regressions of the log of annual earnings on education and problem solving skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
Education		
Upper secondary	0.27***	(0.06)
Higher than upper secondary	0.62***	(0.08)
Skill		
Levels 2, 3 and 4	0.10 *	(0.05)
R square	0.24	
Italy		
(Constant)	9.81***	(0.15)
Experience[1]	0.01***	(0.00)
Experience squared[2]	-0.02	(0.01)
Female	-0.17***	(0.03)
Urban resident	0.07 *	(0.04)
Employed part-time	-0.46***	(0.06)
Native-born	-0.10	(0.13)
Parents' education		
Upper secondary	0.07 *	(0.04)
Higher than upper secondary	0.09	(0.11)
Education		
Upper secondary	0.16***	(0.04)
Higher than upper secondary	0.32***	(0.05)
Skill		
Levels 2, 3 and 4	0.05	(0.04)
R square	0.17	
Netherlands		
(Constant)	10.02***	(0.09)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.13***	(0.01)
Female	-0.12**	(0.05)
Urban resident	0.05	(0.03)
Employed part-time	-0.90***	(0.05)
Native-born	0.23 *	(0.12)
Parents' education		
Upper secondary	0.05	(0.05)
Higher than upper secondary	-0.02	(0.05)
Education		
Upper secondary	0.24***	(0.06)
Higher than upper secondary	0.66***	(0.05)
Skill		
Levels 2, 3 and 4	0.08	(0.07)
R square	0.50	

Table 3.2.4 (continued)

Regressions of the log of annual earnings on education and problem solving skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
New Zealand		
(Constant)	9.89***	(0.06)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.10***	(0.01)
Female	-0.25***	(0.03)
Urban resident	0.10***	(0.03)
Employed part-time	-1.22***	(0.03)
Native-born	0.04	(0.04)
Parents' education		
Upper secondary	0.02	(0.04)
Higher than upper secondary	0.02	(0.04)
Education		
Upper secondary	0.13**	(0.04)
Higher than upper secondary	0.39***	(0.04)
Skill		
Levels 2, 3 and 4	0.27***	(0.05)
R square	0.50	
Norway		
(Constant)	9.50***	(0.14)
Experience[1]	0.03***	(0.00)
Experience squared[2]	-0.15***	(0.01)
Female	-0.21***	(0.04)
Urban resident	0.22***	(0.05)
Employed part-time	-0.69***	(0.05)
Native-born	0.18	(0.11)
Parents' education		
Upper secondary	-0.03	(0.05)
Higher than upper secondary	-0.07	(0.06)
Education		
Upper secondary	0.23***	(0.07)
Higher than upper secondary	0.48***	(0.07)
Skill		
Levels 2, 3 and 4	0.15 *	(0.08)
R square	0.39	

Table 3.2.4 (concluded)

Regressions of the log of annual earnings on education and problem solving skills, controlling for experience, gender, community size, nativity and parents' education, ALL 2003 and 2008

	Unstandardized coefficients	
	β	standard error
Switzerland[5]		
(Constant)	9.67***	(0.11)
Experience[1]	0.02***	(0.00)
Experience squared[2]	-0.13***	(0.01)
Female	-0.24***	(0.06)
Upper secondary	0.13***	(0.04)
Higher than upper secondary	-0.90***	(0.07)
Native-born	-0.03	(0.03)
Parents' education		
Upper secondary	0.04	(0.04)
Higher than upper secondary	0.04	(0.06)
Education		
Upper secondary	0.70***	(0.10)
Higher than upper secondary	1.14***	(0.11)
Skill		
Levels 2, 3 and 4	0.06	(0.06)
R square	0.57	

… not applicable
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
1. Experience was calculated as age minus years of education minus six.
2. Experience squared was divided by 100.
3. Bermuda's entire population resides in urban areas, and therefore this variable was omitted from these models.
4. Individuals who reported working part-time at some point during the previous year.
5. These models for Switzerland apply to the German and French speaking communities only, since they did not field the problem solving skills domain in the Italian speaking community.

Notes: The response variable is the natural log of annual earnings for respondents who reported positive, non-zero earnings.
The experience variables were centred at their means to make the terms orthogonal.
Experience*2 was divided by 100.
The regressions were restricted to respondents in the labour force at the time of the survey.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.3.1

Percentage distribution of the labour force populations aged 16 to 65 years with low earnings by skill level, ALL 2003 and 2008

	Half the median earnings or less			
	Skill level[1]			
	Levels 1 and 2		Levels 3, 4 and 5	
	per cent	standard error	per cent	standard error
A. Prose literacy skills				
Bermuda	20.0	(1.9)	14.3	(1.6)
Canada	29.8	(1.3)	23.8	(1.0)
Hungary	12.4	(1.5)	6.7	(1.0)
Italy	11.3	(1.1)	10.4	(1.7)
Netherlands	26.6	(2.0)	20.4	(1.4)
New Zealand	31.3	(1.4)	23.0	(1.3)
Norway	24.2	(1.5)	24.1	(0.9)
Switzerland	26.7	(1.9)	24.5	(1.5)
United States	28.0	(1.3)	21.0	(1.6)
B. Document literacy skills				
Bermuda	18.6	(2.0)	14.7	(1.8)
Canada	29.0	(1.2)	24.2	(1.1)
Hungary	12.6	(1.5)	6.4	(0.8)
Italy	11.7	(1.1)	8.7	(1.6)
Netherlands	27.3	(1.9)	20.4	(1.3)
New Zealand	31.0	(1.4)	23.3	(1.2)
Norway	25.7	(2.0)	23.5	(0.9)
Switzerland	27.8	(2.2)	23.8	(1.3)
United States	28.1	(1.4)	21.0	(1.7)
C. Numeracy skills				
Bermuda	19.0	(1.8)	13.5	(1.8)
Canada	29.2	(0.8)	23.4	(1.1)
Hungary	13.3	(1.7)	6.4	(1.0)
Italy	12.3	(1.1)	7.0	(1.8)
Netherlands	32.0	(2.2)	18.6	(1.2)
New Zealand	31.8	(1.3)	21.6	(1.2)
Norway	26.9	(1.7)	22.5	(0.8)
Switzerland	29.4	(2.5)	23.4	(1.5)
United States	27.9	(1.5)	20.1	(1.8)
D. Problem solving skills[2]				
Bermuda	22.6	(2.7)	13.6	(1.6)
Canada	29.0	(1.4)	25.0	(0.8)
Hungary	13.6	(1.6)	7.2	(0.8)
Italy	11.9	(1.4)	9.6	(1.4)
Netherlands	29.1	(2.9)	21.3	(1.2)
New Zealand	33.1	(1.9)	24.0	(1.2)
Norway	23.3	(2.1)	24.3	(0.7)
Switzerland[3]	26.4	(2.8)	25.3	(0.9)

1. Comparisons for the problem solving domain are made between levels 1 and levels 2, 3 and 4.
2. United States did not field the problem solving skills domain.
3. The problem solving skills scores for Switzerland apply to the German and French speaking communities only since they did not field the problem solving skills domain in the Italian speaking community.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.3.2

Percentage distribution of the labour force populations aged 16 to 65 years with low earnings by education level, document skills, ALL 2003 and 2008

	Half the median earnings or less					
	Level of education					
	Less than upper secondary		Upper secondary		Higher than upper secondary	
	per cent	standard error	per cent	standard error	per cent	standard error
Bermuda	23.2	(3.5)	20.2	(2.4)	13.4	(1.5)
Canada	45.4	(1.8)	32.2	(1.4)	14.9	(0.8)
Hungary	19.7	(2.7)	8.4	(0.8)	4.9	(1.2)
Italy	14.1	(1.4)	9.2	(1.1)	6.4	(1.3)
Netherlands	35.4	(2.2)	24.7	(2.0)	11.7	(1.0)
New Zealand	34.5	(1.6)	32.6	(1.8)	18.4	(1.0)
Norway	30.8	(1.8)	28.6	(1.2)	16.9	(1.0)
Switzerland	57.3	(3.8)	26.5	(0.8)	7.9	(1.5)
United States	51.7	(3.0)	25.7	(1.6)	11.8	(1.1)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.4.1

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, prose skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Bermuda			
(Constant)	-0.73 *	(0.38)	0.48
Experience[1]	0.06***	(0.01)	1.06
Female	-0.67***	(0.17)	0.51
Urban resident[2]	…	…	…
Native-born	0.14	(0.18)	1.15
Parents' education			
Upper secondary	0.08	(0.26)	1.08
Higher than upper secondary	-0.32	(0.31)	0.73
Education			
Upper secondary	1.02***	(0.34)	2.78
Higher than upper secondary	1.70***	(0.35)	5.45
Skill			
Levels 3, 4 and 5	0.57***	(0.19)	1.76

Table 3.4.1 (continued)

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, prose skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Canada			
(Constant)	-1.31***	(0.20)	0.27
Experience[1]	0.07***	(0.00)	1.08
Female	-0.89***	(0.08)	0.41
Urban resident	0.22**	(0.09)	1.24
Native-born	0.10	(0.14)	1.11
Parents' education			
Upper secondary	0.18 *	(0.10)	1.19
Higher than upper secondary	-0.13	(0.09)	0.88
Education			
Upper secondary	0.89***	(0.13)	2.44
Higher than upper secondary	1.99***	(0.14)	7.28
Skill			
Levels 3, 4 and 5	0.34***	(0.12)	1.40
Hungary			
(Constant)	0.08	(1.15)	1.08
Experience[1]	0.04***	(0.01)	1.04
Female	-0.37**	(0.16)	0.69
Urban resident	0.43**	(0.17)	1.54
Native-born	0.09	(1.09)	1.09
Parents' education			
Upper secondary	0.32 *	(0.17)	1.38
Higher than upper secondary	0.58 *	(0.29)	1.79
Education			
Upper secondary	0.79***	(0.22)	2.21
Higher than upper secondary	1.36***	(0.30)	3.88
Skill			
Levels 3, 4 and 5	0.55**	(0.24)	1.74
Italy			
(Constant)	1.50**	(0.71)	4.49
Experience[1]	0.04***	(0.01)	1.05
Female	-1.32***	(0.20)	0.27
Urban resident	0.22	(0.18)	1.25
Native-born	-0.32	(0.58)	0.72
Parents' education			
Upper secondary	0.12	(0.21)	1.13
Higher than upper secondary	-0.09	(0.58)	0.91
Education			
Upper secondary	1.08***	(0.23)	2.94
Higher than upper secondary	1.53***	(0.28)	4.64
Skill			
Levels 3, 4 and 5	-0.05	(0.28)	0.95

Table 3.4.1 (continued)

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, prose skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Norway			
(Constant)	-1.07***	(0.30)	0.34
Experience[1]	0.06***	(0.01)	1.06
Female	-0.56***	(0.13)	0.57
Urban resident	0.46***	(0.16)	1.58
Native-born	0.24	(0.22)	1.27
Parents' education			
Upper secondary	-0.13	(0.14)	0.88
Higher than upper secondary	-0.54***	(0.11)	0.58
Education			
Upper secondary	0.61***	(0.14)	1.84
Higher than upper secondary	1.29***	(0.14)	3.63
Skill			
Levels 3, 4 and 5	0.34**	(0.16)	1.40
New Zealand			
(Constant)	-0.15	(0.19)	0.86
Experience[1]	0.04***	(0.00)	1.05
Female	-1.09***	(0.09)	0.33
Urban resident	0.07	(0.12)	1.08
Native-born	0.21**	(0.10)	1.24
Parents' education			
Upper secondary	0.17 *	(0.10)	1.19
Higher than upper secondary	0.02	(0.13)	1.02
Education			
Upper secondary	0.35***	(0.14)	1.42
Higher than upper secondary	1.08***	(0.11)	2.95
Skill			
Levels 3, 4 and 5	0.25**	(0.12)	1.28
Netherlands			
(Constant)	-0.30	(0.39)	0.74
Experience[1]	0.05***	(0.01)	1.05
Female	-1.20***	(0.15)	0.30
Urban resident	0.04	(0.13)	1.04
Native-born	0.26	(0.42)	1.30
Parents' education			
Upper secondary	-0.06	(0.16)	0.94
Higher than upper secondary	-0.52***	(0.17)	0.60
Education			
Upper secondary	0.87***	(0.16)	2.39
Higher than upper secondary	2.01***	(0.22)	7.44
Skill			
Levels 3, 4 and 5	0.33 *	(0.17)	1.39

Table 3.4.1 (concluded)

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, prose skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Switzerland			
(Constant)	-0.39	(0.27)	0.68
Experience[1]	0.05***	(0.01)	1.05
Female	-1.71***	(0.13)	0.18
Urban resident	0.39 *	(0.20)	1.48
Native-born	-0.28	(0.19)	0.76
Parents' education			
Upper secondary	-0.15	(0.18)	0.86
Higher than upper secondary	-0.73***	(0.17)	0.48
Education			
Upper secondary	1.70***	(0.18)	5.49
Higher than upper secondary	3.09***	(0.29)	21.91
Skill			
Levels 3, 4 and 5	0.10	(0.23)	1.11
United States			
(Constant)	-0.85**	(0.31)	0.43
Experience[1]	0.06***	(0.00)	1.06
Female	-1.08***	(0.10)	0.34
Urban resident	0.31 *	(0.18)	1.36
Native-born	-0.02	(0.23)	0.98
Parents' education			
Upper secondary	0.27	(0.18)	1.30
Higher than upper secondary	0.10	(0.17)	1.10
Education			
Upper secondary	1.12***	(0.18)	3.05
Higher than upper secondary	2.18***	(0.19)	8.84
Skill			
Levels 3, 4 and 5	0.03	(0.13)	1.04

… not applicable
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
1. Experience was calculated as age minus years of education minus six.
2. Bermuda's entire population resides in urban areas, and therefore this variable was omitted from these models.

Notes: The response variable dichotomizes the population into those who reported earnings equivalent to half of their country's median earnings or less (0) and those who earned greater than half the median earnings (1).

The regressions were restricted to respondents in the labour force who reported positive, non-zero earnings.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.4.2

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, document skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Bermuda			
(Constant)	-0.70 *	(0.37)	0.50
Experience[1]	0.06***	(0.01)	1.06
Female	-0.63***	(0.17)	0.53
Urban resident[2]	...	...	...
Native-born	0.14	(0.18)	1.15
Parents' education			
Upper secondary	0.06	(0.26)	1.06
Higher than upper secondary	-0.31	(0.33)	0.74
Education			
Upper secondary	1.06***	(0.34)	2.90
Higher than upper secondary	1.77***	(0.36)	5.85
Skill			
Levels 3, 4 and 5	0.46	(0.27)	1.58
Canada			
(Constant)	-1.34***	(0.20)	0.26
Experience[1]	0.08***	(0.01)	1.08
Female	-0.87***	(0.08)	0.42
Urban resident	0.21**	(0.09)	1.24
Native-born	0.12	(0.13)	1.13
Parents' education			
Upper secondary	0.17	(0.10)	1.19
Higher than upper secondary	-0.13	(0.09)	0.88
Education			
Upper secondary	0.90***	(0.13)	2.46
Higher than upper secondary	2.00***	(0.13)	7.40
Skill			
Levels 3, 4 and 5	0.31**	(0.12)	1.37
Hungary			
(Constant)	0.03	(1.11)	1.03
Experience[1]	0.04***	(0.01)	1.04
Female	-0.35**	(0.16)	0.71
Urban resident	0.43**	(0.17)	1.54
Native-born	0.13	(1.06)	1.14
Parents' education			
Upper secondary	0.29	(0.17)	1.33
Higher than upper secondary	0.56 *	(0.29)	1.74
Education			
Upper secondary	0.78***	(0.22)	2.18
Higher than upper secondary	1.35***	(0.29)	3.85
Skill			
Levels 3, 4 and 5	0.64***	(0.20)	1.89

Table 3.4.2 (continued)

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, document skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Italy			
(Constant)	1.48**	(0.71)	4.37
Experience[1]	0.04***	(0.01)	1.05
Female	-1.32***	(0.21)	0.27
Urban resident	0.22	(0.18)	1.24
Native-born	-0.31	(0.58)	0.73
Parents' education			
Upper secondary	0.11	(0.20)	1.11
Higher than upper secondary	-0.11	(0.55)	0.90
Education			
Upper secondary	1.06***	(0.22)	2.87
Higher than upper secondary	1.49***	(0.29)	4.44
Skill			
Levels 3, 4 and 5	0.10	(0.24)	1.10
Norway			
(Constant)	-1.14***	(0.31)	0.32
Experience[1]	0.06***	(0.01)	1.06
Female	-0.52***	(0.13)	0.59
Urban resident	0.46***	(0.16)	1.58
Native-born	0.22	(0.22)	1.24
Parents' education			
Upper secondary	-0.13	(0.14)	0.88
Higher than upper secondary	-0.54***	(0.11)	0.58
Education			
Upper secondary	0.57***	(0.15)	1.77
Higher than upper secondary	1.25***	(0.15)	3.49
Skill			
Levels 3, 4 and 5	0.45***	(0.15)	1.57
New Zealand			
(Constant)	-0.19	(0.19)	0.83
Experience[1]	0.04***	(0.00)	1.05
Female	-1.08***	(0.09)	0.34
Urban resident	0.07	(0.12)	1.08
Native-born	0.22 *	(0.10)	1.25
Parents' education			
Upper secondary	0.18 *	(0.10)	1.19
Higher than upper secondary	0.03	(0.13)	1.03
Education			
Upper secondary	0.36***	(0.14)	1.43
Higher than upper secondary	1.09***	(0.12)	2.98
Skill			
Levels 3, 4 and 5	0.24**	(0.11)	1.27

Table 3.4.2 (continued)

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, document skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Netherlands			
(Constant)	-0.38	(0.40)	0.68
Experience[1]	0.05***	(0.01)	1.05
Female	-1.16***	(0.15)	0.31
Urban resident	0.04	(0.13)	1.05
Native-born	0.25	(0.41)	1.29
Parents' education			
Upper secondary	-0.06	(0.16)	0.94
Higher than upper secondary	-0.50***	(0.16)	0.61
Education			
Upper secondary	0.88***	(0.16)	2.40
Higher than upper secondary	2.02***	(0.22)	7.53
Skill			
Levels 3, 4 and 5	0.36 *	(0.19)	1.43
Switzerland			
(Constant)	-0.46	(0.28)	0.63
Experience[1]	0.05***	(0.01)	1.05
Female	-1.70***	(0.13)	0.18
Urban resident	0.40 *	(0.20)	1.49
Native-born	-0.29	(0.17)	0.75
Parents' education			
Upper secondary	-0.17	(0.19)	0.85
Higher than upper secondary	-0.77***	(0.19)	0.47
Education			
Upper secondary	1.69***	(0.19)	5.44
Higher than upper secondary	3.05***	(0.30)	21.17
Skill			
Levels 3, 4 and 5	0.24	(0.20)	1.27
United States			
(Constant)	-0.85***	(0.31)	0.43
Experience[1]	0.06***	(0.00)	1.06
Female	-1.07***	(0.10)	0.34
Urban resident	0.31	(0.18)	1.36
Native-born	-0.03	(0.23)	0.97
Parents' education			
Upper secondary	0.25	(0.18)	1.29
Higher than upper secondary	0.08	(0.16)	1.08

Table 3.4.2 (concluded)

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, document skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Education			
Upper secondary	1.11***	(0.18)	3.03
Higher than upper secondary	2.16***	(0.19)	8.65
Skill			
Levesl 3, 4 and 5	0.10	(0.13)	1.10

... not applicable
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
1. Experience was calculated as age minus years of education minus six.
2. Bermuda's entire population resides in urban areas, and therefore this variable was omitted from these models.

Notes: The response variable dichotomizes the population into those who reported earnings equivalent to half of their country's median earnings or less (0) and those who earned greater than half the median earnings (1).

The regressions were restricted to respondents in the labour force who reported positive, non-zero earnings.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.4.3

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, numeracy skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Bermuda			
(Constant)	-0.69 *	(0.39)	0.50
Experience[1]	0.06***	(0.01)	1.06
Female	-0.60***	(0.18)	0.55
Urban resident[2]	...	...	...
Native-born	0.16	(0.19)	1.17
Parents' education			
Upper secondary	0.08	(0.26)	1.09
Higher than upper secondary	-0.32	(0.31)	0.73
Education			
Upper secondary	1.05***	(0.33)	2.86
Higher than upper secondary	1.75***	(0.32)	5.76
Skill			
Levels 3, 4 and 5	0.47**	(0.22)	1.60

Table 3.4.3 (continued)

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, numeracy skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Canada			
(Constant)	-1.32***	(0.21)	0.27
Experience[1]	0.07***	(0.01)	1.08
Female	-0.85***	(0.08)	0.43
Urban resident	0.21**	(0.09)	1.23
Native-born	0.14	(0.13)	1.15
Parents' education			
Upper secondary	0.18 *	(0.10)	1.20
Higher than upper secondary	-0.11	(0.09)	0.89
Education			
Upper secondary	0.91***	(0.13)	2.49
Higher than upper secondary	2.02***	(0.14)	7.51
Skill			
Levels 3, 4 and 5	0.26 *	(0.13)	1.29
Hungary			
(Constant)	0.13	(1.14)	1.14
Experience[1]	0.04***	(0.01)	1.04
Female	-0.34**	(0.16)	0.71
Urban resident	0.43**	(0.17)	1.53
Native-born	0.07	(1.09)	1.08
Parents' education			
Upper secondary	0.29 *	(0.17)	1.33
Higher than upper secondary	0.52 *	(0.30)	1.68
Education			
Upper secondary	0.76***	(0.22)	2.13
Higher than upper secondary	1.33***	(0.30)	3.79
Skill			
Levels 3, 4 and 5	0.56 *	(0.26)	1.75
Italy			
(Constant)	1.44 *	(0.72)	4.22
Experience[1]	0.04***	(0.01)	1.05
Female	-1.30***	(0.21)	0.27
Urban resident	0.21	(0.18)	1.24
Native-born	-0.30	(0.59)	0.74
Parents' education			
Upper secondary	0.11	(0.21)	1.12
Higher than upper secondary	-0.16	(0.56)	0.86
Education			
Upper secondary	1.01***	(0.22)	2.74
Higher than upper secondary	1.41***	(0.28)	4.11
Skill			
Levels 3, 4 and 5	0.34	(0.28)	1.41

Table 3.4.3 (continued)

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, numeracy skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Norway			
(Constant)	-1.06***	(0.32)	0.35
Experience[1]	0.06***	(0.01)	1.06
Female	-0.50***	(0.13)	0.61
Urban resident	0.47***	(0.16)	1.60
Native-born	0.25	(0.21)	1.28
Parents' education			
Upper secondary	-0.13	(0.14)	0.88
Higher than upper secondary	-0.55***	(0.12)	0.58
Education			
Upper secondary	0.60***	(0.14)	1.82
Higher than upper secondary	1.27***	(0.14)	3.55
Skill			
Levels 3, 4 and 5	0.34**	(0.15)	1.41
New Zealand			
(Constant)	-0.18 *	(0.19)	0.84
Experience[1]	0.04***	(0.00)	1.05
Female	-1.06***	(0.09)	0.35
Urban resident	0.08	(0.12)	1.08
Native-born	0.22 *	(0.10)	1.25
Parents' education			
Upper secondary	0.17 *	(0.10)	1.19
Higher than upper secondary	0.01	(0.13)	1.01
Education			
Upper secondary	0.35**	(0.14)	1.42
Higher than upper secondary	1.07***	(0.11)	2.93
Skill			
Levels 3, 4 and 5	0.27**	(0.10)	1.32
Netherlands			
(Constant)	-0.41	(0.38)	0.66
Experience[1]	0.05***	(0.01)	1.05
Female	-1.12***	(0.15)	0.33
Urban resident	0.06	(0.13)	1.06
Native-born	0.18	(0.42)	1.20
Parents' education			
Upper secondary	-0.08	(0.17)	0.92
Higher than upper secondary	-0.54***	(0.17)	0.58
Education			
Upper secondary	0.84***	(0.16)	2.33
Higher than upper secondary	1.96***	(0.20)	7.11
Skill			
Levels 3, 4 and 5	0.54**	(0.19)	1.71

Table 3.4.3 (concluded)

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, numeracy skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Switzerland			
(Constant)	-0.42 *	(0.24)	0.66
Experience[1]	0.05***	(0.01)	1.05
Female	-1.70***	(0.13)	0.18
Urban resident	0.39 *	(0.20)	1.48
Native-born	-0.28	(0.19)	0.76
Parents' education			
Upper secondary	-0.15	(0.18)	0.86
Higher than upper secondary	-0.73***	(0.17)	0.48
Education			
Upper secondary	1.70***	(0.19)	5.47
Higher than upper secondary	3.08***	(0.32)	21.76
Skill			
Levels 3, 4 and 5	0.12	(0.23)	1.13
United States			
(Constant)	-0.85**	(0.31)	0.43
Experience[1]	0.06***	(0.00)	1.06
Female	-1.07***	(0.10)	0.34
Urban resident	0.31 *	(0.18)	1.36
Native-born	-0.01	(0.23)	0.99
Parents' education			
Upper secondary	0.27	(0.18)	1.31
Higher than upper secondary	0.10	(0.16)	1.10
Education			
Upper secondary	1.12***	(0.18)	3.06
Higher than upper secondary	2.19***	(0.20)	8.89
Skill			
Levels 3, 4 and 5	0.03	(0.15)	1.03

... not applicable
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
1. Experience was calculated as age minus years of education minus six.
2. Bermuda's entire population resides in urban areas, and therefore this variable was omitted from these models.

Notes: The response variable dichotomizes the population into those who reported earnings equivalent to half of their country's median earnings or less (0) and those who earned greater than half the median earnings (1).
The regressions were restricted to respondents in the labour force who reported positive, non-zero earnings.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.4.4

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, problem solving skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Bermuda			
(Constant)	-0.83**	(0.38)	0.44
Experience[1]	0.06***	(0.01)	1.06
Female	-0.69***	(0.17)	0.50
Urban resident[2]	...	...	...
Native-born	0.17	(0.18)	1.19
Parents' education			
Upper secondary	0.06	(0.27)	1.06
Higher than upper secondary	-0.31	(0.31)	0.73
Education			
Upper secondary	0.95**	(0.35)	2.57
Higher than upper secondary	1.62***	(0.34)	5.06
Skill			
Levels 2, 3 and 4	0.76***	(0.24)	2.13
Canada			
(Constant)	-1.37***	(0.20)	0.25
Experience[1]	0.07***	(0.01)	1.08
Female	-0.88***	(0.08)	0.42
Urban resident	0.21**	(0.09)	1.23
Native-born	0.09	(0.13)	1.10
Parents' education			
Upper secondary	0.17	(0.10)	1.18
Higher than upper secondary	-0.13	(0.09)	0.88
Education			
Upper secondary	0.89***	(0.14)	2.44
Higher than upper secondary	2.01***	(0.14)	7.47
Skill			
Levels 2, 3 and 4	0.35**	(0.13)	1.41
Hungary			
(Constant)	-0.01	(1.15)	0.99
Experience[1]	0.04***	(0.01)	1.04
Female	-0.35**	(0.16)	0.71
Urban resident	0.42**	(0.16)	1.52
Native-born	0.12	(1.08)	1.13
Parents' education			
Upper secondary	0.30 *	(0.17)	1.35
Higher than upper secondary	0.58 *	(0.29)	1.79
Education			
Upper secondary	0.81***	(0.22)	2.26
Higher than upper secondary	1.39***	(0.30)	4.01
Skill			
Levels 2, 3 and 4	0.52***	(0.18)	1.67

Table 3.4.4 (continued)

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, problem solving skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Italy			
(Constant)	1.46**	(0.70)	4.30
Experience[1]	0.04***	(0.01)	1.05
Female	-1.32***	(0.21)	0.27
Urban resident	0.21	(0.18)	1.24
Native-born	-0.31	(0.58)	0.73
Parents' education			
Upper secondary	0.11	(0.21)	1.11
Higher than upper secondary	-0.11	(0.56)	0.89
Education			
Upper secondary	1.04***	(0.22)	2.83
Higher than upper secondary	1.48***	(0.27)	4.41
Skill			
Levels 2, 3 and 4	0.13	(0.22)	1.14
Norway			
(Constant)	-1.15***	(0.34)	0.32
Experience[1]	0.06***	(0.01)	1.06
Female	-0.55***	(0.13)	0.57
Urban resident	0.46***	(0.16)	1.59
Native-born	0.24	(0.21)	1.27
Parents' education			
Upper secondary	-0.14	(0.14)	0.87
Higher than upper secondary	-0.55***	(0.11)	0.58
Education			
Upper secondary	0.59***	(0.14)	1.80
Higher than upper secondary	1.28***	(0.15)	3.60
Skill			
Levels 2, 3 and 4	0.41 *	(0.22)	1.50
New Zealand			
(Constant)	-0.25	(0.19)	0.78
Experience[1]	0.04***	(0.00)	1.05
Female	-1.10***	(0.09)	0.33
Urban resident	0.08	(0.12)	1.08
Native-born	0.19 *	(0.10)	1.21
Parents' education			
Upper secondary	0.15	(0.10)	1.17
Higher than upper secondary	0.00	(0.13)	1.00
Education			
Upper secondary	0.33**	(0.14)	1.40
Higher than upper secondary	1.08***	(0.11)	2.93
Skill			
Levels 2, 3 and 4	0.37**	(0.14)	1.45

Table 3.4.4 (concluded)

Binary logistic regressions predicting the odds of earning more than half the median earnings by education and skill level, controlling for experience, gender, community size, nativity and parents' education, problem solving skills, ALL 2003 and 2008

	Standardized coefficients		
	β	standard error	odds ratio
Netherlands			
(Constant)	-0.39	(0.39)	0.68
Experience[1]	0.05***	(0.01)	1.05
Female	-1.18***	(0.15)	0.31
Urban resident	0.04	(0.13)	1.04
Native-born	0.23	(0.41)	1.26
Parents' education			
Upper secondary	-0.07	(0.17)	0.93
Higher than upper secondary	-0.49***	(0.17)	0.61
Education			
Upper secondary	0.89***	(0.16)	2.43
Higher than upper secondary	2.05***	(0.20)	7.74
Skill			
Levels 2, 3 and 4	0.35	(0.21)	1.42
Switzerland[3]			
(Constant)	-0.47	(0.32)	0.63
Experience[1]	0.05***	(0.01)	1.05
Female	-1.71***	(0.14)	0.18
Urban resident	0.39 *	(0.21)	1.48
Native-born	-0.29	(0.19)	0.74
Parents' education			
Upper secondary	-0.15	(0.18)	0.86
Higher than upper secondary	-0.72***	(0.17)	0.48
Education			
Upper secondary	1.74***	(0.19)	5.68
Higher than upper secondary	3.11***	(0.30)	22.53
Skill			
Levels 2, 3 and 4	0.15	(0.23)	1.16

… not applicable
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
1. Experience was calculated as age minus years of education minus six.
2. Bermuda's entire population resides in urban areas, and therefore this variable was omitted from these models.
3. These models for Switzerland apply to the German and French speaking communities only, since they did not field the problem solving skills domain in the Italian speaking community.

Notes: The response variable dichotomizes the population into those who reported earnings equivalent to half of their country's median earnings or less (0) and those who earned greater than half the median earnings (1).
The regressions were restricted to respondents in the labour force who reported positive, non-zero earnings.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.5

Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults being employed full-time in the previous 52 weeks, ALL 2003 and 2008

	Unadjusted		Adjusted	
	odds ratio	standard error	odds ratio	standard error
A. Prose literacy skills				
Bermuda	1.17	(0.12)	1.07	(0.15)
Canada	1.47***	(0.08)	1.29***	(0.08)
Hungary	1.65***	(0.07)	1.19**	(0.08)
Italy	1.46***	(0.08)	1.13	(0.11)
Netherlands	1.33***	(0.08)	1.06	(0.11)
New Zealand	1.36***	(0.06)	1.16**	(0.07)
Norway	1.36***	(0.09)	1.49***	(0.12)
Switzerland	1.58***	(0.10)	1.22	(0.15)
United States	1.66***	(0.09)	1.27**	(0.10)
B. Document literacy skills				
Bermuda	1.05	(0.15)	0.96	(0.19)
Canada	1.53***	(0.08)	1.31***	(0.08)
Hungary	1.74***	(0.08)	1.26**	(0.10)
Italy	1.75***	(0.09)	1.28**	(0.10)
Netherlands	1.54***	(0.08)	1.08	(0.10)
New Zealand	1.43***	(0.08)	1.21	(0.09)
Norway	1.64***	(0.11)	1.70***	(0.13)
Switzerland	1.62***	(0.10)	1.06	(0.12)
United States	1.79***	(0.09)	1.38***	(0.10)
C. Numeracy skills				
Bermuda	1.21	(0.14)	1.03	(0.20)
Canada	1.61***	(0.07)	1.31***	(0.08)
Hungary	2.03***	(0.08)	1.33**	(0.10)
Italy	2.19***	(0.11)	1.51**	(0.14)
Netherlands	2.30***	(0.09)	1.53***	(0.12)
New Zealand	1.74***	(0.08)	1.35***	(0.08)
Norway	1.74***	(0.12)	1.44**	(0.15)
Switzerland	1.80***	(0.11)	1.12	(0.20)
United States	1.77***	(0.11)	1.27 *	(0.13)
D. Problem solving skills				
Bermuda	1.42 *	(0.17)	1.38	(0.20)
Canada	1.53***	(0.06)	1.38***	(0.08)
Hungary	1.73***	(0.10)	1.27**	(0.10)
Italy	1.63***	(0.09)	1.22 *	(0.10)
Netherlands	1.84***	(0.15)	1.41 *	(0.17)
New Zealand	1.46***	(0.07)	1.33***	(0.09)
Norway	1.42***	(0.10)	1.71***	(0.13)
Switzerland[1]	1.40**	(0.15)	1.15	(0.19)
United States	…	…	…	…

… not applicable

* p<0.10, statistically significant at the 10 per cent level

** p<0.05, statistically significant at the 5 per cent level

*** p<0.01, statistically significant at the 1 per cent level

1. These models for Switzerland apply to the German and French speaking communities only, since they did not field the problem solving skills domain in the Italian speaking community.

Notes: The response variable dichotomizes the population into those not employed full-time for the previous 52 weeks (0) and those employed full-time for the previous 52 weeks (1).

Standard errors are of the logarithm of the odds ratios.

Odds are adjusted for age, gender, children under age 16 present in the home and educational attainment.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.6

Percentage distribution of the population aged 16 to 65 years by engagement in community groups or organizations in the previous 12 months, ALL 2003 and 2008

	Engaged		Did not engage	
	per cent	standard error	per cent	standard error
Bermuda	69.6	(1.0)	30.4	(1.0)
Canada	57.7	(0.7)	42.3	(0.7)
Hungary	21.4	(0.9)	78.6	(0.9)
Italy	32.0	(1.3)	68.0	(1.3)
Netherlands	54.9	(1.0)	45.1	(1.0)
New Zealand	70.9	(0.8)	29.1	(0.8)
Norway	70.4	(0.9)	29.6	(0.9)
Switzerland	64.8	(1.5)	35.2	(1.5)
United States	66.4	(1.2)	33.6	(1.2)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.7

Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults engaging in community groups or organizations in the previous 12 months, ALL 2003 and 2008

	Unadjusted		Adjusted	
	odds ratio	standard error	odds ratio	standard error
A. Prose literacy skills				
Bermuda	1.97***	(0.12)	1.72***	(0.18)
Canada	1.93***	(0.06)	1.58***	(0.09)
Hungary	1.45***	(0.10)	1.29 *	(0.13)
Italy	1.73***	(0.11)	1.31 *	(0.14)
Netherlands	1.65***	(0.09)	1.33 *	(0.14)
New Zealand	1.75***	(0.07)	1.34***	(0.10)
Norway	1.72***	(0.11)	1.27 *	(0.13)
Switzerland	1.84***	(0.11)	1.66***	(0.12)
United States	2.37***	(0.09)	1.51***	(0.12)
B. Document literacy skills				
Bermuda	2.01***	(0.13)	1.78***	(0.19)
Canada	1.95***	(0.06)	1.55***	(0.08)
Hungary	1.36***	(0.10)	1.28 *	(0.12)
Italy	1.86***	(0.13)	1.27 *	(0.13)
Netherlands	1.85***	(0.07)	1.58***	(0.11)
New Zealand	1.69***	(0.08)	1.31***	(0.10)
Norway	1.74***	(0.11)	1.28 *	(0.13)
Switzerland	1.59***	(0.09)	1.45**	(0.16)
United States	2.37***	(0.08)	1.55***	(0.10)
C. Numeracy skills				
Bermuda	1.74***	(0.11)	1.55***	(0.15)
Canada	1.82***	(0.07)	1.50***	(0.09)
Hungary	1.69***	(0.09)	1.55**	(0.16)
Italy	1.85***	(0.10)	1.22	(0.13)
Netherlands	1.79***	(0.06)	1.43***	(0.12)
New Zealand	1.73***	(0.10)	1.37**	(0.13)
Norway	1.97***	(0.12)	1.45**	(0.16)
Switzerland	1.64***	(0.15)	1.43 *	(0.20)
United States	2.68***	(0.12)	1.86***	(0.15)

Table 3.7 (concluded)

Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults engaging in community groups or organizations in the previous 12 months, ALL 2003 and 2008

	Unadjusted		Adjusted	
	odds ratio	standard error	odds ratio	standard error
D. Problem solving skills				
Bermuda	1.71***	(0.11)	1.40 *	(0.18)
Canada	2.06***	(0.07)	1.64***	(0.12)
Hungary	1.38***	(0.07)	1.24 *	(0.12)
Italy	1.89***	(0.12)	1.49**	(0.16)
Netherlands	2.12***	(0.08)	1.60**	(0.16)
New Zealand	1.74***	(0.08)	1.37**	(0.11)
Norway	1.94***	(0.13)	1.35 *	(0.16)
Switzerland[1]	1.91***	(0.15)	1.62**	(0.18)
United States	…	…	…	…

… not applicable

* p<0.10, statistically significant at the 10 per cent level

** p<0.05, statistically significant at the 5 per cent level

*** p<0.01, statistically significant at the 1 per cent level

1. These models for Switzerland apply to the German and French speaking communities only, since they did not field the problem solving skills domain in the Italian speaking community.

Notes: Standard errors are of the logarithm of the odds ratios.

Odds are adjusted for age, gender, community size, children under age 16 present in the home, household income, parents' education, and educational attainment.

Models for Bermuda do not adjust for community size, since the entire population resides in urban areas.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.8

Percentage distribution of the population aged 16 to 65 years by engagement in unpaid volunteer activities in the previous 12 months by skill level, ALL 2003 and 2008

	Engaged		Did not engage	
	per cent	standard error	per cent	standard error
Bermuda	60.8	(1.2)	39.2	(1.2)
Canada	52.0	(0.8)	48.0	(0.8)
Hungary	14.0	(0.6)	86.0	(0.6)
Italy	20.9	(1.0)	79.1	(1.0)
Netherlands	22.8	(0.6)	77.2	(0.6)
New Zealand	56.1	(0.7)	43.9	(0.7)
Norway	51.6	(0.9)	48.4	(0.9)
Switzerland	53.9	(0.7)	46.1	(0.7)
United States	58.0	(1.5)	42.0	(1.5)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 3.9

Adjusted and unadjusted odds ratios showing the likelihood of medium to high skilled adults engaging in unpaid volunteer activities in the previous 12 months, ALL 2003 and 2008

	Unadjusted		Adjusted	
	odds ratio	standard error	odds ratio	standard error
A. Prose literacy skills				
Bermuda	2.22***	(0.12)	1.75**	(0.18)
Canada	2.13***	(0.05)	1.68***	(0.08)
Hungary	1.53***	(0.12)	1.32 *	(0.16)
Italy	1.60***	(0.12)	1.21	(0.12)
Netherlands	1.44***	(0.10)	1.24	(0.16)
New Zealand	1.86***	(0.06)	1.42***	(0.08)
Norway	1.51***	(0.08)	1.23 *	(0.12)
Switzerland	1.82***	(0.13)	1.65**	(0.17)
United States	2.26***	(0.10)	1.49***	(0.12)
B. Document literacy skills				
Bermuda	2.06***	(0.11)	1.82***	(0.18)
Canada	2.12***	(0.05)	1.67***	(0.07)
Hungary	1.50***	(0.09)	1.28	(0.18)
Italy	1.62***	(0.13)	1.24	(0.17)
Netherlands	1.41***	(0.09)	1.32 *	(0.14)
New Zealand	1.81***	(0.07)	1.42***	(0.10)
Norway	1.59***	(0.10)	1.33 *	(0.14)
Switzerland	1.56***	(0.13)	1.39**	(0.15)
United States	2.15***	(0.10)	1.43***	(0.12)
C. Numeracy skills				
Bermuda	1.84***	(0.12)	1.60***	(0.16)
Canada	1.78***	(0.08)	1.45***	(0.11)
Hungary	1.83***	(0.15)	1.62**	(0.22)
Italy	1.60***	(0.11)	1.24	(0.17)
Netherlands	1.42***	(0.09)	1.30 *	(0.15)
New Zealand	1.65***	(0.06)	1.30***	(0.08)
Norway	1.87***	(0.09)	1.55***	(0.12)
Switzerland	1.79***	(0.13)	1.56***	(0.14)
United States	2.11***	(0.09)	1.53***	(0.09)
D. Problem solving skills				
Bermuda	2.02***	(0.10)	1.62***	(0.17)
Canada	2.57***	(0.07)	2.11***	(0.07)
Hungary	1.48**	(0.15)	1.19	(0.25)
Italy	1.59***	(0.11)	1.38**	(0.14)
Netherlands	1.81***	(0.14)	1.69**	(0.21)
New Zealand	1.95***	(0.10)	1.58**	(0.16)
Norway	1.68***	(0.11)	1.40**	(0.15)
Switzerland[1]	1.73***	(0.15)	1.49**	(0.18)
United States	...	...	...	...

... not applicable

* p<0.10, statistically significant at the 10 per cent level

** p<0.05, statistically significant at the 5 per cent level

*** p<0.01, statistically significant at the 1 per cent level

1. These models for Switzerland apply to the German and French speaking communities only, since they did not field the problem solving skills domain in the Italian speaking community.

Notes: Standard errors are of the logarithm of the odds ratios.

Odds are adjusted for age, gender, community size, children under age 16 present in the home, household income, parents' education, and educational attainment.

Models for Bermuda do not adjust for community size, since the entire population resides in urban areas.

The response variable dichotomizes the population into those who engaged in at least one unpaid volunteer activity in the previous 12 months (1) and those who did not (0).

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Chapter 4

Adult Numeracy Skills

Summary

This chapter focuses on the numeracy test results obtained from the first (2003) and second (2006 to 2008) rounds of ALL. The chapter falls into four distinct sections, the first of which defines the numeracy concept as measured by ALL and discusses why this basic skill is important. The second section explores the factors influencing numeracy skills by analysing the impact of characteristics such as age, gender, and formal education. The third section discusses and presents evidence about the development of affective responses to numeracy. The final examines the role of numeracy skill in influencing labour market outcome variables such as unemployment, type of occupation and earnings from work.

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Adult Numeracy Skills

4.1 Overview and highlights

This chapter focuses on the numeracy test results obtained from the first (2003) and second (2006 to 2008) rounds of ALL. The chapter falls into four distinct sections, the first of which defines the numeracy concept as measured by ALL and discusses why this basic skill is important. The second section explores the factors influencing numeracy skills by analysing the impact of characteristics such as age, gender, and formal education. The third section discusses and presents evidence about the development of affective responses to numeracy. The final examines the role of numeracy skill in influencing labour market outcome variables such as unemployment, type of occupation and earnings from work.

Key findings presented in this chapter are:

- In all countries, approximately one third of the population falls within Level 2 in numeracy. The main difference between countries is the proportion of people at the high and low ends of the numeracy skill continuum.
- Educational attainment is strongly associated with numeracy skill, with the larger gains in skill associated with upper secondary and tertiary education completion.
- In all countries except Hungary, males have higher average numeracy skills than females. This gender difference is not consistently related to gender differences in education, and the male advantage is larger in older age cohorts.
- Males also tend to report better retrospective experiences with their secondary mathematics instruction. Females are less likely to engage in numeracy tasks and feel greater anxiety than males about performing calculations, even after controlling for numeracy skill.
- Inequities in numeracy skill likely have consequences in the labour market, as numeracy skill is related to the likelihood that an individual will have a job, the type of job he or she has, and the amount of money he or she earns at that job. The individual

economic rewards for numeracy skills are higher in high knowledge and skill intensive occupations.

- In low knowledge and skill intensive skill occupations, the critical numeracy threshold for higher employment and increased income is between Level 1 and 2, whereas the threshold for high knowledge and skill occupations is between Level 2 and 3.

4.2 Defining numeracy in the ALL context

The numeracy concept and measurement framework employed in the ALL survey considers mathematical skills and processes used in the various contexts of everyday adult life. ALL defines numeracy as the knowledge and skills required in effectively managing and responding to the mathematical demands of diverse situations. However, since an assessment can only measure observed behaviours, not internal processes or capacities, the development of the test items used for the survey relied on the concept of *numerate behaviour*.

Numerate behaviour is observed when people manage a situation or solve a problem in a real context; it involves responding to information about mathematical ideas that may be represented in a range of ways; it requires the activation of a range of enabling knowledge, factors and processes. The tasks included in the assessment represent a broad range of item types and cover many aspects of adult numeracy. The ALL tasks assume that numeracy is more than simple calculation and so support the broad conception of numeracy that underlies much current research as well as state of the art school curricula.

Adults are increasingly called upon to adapt to rapid changes occurring in their daily lives. Numeracy skills are critical to individuals being able to function well in today's complex societies. In addition to basic competence in working with numbers, the quantitative literacy skills employers seek include some knowledge of statistics, probability, mental computation strategies, some grasp of proportional reasoning or modeling relationships, and broad problem solving and communication skills about quantitative issues. Workable knowledge and skill related to mathematical concepts are increasingly required to succeed in fulfilling roles as family members, workers, consumers and members of communities.

Many adults in OECD countries seek opportunities to update their skills in a variety of learning contexts – adult education centres and community colleges, vocational and technical schools, work-based and online study programmes, colleges and universities – in order to improve their employability in the changing global economy. Even as more opportunities emerge, mathematics remains a "gatekeeper" to achieving success for many young people and adults.

The precise set of mathematical skills school graduates should possess in order to be adequately prepared for tertiary education, employment and citizenship remains an area of study and of impassioned debate. Numeracy is a key to being able to interpret graphs, charts and statistical data. Consequently, in addition to job-specific numeracy skills, education policy must consider numeracy in broad civic, social and economic contexts. These contexts pose demands that call for the type of information collected for the numeracy domain in the ALL survey. Information about the numeracy proficiency of students, workers and citizens is critical to understanding human capital supply, planning effective school-based and lifelong learning opportunities, and appreciating the factors that affect citizens' ability to enhance their well being.

4.3 Predictors of adult numeracy skills

As previously shown in Chapter 2, the countries surveyed in ALL show varying results on the numeracy assessment. In the Netherlands, Norway and Switzerland, close to 60 per cent of the population is estimated to have numeracy skills at Level 3 and above. In Australia, Canada, Hungary and New Zealand about 50 per cent of the adult population reach the important threshold of Level 3 or above. In the United States and Bermuda, fewer than 50 per cent are at Level 3 or above. Overall, the proportions of individuals with Level 2 numeracy proficiency are mostly similar across countries, representing about one third of the population. However, within each country, the range of numeracy skills remains very wide. The following sections examine several factors explaining why some individuals have high numeracy skills while others do not.

Educational attainment

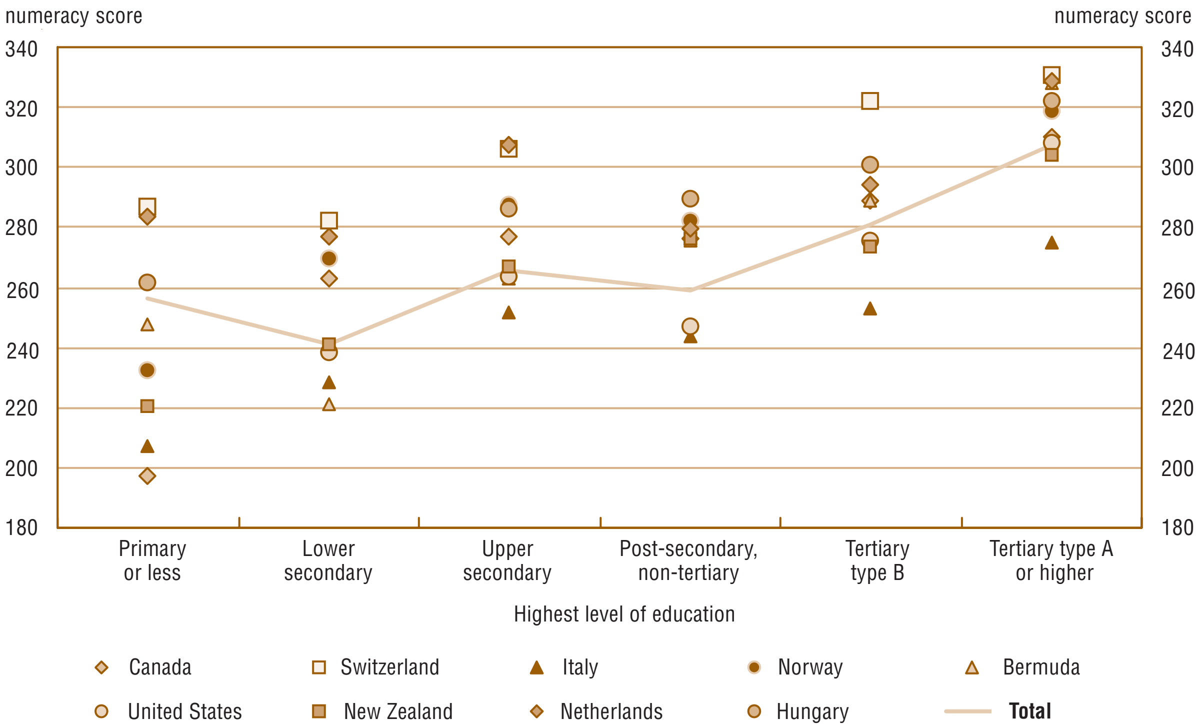
Numeracy makes use of codes and skills that are tied closely to formal instruction of mathematical concepts. Across the countries surveyed, the relationship between level of education and numeracy proficiency suggests that the latter increases across primary, secondary and tertiary education.[1] The plots shown in Figure 4.1 indicate that this pattern is relatively linear and consistent across the countries. The data in this figure include only individuals whose most recent educational experience was within the last ten years. This selection is made in order to minimize the reciprocal effects of occupational practice and skill loss on the observed relationships.

There is a general positive trend, with some exceptions. In Bermuda, Canada, Hungary, the Netherlands, New Zealand and Norway, individuals with some post-secondary non-university education (such as adult continuing education programmes) tend to have numeracy skills similar to those who have received only secondary education. In Italy and the United States, the numeracy skills of such individuals are even lower than those with only completed secondary education. This anomaly in the trend could be due to the nature of selection in these programs. Although the exact nature of programs in this category differs between countries, many adult non-tertiary education programs include a large proportion of adults who may not have completed basic secondary mathematics education.

Figure 4.1

Numeracy proficiency and educational attainment

Average scores on the numeracy scale within successive levels of educational attainment, population comprising graduates completing education within ten years of the time of the interview, 2003 and 2008



Note: Switzerland's education system does not have post-secondary non-tertiary education. In the United States no respondents reported primary education or less as their highest level of educational attainment.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

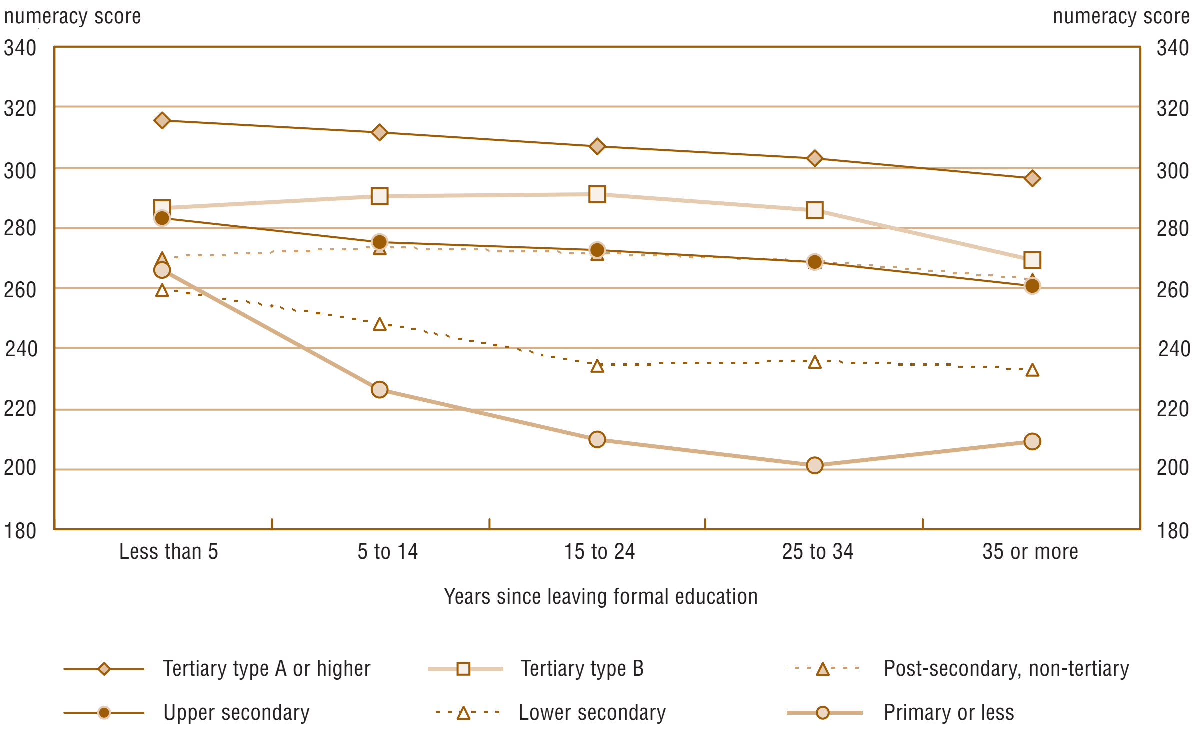
Education and age

Even if the effects of education differ across countries, the evidence supporting the notion that numeracy skill is directly related to formal education is strong. The average numeracy scores for different groups, classified by the number of years since they completed their highest level of education, are plotted in Figure 4.2. Across all groups, higher levels of education are associated with better problem solving proficiency. There are three distinct patterns in the data. The first, associated with upper secondary and tertiary completion, shows a shallow decrease in numeracy scores with an increase in the number of years beyond the education system. The second pattern, for tertiary non-university education, shows an increase in skill immediately following education completion, which most likely reflects the high proportion of informal learning associated with skilled trades. The third pattern, associated with the population sub-group with less-than-complete secondary education, shows a steep initial drop in numeracy scores in the years immediately following departure from the formal education system.

Figure 4.2

Numeracy scores by educational attainment and years spent beyond school

Average numeracy scores by highest level of education completed and the number of years spent beyond the formal education system, population aged 16 to 65 who are not currently enrolled in a study programme, 2003 and 2008



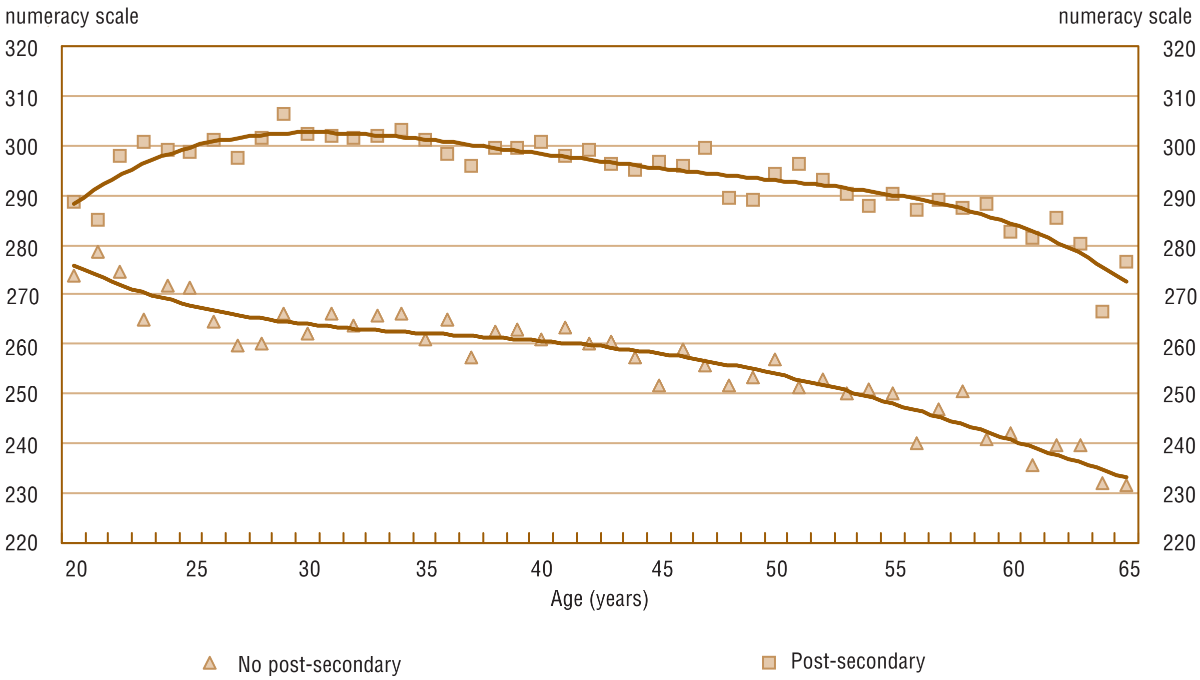
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

These results are confirmed by the pattern of results illustrating the age-related decline in numeracy comparing individuals with and without post-secondary education (Figure 4.3). For those with post-secondary education, there is a trend of increasing skill until approximately age 25. In contrast, individuals without post-secondary are more likely to see a steep decline in skill in early adulthood. The resulting gap in average numeracy skill between those with post-secondary and those without remains relatively constant for most of the lifespan, even past age 60, when both groups see a rapid decrease in numeracy skills.

Figure 4.3

Numeracy scores by post-secondary education status and age

Average numeracy scores by post-secondary education status and age, population aged 20 to 65, 2003 and 2008



Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Individuals with low initial education face multiple disadvantages. If individuals do not acquire a sufficient level of skill in formal education to encourage frequent use of these skills in the future, the skills they have developed are likely to atrophy. As one would expect, the number of years since leaving formal education is related to the total number of years spent in education; given two individuals of the same age, one who has spent more years in education will more than likely have been in an educational settting more recently. Furthermore, persons with lower initial levels of education in early adulthood are less likely to be employed in highly numerate occupations or pursue further education. As a result, their numeracy skills, which already tend to be lower due to their lower level of initial education, decline more immediately than other adults. Thus, low educated adults face 'triple jeopardy' in their numeracy skills: low education is linked to low initial numeracy scores; employment in low-skill occupations and lack of workplace experience do not reinforce existing numeracy skills; and less frequent participation in adult education or exposure to workplace learning is associated with age-related decline of skills.

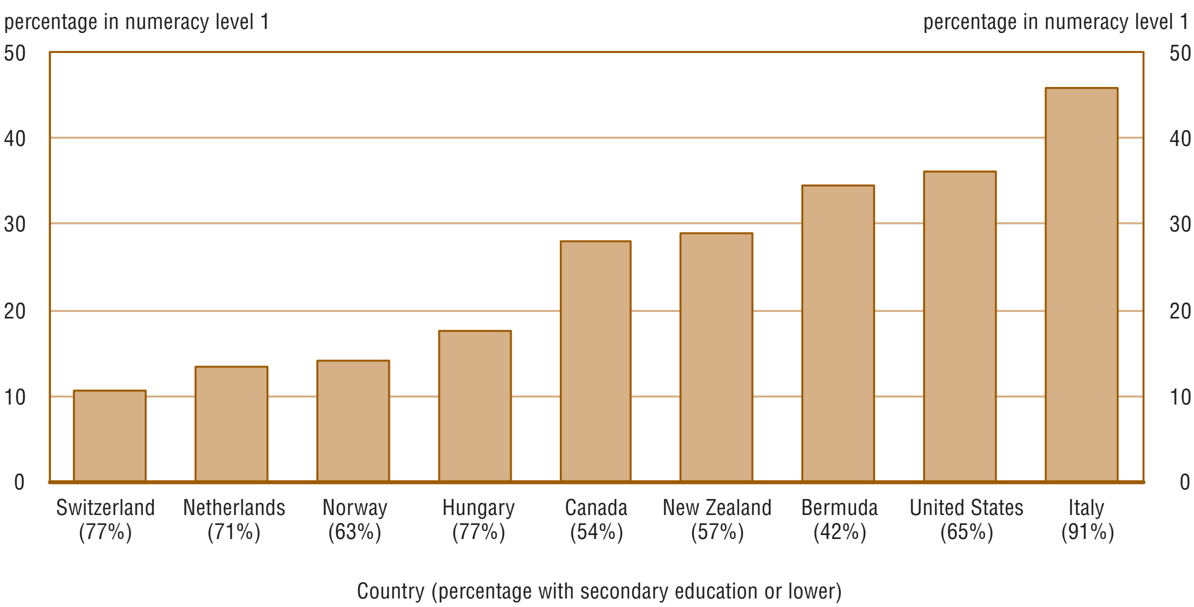
Basic education and numeracy

In order to illustrate the variation between countries in terms of literacy and basic education, Figure 4.4 displays the proportions of adults with completed secondary education or less who score at Level 1 on the numeracy scale. The percentage of the population with secondary education or less in the total population is given beneath the label for each country. Two groups of countries emerge from this comparison. The first comprises Hungary, the Netherlands, Norway and Switzerland. Although the proportions of adults with lower levels of educational attainment are relatively high among the populations of these four countries, the proportions of secondary graduates with Level 1 numeracy proficiency are equivalent to or below 10 per cent. The second group, including Bermuda, Canada, Italy, New Zealand and the United States, have almost twice as many Level 1 numeracy performers among their population of adults with completed secondary education.

Figure 4.4

Low performers among secondary graduates

Proportion of the population scoring at Level 1 on the numeracy scale among those whose highest level of education is upper secondary completion, population aged 16 to 65, 2003 and 2008



Note: The percentage in parentheses for each country is the percentage of the population with secondary education or lower.
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

In general, countries with higher average performance also tend to have lower incidence of low skills among individuals with low education. The three countries with the highest average numeracy performance (see Chapter 2) – the Netherlands, Norway and Switzerland – also have fewer low-skilled individuals with low education. Bermuda, Canada, Italy, New Zealand and the United States reproduce the relationship between average numeracy performance and the proportion of the population at numeracy Level 1, despite widely varying proportions of people with low education, ranging from 42 per cent in Bermuda to 65 per cent in the United States. Italy has the largest percentage of people with low education in numeracy Level 1 (91%) as well as the largest percentage of individuals with Level 1 numeracy (46%).

The exception to the pattern is Hungary. Individuals with low education in Hungary perform well, with only 18 per cent of those with low education performing at numeracy Level 1. In this respect Hungary is more similar to the highest performing countries than it is to countries with similar average performance. Much like the top performing countries, Hungary also has a relatively large proportion of adults with low education, at 77%, compared to 71% in the Netherlands, 63% in Norway and 77% in Switzerland.

Gender

Gender is a factor that has consistently been shown to have an effect on numeracy skills. In the PISA 2003 survey of mathematical literacy, 15-year-old boys outscored same age girls in all but two countries (OECD, 2004a). In terms of equity in the development of adult numeracy skill most countries also have significant gender differences favouring men for the ALL numeracy tasks (see Figure 4.5). Moreover, the three highest scoring countries also have the largest differences between the numeracy scores of men and women, suggesting that the rate of age-related skill decline is faster for females. The largest difference of 19 points is found in the Netherlands but the average numeracy skill of women in that country still exceeds the average numeracy skill of the populations in most other countries. The smallest male advantage is in Italy (11 points), and the only exception to the male skill advantage is Hungary, where no statistically significant advantage is found for either sex.

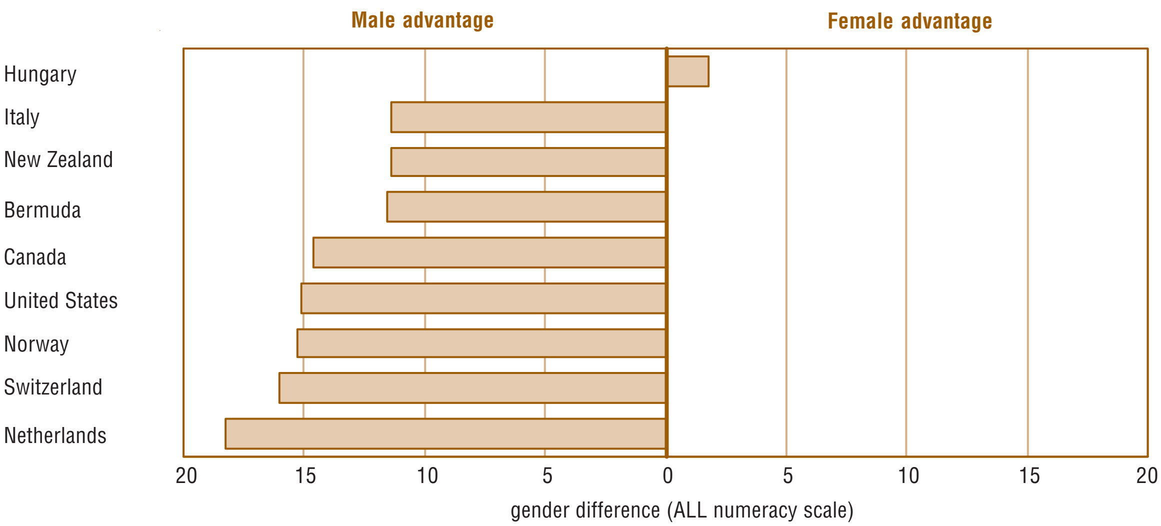
Gender and age

The age of respondents, shown in Figure 4.6, provides a better explanation for gender differences in numeracy scores, with smaller advantages for men for younger age groups and larger advantages for men for older age groups. In most countries, the male advantage is greater in older age groups than in younger age groups. The interaction between age and gender is more pronounced in Bermuda, Canada, Italy and New Zealand than in other countries. The interaction is less pronounced but still apparent in the Netherlands, Norway, Switzerland and the United States. Hungary is again the exception, with women having a greater advantage over men in the middle age group (ages 26 to 45) and no significant difference in the other age groups.

Figure 4.5

Gender differences in numeracy proficiency

Scale score differences in the numeracy scores of men and women, population aged 16 to 65, 2003 and 2008

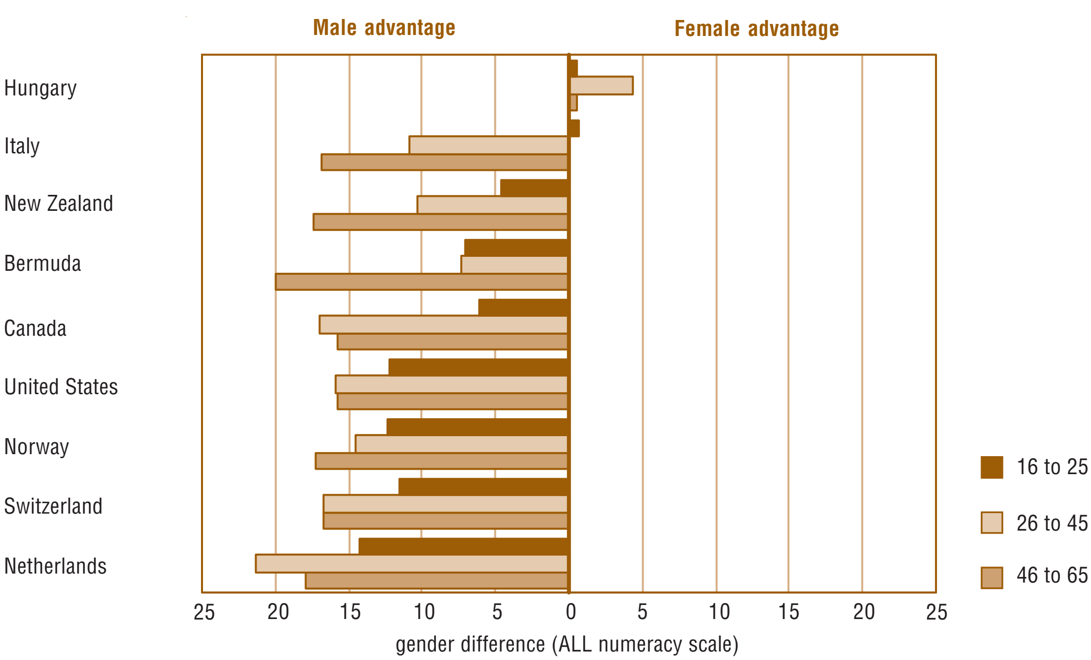


Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Figure 4.6

Gender differences in numeracy by age groups

Scale score differences in the numeracy scores of men and women by age groups, population aged 16 to 65, 2003 to 2008



Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

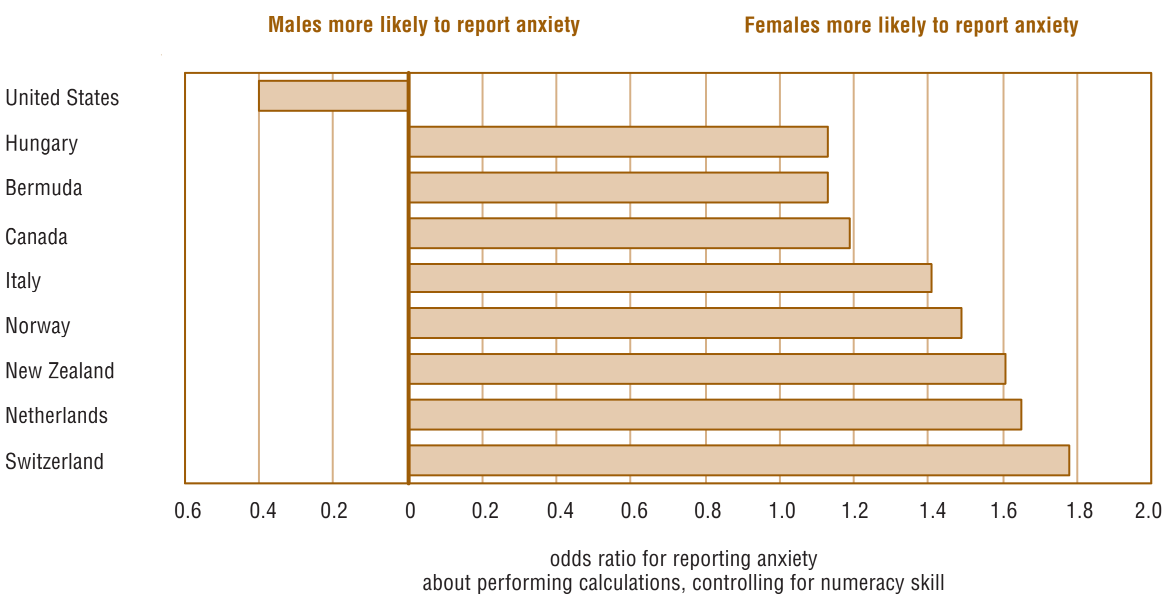
4.4 Gender and affective response to numeracy

One possible cause of the gender differences in numeracy is the affective component of numerate behaviour. Results from international studies of school-aged youth indicate that boys are generally more confident in their mathematics skills than girls, regardless of the actual level of those skills (OECD, 2009; Else-Quest and Hyde, 2010). A similar pattern of affective response can be seen in the ALL data. Women in all countries except the United States are more likely to be anxious about performing calculations, even after controlling for variation in their level of numeracy (Figure 4.7). This affective response translates into behaviour, with men being consistently more likely to engage in numeracy related tasks at all levels of numeracy (Figure 4.8). Women are less likely to engage their numeracy skills at work even at the highest levels of numeracy.

Figure 4.7

Gender differences in anxiety about performing calculations

Odds ratios for men and women in reporting anxiety about performing calculations, with controls for variation in numeracy proficiency, population aged 16 to 65, 2003 and 2008

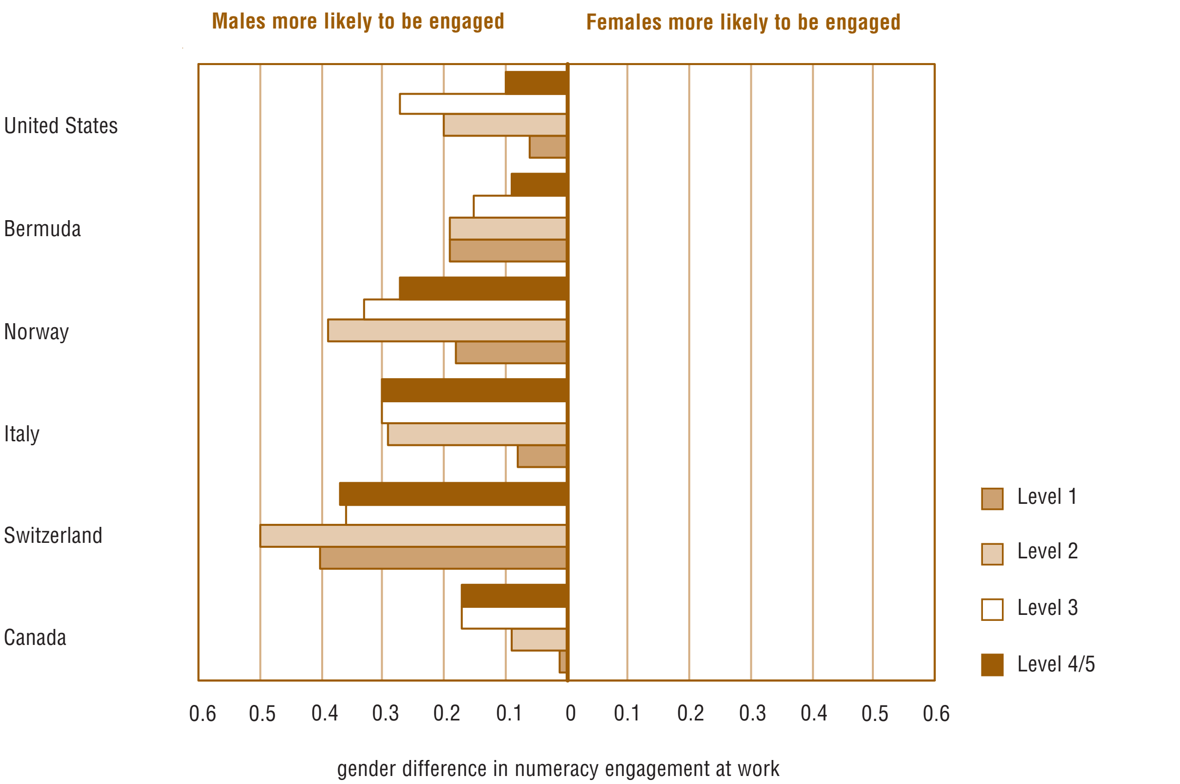


Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Figure 4.8

Gender differences in numeracy engagement at work

Scale score differences between men and women reporting on the frequency of engagement with numeracy tasks at work by numeracy level, population aged 16 to 65, 2003 and 2008



Note: Information about engagement with numeracy tasks at work was not available for Hungary, the Netherlands and New Zealand.
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

The influence of gender-related differences in engagement with tasks requiring numeracy has significant consequences at many levels, particularly since this influence is unrelated to actually observed levels of numeracy skill. These consequences are more immediately apparent for younger people because they are more likely to make choices in education and career planning that are difficult to remedy later on.

Women tend to make educational and career choices that exclude the highest paying occupations in science, engineering and finance that are typically associated with high numeracy skill. The ALL data suggest that these choices may be related to women's perceptions, aptitudes and affective responses to numeracy rather than their actual skill. The scarcity of women in occupations demanding high numeracy skill does not only reduce women's relative income but also accelerates their age-related decline in numeracy skills, which further decreases their likelihood of numeracy engagement later in life.

4.5 Numeracy and labour market outcomes

This section examines associations between numeracy skill and several important labour market variables, including labour force participation and unemployment, occupation type, and earnings from work.

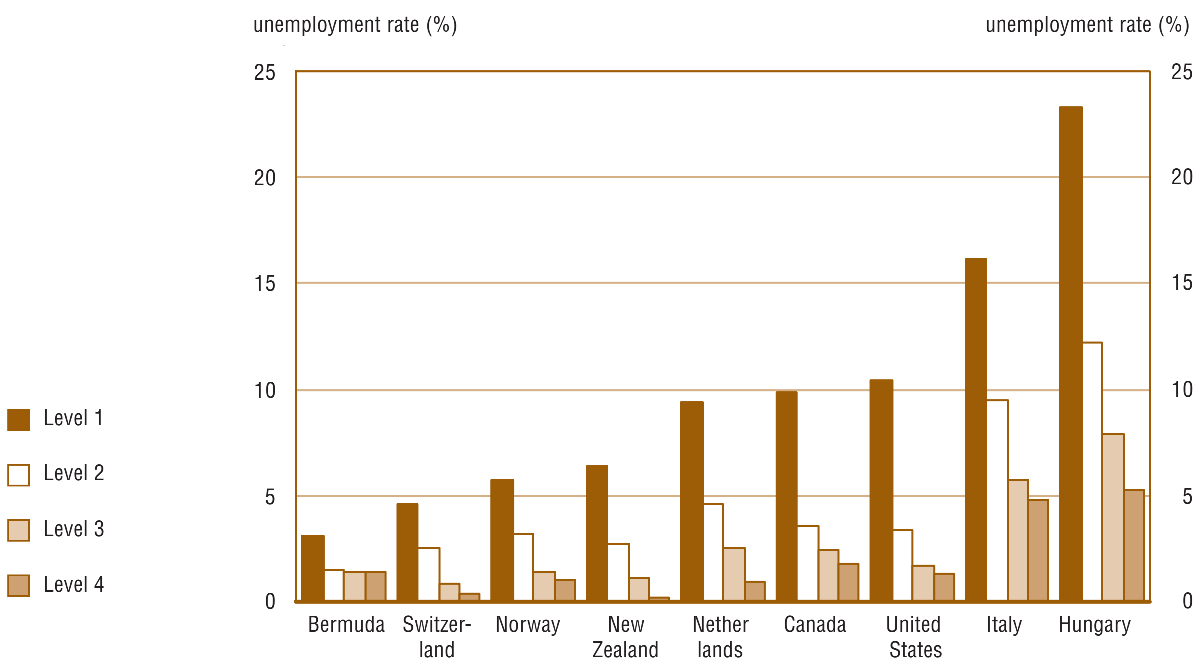
Unemployment

The ALL data suggest that the labour market recognises skill in numeracy. Higher levels of numeracy skill are associated with lower unemployment rates in all countries, independent of the overall unemployment rate (Figure 4.9). The strongest relative effects are seen in Italy, Hungary, the Netherlands, Switzerland and New Zealand. These countries show a consistent decrease in unemployment rates with each successive numeracy level. In Bermuda, Canada, Norway and the United States employment rates are relatively similar for the highest levels of numeracy, with a threshold at Level 2 on the numeracy scale. In these four countries, Level 2 numeracy is associated with relative decreases in unemployment rates of 50 per cent or more compared to higher levels.

Figure 4.9

Unemployment rates by numeracy levels

Unemployment rates in per cent by levels of numeracy, population aged 16 to 65 who were in the labour force at the time of the interview, 2003 and 2008



Countries are ordered by the unemployment rate for individuals with Level 1 numeracy.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Occupation type

Numeracy skill is related not only to whether one is employed but also to the type of occupation one has. Figure 4.10 shows the average numeracy skill that is associated with occupations, classified according to their knowledge and skill and skill intensity. As one would expect, occupations associated with high knowledge and skill intensity are also associated with high average numeracy. Across countries, the occupational categories cluster into two classes: "high knowledge and skill occupations", including knowledge experts, managers, high skill information occupations and low skill information occupations; and "low knowledge and skill occupations" including occupations in low skill services and manufacturing goods.

Box 4.1

Measuring knowledge-based occupations

A number of efforts reclassify the International Standard Classification of Occupations (ISCO) into fewer occupational groups (e.g., Osberg, Wolff and Baumol, 1989; Lavoie and Roy, 1998; Boothby, 1999). These efforts attempt to delimit types of occupations on the basis of knowledge content and common skills requirements including cognitive, communication, management and motor skills. Many skills are required in varying degrees to carry out typical tasks associated with different jobs, but some preliminary evidence suggests that occupations tend to cluster according to relatively few mixes of skill requirements and accordingly few occupational types (Béjaoui, 2000). Note that the types of skills measured in ALL are considered to be associated with cognitive skills only.

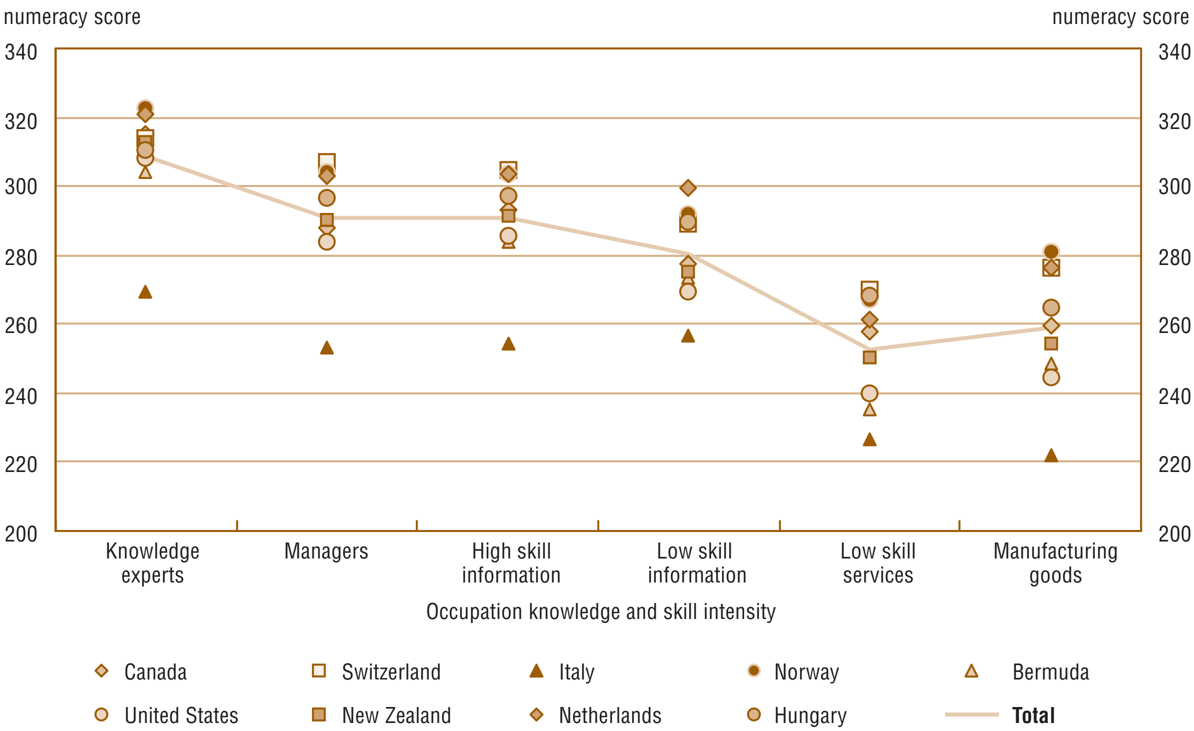
In this section, all ISCO occupations are classified according to different types of job tasks that require varying skills as follows: knowledge expert, management, information high-skill, information low-skill, services low-skill, and goods-related.

See Boothby (1999) and Béjaoui (2000) for a more detailed description of the relative requirements of different skills by occupational types. In summary, knowledge expert types of occupations require the most use of cognitive skills, more than average management and communication skills as well as fine motor skills. Although managers are required to use cognitive skills slightly less intensively than experts, they are required to use management and communication skills the most often, making their required skills set the most balanced. Similar to experts, high-skill information occupations require the use of cognitive, management and communication skills more than the average. Although lower, low-skill information occupations also require the use of these skills slightly more than average. Low-skill services and good-related occupations require the use of these types of skills comparatively less often.

Figure 4.10

Numeracy in occupational categories

Average numeracy scores for occupations classified by their knowledge and skill intensity, population aged 16 to 65 who were in the labour force at the time of the interview, 2003 and 2008



Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

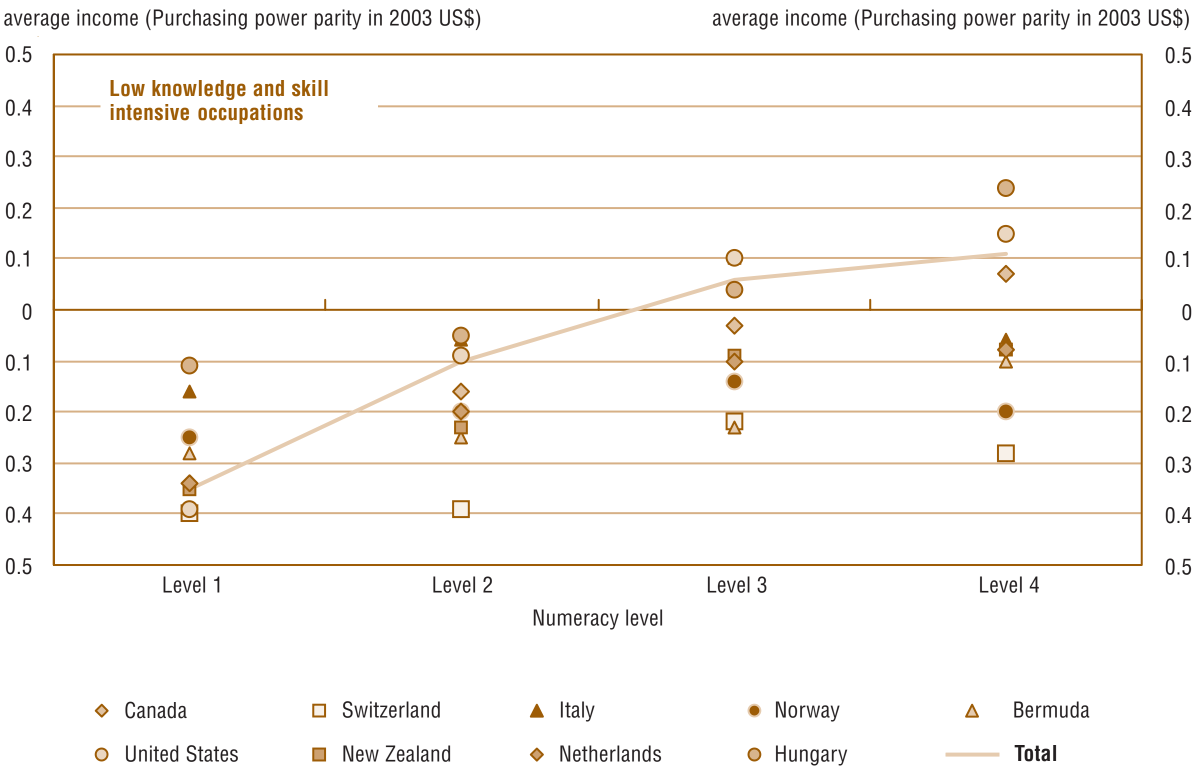
Earnings from work

The relationship between personal income and level of numeracy skill is different for occupational groups with low and high knowledge intensity (Figure 4.11.1). For low skilled occupations, monetary payoffs for numeracy are associated with numeracy Levels 1 and 2, which are 'gateway' skills allowing for labour force participation. The most pronounced example of this pattern is observed in the United States. In this country, there is a steeper earnings premium for moving from numeracy Level 1 to Level 2, compared to the higher skill level thresholds. The exception to this pattern is Switzerland, for which the major threshold is between Levels 2 and 3.

Figure 4.11.1

Numeracy levels and earnings for workers in low knowledge intensive jobs

Relationship between numeracy levels and earnings in purchasing power parity adjusted 2003 US dollars for the population aged 16 to 65 employed in low knowledge and skill intensive occupations, 2003 and 2008



Note: Average income has been standardised to have a mean of 0 and standard deviation of 1 within each country. Low knowledge and skill occupations tend to have average income less than the national average.

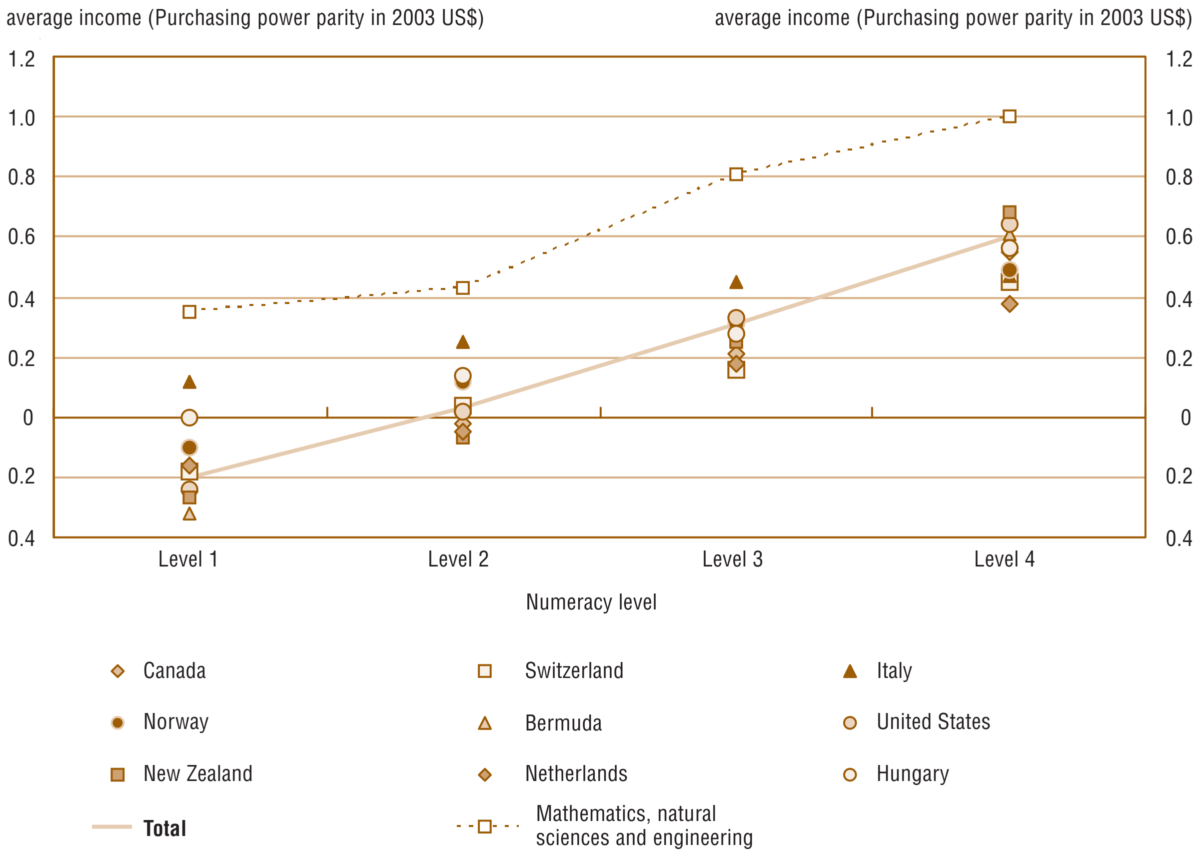
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

The earnings premium is greater across all countries for high knowledge intensive occupations (Figure 4.11.2). Across all level thresholds, the income premium for high skilled occupations is more than twice as great as for the low skilled occupations. The data do not indicate a common threshold across countries associated with higher income. However, different industries focus on different skill markets. For example, the trend calculated specifically for the sub-group employed in mathematics, natural sciences and engineering occupations across all participating countries. Mathematics, natural sciences and engineering illustrates an earnings threshold associated with these occupations between numeracy Levels 2 and 3.

Figure 4.11.2

Numeracy levels and earnings for workers in high knowledge intensive jobs

Relationship between numeracy levels and earnings in purchasing power parity adjusted 2003 US dollars for the population aged 16 to 65 employed in high knowledge and skill intensive occupations, 2003 and 2008



Notes: Average income has been standardised to have a mean of 0 and standard deviation of 1 within each country.

Due to insufficient sample size, the mathematics and engineering group used a combined sample from all countries. To reduce the influence of labour market composition differences between countries, population weights rather than senate weights were used. The senate weight corresponds to a weight adjustment enabling the attribution to each country the same total weight in the calculation of statistical parameters when combining several countries in certain analysis. For example, with this method, data coming from the United States would not count for more in the calculation of item parameters than those coming from Switzerland.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Conclusion

This chapter explored many key determinants and outcomes of numeracy skill. Education plays a key role in the development of numeracy, but the effects of education are not necessarily permanent. The data from the ALL survey suggest that behaviours in life and work beyond education may determine how individuals maintain their numeracy skills. Those with very low education may be in triple jeopardy because their low initial education disadvantages their initial skill level, the shorter academic tenure triggers an earlier initiation of skill loss, and the lack of work opportunities to foster their skills results in almost immediate atrophy of numeracy skills once they leave formal education. Although gender inequity in numeracy is pervasive across most countries and is consistent across education levels, the example of Hungary shows that it is not universal. However, females remain consistently less likely to feel comfortable using their numeracy and mathematics skills, particularly in the workplace. Given the strong relationship of numeracy skills to employment, occupational choice, and earnings, these inequities represent substantial losses to individuals as well as the labour market.

Endnote

1. Tertiary type A programmes (ISCED 5A) are largely theory-based and are designed to provide sufficient qualifications for entry to advanced research programmes and professions with high skill requirements, such as medicine, dentistry or architecture. Tertiaty type A programmes have a minimum cumulative theoretical duration (at tertiary level) of three years' full-time equivalent, although they typically last four or more years.

   Tertiary type B programmes (ISCED 5B) are largely shorter than those of Tertiary type A and focus on practical, technical or occupational skills for direct entry into the labour market, although some theoretical foundations may be covered in the respective programmes. They have a minimum duration of two years full-time equivalent at the tertiary level.

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Annex 4

Data Values for the Figures

Table 4.1

Average scores on the numeracy scale within successive levels of educational attainment, population comprising graduates completing education within 10 years of the time of the interview, 2003 and 2008

	Numeracy scale											
	Primary or less		Lower secondary		Upper secondary		Post-secondary, non-tertiary		Tertiary type B		Tertiary type A or higher	
	mean	standard error	mean	standard error	mean	standard error	mean	standard error	mean	standard error	mean	standard error
Canada	197.3	(14.8)	262.8	(3.1)	276.8	(2.2)	276.5	(3.4)	288.9	(3.5)	310.2	(2.6)
Switzerland	287.1	(20.1)	282.0	(8.3)	306.0	(3.3)	…	…	322.1	(3.0)	330.7	(4.0)
Italy	207.0	(16.3)	228.7	(3.7)	251.8	(2.7)	243.5	(9.3)	253.1	(16.9)	275.3	(5.6)
Norway	232.5	(65.1)	269.4	(2.5)	287.4	(1.8)	282.5	(3.2)	301.0	(2.3)	319.0	(1.1)
Bermuda	247.7	(14.0)	221.0	(13.3)	262.9	(4.5)	275.3	(4.2)	288.8	(5.7)	328.0	(4.8)
United States	…	…	238.2	(4.7)	263.6	(3.2)	247.0	(9.1)	275.6	(5.8)	308.0	(3.2)
New Zealand	220.5	(26.0)	241.1	(2.6)	267.3	(2.7)	276.5	(4.1)	273.7	(5.8)	304.0	(2.0)
Netherlands	283.6	(8.5)	276.9	(2.7)	307.7	(3.5)	279.6	(8.4)	293.9	(4.5)	328.4	(2.6)
Hungary	261.4	(3.5)	…	…	286.1	(2.1)	289.3	(2.4)	300.7	(3.9)	322.3	(4.3)
All countries	**242.1**	**(9.5)**	**252.5**	**(2.2)**	**278.8**	**(0.9)**	**271.3**	**(2.1)**	**288.7**	**(2.0)**	**314.0**	**(1.6)**

… not applicable

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 4.2

Average numeracy scores by highest level of education completed and the number of years spent beyond the formal education system, population aged 16 to 65 who are not currently enrolled in a study programme, 2003 and 2008

	Numeracy scale									
	Less than 5 years		5 to 14 years		15 to 24 years		25 to 34 years		35 or more years	
Highest educational attainment	mean	standard error	mean	standard error	mean	standard error	mean	standard error	mean	standard error
Tertiary type A or higher	315.4	(1.7)	311.5	(1.9)	306.8	(1.6)	301.5	(2.0)	296.5	(3.3)
Tertiary type B	286.7	(2.7)	290.5	(3.0)	291.0	(2.7)	285.8	(5.6)	269.2	(6.3)
Post-secondary, non-tertiary	269.7	(3.8)	273.0	(1.7)	270.8	(2.1)	268.4	(2.9)	262.0	(3.4)
Upper secondary	282.2	(1.3)	273.5	(1.3)	271.6	(1.3)	266.5	(1.2)	258.6	(1.3)
Lower secondary	255.9	(2.5)	242.3	(3.2)	235.0	(2.9)	233.2	(1.9)	230.8	(1.5)
Primary or less	258.4	(8.9)	210.8	(9.6)	206.9	(12.1)	206.9	(4.2)	195.8	(4.2)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 4.3

Average numeracy scores by age and post-secondary education status, population aged 20 to 65, 2003 and 2008

	Numeracy scale			
	No post-secondary education		Post-secondary education	
Age	mean	standard error	mean	standard error
20	273.7	(3.1)	288.6	(8.8)
21	278.7	(4.2)	285.0	(5.5)
22	274.6	(2.6)	298.1	(5.1)
23	265.0	(4.7)	300.8	(3.8)
24	271.7	(4.3)	299.3	(8.0)
25	271.5	(3.4)	298.6	(4.0)
26	264.8	(3.8)	301.2	(3.6)
27	259.7	(3.9)	297.4	(3.7)
28	260.0	(3.1)	301.5	(4.8)
29	266.1	(3.5)	306.4	(3.3)
30	262.1	(3.5)	302.5	(3.0)
31	266.1	(2.7)	301.9	(3.4)
32	263.8	(3.0)	301.4	(3.8)
33	265.6	(4.2)	301.8	(3.4)
34	266.0	(3.0)	303.1	(3.1)
35	260.9	(3.7)	301.3	(2.8)
36	265.1	(2.1)	298.4	(3.3)
37	257.2	(3.4)	295.8	(2.7)
38	262.7	(3.8)	299.6	(2.9)
39	263.1	(2.9)	299.3	(2.5)
40	261.1	(3.5)	300.9	(3.3)
41	263.6	(3.0)	298.1	(3.9)
42	260.3	(3.3)	299.0	(3.1)
43	260.6	(3.0)	296.3	(4.1)
44	257.5	(2.1)	295.3	(3.8)
45	251.9	(3.1)	296.5	(2.6)
46	258.9	(3.1)	296.1	(4.5)
47	255.8	(3.1)	299.5	(3.3)

Table 4.3 (concluded)

Average numeracy scores by age and post-secondary education status, population aged 20 to 65, 2003 and 2008

	Numeracy scale			
	No post-secondary education		Post-secondary education	
Age	mean	standard error	mean	standard error
48	251.7	(3.1)	289.4	(3.1)
49	253.5	(3.1)	288.9	(3.3)
50	256.8	(2.9)	294.3	(5.6)
51	251.3	(3.3)	296.3	(2.9)
52	253.0	(3.4)	293.1	(3.7)
53	250.0	(3.6)	290.1	(3.9)
54	250.9	(2.5)	287.9	(3.4)
55	250.2	(4.0)	290.5	(3.3)
56	240.1	(2.7)	287.0	(3.3)
57	246.8	(2.8)	289.2	(3.3)
58	250.6	(3.2)	287.4	(6.5)
59	240.7	(3.0)	288.1	(5.3)
60	242.0	(3.4)	282.6	(3.5)
61	235.7	(3.1)	281.6	(6.0)
62	239.9	(3.2)	285.5	(4.1)
63	239.7	(2.8)	280.3	(4.4)
64	232.2	(2.2)	266.8	(4.2)
65	231.8	(3.3)	276.5	(6.0)

Source: Adult Literacy and Life Skills Survey, 2003 to 2008.

Table 4.4

Proportion of the population scoring at Level 1 on the numeracy scale among those whose highest level of education is upper secondary completion, population aged 16 to 65, 2003 and 2008

	Individuals with secondary education or less in numeracy Level 1		Individuals with secondary education or less	
	per cent	standard error	per cent	standard error
Canada	28.1	(1.0)	53.9	(0.6)
Switzerland	10.7	(0.9)	76.8	(0.1)
Italy	45.8	(1.3)	90.9	(0.0)
Norway	14.1	(1.0)	63.3	(0.4)
Bermuda	34.5	(2.1)	42.4	(0.0)
United States	36.1	(1.3)	64.8	(0.8)
New Zealand	28.9	(1.2)	56.5	(0.8)
Netherlands	13.5	(1.1)	70.6	(0.3)
Hungary	17.6	(1.0)	77.4	(0.4)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 4.5

Scale score differences in the numeracy scores of men and women, population aged 16 to 65, 2003 and 2008

	Intercept[1]		Gender effect[2]	
	regression coefficient	standard error	regression coefficient	standard error
Canada	294.2	(3.4)	-14.6***	(2.0)
Switzerland	313.8	(2.5)	-16.0***	(1.7)
Italy	250.3	(3.1)	-11.4***	(2.0)
Norway	307.7	(3.2)	-15.3***	(1.9)
Bermuda	287.3	(3.4)	-11.6***	(2.6)
United States	283.7	(4.0)	-15.1***	(2.4)
New Zealand	288.2	(3.4)	-11.4***	(2.0)
Netherlands	315.9	(3.2)	-18.2***	(1.8)
Hungary	270.5	(2.9)	1.8	(1.5)

*** $p<0.01$, statistically significant at the 1 per cent level
1. The intercept term represents the mean male numeracy performance.
2. Negative values indicate lower numeracy performance for females.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 4.6

Scale score differences in the numeracy scores of men and women by age groups, population 16 to 65, 2003 and 2008

	Intercept[1]		Gender effect[2]	
Age category	regression coefficient	standard error	regression coefficient	standard error
Canada				
16 to 25	288.7	(5.2)	-6.1 *	(3.2)
26 to 45	304.3	(4.4)	-17.0***	(2.7)
Over 45	283.7	(5.6)	-15.8***	(3.2)
Switzerland				
16 to 25	318.3	(10.1)	-11.6 *	(6.7)
26 to 45	320.6	(4.2)	-16.7***	(2.6)
Over 45	302.7	(4.5)	-16.8***	(3.1)
Italy				
16 to 25	240.0	(5.5)	0.7	(3.5)
26 to 45	256.3	(5.8)	-10.9***	(3.6)
Over 45	246.7	(5.0)	-16.8***	(3.0)
Norway				
16 to 25	308.6	(7.0)	-12.4***	(4.2)
26 to 45	315.0	(4.5)	-14.5***	(2.6)
Over 45	298.0	(4.9)	-17.3***	(3.3)
Bermuda				
16 to 25	280.7	(13.3)	-7.0	(9.6)
26 to 45	289.1	(5.0)	-7.3**	(3.5)
Over 45	286.9	(7.2)	-20.0***	(4.1)
United States				
16 to 25	281.9	(6.5)	-12.2***	(4.0)
26 to 45	287.4	(6.6)	-15.8***	(4.1)
Over 45	279.8	(4.9)	-15.7***	(2.9)

Table 4.6 (concluded)

Scale score differences in the numeracy scores of men and women by age groups, population 16 to 65, 2003 and 2008

	Intercept[1]		Gender effect[2]	
Age category	regression coefficient	standard error	regression coefficient	standard error
New Zealand				
16 to 25	271.9	(6.7)	-4.6	(3.7)
26 to 45	293.0	(4.0)	-10.4***	(2.6)
Over 45	292.8	(5.9)	-17.4***	(3.4)
Netherlands				
16 to 25	317.5	(8.3)	-14.3**	(5.4)
26 to 45	328.6	(4.1)	-21.4***	(2.8)
Over 45	303.7	(4.7)	-17.9***	(2.7)
Hungary				
16 to 25	275.6	(6.1)	0.6	(3.4)
26 to 45	271.5	(4.2)	4.4 *	(2.4)
Over 45	265.7	(4.6)	0.5	(2.5)

* p<0.10, statistically significant at the 10 per cent level

** p<0.05, statistically significant at the 5 per cent level

*** p<0.01, statistically significant at the 1 per cent level

1. The intercept term represents the mean male numeracy performance.
2. Negative values indicate lower numeracy performance for females.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 4.7

Differences in probability between men and women reporting anxiety about performing calculations, with controls for variation in numeracy proficiency, population aged 16 to 65, 2003 and 2008

	Intercept		Gender effect[1]			Numeracy effect	
	logistic regression coefficent	standard error	logistic regression coefficent	standard error	odds ratio	logistic regression coefficent	standard error
Canada	-4.20	(0.28)	0.17	(0.06)	1.19***	0.01	(0.00)
Switzerland	-3.02	(0.45)	0.58	(0.09)	1.79***	0.01	(0.00)
Italy	-2.30	(0.41)	0.35	(0.10)	1.41***	0.01	(0.00)
Norway	-5.06	(0.39)	0.40	(0.09)	1.49***	0.02	(0.00)
Bermuda	-5.76	(0.59)	0.12	(0.13)	1.14	0.02	(0.00)
United States	-5.99	(0.42)	-0.04	(0.11)	0.96	0.02	(0.00)
New Zealand	-6.31	(0.35)	0.48	(0.08)	1.61***	0.02	(0.00)
Netherlands	-3.00	(0.36)	0.50	(0.07)	1.64***	0.01	(0.00)
Hungary	-3.75	(0.37)	0.12	(0.08)	1.12	0.01	(0.00)

*** p<0.01, statistically significant at the 1 per cent level

1. Odds ratios above 1 indicate females are more likely to report anxiety; values below 1 indicate males are more likely to report anxiety.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 4.8

Scale score differences between men and women reporting on the frequency of engagement with numeracy tasks at work by numeracy level, population aged 16 to 65, 2003 and 2008

	Intercept[1]		Gender effect[2]	
	regression coefficient	standard error	regression coefficient	standard error
Canada				
Level 1	-0.64	(0.16)	-0.01	(0.10)
Level 2	0.00	(0.10)	-0.09	(0.06)
Level 3	0.41	(0.09)	-0.17**	(0.07)
Level 4/5	0.61	(0.11)	-0.17**	(0.08)
Switzerland				
Level 1	0.17	(0.34)	-0.40 *	(0.23)
Level 2	0.74	(0.21)	-0.50***	(0.12)
Level 3	0.81	(0.10)	-0.36***	(0.07)
Level 4/5	0.98	(0.13)	-0.37***	(0.10)
Italy				
Level 1	-0.91	(0.16)	-0.08	(0.11)
Level 2	-0.11	(0.21)	-0.29 *	(0.13)
Level 3	0.33	(0.19)	-0.30**	(0.12)
Level 4/5	0.56	(0.43)	-0.30	(0.35)
Norway				
Level 1	-0.23	(0.23)	-0.18	(0.13)
Level 2	0.36	(0.11)	-0.39***	(0.07)
Level 3	0.50	(0.09)	-0.33***	(0.06)
Level 4/5	0.53	(0.07)	-0.27***	(0.05)
Bermuda				
Level 1	-0.19	(0.18)	-0.19 *	(0.11)
Level 2	0.37	(0.14)	-0.19 *	(0.10)
Level 3	0.63	(0.13)	-0.15 *	(0.09)
Level 4/5	0.77	(0.18)	-0.09	(0.13)
United States				
Level 1	-0.36	(0.22)	-0.06	(0.13)
Level 2	0.45	(0.20)	-0.20	(0.11)
Level 3	0.79	(0.14)	-0.27***	(0.09)
Level 4/5	0.68	(0.14)	-0.10	(0.11)

* p<0.10, statistically significant at the 10 per cent level

** p<0.05, statistically significant at the 5 per cent level

*** p<0.01, statistically significant at the 1 per cent level

1. The intercept term represents the mean male numeracy performance.
2. Negative values indicate lower numeracy performance for females.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 4.9

Unemployment rates in per cent by levels of numeracy, population aged 16 to 65 who were in the labour force at the time of the interview, 2003 and 2008

	Level 1		Level 2		Level 3		Level 4/5	
	per cent	standard error	per cent	standard error	per cent	standard error	per cent	standard error
Canada	9.8	(1.4)	3.6	(0.6)	2.4	(0.4)	1.8	(0.4)
Switzerland	4.7	(2.1)	2.5	(1.3)	0.9	(0.4)	0.3	(0.3)
Italy	16.2	(1.2)	9.5	(0.9)	5.8	(1.3)	4.8	(2.6)
Norway	5.8	(1.9)	3.2	(1.1)	1.4	(0.7)	1.0	(0.6)
Bermuda	3.1	(1.0)	1.5	(0.8)	1.4	(0.6)	1.4	(0.9)
United States	10.5	(1.2)	3.4	(0.8)	1.7	(0.5)	1.3	(0.9)
New Zealand	6.4	(1.2)	2.8	(0.5)	1.1	(0.3)	0.2	(0.2)
Netherlands	9.4	(1.9)	4.6	(0.9)	2.5	(0.5)	0.9	(0.3)
Hungary	23.4	(3.0)	12.2	(1.3)	7.9	(0.7)	5.3	(1.0)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 4.10

Average numeracy scores for occupations classified by their knowledge and skill intensity, population aged 16 to 65 who were in the labour force at the time of the interview, 2003 and 2008

	Numeracy scale											
	Knowledge experts		Managers		High skill information		Low skill information		Low skill services		Manufacturing goods	
	mean	standard error	mean	standard error	mean	standard error	mean	standard error	mean	standard error	mean	standard error
Canada	315.3	(2.6)	287.7	(2.7)	293.0	(1.8)	277.5	(1.5)	258.1	(2.0)	259.4	(2.2)
Switzerland	314.0	(5.1)	307.2	(3.4)	304.7	(2.2)	289.3	(3.5)	269.8	(4.2)	276.4	(2.2)
Italy	269.2	(4.9)	253.3	(4.8)	254.2	(3.4)	256.5	(2.2)	226.7	(3.4)	222.2	(2.6)
Norway	322.6	(3.6)	304.0	(2.1)	303.8	(2.3)	292.0	(2.8)	267.3	(2.3)	281.2	(3.0)
Bermuda	303.9	(3.4)	290.5	(3.0)	283.7	(3.6)	273.5	(3.0)	235.1	(4.0)	248.8	(3.3)
United States	307.9	(3.1)	283.9	(3.6)	285.7	(2.6)	269.3	(2.1)	239.7	(2.5)	244.5	(2.7)
New Zealand	312.7	(3.4)	290.4	(3.1)	291.3	(1.8)	275.1	(2.4)	250.2	(1.8)	254.5	(1.8)
Netherlands	320.8	(2.1)	302.8	(1.9)	303.3	(2.1)	299.2	(2.2)	261.2	(3.6)	276.5	(2.7)
Hungary	310.4	(4.0)	296.7	(3.0)	297.0	(3.0)	289.6	(1.9)	268.1	(2.4)	265.0	(2.0)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 4.11

Relationship between numeracy levels and earnings in standardized purchasing power parity for the population aged 16 to 65 employed by knowledge and skill requirements of occupation, 2003 and 2008

	Purchasing power parity in US dollars							
	Level 1		Level 2		Level 3		Level 4/5	
	mean	standard error	mean	standard error	mean	standard error	mean	standard error
Canada								
Low knowledge and skill intensive occupations	-0.34	(0.03)	-0.16	(0.04)	-0.03	(0.03)	0.07	(0.10)
High knowledge and skill intensive occupations	-0.25	(0.05)	-0.02	(0.04)	0.21	(0.05)	0.55	(0.07)
Switzerland								
Low knowledge and skill intensive occupations	-0.40	(0.09)	-0.39	(0.06)	-0.22	(0.08)	-0.28	(0.14)
High knowledge and skill intensive occupations	-0.18	(0.16)	0.04	(0.10)	0.16	(0.05)	0.45	(0.06)
Italy								
Low knowledge and skill intensive occupations	-0.16	(0.06)	-0.06	(0.05)	0.10	(0.08)	-0.06	(0.39)
High knowledge and skill intensive occupations	0.12	(0.09)	0.25	(0.07)	0.45	(0.12)	0.47	(0.25)
Norway								
Low knowledge and skill intensive occupations	-0.25	(0.05)	-0.20	(0.05)	-0.14	(0.05)	-0.20	(0.09)
High knowledge and skill intensive occupations	-0.10	(0.11)	0.12	(0.04)	0.31	(0.05)	0.49	(0.05)
Bermuda								
Low knowledge and skill intensive occupations	-0.28	(0.10)	-0.25	(0.10)	-0.23	(0.06)	-0.10	(0.12)
High knowledge and skill intensive occupations	-0.32	(0.06)	-0.05	(0.07)	0.26	(0.08)	0.61	(0.08)
United States								
Low knowledge and skill intensive occupations	-0.39	(0.03)	-0.09	(0.09)	0.10	(0.12)	0.15	(0.17)
High knowledge and skill intensive occupations	-0.24	(0.05)	0.02	(0.05)	0.33	(0.05)	0.64	(0.11)
New Zealand								
Low knowledge and skill intensive occupations	-0.35	(0.04)	-0.23	(0.04)	-0.09	(0.04)	-0.08	(0.08)
High knowledge and skill intensive occupations	-0.27	(0.05)	-0.07	(0.03)	0.25	(0.04)	0.68	(0.09)
Netherlands								
Low knowledge and skill intensive occupations	-0.34	(0.07)	-0.20	(0.06)	-0.10	(0.04)	-0.08	(0.12)
High knowledge and skill intensive occupations	-0.16	(0.14)	-0.05	(0.08)	0.18	(0.05)	0.38	(0.06)

Table 4.11 (concluded)

Relationship between numeracy levels and earnings in standardized purchasing power parity for the population aged 16 to 65 employed by knowledge and skill requirements of occupation, 2003 and 2008

	Purchasing power parity in US dollars							
	Level 1		Level 2		Level 3		Level 4/5	
	mean	standard error	mean	standard error	mean	standard error	mean	standard error
Hungary								
Low knowledge and skill intensive occupations	-0.11	(0.09)	-0.05	(0.04)	0.04	(0.06)	0.24	(0.10)
High knowledge and skill intensive occupations	0.00	(0.19)	0.14	(0.10)	0.28	(0.09)	0.56	(0.19)
All countries								
Low knowledge and skill intensive occupations	**-0.35**	**(0.03)**	**-0.10**	**(0.07)**	**0.06**	**(0.09)**	**0.11**	**(0.12)**
High knowledge and skill intensive occupations	**-0.20**	**(0.04)**	**0.03**	**(0.04)**	**0.31**	**(0.04)**	**0.60**	**(0.09)**
Mathematics and engineering occupations[1]	**0.35**	**(0.24)**	**0.43**	**(0.29)**	**0.81**	**(0.16)**	**1.00**	**(0.12)**

1. Mathematics and engineering occupations include all occupations with ISCOR codes in the 2100 group. Due to insufficient sample size, the Mathematics and engineering group used a combined sample from all countries. To reduce the influence of labour market composition differences between countries, population weights rather than senate weights were used.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Chapter 5

Adult Problem Solving Skills

Summary

This chapter examines results obtained from the problem solving assessment fielded by participating countries in the first (2003) and second (2006 to 2008) rounds of data collection for the ALL survey. A total of nine countries administered the problem solving component: Australia,[1] Bermuda, Canada, Hungary, Italy, New Zealand, the Netherlands, Norway and Switzerland.[2]

The chapter consists of four sections. The first defines the problem solving domain, as measured in the ALL, and describes its importance as a foundation skill. The second compares the distributions and levels of problem solving skill among the adult populations of participating countries. The third section examines possible determinants of the problem solving skills of population sub-groups, including prose literacy skill, educational attainment, gender, age and occupation. The final section explores the role of problem solving skill in influencing important labour market outcomes.

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Adult Problem Solving Skills

5.1 Overview and highlights

This chapter examines results obtained from the problem solving assessment fielded by participating countries in the first (2003) and second (2006 to 2008) rounds of data collection for the ALL survey. A total of nine countries administered the problem solving component: Australia,[1] Bermuda, Canada, Hungary, Italy, New Zealand, the Netherlands, Norway and Switzerland.[2]

The chapter consists of four sections. The first defines the problem solving domain, as measured in the ALL, and describes its importance as a foundation skill. The second compares the distributions and levels of problem solving skill among the adult populations of participating countries. The third section examines possible determinants of the problem solving skills of population sub-groups, including prose literacy skill, educational attainment, gender, age and occupation. The final section explores the role of problem solving skill in influencing important labour market outcomes.

Several key findings arise from the analysis presented in this chapter:

- Literacy skills present a lower boundary on how well problem solving skills can be measured, since individuals must be able to understand how a problem is defined in order to solve it.
- Most countries have very similar distributions of individual problem solving skill. With the exceptions of Italy and Hungary, who have distinctly lower distributions of problem solving skill, the countries mainly differ in the variation of problem solving skills with the most variable country being Switzerland (French and German). Interestingly, despite having the greatest variation, Switzerland also has the lowest correlation between prose literacy and problem solving skill.
- Problem solving skill develops in concert with education, with plateaus in problem solving skill corresponding to thresholds at the completion of secondary education and again at the completion of tertiary education.

- The relationship between education and problem solving skill is stronger for older cohorts, suggesting an interaction that life experiences may magnify initial relationship between education and skill.
- There are no consistent gender differences in problem solving skill, and in the countries where males do perform better, the gender difference can be explained by gender differences in education and occupation.
- Occupation seems to have a more significant effect on problem solving skill than education; individuals who have lower education but are employed in occupations with high knowledge and skill demands tend to have better problem solving skills than those with initially high education who follow lower-skilled occupations. In general, problem solving skill is more related to current life activities than past achievements.
- Problem solving skill is related to individual labour market outcomes, such as employment and income. However, this degree of influence varies by country and depends primarily on type of occupation.

5.2 Defining problem solving in the ALL context

The ALL survey assessed four foundation skills thought to be essential for social, professional and economic success. Problem solving is ranked as a major competency by experts in educational assessment (see Binkley, Sternberg, Jones and Nohara, 1999; Reeff, Zabal and Klieme, 2005) as well as in the literature on vocational education and training (Didi, Fay, Kloft and Vogt, 1993). Furthermore, problem solving skills are identified as an important outcome of initial schooling by experts on the definition of key competencies (Rychen and Salganik, 2001), and are often translated into high-level curricular aims (see, e.g., Klieme, 1999). Recent discussions of lifelong learning also point to problem solving as one of the major competencies to be fostered in a lifelong learning process.

> "The importance for employers that individuals display good problem solving skills when presented with a typical workplace challenge, displaying ability to prioritize tasks with little direction and reviewing information to make decisions.
>
> According to Canada's Office of Literacy and Essential skills, problem solving is one of the most important skills for success in the workplace and at home. The ability to identify a problem, evaluate all of the relevant factors and develop a good solution is essential. Whether you are experiencing conflict with a co-worker, dealing with multiple tasks that need to be prioritized, or trying to track a shipment that hasn't arrived, problem solving is a part of everyday life." (HRSDC, 2008).

Problem solving is presented and defined broadly by authors in the psychological literature (Hunt, 1994; Mayer, 1992; Mayer and Wittrock, 1996; Smith, 1991), as the following:

> *"Problem solving is goal-directed thinking and action in situations for which no routine solution procedure is available.* The problem solver has a more or less well-defined goal, but does not immediately know how to reach it. The incongruence of goals and admissible operators constitutes a problem. The

> understanding of the problem situation and its step-by-step transformation, based on planning and reasoning, constitute the process of problem solving." (OECD and Statistics Canada, 2005).

A major challenge in developing a measurement framework for problem solving is how best to adapt the research literature to the constraints imposed by a large-scale international study. In order to make this possible, the decision was taken to focus the assessment on one essential subset of problem solving, namely analytical problem solving. The quality of problem solving is primarily determined by the comprehension of the problem situation, the thinking processes used to approach the problem, and the appropriateness of the solution. The approach taken for the assessment of problem solving in ALL relies on the notion of (moderately) familiar tasks. Within a somewhat familiar context, the problems to be solved are sufficiently "intransparent" so as not to be perceived as mere routine tasks. In addition, the domain-specific knowledge prerequisites are sufficiently limited so as to make analytical reasoning techniques the main cognitive tool for solving the problems.

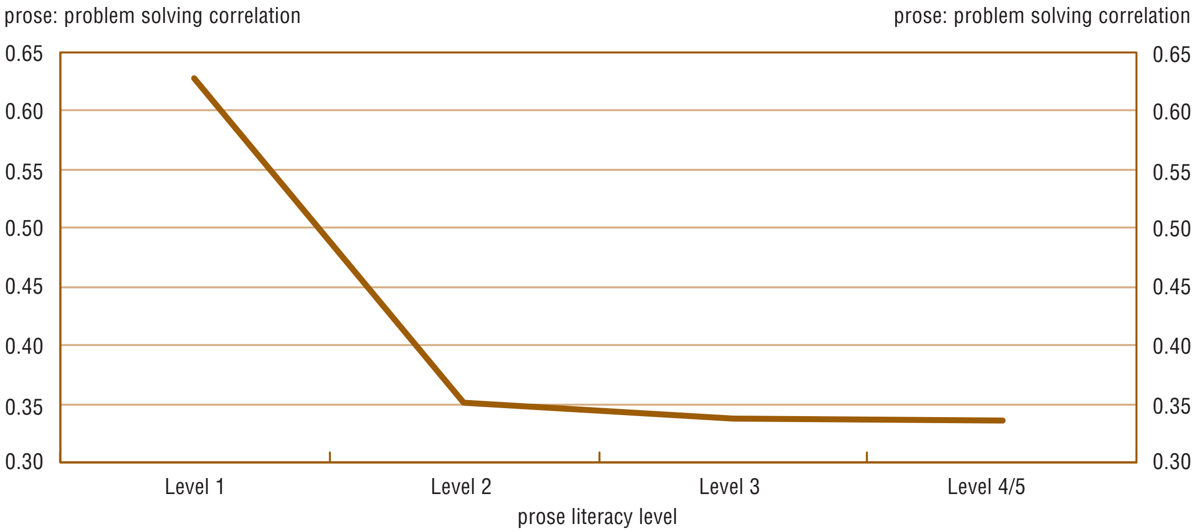
A large challenge is encountered when constructing test items for measuring problem solving skills as a part of an international study. As is the case in ALL, such assessments are predominantly carried out using written material assembled in paper and pencil booklets. Hence, written language permeates the contextualisation of the items, the stimuli, the questions, and the specific instructions issued. This written information must be read and understood by respondents before they can use their problem solving skills to try and find solutions to the questions. Consequently, performance on the test items depends on a minimum level of prose literacy. A minimum level of prose literacy is therefore a prerequisite for the measurement of problem solving skills in large surveys. Also conceptually there is a common-cause relationship between prose literacy and problem solving because both make use of a shared basic set of cognitive resources, such as working memory, processing speed and acquired knowledge. However, for people with a low level of prose literacy, there is an additional cause-effect correlation, because each problem solving task is essentially a combined literacy and problem solving task. This phenomenon is illustrated in Figure 5.1, which shows the correlation between prose literacy and problem solving skill within each level of prose literacy.

In Figure 5.1 the correlation between prose literacy and problem solving is high for the lowest level of prose literacy. At this basic level not all respondents have sufficient literacy command to fully understand the intent of the questions. As a result, for these individuals, the variability in successfully completing the problem solving tasks is more closely related to variability in literacy. However, the reading prerequisites of the questions do not pose challenges for respondents with higher levels of prose literacy, who are above the minimum literacy threshold. The strength of the correlation within all higher literacy levels is quite constant and proportional to the expected common-cause correlation between the two skill domains.

Figure 5.1

Correlation of problem solving and prose literacy within literacy levels

Zero order correlation coefficients indicating the strength of the association between problem solving skills and prose literacy skills within each defined level of prose literacy, ALL, 2003 and 2008



Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

In order to minimise the confounding influence of prose literacy on the interpretation of problem solving results, most of the data analyses presented in this chapter are based on a subsample of respondents whose prose literacy is at Level 2 or above. The literacy demands of the problem solving items are a relative constant for this subsample, because their literacy exceeds the minimum threshold. Consequently, variation in prose literacy has a minimal influence on the variation in problem solving scores of this subsample.

5.3 Comparative distributions of adult problem solving skill

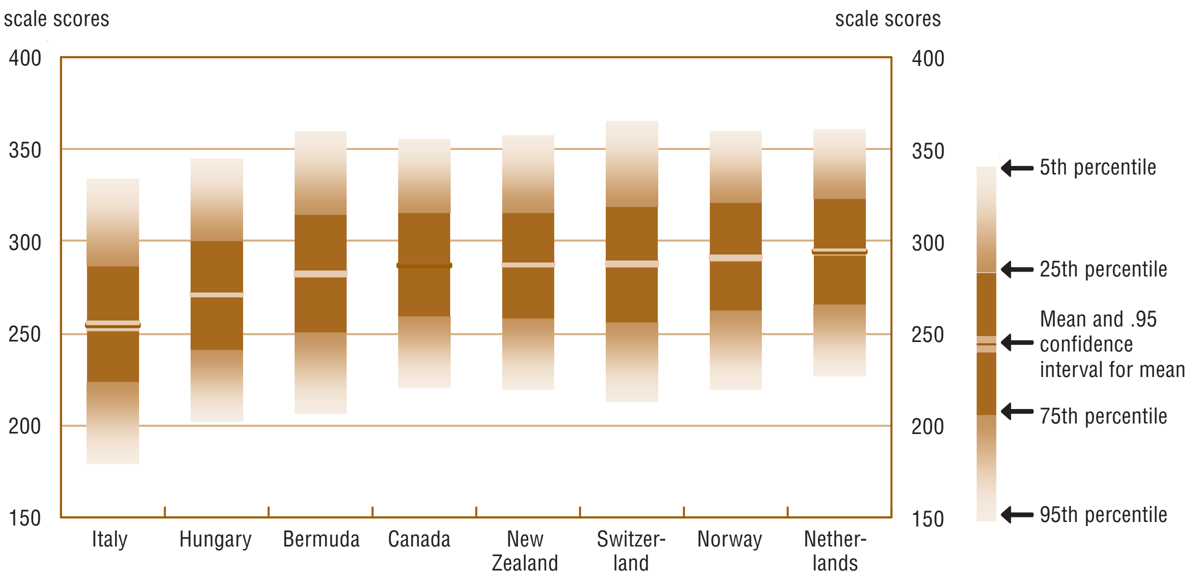
This section presents the general distributions of problem solving skills and performance levels for all participating countries. The results differ from the comparisons presented in Chapter 2 due to the exclusion of the Level 1 prose proficiency subsample of respondents for the reasons explained above.

Each country's overall performance in problem solving can be described in terms of its mean score and the variation around this average. In Figure 5.2 countries are represented with their average problem solving score and their interquartile range of scores. Although there is a tendency for higher performing countries to also have lower variation, no single pattern is consistent across all countries. The Netherlands and Norway are relatively distinct in having the desirable combination of higher performance and lower variation. However, the cluster of countries narrowly distributed above the international average includes both the most variable country, Switzerland (French and German), as well as the least variable country, Canada.

Figure 5.2

Comparative distribution of problem solving skills

Mean problem solving scores with .95 confidence interval and scores at the 5th, 25th, 75th and 95th percentiles on a scale ranging from 0 to 500 points, population performing at prose literacy Level 2 or above, and aged 16 to 65 years, 2003 and 2008



Countries are ranked by mean scores.

Note: Switzerland (Italian), the United States, and the province of Nuevo Leon in Mexico did not field the problem solving skills domain.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

5.4 Factors predicting problem solving skills

This section examines a set of variables that may explain variation in the distributions of problem solving skills across countries. These variables include prose literacy skill, initial educational attainment, age, gender and occupation. The section also examines the relationship between these variables and the development and maintenance of problem solving skills throughout the life career and across countries.

Prose literacy

According to the ALL measurement framework one should expect there to be a degree of correspondence between literacy domains such as prose and document. Much less is known, however, about the link between these literacy domains and problem solving skills, as the research literature exploring this relationship is quite limited. The opening section of this chapter already described the dependency of analytical problem solving on a minimum level of prose literacy. However, that effect is partially an artifact of the medium used to measure problem solving, namely a paper-and-pencil test. Beyond the measurement context a key question remains, namely, how do the literacy and problem solving domains develop in relation to each other, and do these relationships differ across countries?

The degree to which the development of prose literacy and problem solving skills are intertwined is investigated below.

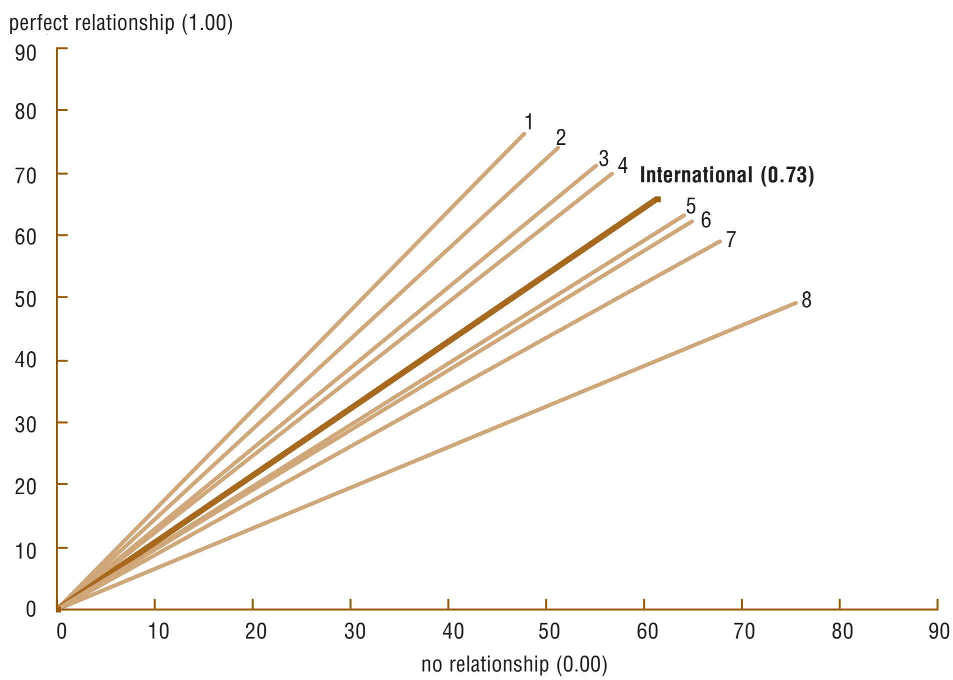
Prose literacy is a cornerstone of instruction in the formal education system. Hence there is an expected, positive relationship between educational attainment and prose literacy, so that population sub-groups without advanced formal education rarely exhibit high levels of literacy. In contrast analytical problem solving is described as a generic, but also higher-order skill that can be developed in formal as well as in informal settings. Consequently, since problem solving is not closely tied to forms of textual representation outside the measurement context, it could theoretically be possible for people to possess strong problem solving skills even in the absence of strong literacy skills.

A linear relationship between literacy and problem solving exists in each country surveyed, as illustrated in Figure 5.3. In the chart the strength of the relationship is illustrated by the angle of the line, with a vertical line indicating a perfect correlation and a horizontal line indicating a nonexistent correlation. In countries such as Canada and New Zealand where the correlation is high, most individuals possess similar levels of prose literacy and problem solving skills. The proportions of people with grossly mismatched skills in each country, as well as the degrees to which they are mismatched, is inversely proportional to the strengths of these correlations. Thus, Switzerland (French and German) has the highest proportion of strong problem solvers with weak literacy skills and/or weak problem solvers with high literacy skills.

Figure 5.3

Correspondence between prose literacy and problem solving

Zero order correlation coefficients denoting the strength of the association between prose literacy skill and problem solving skill, population scoring at prose literacy Level 2 or above, and aged 16 to 65 years, 2003 and 2008



1. New Zealand (0.85)
2. Canada (0.82)
3. Norway (0.79)
4. Netherlands (0.78)

International (0.73)

5. Bermuda (0.7)
6. Italy (0.69)
7. Hungary (0.66)
8. Switzerland (0.54)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Educational attainment

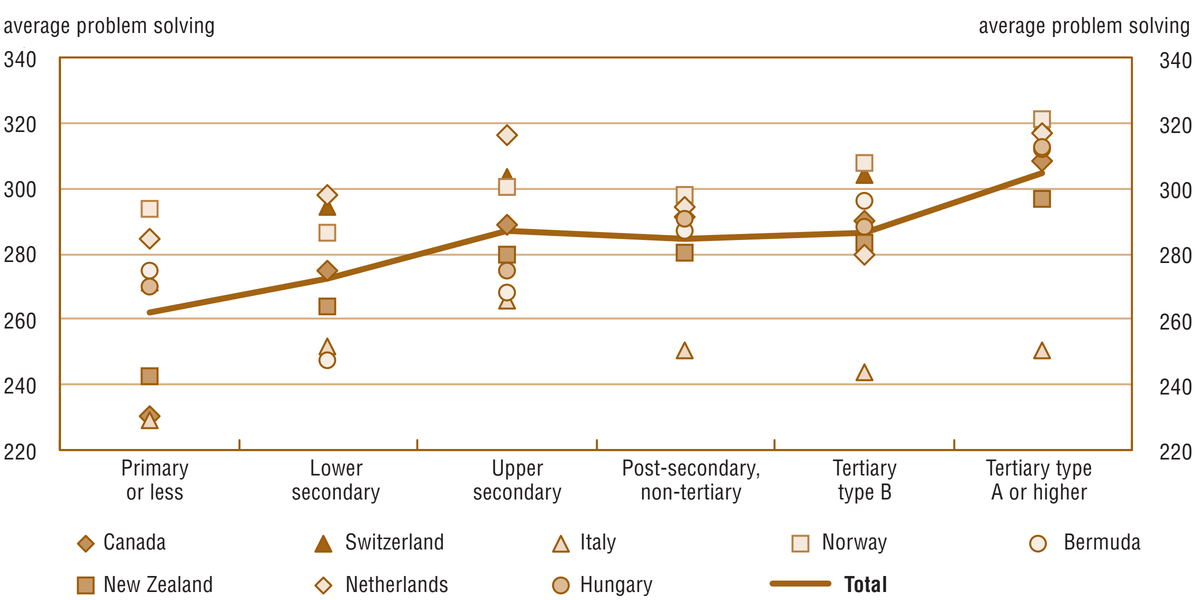
As discussed previously in Chapter 2 there exists an inherently strong relationship between educational attainment and problem solving. This relationship is explored further below in pursuit of tentative answers to the following questions. First, are specific levels of educational attainment associated with observable plateaus in the development of problem solving skills? Second, given that formal education fosters the development of foundation skills regardless of specialised study orientations, what might be the marginal contributing effects of continuing education and training? Third, are education systems more effective in some countries than others in imparting problem solving skills to students?

In order to assess the net effect of formal educational attainment on problem solving skill, the influence of variation in confounding factors such as recent participation in informal and non-formal learning activities should be held constant. This was achieved by limiting the subsample of respondents to those who had participated in any formal education activities within five years of the time of the interview. The average population problem solving scores at each level of formal education and for each country are plotted in Figure 5.4. With the exception of the systematically lower scores of Italy at all levels of educational attainment, all countries generally display a similar pattern in the association of educational attainment and problem solving. The international average, marked by the solid line, indicates two plateaus: the first upon completion of upper secondary education and the second upon completion of a first tertiary qualification.

Figure 5.4

Problem solving and educational attainment

Levels of educational attainment and average problem solving scores, population performing at prose literacy Level 2 or above, and aged 16 to 65 years, with participation in formal education within five years of the time of the interview, 2003 and 2008



Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

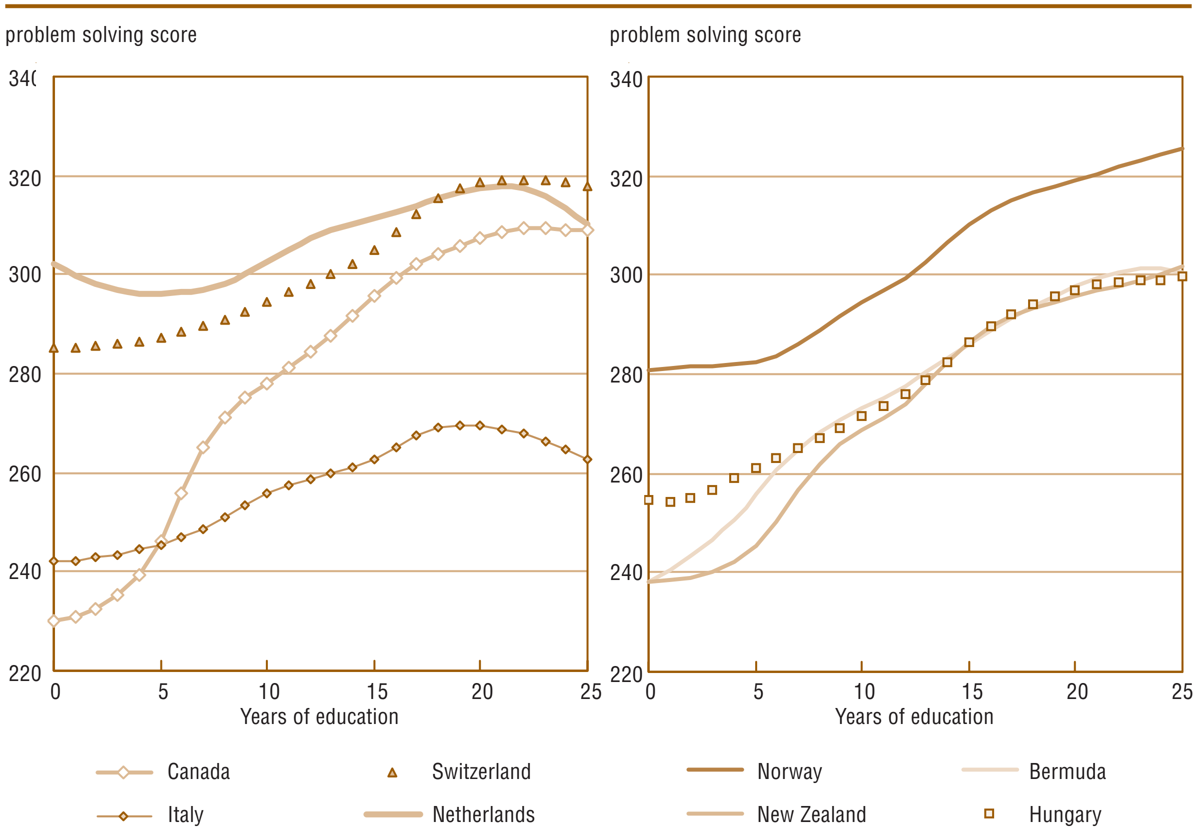
Although the problem solving skill gains associated with primary and secondary education and the first stage of tertiary education appear relatively steep, these levels of education, along with advanced research degrees, are also associated with the longest periods of study. When the different levels of educational attainment are expressed in terms of number of years of education, the resulting graph indicates a gradual leveling off of skill gain with each additional year of schooling.

Two patterns of diminishing returns are illustrated in Figure 5.5. The first, characterising Canada, Switzerland (French and German), Italy and the Netherlands, suggests small incremental gains per additional year of schooling, followed by a rapid rise in skill gains in the first few years of tertiary education. After those initial years in tertiary education, however, growth plateaus and there are no notable increases in problem solving skills associated with additional years of formal education. The second pattern, shared by Norway, Bermuda, New Zealand and Hungary, is denoted by a steeper initial rise in skill gain during the primary and secondary years, followed by a gradually decreasing slope. However, the slope indicating skill gain does not completely level off, as with the first pattern.

Figure 5.5

Problem solving and years of schooling

Total years spent in formal education and problem solving skills, population scoring at prose literacy Level 2 or above, and aged 16 to 65 years, with participation in formal education activities within five years of the time of the interview, 2003 and 2008



Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

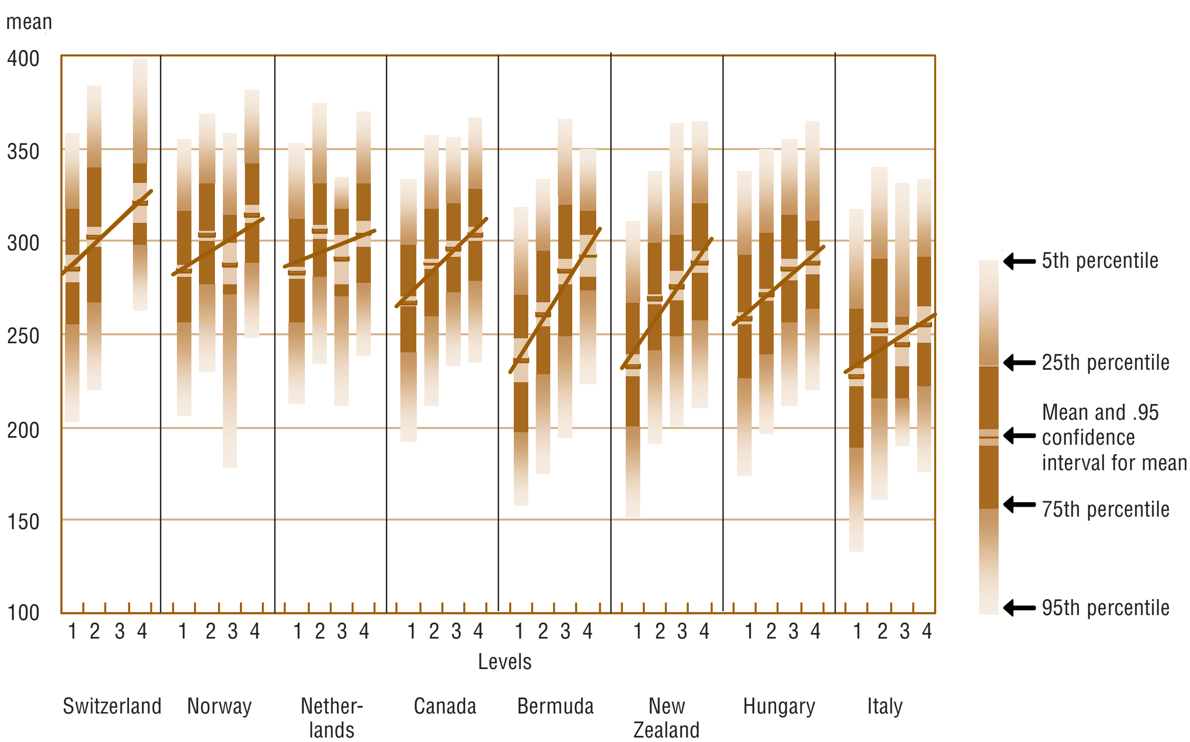
Education and age

Interestingly, the strength of the relationship between educational attainment and problem solving skill remains strong even for older individuals, who completed their initial formal education years ago (Figure 5.6.1 and Figure 5.6.2). This finding may be attributed in part to a cohort effect. At the time when people aged 55 to 65 years initially completed their studies, a more pronounced disparity existed between individuals with increasing levels of educational attainment – i.e. initially, tertiary education was more selective and exclusive, and its completion carried a higher premium than it does today. However, the initial education effect is most likely confounded and reinforced by factors subsequently at play over the life career, such as access to cognitively challenging employment, continued learning, use of technology, and high engagement in literacy practices. These results highlight the importance of using the formal education system to raise initial skills to levels permitting easy access to life's opportunities, thereby improving individuals' chances of retaining skills throughout their life career.

Figure 5.6.1

Problem solving and educational attainment

Mean scores with 0.95 confidence interval and scores at 5th, 25th, 75th, and 95th percentiles on the problem solving scale, population aged 16 to 25 years, 2003 and 2008



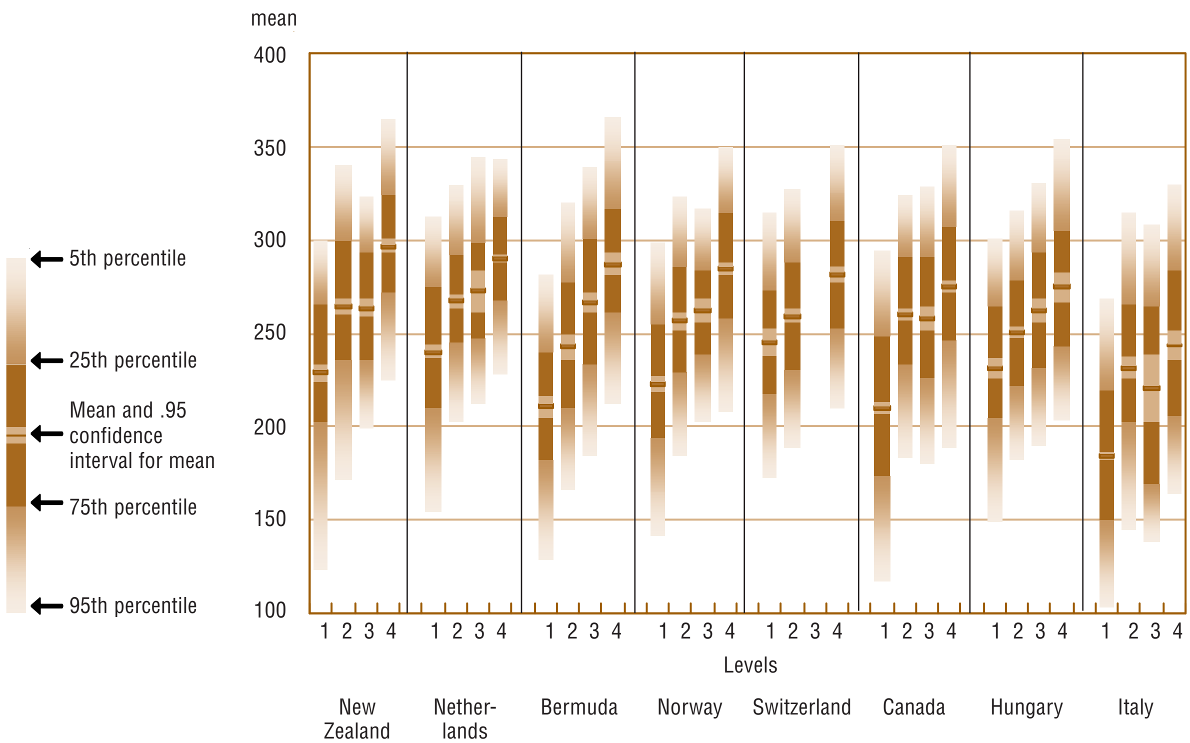
Countries are ordered in terms of the tertiary type A mean performance for each country.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Figure 5.6.2

Problem solving and educational attainment

Mean scores with 0.95 confidence interval and scores at 5th, 25th, 75th, and 95th percentiles on the problem solving scale, population aged 56 to 65 years, 2003 and 2008



Countries are ordered in terms of the tertiary type A mean performance for each country.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Gender

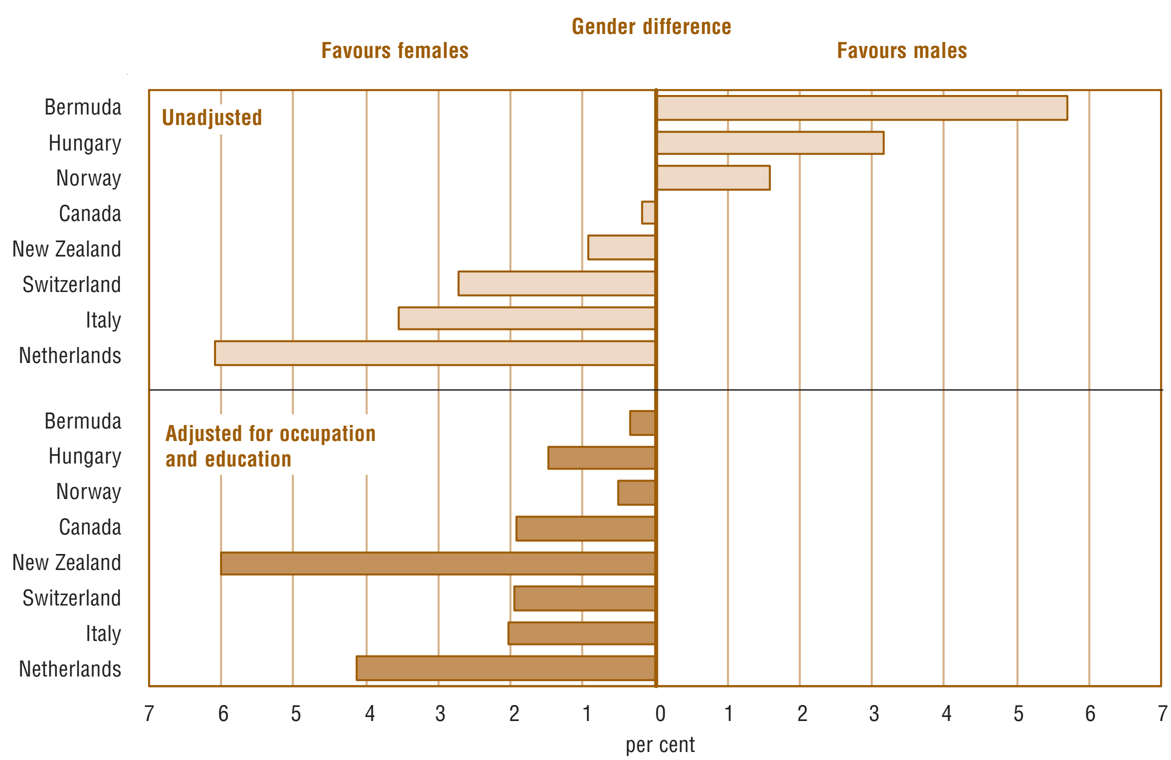
The previous international ALL report (OECD and Statistics Canada, 2005), along with other studies using data from the OECD Programme for International Student Assessment (PISA), consistently report women to have an advantage in reading proficiency or prose literacy skill and men to have an advantage in numeracy or mathematical literacy domains. However, the findings with respect to gender differences in problem solving skill are more ambiguous. In the recent ALL data, few significant differences are found in the average problem solving scores of men and women. Moreover, among the countries where the problem solving results are in fact significantly different between sexes, the advantage is small and does not always favour the same gender. Evidence from PISA (OECD, 2004) presents a similar story for 15 year-olds; the few differences found were as much in favour of boys as they were of girls. The authors of the PISA report suggest that problem solving scores tend to be gender neutral since they rely as much on analytical reasoning, which is closely related to mathematical literacy, as on reading skills.

The horizontal bars in Figure 5.7 compare the raw gender differences to the gender differences that emerge once variation in educational attainment and occupation are held constant for each country. Before these controls only three countries are found to have a statistically significant difference in the problem solving scores of women and men, namely Bermuda, Hungary and the Netherlands. After the controls for education and occupation are applied, women appear to have a slight skill advantage over men in all countries. However, the only statistically significant differences are in the Netherlands and New Zealand. These results suggest that although men appear to have an advantage over women in problem solving in many countries, this advantage is most likely due to the existence of gender differences in the education and occupation variables. For example, women may have been underrepresented among tertiary education graduates in some countries but not in others, or women may have had markedly less presence than men in knowledge intensive occupations. Where women are not disadvantaged in such factors they tend to have higher problem solving skills than men.

Figure 5.7

Gender differences in problem solving skill

Differences between women and men in raw and adjusted mean scores on the problem solving scale, by country, population performing at prose literacy Level 2 or above, and aged 16 to 65 years, 2003 and 2008



Notes: Countries are ordered by the size of the difference between men and women's mean problem solving scores. Statistically significant differences are found in Bermuda, Hungary and the Netherlands. Education and occupation are described dichotomously.

The 'low education' group comprises all levels prior to tertiary education and the 'low-skilled occupation' group consists of services and manufacturing occupations.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Occupation

This section explores the influence of occupational experiences acquired during the period beyond initial education on the development and retention of problem solving skills. In Figure 5.8 the distributions of problem solving scores across different classes of occupation illustrate that, in all countries surveyed, occupations described as more 'knowledge intensive' are associated with higher levels of problem solving skill. The exception to this pattern is the manager class, which is measured on a non-ordinal scale in half of the countries: Canada, Italy, Norway, the Netherlands and Switzerland (French and German). This effect might be a result of between country differences in definition because people with supervisory roles tend to have higher problem solving skills than those without in all countries. However, it is difficult to infer from this association between two variables whether individuals develop their skills in response to their occupations or if they are somehow sorted into skill-appropriate occupational categories through labour market dynamics.

Isolating the effects of workplace learning and other informal learning in every day life is difficult because, while these effects should result in skill growth, the absence of learning opportunities and effects of cognitive aging also result in skill loss over time. The extent of this skill loss might be of larger magnitude than the expected skill gain from additional learning. In all countries surveyed, tenure in the workforce after completing initial education is associated with a steady decline in average problem solving skills. These findings are consistent with other studies which have found that typically, older adults perform at lower levels when compared to middle-aged adults on problem solving tasks (Denney and Pearce, 1989; Haught and Walls, 2007; Hershey and Farrell, 1999).

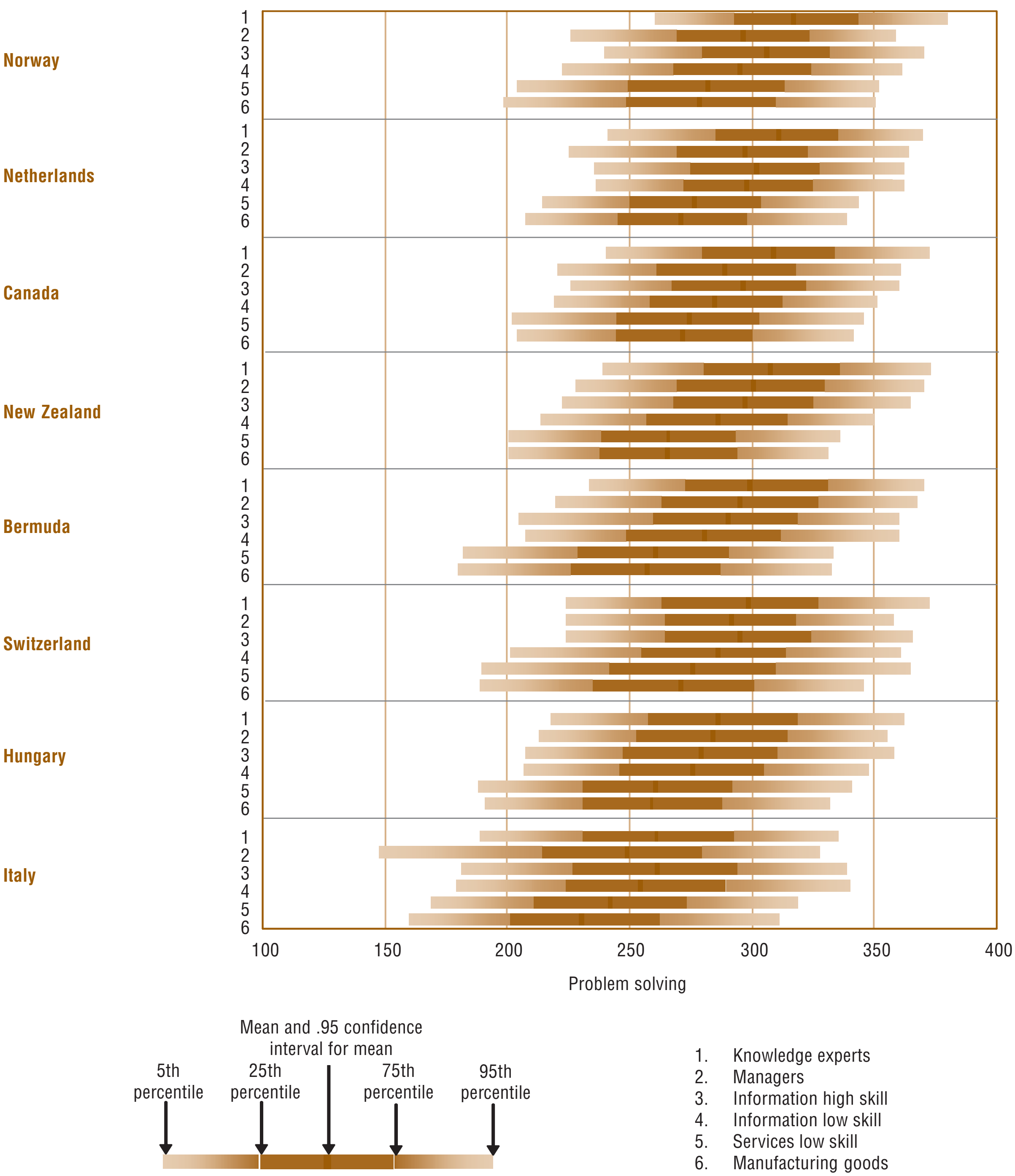
The interactive effects of initial education and subsequent learning are studied below by defining four combinations of education and occupation, using a simplified version of the International Standard Classification of Education (ISCED) and a measure of the knowledge intensity of occupational groups.[3] All forms of tertiary education were combined to form one 'high education' group that was compared to a 'low education' group comprising individuals with completed secondary education or less. Occupations including knowledge experts, managers and high and low skill information workers were classified as 'high knowledge' occupations, while low skill services and manufacturing occupations were classified as 'low knowledge' occupations. The resulting four combinations of these categories were:

1. High education, high knowledge occupation;
2. High education, low knowledge occupation;
3. Low education, high knowledge occupation;
4. Low education, low knowledge occupation.

Figure 5.8

Problem solving and the knowledge intensity of jobs

Scores on the 5th, 25th, 75th, and 95th percentiles for knowledge intensity in occupational classes by problem solving skills, population scoring at prose literacy Level 2 or above, and aged 16 to 65 years, ordered by median skill of knowledge experts, 2003 and 2008



Countries are ordered according to the median of the problem solving scale for the knowledge expert group.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

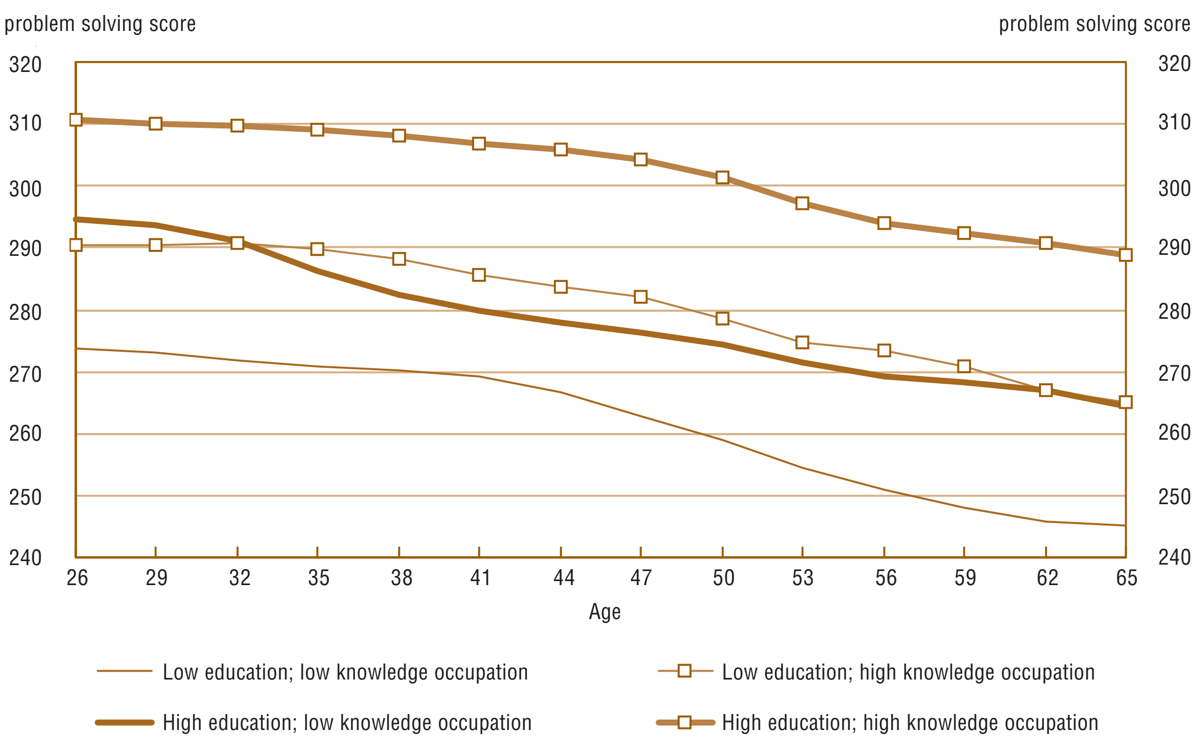
In comparing the distributions of problem solving skills by age groups separately for these four education and knowledge groups, the importance in skill maintenance of workplace and other experiential learning relative to formal education can be studied. Conventional knowledge in the field of literacy suggests that the high education groups will outperform the low education groups throughout the lifespan, due to the positive and cumulative effects of initial education on lifelong learning (Tuijnman, 1991). However, the results of this analysis of ALL data suggest a different explanation for the development and maintenance of problem solving skill.

The age-related trends for each of the four groups are plotted in Figure 5.9. In most countries age-related decline in problem solving skill is moderated by both education and occupation. The combination of high education and high skill occupation is associated with the greatest degree of skill maintenance. High initial education is associated with significantly higher problem solving skill for younger people, but this does not remain true through the life course. In fact, over time the scores of individuals with low education in high skill occupations tend to be higher than those of individuals with high education in low skill occupations.

Figure 5.9

Maintenance of problem solving skill by education, occupation and age

Synthetic international age-bound trends in problem solving skill in relation to high/low educational attainment and high/low knowledge intensity in occupations, population scoring at prose literacy Level 2 or above, and aged 26 to 65 years, 2003 and 2008



Note: The data analysis underlying the chart was produced using information from only four countries with sufficient sample sizes in each category: Canada, New Zealand, Norway and Switzerland (French and German).

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Overall the effects of initial educational attainment on the long term maintenance of problem solving skills seem to be of similar or lesser magnitude than the effects of skill use in knowledge occupations. Although individuals with high education do tend to pursue occupations with high skill intensity, high education by itself does not guarantee skill retention. Although sample size was insufficient in some countries to report on all population sub-groups, the patterns in the data seem to be consistent with the notion that initial skill levels are mainly determined by educational attainment, but maintenance of skill is determined more by continuing activities. These results suggest that informal and non-formal learning play an important role in the maintenance of problem solving skills over the life course.

5.5 Problem solving skills and labour market outcomes

The previous sections have dealt primarily with factors distinguishing persons with high problem solving skills from those with low skills and possible factors influencing the development of those skills. This section turns to labour market outcomes associated with various levels of problem solving skill, particularly employment and earnings from work.

Employment

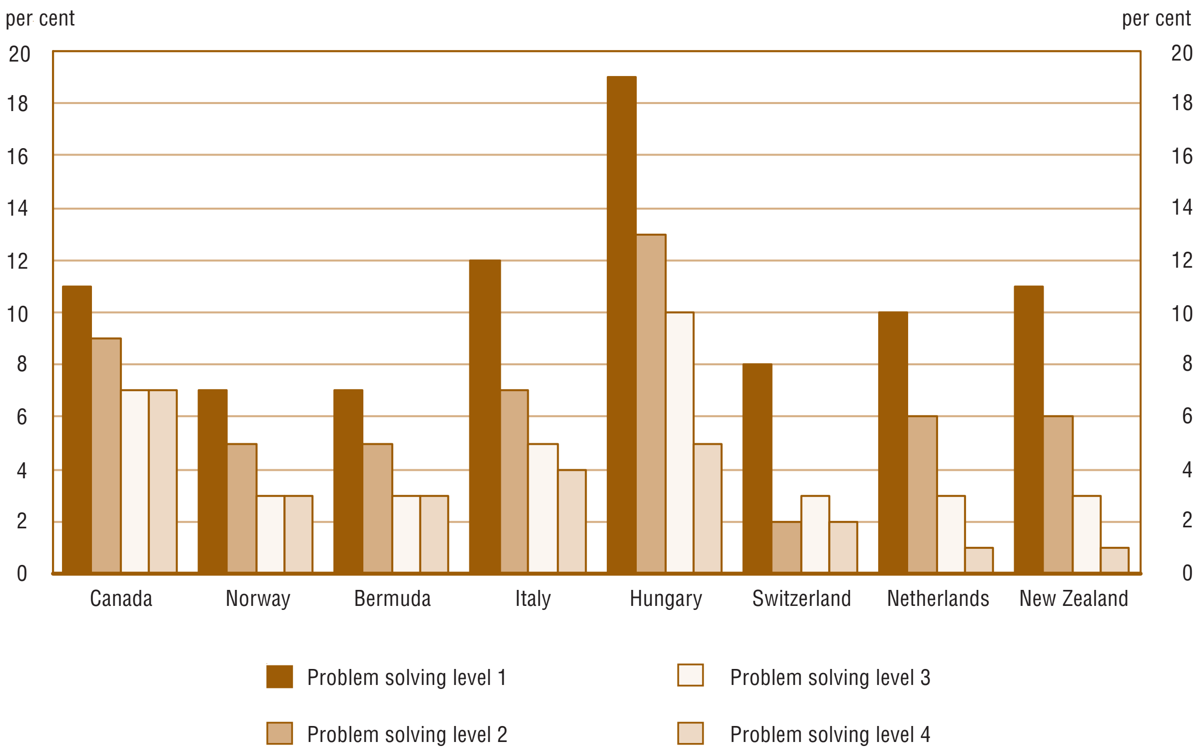
In general, individuals with high problem solving skills are more likely to be in the labour force and even more likely to be employed than persons with low skills, as can be seen from the results presented in Figure 5.10. As one would expect, the effect decreases as the overall employment rate in a country increases. Countries with relatively higher unemployment rates, such as the Netherlands and New Zealand, have the largest gaps in employment between skill levels, whereas countries with over 95 per cent employment, such as Bermuda and Norway, only have significant differences in unemployment above the two lowest levels. The two exceptions to this pattern, Hungary and Italy, have both lower employment and weaker between-skill level differences.

These results are consistent with a labour market model in which problem solving increases the competitiveness and productivity of individuals. When the supply of jobs is saturated, as in Switzerland, only the poorest problem solvers have a lower chance of being employed, whereas when the supply of labour is abundant, as in Hungary, problem solving is still a major factor affecting employment at the highest proficiency levels. In countries where unemployment may be high and high industrial and geographic diversity limit worker mobility, such as Hungary, the Netherlands, and New Zealand, problem solving skill has a large effect on employment outcomes at all levels.

Figure 5.10

Problem solving skills and employment

Unemployment rates and problem solving levels by country, population at prose literacy Level 2 or above, and aged 26 to 65 years, 2003 and 2008



Countries are ordered by the percentage difference in unemployment rate between level 1 and level 4 problem solving.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Earnings from work

Once individuals have acquired a job, is there still a premium associated with problem solving skills? Even though the ability to solve problems is a valued trait in the eyes of many employers, does that value translate into higher pay for individuals with higher problem solving skills? With so many filters in place as precursors to acquiring a job and then possibly embarking on a career, including education and being hired, most already related to both prose literacy and problem solving skills, it is difficult to identify how well observed skills are rewarded in the labour market.

A specific analysis of the ALL data was undertaken to explore these issues. The effects of problem solving skill, both direct and interacting with education and occupation type, on annual earnings from work was estimated while holding variation associated with occupation constant. However, in most labour markets, the role of formal education is as a critical filter that grants access to occupations with higher wages. By controlling for the knowledge intensity level of occupations, the difference in wage income between those with low problem solving skill and high problem solving skill indicates the premium for skill in each country. The annual earnings premium for individuals with high problem solving skills in each country is illustrated in Figure 5.11. All amounts are converted into 2003 equivalent US dollars using purchasing power parities. There are two bars for each country, corresponding to the combinations of high versus low problem solving skill and high versus low knowledge intensity occupation. There are substantive differences between countries in the labour market rewards accruing to problem solving skill.

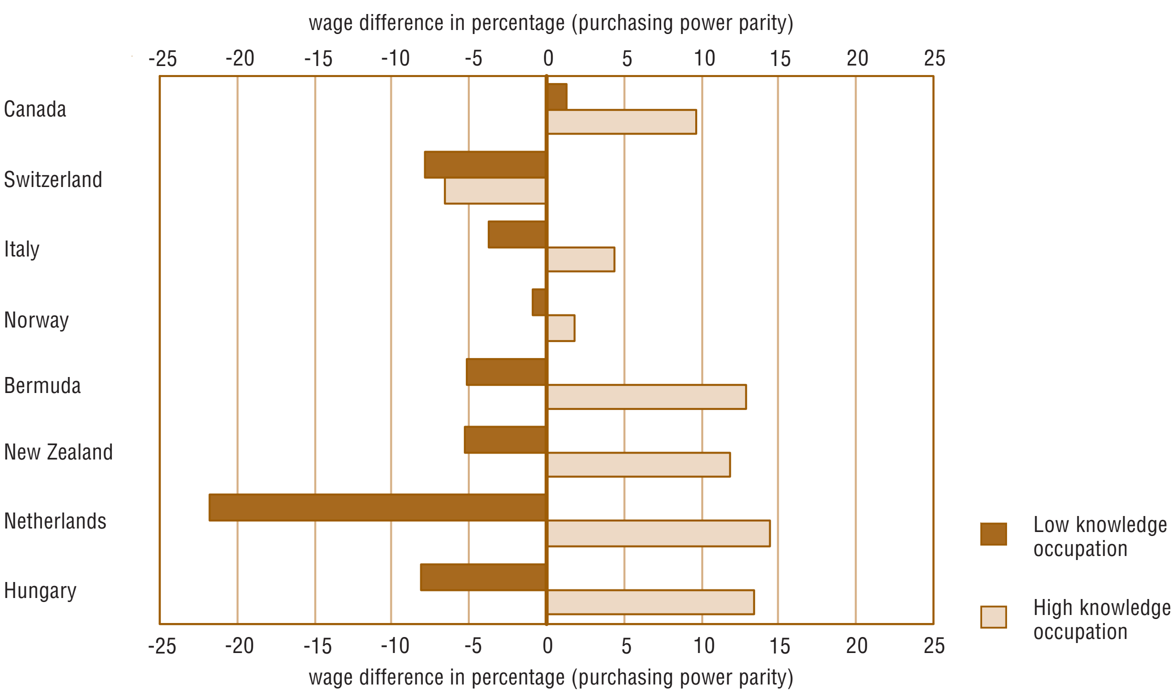
In general, where there is a reward for higher problem solving skill, it is likely to be for individuals in occupations with greater knowledge intensity. This pattern is evident in Canada, Bermuda, New Zealand and the Netherlands. However, there is a great deal of variation between countries. In most countries, there are no significant differences in wage income associated with problem solving skill. Moreover, in several countries, particularly Switzerland and the Netherlands (for low knowledge occupations), individuals with lower skills tend to earn more than those with higher skills in occupations with similar knowledge intensity.

It should be noted that wage income responds to many factors outside of skills and occupation type. To different extents in each country, individual characteristics such as tenure, education and age can play an important role in wage income. Other societal factors such as economic climate, labour market structure and regulation can also play a determinant role.

Figure 5.11

Problem solving skills and income

Effect of problem solving skills on earnings from work in different occupational knowledge intensities, purchasing power parity adjusted to 2003 US dollars, population scoring at prose literacy Level 2 or above, and aged 26 to 65 years, 2003 and 2008



Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Earnings from self employment

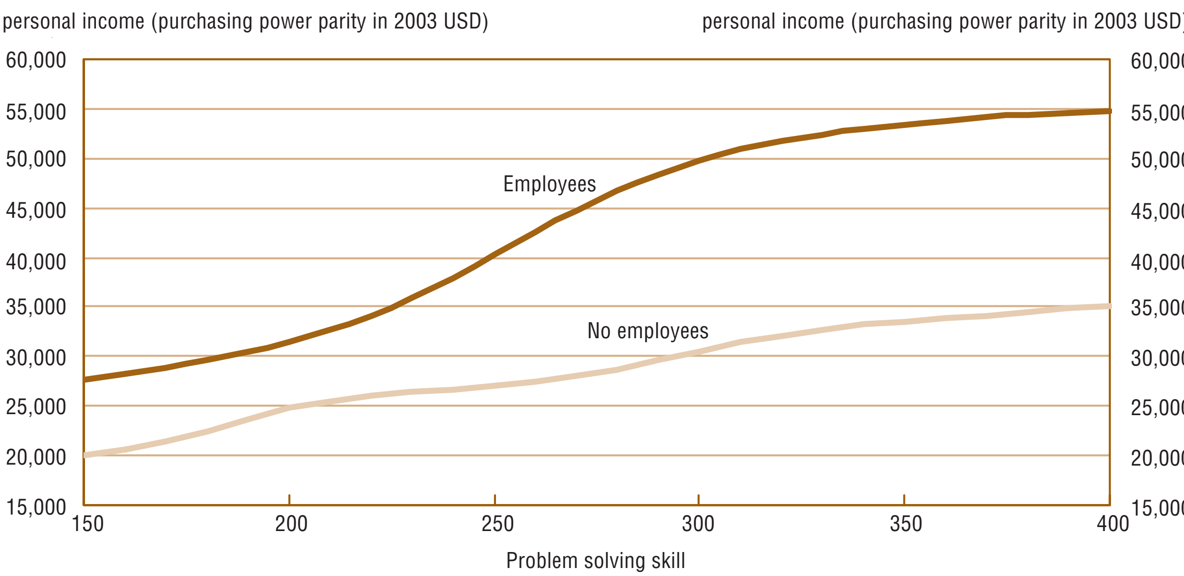
The variable 'earnings from work' analysed above is of high interest to economists and others, but presents only some measures of the economic returns accruing to problem solving skill, because the effects of skill on wage income may be moderated by the effects of entrepreneurialism. People with skills or motivation that exceed the demand of available jobs and the capacity of employers to reward them may be more likely to be self employed. About 10 per cent of the labour force in most of the countries surveyed was self employed.

The general trends for self employed people with and without employees are illustrated in Figure 5.12. In both types of self employed individuals, the association between earnings and problem solving skill is positive, although self-employed people with employees tend to have higher earnings at all levels of problem solving. Business owners with employees fall into two broad categories: those with low skills and low income and those with high skills and high income. The steep curve in the relationship connecting these two groups – in the range of 230 to 280 points on the problem solving scale – suggests that there may be a threshold of problem solving skill that people need in order to successfully manage a large firm or number of employees. Above Level 3 (300 points) on the problem solving scale, the strength of the relationship between problem solving skill and earnings from self employment weakens. In contrast, the relationship between problem solving skill and earnings for self employed individuals without employees is much more consistent across the entire problem solving scale.

Figure 5.12

Problem solving ability and earnings of the self employed

Overall international problem solving skill distribution and earnings from work for the self employed, population scoring at prose literacy Level 2 or above, and aged 16 to 65 years, 2003 and 2008



Note: The sample size of the self employed was too small in most countries to compute effect sizes for specific population sub-groups therefore, pooled international data was used to compute the results. Hungary and the Netherlands were excluded due to insufficient sample sizes.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Conclusion

This chapter has explored problem solving skill both as an outcome of individual choice and circumstance and as an antecedent of labour market outcomes. Unlike many other skills, such as prose literacy, that require heavier use of crystallised cognitive structures, the fluidity of problem solving renders it more sensitive to ongoing experiences and behaviours. Also, problem solving skill has a weaker relationship to demographic characteristics, such as gender. While education plays a role in developing problem solving skills, this is not as significant as the daily use of these skills, particularly in the workplace.

Countries with higher proportions of problem solvers at Levels 3 and 4, as well as high average problem solving skills, are better equipped in the global economy to deal constructively with rapid changes in work environments and to use technology in order to enhance efficiency and productivity. Countries with greater variation in problem solving skills are likely to face challenges in adapting to changes in the workplace and developing a culture of lifelong learning. For example, programmes or technologies well-suited to high skilled people may not be accessible to low skilled individuals.

The contribution of problem solving to individuals' economic outcomes is probably more a product of labour market dynamics than the result of an intrinsic appreciation of problem solving skills on the part of employers. Individuals with higher problem solving skills tend to have greater employment. Earnings tend to be higher for better problem solvers, but the rewards, where they exist, are seen more in occupations with greater knowledge intensity. These results suggest that in general, problem solving skills are related to important individual labour market outcomes. They also suggest that the strength with which problem solving skills relate to labour market outcomes rests on a more complex scheme of interactions between labour market structure and individual characteristics. Further research is required to understand the role between problem solving skills and labour market outcomes in that context.

Endnotes

1. Data for Australia were only partially available and so not all of the analyses required for this chapter could be performed for the country.
2. The United States and the Italian speaking region of Switzerland did not field the problem solving domain. Therefore results for these two countries do not appear in this chapter.
3. Since the available data elements were insufficient to undertake this comparison in a statistically valid manner for each country individually, the national data sets were pooled and general international results were produced instead.

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Annex 5

Data Values for the Figures

Table 5.1

Zero order correlation coefficients indicating the strength of the association between problem solving skill and prose literacy skill within each defined level of prose literacy, ALL, 2003 and 2008

Prose literacy level	correlation	standard error
Level 1	0.63***	(0.02)
Level 2	0.35***	(0.01)
Level 3	0.34***	(0.01)
Level 4	0.34***	(0.03)

*** p<0.01, statistically significant at the 1 per cent level

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 5.2

Mean problem solving scores with .95 confidence interval and scores at the 5th, 25th, 75th and 95th percentiles on a scale ranging from 0 to 500 points, population performing at prose literacy Level 2 or above, and aged 16 to 65 years, 2003 and 2008

	Problem solving scale									
Country	5th percentile	standard error	25th percentile	standard error	75th percentile	standard error	95th percentile	standard error	average	standard error
Canada	220.2	(2.0)	259.0	(1.0)	315.1	(1.5)	356.0	(2.7)	287.1	(0.8)
Switzerland	212.6	(3.7)	255.8	(2.2)	318.4	(1.7)	365.2	(2.2)	287.7	(1.5)
Italy	179.1	(7.1)	223.1	(3.4)	286.4	(1.9)	333.7	(2.7)	254.6	(2.6)
Norway	219.5	(3.0)	263.1	(2.5)	321.1	(1.4)	360.1	(1.8)	291.6	(1.6)
Bermuda	206.5	(4.1)	251.2	(2.5)	314.7	(2.1)	359.6	(2.3)	282.9	(1.6)
New Zealand	219.5	(3.2)	258.3	(1.2)	315.5	(1.5)	357.6	(1.6)	287.3	(1.0)
Netherlands	227.2	(2.6)	266.0	(1.0)	321.8	(1.5)	359.8	(2.6)	293.9	(0.9)
Hungary	201.5	(1.8)	241.2	(1.3)	300.4	(1.4)	344.7	(2.4)	271.2	(1.0)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 5.3

Zero order correlation coefficients denoting the strength of the association between prose literacy skill and problem solving skill, population scoring at prose literacy Level 2 or above, and aged 16 to 65 years, 2003 and 2008

Country	correlation	standard error
Canada	0.82***	(0.01)
Switzerland	0.54***	(0.03)
Italy	0.69***	(0.02)
Norway	0.79***	(0.01)
Bermuda	0.70***	(0.02)
New Zealand	0.85***	(0.01)
Netherlands	0.78***	(0.01)
Hungary	0.66***	(0.01)
International	0.73***	(0.00)

*** p<0.01, statistically significant at the 1 per cent level

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 5.4

Levels of educational attainment and average problem solving scores, population performing at prose literacy Level 2 or above, and aged 16 to 65 years, with participation in formal education within five years of the time of the interview, 2003 and 2008

	Problem solving scale	
Educational attainment	average	standard error
Canada		
Primary or less	230.6	(43.8)
Lower secondary	274.8	(2.1)
Upper secondary	288.9	(2.6)
Post-secondary, non-tertiary	291.4	(2.9)
Tertiary type B	289.8	(4.1)
Tertiary type A or higher	308.2	(2.8)
Switzerland		
Primary or less	270.9	(34.6)
Lower secondary	294.1	(7.1)
Upper secondary	303.7	(5.8)
Tertiary type B	304.2	(4.9)
Tertiary type A or higher	319.9	(8.6)
Italy		
Primary or less	229.0	(29.1)
Lower secondary	251.7	(5.7)
Upper secondary	265.5	(3.7)
Post-secondary, non-tertiary	250.7	(10.0)
Tertiary type B	243.5	(43.6)
Tertiary type A or higher	250.2	(12.0)

Table 5.4 (concluded)

Levels of educational attainment and average problem solving scores, population performing at prose literacy Level 2 or above, and aged 16 to 65 years, with participation in formal education within five years of the time of the interview, 2003 and 2008

	Problem solving scale	
Educational attainment	average	standard error
Norway		
Primary or less	293.8	(24.1)
Lower secondary	286.5	(3.9)
Upper secondary	300.5	(2.4)
Post-secondary, non-tertiary	297.9	(6.3)
Tertiary type B	307.7	(2.6)
Tertiary type A or higher	320.9	(2.8)
Bermuda		
Primary or less	274.8	(34.9)
Lower secondary	247.4	(14.5)
Upper secondary	268.3	(5.6)
Post-secondary, non-tertiary	286.9	(6.5)
Tertiary type B	296.2	(7.5)
Tertiary type A or higher	311.7	(5.9)
New Zealand		
Primary or less	242.4	(32.0)
Lower secondary	264.1	(4.3)
Upper secondary	279.5	(2.5)
Post-secondary, non-tertiary	280.2	(4.6)
Tertiary type B	283.1	(5.8)
Tertiary type A or higher	296.9	(2.6)
Netherlands		
Primary or less	284.3	(14.5)
Lower secondary	298.3	(9.7)
Upper secondary	316.1	(3.8)
Post-secondary, non-tertiary	294.3	(10.8)
Tertiary type B	279.6	(9.0)
Tertiary type A or higher	317.1	(3.7)
Hungary		
Primary or less	269.7	(3.9)
Upper secondary	274.8	(3.9)
Post-secondary, non-tertiary	291.0	(5.5)
Tertiary type B	288.0	(3.0)
Tertiary type A or higher	312.4	(6.3)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 5.5

Total years spent in formal education and problem solving skill, population scoring at prose literacy Level 2 or above, and aged 16 to 65 years, with participation in formal education activities within five years of the time of the interview, 2003 and 2008

	Estimated problem solving score							
	Canada		Switzerland		Italy		Norway	
Years of education	score	standard error	score	standard error	score	standard error	score	standard error
0	230.0	(7.0)	285.0	(11.4)	242.0	(6.9)	280.8	(11.7)
1	231.0	(6.5)	285.4	(9.9)	242.3	(6.7)	281.3	(10.9)
2	232.7	(6.0)	285.7	(8.5)	242.9	(6.4)	281.5	(9.6)
3	235.1	(5.5)	286.1	(7.1)	243.5	(6.0)	281.7	(7.9)
4	239.1	(4.9)	286.6	(6.0)	244.4	(5.6)	281.9	(6.2)
5	246.0	(4.1)	287.3	(5.3)	245.5	(5.2)	282.5	(4.9)
6	255.9	(3.1)	288.3	(4.7)	246.9	(4.8)	283.7	(4.1)
7	265.3	(2.3)	289.5	(4.2)	248.7	(4.3)	285.8	(3.4)
8	271.3	(2.0)	291.0	(3.8)	250.9	(3.8)	288.7	(2.8)
9	275.1	(1.8)	292.7	(3.4)	253.5	(3.2)	291.7	(2.3)
10	278.2	(1.7)	294.5	(3.2)	255.9	(2.7)	294.4	(2.1)
11	281.2	(1.5)	296.3	(3.1)	257.6	(2.5)	296.9	(2.0)
12	284.3	(1.4)	298.1	(3.0)	258.7	(2.5)	299.5	(1.9)
13	287.8	(1.4)	300.1	(3.0)	259.8	(2.5)	302.6	(1.7)
14	291.7	(1.4)	302.3	(3.0)	261.0	(2.5)	306.5	(1.6)
15	295.8	(1.5)	305.1	(2.9)	262.8	(2.4)	310.3	(1.7)
16	299.5	(1.6)	308.6	(2.9)	265.2	(2.5)	313.2	(1.8)
17	302.2	(1.8)	312.4	(3.2)	267.5	(3.0)	315.1	(1.9)
18	304.1	(1.9)	315.5	(3.7)	269.0	(3.4)	316.5	(2.0)
19	305.8	(2.1)	317.6	(4.1)	269.5	(3.7)	317.7	(2.2)
20	307.4	(2.3)	318.7	(4.4)	269.3	(4.0)	319.0	(2.5)
21	308.6	(2.6)	319.2	(4.6)	268.8	(4.4)	320.4	(3.0)
22	309.3	(3.0)	319.2	(4.7)	267.8	(5.0)	321.8	(3.5)
23	309.2	(3.6)	319.0	(4.9)	266.4	(5.7)	323.1	(4.0)
24	308.9	(4.3)	318.5	(5.3)	264.8	(6.5)	324.3	(4.6)
25	308.8	(4.9)	318.0	(6.1)	262.8	(7.2)	325.6	(5.3)

Table 5.5 (concluded)

Total years spent in formal education and problem solving skill, population scoring at prose literacy Level 2 or above, and aged 16 to 65 years, with participation in formal education activities within five years of the time of the interview, 2003 and 2008

	Estimated problem solving score							
	Bermuda		New Zealand		Netherlands		Hungary	
Years of education	score	standard error	score	standard error	score	standard error	score	standard error
0	238.0	(16.1)	238.2	(7.6)	302.0	(8.0)	254.7	(11.9)
1	240.6	(13.4)	238.5	(7.5)	299.6	(7.4)	254.1	(8.7)
2	243.3	(11.8)	239.0	(7.3)	297.9	(7.1)	255.0	(6.8)
3	246.6	(10.5)	240.1	(6.8)	296.9	(6.9)	256.8	(5.6)
4	250.8	(9.1)	242.1	(6.1)	296.3	(6.7)	258.9	(4.7)
5	255.7	(7.5)	245.4	(5.2)	296.2	(6.4)	261.0	(4.1)
6	260.6	(6.0)	250.3	(4.1)	296.4	(5.9)	263.0	(3.7)
7	264.8	(5.0)	256.5	(3.0)	297.1	(5.3)	265.1	(3.3)
8	268.2	(4.4)	262.0	(2.2)	298.3	(4.7)	267.2	(2.9)
9	270.8	(4.1)	265.8	(2.0)	300.2	(4.1)	269.3	(2.5)
10	273.0	(3.9)	268.6	(1.8)	302.5	(3.5)	271.4	(2.4)
11	275.2	(3.7)	271.0	(1.8)	305.0	(3.1)	273.5	(2.3)
12	277.6	(3.5)	274.0	(1.6)	307.2	(2.9)	275.9	(2.2)
13	280.3	(3.3)	277.9	(1.6)	308.9	(2.7)	278.8	(2.0)
14	283.2	(3.1)	282.4	(1.6)	310.2	(2.6)	282.4	(2.0)
15	286.1	(3.1)	286.5	(1.8)	311.3	(2.6)	286.3	(2.1)
16	288.9	(3.2)	289.6	(2.0)	312.5	(2.5)	289.7	(2.2)
17	291.4	(3.3)	291.6	(2.1)	313.8	(2.4)	292.3	(2.4)
18	293.6	(3.5)	293.2	(2.3)	315.2	(2.5)	294.2	(2.5)
19	295.7	(3.6)	294.5	(2.5)	316.6	(2.6)	295.8	(2.6)
20	297.6	(3.8)	295.7	(2.9)	317.6	(2.8)	297.1	(2.9)
21	299.4	(4.2)	296.8	(3.3)	317.9	(3.0)	298.0	(3.2)
22	300.7	(4.9)	297.8	(3.8)	317.4	(3.2)	298.6	(3.7)
23	301.4	(5.6)	298.8	(4.4)	316.0	(3.4)	298.8	(4.2)
24	301.3	(6.3)	300.0	(5.2)	313.5	(3.7)	299.1	(4.9)
25	300.5	(7.0)	301.6	(6.0)	310.4	(4.3)	299.6	(5.7)

Note: Smoothing bandwidths vary across countries depending on the sample size and consistency of estimates. The average bandwidths for the countries are: Canada: 2.639, Switzerland: 3.309, Italy: 3.052, Norway: 2.877, Bermuda: 3.528, New Zealand: 2.682, Netherlands: 3.114 and Hungary: 2.826.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 5.6

Mean scores with 0.95 confidence interval and scores at 5th, 25th, 75th, and 95th percentiles on the problem solving scale, populations aged 16 to 25 and 56 to 65, 2003 and 2008

	Problem solving scale: Youth aged 16 to 25									
Educational attainment	5th percentile	standard error	25th percentile	standard error	75th percentile	standard error	95th percentile	standard error	average	standard error
Canada										
Less than secondary	192.5	(6.8)	239.9	(4.3)	298.0	(3.3)	334.0	(6.4)	267.4	(2.5)
Completed secondary	211.9	(4.7)	259.7	(3.9)	318.0	(5.0)	357.2	(5.4)	288.0	(2.6)
Post-secondary, non-tertiary	232.6	(12.2)	272.0	(7.0)	320.7	(6.7)	356.5	(6.2)	296.4	(4.3)
Tertiary	234.6	(8.1)	279.1	(4.3)	328.5	(4.0)	366.9	(9.5)	303.9	(3.6)
Switzerland										
Less than secondary	202.7	…	255.5	(12.6)	317.8	(6.1)	358.3	(9.1)	285.4	(7.0)
Completed secondary	220.0	(18.2)	267.4	(9.9)	339.6	(8.3)	383.5	(12.4)	302.8	(5.5)
Tertiary	262.7	…	298.3	…	341.8	(10.5)	397.5	(35.9)	320.5	(10.6)
Italy										
Less than secondary	132.9	(14.7)	189.3	(5.5)	264.5	(5.1)	317.2	(7.9)	227.0	(4.6)
Completed secondary	161.0	(11.2)	215.9	(5.0)	291.1	(4.7)	340.4	(7.0)	252.2	(3.8)
Post-secondary, non-tertiary	189.7	(18.0)	216.1	(14.4)	259.9	(15.2)	331.1	(21.4)	244.2	(11.2)
Tertiary	176.4	(19.9)	222.3	(18.1)	292.0	(13.3)	333.7	(17.5)	255.7	(9.6)
Norway										
Less than secondary	206.6	(13.0)	256.7	(4.9)	316.4	(3.7)	354.8	(4.0)	284.2	(3.6)
Completed secondary	229.5	(8.4)	277.3	(3.9)	331.7	(4.2)	368.5	(6.8)	303.1	(2.5)
Post-secondary, non-tertiary	178.6	(29.6)	271.3	(14.3)	314.3	(11.8)	358.7	(19.0)	287.8	(11.2)
Tertiary	247.9	(28.1)	289.0	(3.8)	342.1	(7.6)	381.4	(11.0)	314.7	(4.5)
Bermuda										
Less than secondary	158.1	(11.8)	197.5	(19.7)	271.4	(21.5)	318.8	(14.0)	235.8	(11.9)
Completed secondary	175.4	(12.3)	228.2	(9.6)	295.2	(6.5)	333.3	(9.5)	260.5	(6.7)
Post-secondary, non-tertiary	194.0	(21.7)	248.9	(12.5)	319.9	(9.3)	366.2	(19.9)	284.1	(7.0)
Tertiary	223.6	(22.3)	273.2	(24.5)	316.7	(16.8)	350.0	(13.7)	292.4	(11.3)
New Zealand										
Less than secondary	151.0	(24.2)	201.0	(10.0)	267.3	(9.4)	311.1	(13.1)	233.3	(5.5)
Completed secondary	190.8	(3.1)	241.3	(4.8)	299.1	(3.4)	337.5	(4.0)	268.9	(2.7)
Post-secondary, non-tertiary	201.1	(26.7)	248.7	(6.8)	303.2	(10.3)	363.9	(26.2)	276.1	(7.9)
Tertiary	210.4	(12.8)	258.0	(8.3)	321.1	(7.5)	364.4	(6.9)	288.9	(5.8)

Table 5.6 (continued)

Mean scores with 0.95 confidence interval and scores at 5th, 25th, 75th, and 95th percentiles on the problem solving scale, populations aged 16 to 25 and 56 to 65, 2003 and 2008

	Problem solving scale: Youth aged 16 to 25									
Educational attainment	5th percentile	standard error	25th percentile	standard error	75th percentile	standard error	95th percentile	standard error	average	standard error
Netherlands										
Less than secondary	212.1	(11.3)	256.1	(4.4)	311.9	(4.7)	352.8	(9.9)	283.1	(3.0)
Completed secondary	234.1	(13.6)	281.5	(7.0)	331.8	(6.0)	373.8	(11.3)	305.4	(4.0)
Post-secondary, non-tertiary	211.9	(21.9)	270.4	(18.3)	317.7	(19.8)	334.6	(15.8)	290.5	(13.3)
Tertiary	238.2	(25.5)	277.6	(8.8)	331.9	(9.8)	369.6	(17.9)	304.0	(7.1)
Hungary										
Less than secondary	174.1	(8.4)	226.0	(5.5)	293.0	(5.6)	338.1	(6.7)	258.5	(3.0)
Completed secondary	196.5	(6.3)	239.4	(5.4)	305.0	(4.0)	349.3	(5.1)	271.6	(3.5)
Post-secondary, non-tertiary	211.5	(18.5)	256.9	(7.1)	314.8	(10.1)	354.8	(13.4)	285.1	(6.0)
Tertiary	219.6	(18.1)	264.1	(7.8)	311.1	(7.9)	364.2	(26.5)	288.7	(6.1)
	Problem solving scale: Adults aged 56 to 65									
Educational attainment	5th percentile	standard error	25th percentile	standard error	75th percentile	standard error	95th percentile	standard error	average	standard error
Canada										
Less than secondary	117.2	(13.3)	173.7	(7.0)	248.7	(2.8)	293.8	(8.5)	209.8	(3.1)
Completed secondary	183.7	(9.2)	233.3	(4.6)	290.8	(3.5)	324.6	(4.9)	260.3	(2.9)
Post-secondary, non-tertiary	180.2	(23.7)	225.8	(7.3)	291.1	(10.0)	328.1	(9.4)	258.4	(6.5)
Tertiary	188.4	(9.0)	246.1	(3.8)	307.4	(4.9)	350.6	(5.8)	275.2	(2.8)
Switzerland										
Less than secondary	172.3	...	217.9	(14.4)	273.4	(9.5)	315.0	(15.5)	245.1	(7.1)
Completed secondary	188.3	(13.9)	230.7	(4.8)	288.1	(5.1)	327.8	(4.9)	259.4	(3.5)
Tertiary	209.7	(12.6)	252.8	(6.7)	309.8	(8.4)	351.0	(12.2)	281.6	(4.3)
Italy										
Less than secondary	102.8	(3.9)	149.8	(3.9)	219.5	(3.9)	268.4	(5.5)	184.4	(2.5)
Completed secondary	144.7	(10.9)	202.0	(9.5)	265.2	(8.8)	315.0	(11.8)	231.6	(6.0)
Post-secondary, non-tertiary	138.1	(8.2)	169.8	(27.4)	264.2	(25.2)	308.2	(26.2)	221.0	(18.0)
Tertiary	164.5	(21.6)	206.0	(7.7)	284.1	(11.6)	329.6	(16.5)	243.6	(7.8)

Table 5.6 (concluded)

Mean scores with 0.95 confidence interval and scores at 5th, 25th, 75th, and 95th percentiles on the problem solving scale, populations aged 16 to 25 and 56 to 65, 2003 and 2008

	Problem solving scale: Adults aged 56 to 65									
Educational attainment	5th percentile	standard error	25th percentile	standard error	75th percentile	standard error	95th percentile	standard error	average	standard error
Norway										
Less than secondary	141.6	(11.2)	194.4	(5.6)	255.0	(6.1)	298.6	(10.4)	223.0	(4.1)
Completed secondary	184.3	(17.1)	228.9	(4.7)	286.1	(7.0)	323.4	(6.2)	256.6	(4.5)
Post-secondary, non-tertiary	202.1	(21.9)	239.1	(9.6)	283.3	(7.3)	316.6	(10.9)	261.8	(6.4)
Tertiary	207.9	(12.1)	258.5	(4.8)	314.7	(4.8)	349.8	(5.8)	284.9	(2.9)
Bermuda										
Less than secondary	128.3	(19.7)	182.1	(6.0)	240.2	(7.2)	282.0	(10.7)	210.6	(5.5)
Completed secondary	166.0	(24.9)	210.0	(9.4)	277.2	(7.1)	319.9	(19.9)	242.7	(7.1)
Post-secondary, non-tertiary	183.9	(20.9)	233.3	(8.6)	300.7	(10.2)	339.5	(17.0)	266.5	(5.3)
Tertiary	212.3	(35.2)	261.4	(8.8)	316.8	(11.6)	365.9	(13.6)	287.2	(6.0)
New Zealand										
Less than secondary	123.4	(9.5)	202.0	(8.6)	265.6	(7.1)	300.1	(7.5)	228.8	(4.8)
Completed secondary	171.6	(13.8)	235.2	(5.2)	299.3	(4.7)	340.3	(8.8)	264.7	(4.3)
Post-secondary, non-tertiary	199.6	(16.9)	235.3	(6.3)	292.8	(7.7)	323.4	(8.8)	263.5	(4.8)
Tertiary	224.8	(7.5)	271.9	(4.8)	324.3	(4.6)	364.3	(5.7)	296.9	(3.6)
Netherlands										
Less than secondary	154.8	(13.6)	210.1	(5.1)	275.3	(4.4)	312.6	(5.4)	240.2	(3.9)
Completed secondary	202.7	(5.4)	244.9	(4.3)	291.9	(4.0)	329.5	(5.2)	267.2	(3.3)
Post-secondary, non-tertiary	212.2	(13.5)	246.9	(15.0)	298.2	(24.7)	344.8	(16.8)	272.6	(11.2)
Tertiary	227.7	(7.2)	267.9	(3.5)	312.9	(2.0)	343.8	(5.3)	289.9	(2.0)
Hungary										
Less than secondary	148.9	(18.2)	205.1	(8.2)	264.3	(5.1)	301.2	(8.6)	231.5	(5.1)
Completed secondary	182.5	(4.7)	222.2	(4.0)	278.8	(4.1)	316.1	(6.1)	250.2	(3.0)
Post-secondary, non-tertiary	189.8	(12.4)	231.8	(7.7)	293.1	(8.3)	331.0	(16.4)	262.7	(6.5)
Tertiary	203.4	(13.1)	243.0	(11.3)	305.4	(8.3)	354.0	(15.6)	274.8	(7.9)

... not applicable

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 5.7

Differences between women and men in raw and adjusted mean scores on the problem solving scale, by country, population performing at prose literacy Level 2 or above, and aged 16 to 65 years, 2003 and 2008

	Problem solving scale	
Parameter	estimate	standard error
Canada		
Unadjusted intercept	283.2	(2.6)
Unadjusted gender effect	-0.2	(1.5)
Adjusted intercept	272.0	(2.3)
Adjusted gender effect	-1.9	(1.3)
High education	16.2***	(2.3)
High occupational knowledge and skill intensity	14.9***	(1.6)
Switzerland		
Unadjusted intercept	287.8	(2.6)
Unadjusted gender effect	-2.7	(1.5)
Adjusted intercept	273.0	(2.3)
Adjusted gender effect	-1.9	(1.3)
High education	17.2***	(2.3)
High occupational knowledge and skill intensity	15.1***	(1.6)
Italy		
Unadjusted intercept	250.6	(4.7)
Unadjusted gender effect	-3.5	(2.9)
Adjusted intercept	238.8	(4.8)
Adjusted gender effect	-2.0	(2.8)
High education	3.1	(7.0)
High occupational knowledge and skill intensity	19.9***	(3.6)
Norway		
Unadjusted intercept	286.0	(4.6)
Unadjusted gender effect	1.6	(2.4)
Adjusted intercept	278.3	(5.2)
Adjusted gender effect	-0.5	(2.4)
High education	19.9***	(2.8)
High occupational knowledge and skill intensity	13.9***	(2.6)
Bermuda		
Unadjusted intercept	269.7	(4.8)
Unadjusted gender effect	5.7 *	(3.1)
Adjusted intercept	255.5	(5.5)
Adjusted gender effect	-0.3	(3.4)
High education	27.5***	(2.9)
High occupational knowledge and skill intensity	24.2***	(2.8)
New Zealand		
Unadjusted intercept	284.1	(3.5)
Unadjusted gender effect	-0.9	(2.1)
Adjusted intercept	271.5	(3.4)
Adjusted gender effect	-6.0**	(2.3)
High education	17.1***	(2.5)
High occupational knowledge and skill intensity	24.2***	(1.7)
Netherlands		
Unadjusted intercept	299.9	(3.1)
Unadjusted gender effect	-6.1***	(1.9)
Adjusted intercept	278.1	(4.2)
Adjusted gender effect	-4.1 *	(2.2)
High education	18.9***	(2.1)
High occupational knowledge and skill intensity	20.7***	(2.3)

Table 5.7 (concluded)

Differences between women and men in raw and adjusted mean scores on the problem solving scale, by country, population performing at prose literacy Level 2 or above, and aged 16 to 65 years, 2003 and 2008

	Problem solving scale	
Parameter	estimate	standard error
Hungary		
Unadjusted intercept	261.9	(2.4)
Unadjusted gender effect	3.2**	(1.4)
Adjusted intercept	261.6	(3.7)
Adjusted gender effect	-1.5	(1.7)
High education	18.7***	(3.7)
High occupational knowledge and skill intensity	13.7***	(1.9)

* p<0.10, statistically significant at the 10 per cent level

** p<0.05, statistically significant at the 5 per cent level

*** p<0.01, statistically significant at the 1 per cent level

Notes: Unadjusted intercept represents the expected average for females.

Positive estimates indicate male advantage.

Adjusted intercept represents the expected average for females with low education and low occupational knowledge and skill intensity.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 5.8

Scores on the 5th, 25th, 50th, 75th, and 95th percentiles for knowledge intensity in occupational classes by problem solving skills, population scoring at prose literacy Level 2 or above, and aged 16 to 65 years, ordered by median skill of knowledge experts, 2003 and 2008

Occupational skill and knowledge intensity group	Problem solving scale									
	5th percentile	standard error	25th percentile	standard error	50th percentile	standard error	75th percentile	standard error	95th percentile	standard error
Canada										
Knowledge experts	240.6	(4.3)	279.4	(1.5)	308.7	(2.1)	333.9	(1.9)	372.4	(3.0)
Managers	220.4	(5.5)	261.3	(3.5)	288.6	(3.1)	318.1	(3.1)	360.7	(5.5)
Information high skill	226.0	(5.3)	267.1	(2.4)	296.2	(3.7)	322.3	(2.9)	360.3	(7.0)
Information low skill	219.2	(5.0)	258.6	(2.7)	285.0	(2.4)	312.5	(3.2)	351.2	(3.6)
Services low skill	202.1	(3.2)	244.8	(2.0)	274.6	(2.0)	303.3	(2.3)	345.7	(5.7)
Manufacturing goods	204.0	(4.2)	244.2	(2.8)	271.5	(3.0)	300.4	(2.7)	341.4	(5.4)
Switzerland										
Knowledge experts	223.9	(7.3)	263.3	(3.6)	298.5	(3.7)	327.3	(2.7)	372.8	(7.9)
Managers	224.0	(4.7)	264.2	(4.9)	291.4	(3.5)	318.3	(1.1)	358.2	(2.7)
Information high skill	223.8	…	264.2	(3.6)	294.9	(4.9)	324.2	(5.6)	365.8	(9.2)
Information low skill	201.3	(8.6)	254.9	(4.0)	285.9	(3.8)	314.1	(4.7)	360.5	(6.9)
Services low skill	189.4	(9.9)	241.9	(5.1)	276.1	(4.6)	309.5	(4.1)	364.8	(15.1)
Manufacturing goods	188.6	(11.0)	234.9	(7.0)	271.2	(4.5)	300.9	(4.4)	345.9	(7.9)
Italy										
Knowledge experts	188.5	(18.9)	230.7	(8.4)	261.0	(7.2)	292.6	(7.6)	335.3	(10.3)
Managers	147.8	…	214.2	(6.1)	248.7	(4.3)	279.9	(8.1)	327.5	(6.0)
Information high skill	181.2	(6.0)	226.5	(3.1)	261.5	(3.9)	293.9	(4.1)	338.7	(4.7)
Information low skill	178.9	(9.3)	223.8	(5.9)	254.4	(6.0)	289.3	(6.3)	340.1	(6.8)
Services low skill	168.9	(7.0)	210.8	(10.3)	242.0	(5.6)	273.7	(5.5)	318.8	(13.5)
Manufacturing goods	160.0	(6.3)	201.2	(3.9)	230.7	(5.1)	262.2	(4.8)	311.5	(7.1)

Table 5.8 (concluded)

Scores on the 5th, 25th, 50th, 75th, and 95th percentiles for knowledge intensity in occupational classes by problem solving skills, population scoring at prose literacy Level 2 or above, and aged 16 to 65 years, ordered by median skill of knowledge experts, 2003 and 2008

Occupational skill and knowledge intensity group	Problem solving scale									
	5th percentile	standard error	25th percentile	standard error	50th percentile	standard error	75th percentile	standard error	95th percentile	standard error
Norway										
Knowledge experts	260.6	(8.8)	292.8	(5.3)	317.4	(4.4)	343.9	(5.9)	380.0	(8.5)
Managers	226.3	(12.0)	269.0	(5.3)	296.4	(5.4)	323.7	(5.2)	359.0	(6.4)
Information high skill	239.5	(4.7)	279.5	(3.9)	306.0	(2.2)	331.8	(3.6)	370.3	(5.1)
Information low skill	222.3	(4.1)	268.0	(3.8)	295.3	(3.7)	324.2	(1.2)	361.7	(3.6)
Services low skill	203.7	(5.6)	249.3	(5.4)	282.2	(4.4)	313.4	(4.9)	351.6	(10.1)
Manufacturing goods	198.6	(8.4)	248.3	(5.8)	278.5	(4.9)	309.8	(3.9)	350.2	(6.5)
Bermuda										
Knowledge experts	233.6	(4.3)	272.9	(3.4)	299.3	(4.5)	330.9	(2.9)	370.3	(4.4)
Managers	219.8	(4.6)	263.2	(4.6)	294.8	(4.0)	327.1	(3.7)	367.4	(7.7)
Information high skill	204.5	(11.5)	259.7	(4.8)	290.5	(4.9)	319.0	(5.4)	360.4	(7.4)
Information low skill	207.7	(9.4)	248.3	(4.5)	280.5	(3.5)	311.9	(4.1)	359.9	(5.8)
Services low skill	182.2	(6.8)	228.5	(2.6)	260.7	(3.7)	290.9	(2.6)	332.9	(10.0)
Manufacturing goods	179.5	(7.1)	225.9	(5.7)	257.2	(4.9)	287.0	(5.2)	332.4	(4.8)
New Zealand										
Knowledge experts	239.2	(6.8)	280.6	(3.7)	307.7	(4.3)	336.2	(4.7)	373.2	(6.3)
Managers	228.3	(12.2)	269.6	(6.9)	300.6	(3.0)	329.5	(6.2)	370.4	(7.8)
Information high skill	222.2	(5.1)	268.1	(3.9)	297.2	(2.6)	324.8	(4.0)	364.9	(4.9)
Information low skill	213.3	(13.4)	256.9	(5.1)	286.4	(5.5)	314.5	(5.6)	349.8	(5.1)
Services low skill	200.5	(7.2)	238.6	(4.6)	265.8	(3.3)	293.2	(4.7)	336.1	(11.3)
Manufacturing goods	200.5	(2.1)	237.3	(1.5)	265.4	(1.9)	294.0	(1.2)	331.2	(0.5)
Netherlands										
Knowledge experts	240.7	(7.6)	285.0	(3.8)	310.8	(3.9)	335.4	(3.8)	369.5	(5.1)
Managers	225.1	(6.4)	269.0	(3.5)	297.0	(4.0)	323.1	(3.0)	364.0	(6.8)
Information high skill	235.7	(3.1)	274.7	(3.4)	302.0	(2.7)	328.0	(2.6)	362.1	(4.0)
Information low skill	236.2	(3.2)	272.3	(1.9)	298.1	(2.5)	324.9	(3.2)	361.8	(4.7)
Services low skill	214.5	(4.9)	249.9	(4.4)	276.8	(2.6)	303.8	(3.3)	343.5	(5.1)
Manufacturing goods	207.5	(3.6)	244.9	(2.4)	271.1	(1.9)	298.2	(4.2)	338.6	(5.6)
Hungary										
Knowledge experts	217.6	(2.9)	257.7	(4.2)	286.4	(1.7)	318.7	(2.4)	362.3	(4.2)
Managers	212.7	(6.9)	252.9	(5.3)	284.0	(3.5)	314.8	(3.9)	355.2	(4.1)
Information high skill	207.1	(4.8)	247.6	(4.3)	279.1	(4.1)	310.6	(4.3)	357.9	(6.2)
Information low skill	206.7	(3.7)	246.0	(3.9)	275.8	(3.1)	305.0	(2.0)	347.7	(2.8)
Services low skill	187.8	(6.5)	230.9	(3.2)	260.9	(3.3)	291.7	(4.1)	340.9	(5.4)
Manufacturing goods	190.8	(6.0)	230.8	(2.6)	258.9	(3.5)	287.8	(3.1)	332.0	(3.1)

… not applicable

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 5.9

Synthetic international age-bound trends in problem solving skill in relation to high/low educational attainment and high/low knowledge intensity in occupations, population scoring at prose literacy Level 2 or above, and aged 26 to 65 years, 2003 and 2008

	Low education, low knowledge occupation		Low education, high knowledge occupation		High education, low knowledge occupation		High education, high knowledge occupation	
Age	average	standard error	average	standard error	average	standard error	average	standard error
26	273.7	(2.6)	290.3	(2.4)	294.7	(3.6)	310.6	(2.4)
29	273.0	(2.2)	290.3	(2.0)	293.7	(3.2)	309.9	(1.8)
32	271.7	(1.9)	290.8	(1.7)	290.9	(2.9)	309.6	(1.5)
35	270.8	(1.8)	289.9	(1.6)	286.3	(2.7)	309.2	(1.3)
38	270.2	(1.7)	288.1	(1.5)	282.3	(2.6)	308.0	(1.3)
41	269.4	(1.8)	285.8	(1.5)	279.8	(2.6)	307.0	(1.3)
44	266.7	(1.7)	283.7	(1.4)	277.8	(2.6)	305.7	(1.3)
47	262.9	(1.7)	282.1	(1.5)	276.3	(2.6)	304.4	(1.4)
50	258.9	(1.7)	278.4	(1.5)	274.5	(2.6)	301.2	(1.4)
53	254.5	(1.7)	274.7	(1.6)	271.5	(2.9)	297.2	(1.5)
56	250.8	(1.8)	273.6	(1.7)	269.2	(3.2)	294.0	(1.5)
59	248.0	(2.0)	270.8	(1.7)	268.3	(3.4)	292.4	(1.7)
62	245.7	(2.4)	266.8	(2.2)	267.0	(4.0)	290.8	(2.0)
65	245.1	(3.0)	265.1	(2.6)	264.5	(5.1)	288.9	(2.6)

Notes: Smoothing bandwidths vary across groups, depending on the sample size and consistency of estimates. The average bandwidths for the groups are:

Low education, low knowledge occupation: 3.149.

Low education, high knowledge occupation: 2.942.

High education, low knowledge occupation: 4.191.

High education, high knowledge occupation: 2.796.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 5.10

Unemployment rates and problem solving levels by country, population at prose literacy Level 2 or above, and aged 26 to 65 years, 2003 and 2008

	Problem solving level							
	Level 1		Level 2		Level 3		Level 4	
Country	unemploy-ment rate	standard error	unemploy-ment rate	standard error	unemploy-ment rate	standard error	unemploy-ment rate	standard error
Canada	0.11	(0.01)	0.09	(0.01)	0.07	(0.01)	0.07	(0.03)
Switzerland	0.08	(0.02)	0.02	(0.01)	0.03	(0.01)	0.02	(0.02)
Italy	0.12	(0.01)	0.07	(0.01)	0.05	(0.01)	0.04	(0.03)
Norway	0.07	(0.02)	0.05	(0.01)	0.03	(0.01)	0.03	(0.01)
Bermuda	0.07	(0.02)	0.05	(0.01)	0.03	(0.01)	0.03	(0.03)
New Zealand	0.11	(0.01)	0.06	(0.01)	0.03	(0.01)	0.01	(0.01)
Netherlands	0.10	(0.02)	0.06	(0.01)	0.03	(0.01)	0.01	(0.01)
Hungary	0.19	(0.01)	0.13	(0.01)	0.10	(0.02)	0.05	(0.03)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 5.11

Effect of problem solving skills on earnings from work in different occupational knowledge intensities, purchasing power parity adjusted to 2003 US dollars, population scoring at prose literacy Level 2 or above, and aged 26 to 65 years, 2003 and 2008

	Average wage income			
	Below level 3		Level 3 or above	
	US dollars	standard error	US dollars	standard error
Canada				
High knowledge occupation	61,277	(30,143)	67,186	(36,949)
Low knowledge occupation	27,905	(2,919)	28,280	(1,231)
Switzerland				
High knowledge occupation	38,081	(2,902)	35,583	(2,257)
Low knowledge occupation	24,644	(1,662)	22,720	(1,168)
Italy				
High knowledge occupation	22,082	(1,648)	23,059	(2,019)
Low knowledge occupation	21,051	(3,027)	20,253	(2,589)
Norway				
High knowledge occupation	26,613	(808)	27,104	(426)
Low knowledge occupation	19,378	(813)	19,200	(539)
Bermuda				
High knowledge occupation	55,605	(2,332)	62,798	(2,368)
Low knowledge occupation	41,645	(2,081)	39,501	(2,120)
New Zealand				
High knowledge occupation	29,861	(1,682)	33,420	(1,434)
Low knowledge occupation	24,140	(1,017)	22,868	(787)
Netherlands				
High knowledge occupation	36,557	(2,526)	41,823	(2,815)
Low knowledge occupation	42,979	(8,710)	33,608	(6,784)
Hungary				
High knowledge occupation	13,966	(1,567)	15,831	(1,209)
Low knowledge occupation	12,039	(2,471)	11,061	(1,561)

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 5.12

Overall international problem solving skill distribution and earnings from work for the self employed, population scoring at prose literacy Level 2 or above, and aged 16 to 65 years, 2003 and 2008

	No employees		Employees	
	Purchasing power parity in 2003		Purchasing power parity in 2003	
Problem solving score	US dollars	standard error	US dollars	standard error
150	20,019	(1,973)	27,698	(2,055)
160	20,600	(1,849)	28,243	(1,978)
170	21,441	(1,677)	28,859	(1,916)
180	22,528	(1,467)	29,575	(1,861)
190	23,718	(1,262)	30,423	(1,806)
200	24,774	(1,123)	31,443	(1,750)
210	25,544	(1,064)	32,680	(1,692)
220	26,047	(1,053)	34,175	(1,635)
230	26,396	(1,055)	35,951	(1,585)
240	26,702	(1,054)	37,996	(1,551)
250	27,043	(1,048)	40,237	(1,543)
260	27,472	(1,040)	42,545	(1,565)
270	28,026	(1,035)	44,760	(1,612)
280	28,727	(1,040)	46,745	(1,676)
290	29,565	(1,070)	48,422	(1,749)
300	30,486	(1,144)	49,783	(1,823)
310	31,390	(1,269)	50,865	(1,893)
320	32,172	(1,427)	51,720	(1,955)
330	32,778	(1,588)	52,402	(2,012)
340	33,222	(1,729)	52,952	(2,072)
350	33,562	(1,848)	53,402	(2,146)
360	33,858	(1,963)	53,775	(2,249)
370	34,158	(2,103)	54,086	(2,388)
380	34,483	(2,294)	54,348	(2,563)
390	34,830	(2,543)	54,571	(2,761)
400	35,174	(2,832)	54,765	(2,968)

Note: Smoothing bandwidths varied by employee status group, depending on the sample size and consistency of estimates. The average bandwidths for the groups are No employees: 38.544 and Employees: 46.245.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Chapter 6

Performance in Multiple Skill Domains

Summary

The purpose of this chapter is to explore performance across multiple skill domains. The analysis investigates the skill profiles of various population groups who score at levels deemed to be low in one or more skill domains. A key question is whether the characteristics of those who score low in one skill domain are distinct from those who score low in other skill domains? The findings show that adults who are low educated, older, belong to a minority language group, and/or have a disadvantaged socioeconomic background are much more likely to perform poorly in multiple skill domains. The analysis also examines the relationships between skill profiles and a range of outcomes such as employment, income, health and access to educational opportunities. The focus is on those adults who may face adverse labour market, educational and other outcomes because they perform low on one or more skill domains.

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Performance in multiple skill domains

6.1 Overview and highlights

The purpose of this chapter is to explore performance across multiple skill domains. The analysis investigates the skill profiles of various population groups who score at levels deemed to be low in one or more skill domains. A key question is whether the characteristics of those who score low in one skill domain are distinct from those who score low in other skill domains? The findings show that adults who are low educated, older, belong to a minority language group, and/or have a disadvantaged socioeconomic background are much more likely to perform poorly in multiple skill domains. The analysis also examines the relationships between skill profiles and a range of outcomes such as employment, income, health and access to educational opportunities. The focus is on those adults who may face adverse labour market, educational and other outcomes because they perform low on one or more skill domains.

The highlights of the chapter are as follows:

- Although adults facing skill disadvantages are present in all countries surveyed, the Netherlands and Norway appear to fare best, even if low performance in at least one skill domain is a reality for over half of their populations. Low performance reaches as high as 71 and 91 per cent in Hungary and Italy, respectively.
- While gender differences in performance are marginal when domains are considered in isolation, in some countries there are more women than men who are disadvantaged in multiple domains,
- Performance differences between native and non-native speakers are most pronounced in Canada, the Netherlands, New Zealand, and the French and German speaking communities of Switzerland.
- A significant number of adults perform low in all four skill domains, even after having completed more than upper secondary education. The figure is as high as 32 per cent for Italians who have completed more than upper secondary education and as low as 5 per cent for the Dutch.

- Young adults who score poorly on all four domains are about five to 12 times more likely, depending on the country, to not complete upper secondary education than young adults who perform well on all domains.
- Adults who perform poorly in one or more skill domains have a high risk of being unemployed, but the patterns are not uniform and may depend on the industrial and production structures of different countries.
- Performance in the measured skills is associated with an earnings premium in nearly all countries surveyed. Results show that adults with low performance in at least one skill domain are more likely to earn less compared to adults without any skill disadvantage. The higher the number of skill domains with low performance the higher the labour market penalty in terms of pay.
- Despite being among those who may need to engage in learning opportunities the most, adults who perform low in multiple skill domains are much less likely to participate in adult learning or interact with Information and Communication Technologies (ICTs) of any kind.
- Finally, adults who perform poorly in any of the measured skills are disadvantaged in terms of their health and their level of engagement in the community.

6.2 Performance in multiple skill domains

The purpose of this chapter is to explore performance across multiple skill domains. The data analyses investigate the skill profiles of various population groups defined in terms of the demographic and socioeconomic characteristics of those who score at levels deemed to be low in one or more skill domains. A key question is whether the characteristics of those who score low in one skill domain are distinct from those who score low in other skill domains? The findings in this respect show that adults who are low educated and older, belong to a minority language group and have a disadvantaged socioeconomic background are much more likely to perform poorly in multiple skill domains than adults with the opposite characteristics. In addition, the data analyses examine the relationships between skill profiles and a range of outcome variables such as incidence of unemployment, low income, poor self-reported health status and difficulty in accessing educational opportunities. The focus is on those adults who, because they perform low on one or more skill domains, might face adverse labour market, educational and other outcomes. Of interest also is whether certain patterns of performance by skill domain can be identified, such as a bias toward low performance in one skill domain but not in others. Whereas problem solving and numeracy, for example, might classify as higher order skills, they also might be part of a substitute or alternate skill set.

After defining low performance in multiple skill domains in the first section, the next section presents comparative data on the extent of multiple disadvantage. The third section considers the characteristics of adults who perform low in multiple domains followed by the results of an adjusted model of the socio-demographic determinants of disadvatange in multiple skills domains. The last two sections consider the labour market outcomes and personal and social outcomes that are associated with disadvantage in multiple domains.

6.3 Defining low performance in multiple skill domains

Performance at Level 3 on the prose and document literacy domains has been shown in previous studies to constitute a major threshold with respect to achieving a range of labour market, educational and other outcomes (OECD and Statistics Canada, 2000). Experts knowledgeable about the specification of the measurement framework for the ALL numeracy domain also consider that performance at Level 3 is the requisite level of skill needed in order to function effectively in a modern knowledge society. However, the designation of a specific threshold level of performance, such as Level 3 for the prose, document and numeracy domains, is not without controversy. Certain academics consider the setting of any threshold as context sensitive and as relative to societal circumstances and associated expectations (Valdivielso Gomez, 2000). Depending on given circumstances and expectations, adults may very well be functional even if they do not score at Level 3 or higher on these three skill domains. Thus it should be made explicitly clear that the Level 3 performance threshold applied in this chapter results from an attempt by experts to identify the expected levels of literacy and numeracy people need in order to cope with the many tasks and situations they are likely to encounter in today's information oriented societies.

Technology biased change increases the likelihood that people will regularly face Level 3 tasks on the prose, document and numeracy scales. Continuing innovations in Information and Communication Technologies (ICTs) combined with technological developments in many other fields are profoundly transforming OECD countries. The resulting, ever expanding flows of information, with changing formats and platforms of delivery, have brought increased complexity and hence have augmented the desired level of skill needed to function effectively.

As a consequence, population sub-groups with low levels of skill are at an increased risk of not being able to cope with or adapt to change: at-risk of not finding or being able to keep a job; at-risk of being unqualified to handle the new tools and processes that are increasingly required to be productive and add value; at-risk of poor health; and at-risk of being unable to pursue continuing educational opportunities.

The notion of low performance in the problem solving domain needs to be approached differently, partly because it was defined and scaled with only four levels of difficulty, and partly because the empirically established levels of item difficulty do not strictly correspond to levels derived from expert judgements on what constitutes a desired threshold needed to function well in modern societies. Performance at Level 2 on the problem solving domain is considered a threshold for achieving a range of economic and social outcomes. Thus, for the purposes of this chapter, Level 1 defines low performance on the problem solving scale.

Against this background, it becomes important to understand the demographic and socioeconomic characteristics not only of adults with a low level of skill in any given domain, but also of those with disadvantage in more than one domain. Accordingly, the data analysis reported in this chapter is premised on groups whose performance is low in one or more domains, defined as those who perform at Levels 1 or 2 on the prose, document and numeracy domains and at Level 1 on the problem solving domain. Also investigated are the likely social and economic consequences of being a low performer in one or more skill domains.

The chapter refers to poor performance in some skill domains but not all as *partial disadvantage*, while poor performance in more than one domain is referred to as *multiple disadvantage*. Individuals are classified into the following groups:

0 – Good performance in all domains
1 – Low performance in one domain
2 – Low performance in two domains
3 – Low performance in three domains
4 – Low performance in four domains

6.4 Disadvantage in one or more skill domains

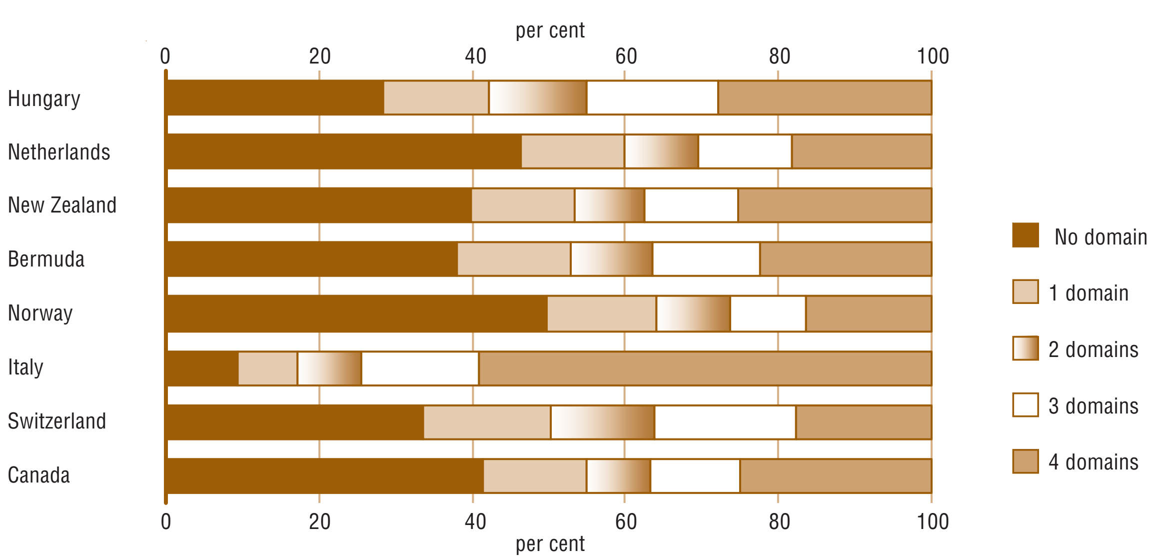
The results of the ALL survey document clearly the pervasiveness of disadvantage in at least one skill domain. Figure 6.1 shows the proportion of adults scoring low in one or more skill domains, or no domain at all, for those countries where the complete assessment was fielded. In all countries, fewer than half of adults score above the threshold levels on all skill domains. Although adults facing skill disadvantages are present in all countries surveyed, the Netherlands and Norway appear to fare best, even if low performance in at least one skill domain is a reality for over half of their populations. Low performance in at least one skill domain reaches as high as 71 and 91 per cent in Hungary and Italy, respectively. The remaining countries fall somewhere in between.

A fairly consistent pattern emerges in analysing disadvantage in multiple skill domains. With the exception of Italy, between 13 and 17 per cent of adults have difficulty in only one skill domain; 8 to 14 per cent in two domains; 10 to 18 per cent in three domains; and 16 to 28 per cent have difficulty in all four domains. Italy stands out with 59 per cent of the adult population scoring low on all four skill domains. Only eight per cent of Italians perform poorly in only one domain.[1]

Figure 6.1

International comparison of multiple disadvantage

Per cent of adults performing at levels 1 or 2 in one or more skill domains or no domain at all, by country, 2003 and 2008



Source: Adult Literacy and Life Skills survey, 2003 and 2008.

6.5 Characteristics of low skilled adults

Age

Age-skill profiles constructed with the 1994-1998 IALS data set (OECD and Statistics Canada, 2000, p. 34) and those presented previously in this report (Chapter 2) reveal that age is consistently negatively related with skill distributions in a range of countries. The estimates in Figure 6.2 confirm this pattern with reference to low performance and the number of skill domains concerned.

In most countries, adults aged 55 to 65 years are markedly more likely to perform poorly in all four domains compared to youth and young adults aged 16 to 25 years. The percentage differences range from about two to three times higher for older adults in Bermuda (42% vs 18%), Canada (43% vs 17%), the Netherlands (34% vs 10%), Norway (35% vs 8%) and the French and German speaking communities of Switzerland (27% vs 9%). A notable exception is New Zealand where adults aged 55-65 years are nearly as likely to be disadvantaged in all four skill domains as those aged 16 to 25 years (30% vs 26%). In Italy there are more adults aged 55 to 65 years who are disadvantaged in all four domains (78%), which is consistent with the general pattern, but the proportion of young adults in this category (48%) is higher than the proportion of older adults who score low on all four domains in any other country. Hungary also features a high proportion of young adults in this category, at 25 per cent. In contrast, the Netherlands, Norway and Switzerland (French and German) have the lowest proportions of young adults with low performance in all four domains, at 10, 8 and 9 per cent, respectively. Bermuda and Canada are in between with 18 and 17 per cent.

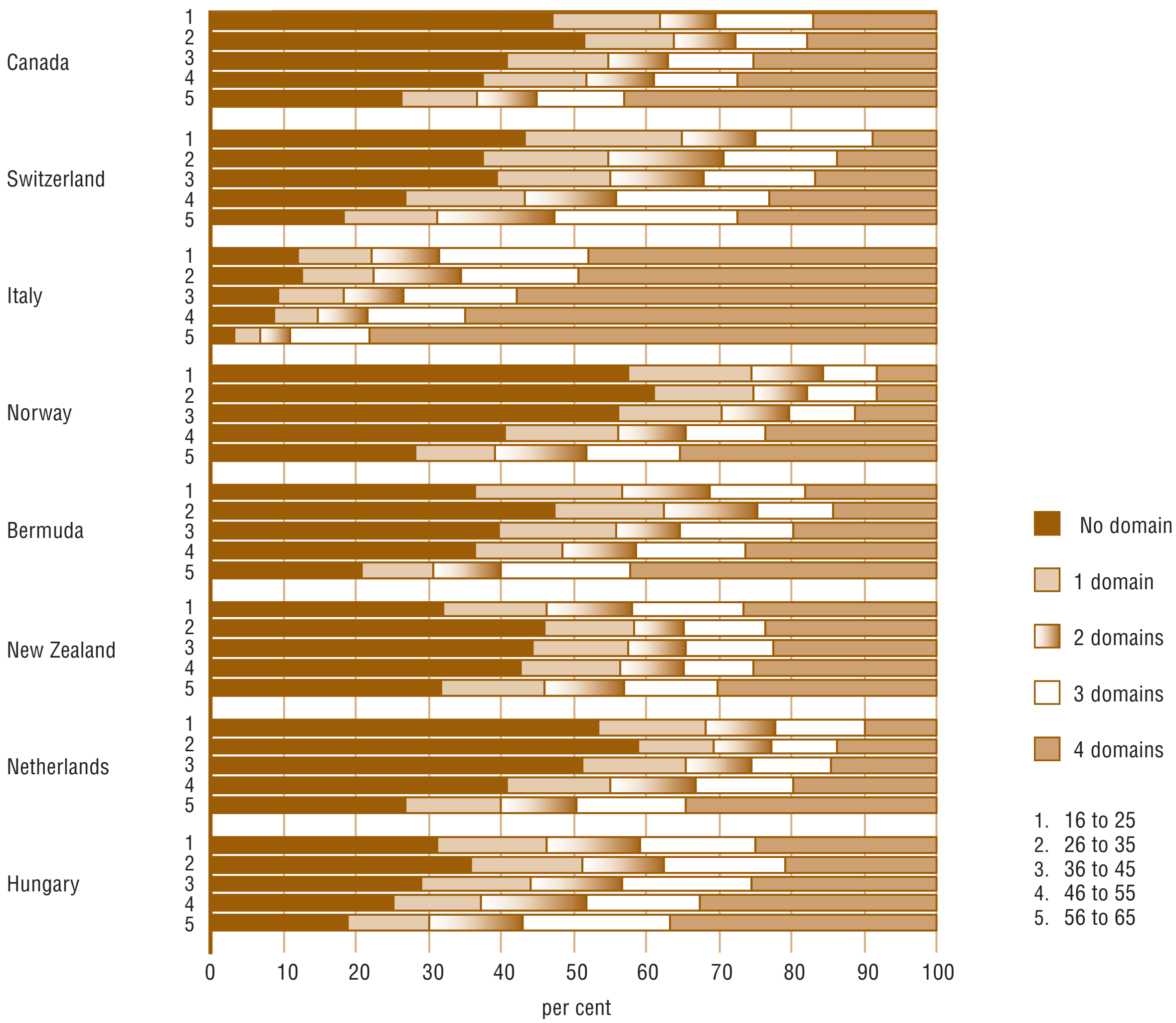
With the exception of New Zealand, young adults are much more likely to be only partially disadvantaged in one domain. This ranges from 15 to 22 per cent for Bermuda, Canada, the Netherlands, Norway and Switzerland (French and German). Italy's youth are also more likely to be disadvantaged in only one domain compared to older adults but the proportion is lower (10%). Thus it would seem that low performance accumulates more easily across multiple skill domains among young Italians compared to those in the other countries.

Overall, partial disadvantage tends to be concentrated in numeracy but there is also a clear bias toward prose in the Netherlands and Switzerland. In Bermuda, 13 per cent of the population aged 16 to 25 years are disadvantaged only in numeracy – the highest proportion, followed by Norway (12%) and Canada (10%).

Figure 6.2

Age and multiple disadvantage

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by age group, 2003 and 2008



Countries are ranked by per cent of youths aged 16 to 25 who are multiply disadvantaged in all four domains.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Gender

Gender is an important characteristic. It predicts a number of socioeconomic outcomes especially among older generations and in countries where women are at a disadvantage in educational attainment. But recent evidence with regard to skill acquisition indicates few systematic or substantial gender differences, partly because the education gap has narrowed in the majority of OECD countries (see OECD, 2008). Where differences do exist, they are often only marginal and tend to reflect an advantage for women when it comes to prose related tasks while men tend to fare better with more technically related tasks such as numeracy (see OECD and Statistics Canada , 2000; 2005). Results from an analysis of skill disadvantage by type and number of domains underscore these prior findings but add some interesting new insights.

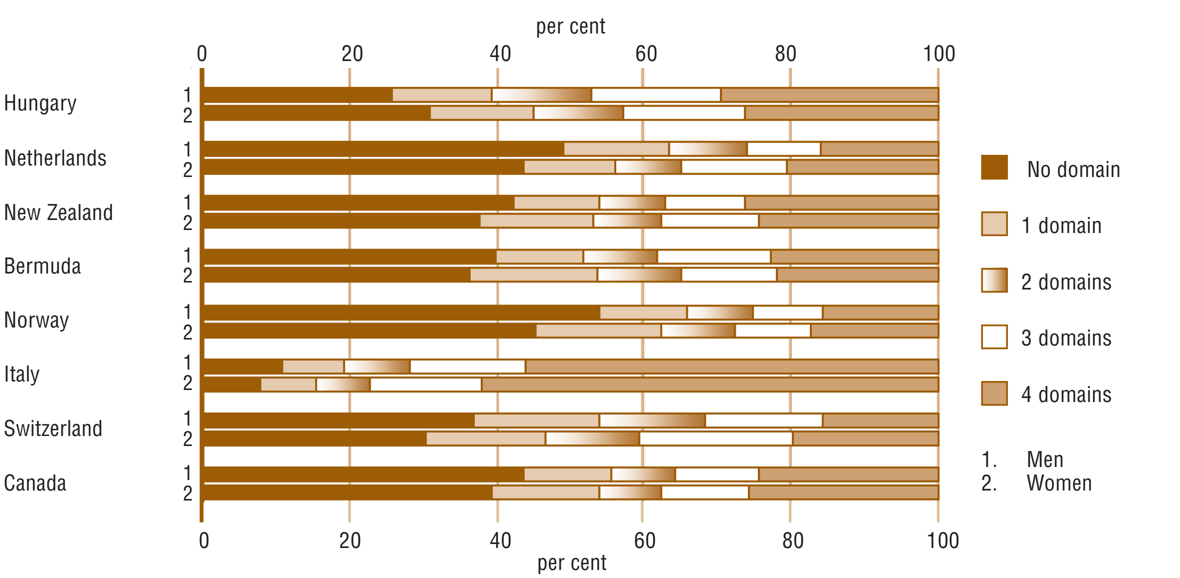
When analysing performance in multiple skill domains women fare worse than when any given domain is considered in isolation. This suggests that for women low performance can be more cumulative across domains, although this does not hold for all countries. The data presented in Figure 6.3 indicate that women are at a majority over men in terms of being disadvantaged in all four skill domains in Italy (62% vs 56%), the Netherlands (21% vs 16%) and the French and German speaking communities of Switzerland (20% vs 16%). In contrast, cumulative gender differences show the opposite pattern in Bermuda, Hungary and New Zealand. But only in Hungary is the difference statistically significant, with three per cent more men disadvantaged in all four domains. In New Zealand women are more likely than men to experience partial disadvantage in combinations of one, two or three skill domains, while men are more likely to accumulate low performance across all four domains. In Norway women are more likely to fare worse in all combinations of one, two, three and four skill domains.

Helping to confirm prior findings, Table 6.3 in Annex 6 shows that very few women have difficulty only with prose. Thus when women do perform low in the prose domain it often is in combination with poor performance in other domains. Also consistent with prior findings, men tend to do better in numeracy than women. Specifically, more women than men tend to have difficulty in only the numeracy domain, with proportions nearly twice as high in Bermuda (12% vs 7%), Canada (12% vs 6%), Norway (13% vs 6%) and New Zealand (12% vs 6%).

Figure 6.3

Gender and multiple disadvantage

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by gender, 2003 and 2008



Countries are ranked by per cent of women who are multiply disadvantaged in all four domains.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Language status[2]

Prose and document literacy, numeracy and problem solving are all bounded by language, at least in terms of how these were operationalised in the ALL study. Even success in using printed material to perform simple calculations depends on language, since the numbers are often embedded or framed within textual set ups. Proficiency in the language used for the assessment is therefore a key factor to take into account. Not surprisingly, prior investigations have revealed that adults whose mother tongue is different from the language of the assessment perform, on average, lower than adults whose mother tongue is the same as the test language (see also Chapter 2 for comparisons across language groups). Previous research has found that students with a home language different than that used in school demonstrate lower literacy proficiency (e.g., OECD, 2004: p. 170). Similar results were found in IALS, where in the majority of countries non-native speakers demonstrated lower literacy proficiency (OECD and Statistics Canada, 2000: pp. 51-52).

Performance differences between native and non-native speakers in terms of their mother tongue can be even larger when multiple skill domains are considered. Figure 6.4 indicates that the impact of language status is most pronounced in New Zealand, with 48 per cent of non-native speakers compared to 20 per cent of native speakers scoring low in all four skill domains. This is followed by the Netherlands (38% vs 15%), Canada (42% vs 20%) and the French and German speaking communities of Switzerland (26% vs 11%). Only Italy and Hungary record marginal differences of one to three per cent.

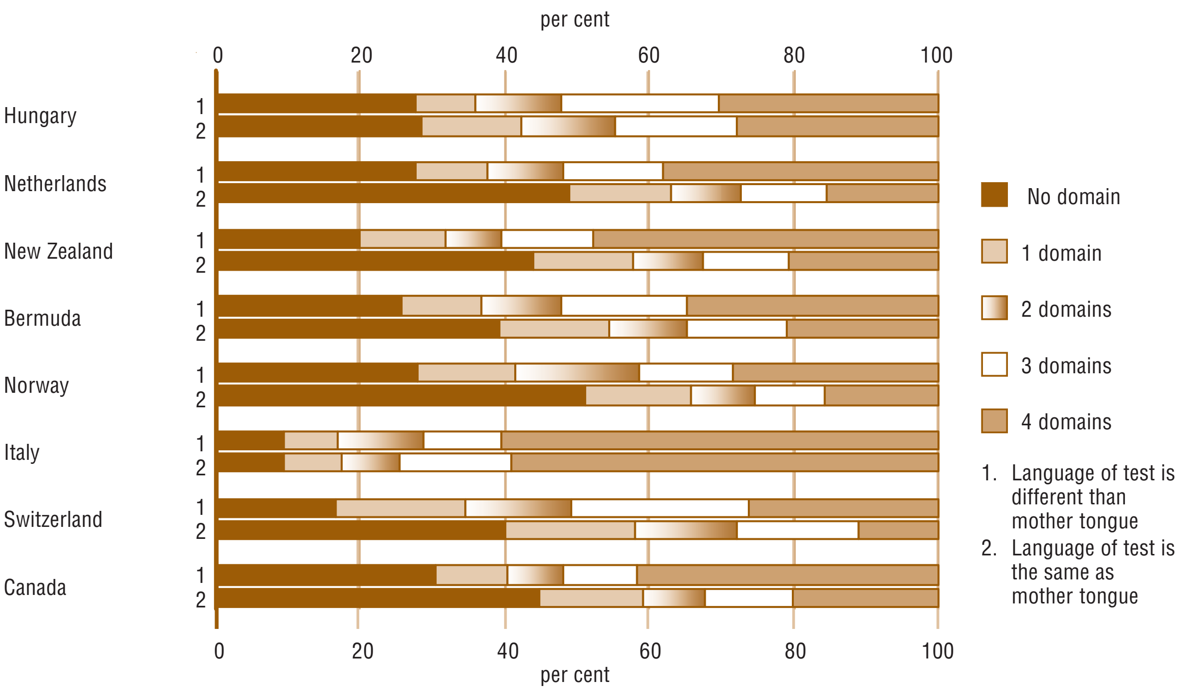
In some countries non-native speakers are more susceptible to cumulative disadvantage while native speakers are more likely to be only partially disadvantaged in one or two domains. This is the case in Canada, Hungary, the Netherlands and New Zealand. This pattern does not hold in Switzerland (French and German) and Norway where non-native speakers are more likely to be disadvantaged in any combination of one, two, three or four skill domains.

Furthermore, the data in Table 6.4 in Annex 6 document that in Bermuda, Canada, Hungary, Italy and New Zealand partial disadvantage in only one domain among native speakers is biased toward numeracy. It suggests that policies and programmes aimed at non-native speakers in these countries could benefit from being comprehensive in covering the full range of skill domains while those aimed at native speakers are more likely to benefit from targeted training in some of the more advanced skill domains (i.e., numeracy). In the Netherlands however, about nine per cent of both native and non-native speakers experience difficulty only in the numeracy domain. Meanwhile, in the Netherlands and Switzerland (French and German) both native and non-native speakers have equally high concentrations of low performance in only the prose domain, ranging from five to seven per cent of the adult population.

Figure 6.4

Language status and multiple disadvantage

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by language status, 2003 and 2008



Countries are ranked by per cent of adults whose mother tongue is different than the language of test and who are multiply disadvantaged in all four domains.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Socioeconomic background

The finding that socioeconomic background is an important determinant of skill development is supported by much empirical evidence (e.g., OECD and Statistics Canada, 2000: p. 32; OECD and Statistics Canada, 2005, pp. 230-231). This relationship is linked to a nurturing and educative climate in the home and family environment as a child, exerting a strong effect on life chances (Schuller *et al.*, 2004). Parents' level of education is a good indicator of this phenomenon. The data presented in Figure 6.5 allow this relationship to be investigated with a closer look at differences by type and number of domains.

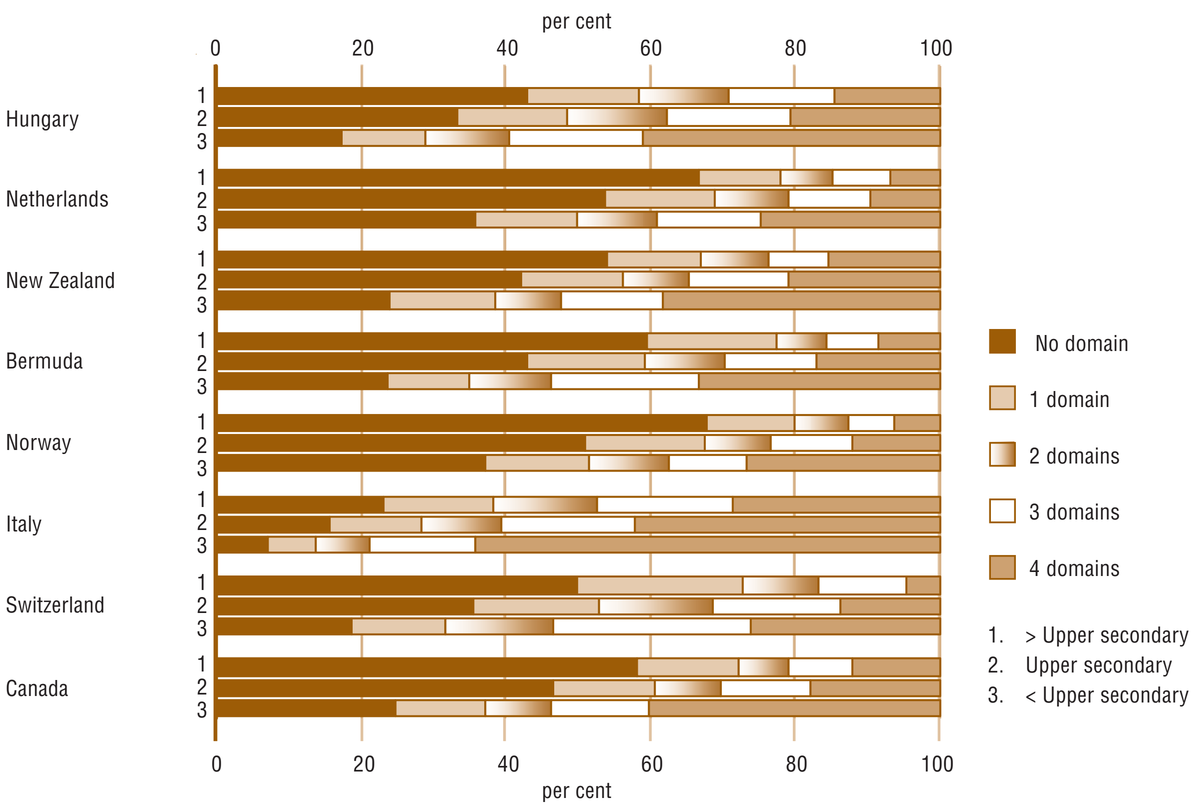
With few exceptions the pattern is as expected, namely the higher the educational attainment of the parents the lower the likelihood of adults being disadvantaged in multiple skill domains. Adults for whom neither parents completed upper secondary education are 2 to 5.5 times more likely to perform low in all four domains than those for whom at least one parent obtained a higher level of education. The cumulative disadvantage in all four domains is highest among adults whose parents did not complete upper secondary education: Bermuda (33%), Canada (40%), Hungary (41%), Italy (64%), the Netherlands (25%), New Zealand (38%), Norway (27%), and Switzerland (26%).

When considering partial disadvantage, the gap narrows substantially. This is because a fairly large proportion of those for whom at least one parent completed either upper or post-secondary education are partially disadvantaged in one or two domains. Data in Table 6.5 help to reveal that across all countries about 12 to 17 per cent of adults whose parents attained at least upper secondary education are disadvantaged in only one domain. Similarly, about 11 to 23 per cent of adults whose parents attained post secondary education are disadvantaged in only one domain. Typically, partial disadvantage in one domain is biased toward numeracy.

Figure 6.5

Socioeconomic background and multiple disadvantage

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by parents' highest level of education, 2003 and 2008



Countries are ranked by per cent of adults whose parents' completed less than upper secondary schooling and who are multiply disadvantaged in all four domains.

Note: Parents' highest level of education is defined as the higher of either the mother or father's level of education.
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Educational attainment

The importance of educational attainment in predicting performance in literacy, numeracy, and problem solving comes as no surprise since in most societies, a principal goal of initial schooling is precisely to produce a population able to read, write and count as well as cope with everyday situations. As expected, the data in Figure 6.6 confirm that the less educated are much more likely to score low in any given skill domain. Notably, however, the impact can be very substantial.

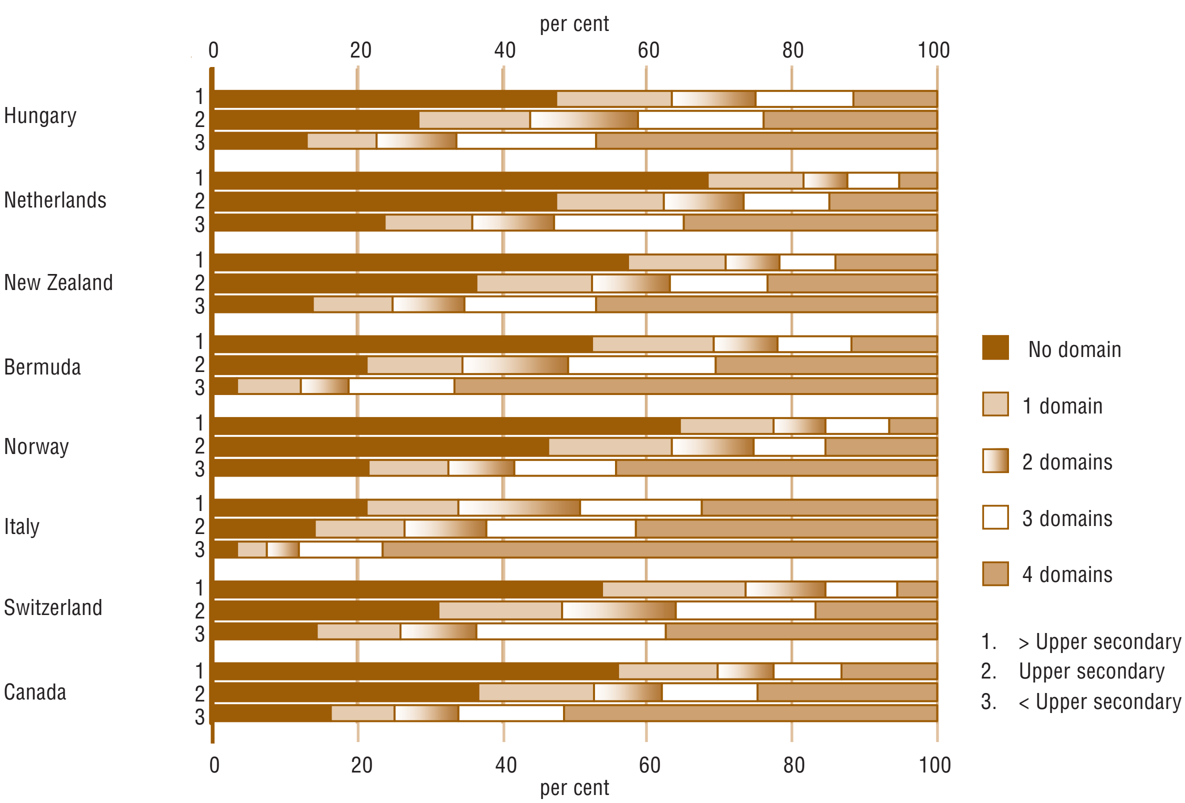
About two to seven times more adults who have not completed upper secondary education perform poorly in all four domains compared to those who completed upper secondary or tertiary education. Another key finding is that a significant number of adults perform low in all four skill domains, even after having completed more than upper secondary education. The Figure is as high as 32 per cent for Italians who have completed more than upper secondary education and as low as 5 per cent for the Dutch and Swiss (from German and French speaking communities).

Furthermore, a fairly large proportion of tertiary graduates are partially disadvantaged in only one or two domains. Notably, adults with upper secondary or tertiary education are much more likely than those with less than upper secondary education to be disadvantaged in only one domain. At least 13 per cent of adults with some tertiary education are disadvantaged in only one domain: Bermuda (17%), Canada (14%), Hungary (16%), Norway (13%), the Netherlands (13%), New Zealand (14%) and the French and German speaking communities of Switzerland (20%). Again, most of this partial disadvantage is concentrated in the numeracy domain with proportions reaching four to 11 per cent among tertiary graduates and four to 12 per cent among upper secondary graduates.

Figure 6.6

Educational attainment and multiple disadvantage

Per cent of adults performing at levels 1 or 2 in one or more skill domains or no domain at all, by level of education, 2003 and 2008



Countries are ranked by per cent of adults who completed less than upper secondary schooling and who are multiply disadvantaged in all four domains.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

6.6 Disadvantage in all four skill domains – an adjusted model

By considering only the bivariate relationships between demographic and socioeconomic variables and low performance in multiple skill domains, the above analysis does not adjust for systematic variations in other variables which may influence the observed relationships. For example, women may have a tendency to display cumulative disadvantage in three or four domains in Italy, the Netherlands and Switzerland because women systematically attain lower levels of education in those countries. To take such possibilities into account a multivariate analysis was undertaken of a model that specified all variables discussed in the previous section, namely age, gender, language status, socioeconomic background and educational attainment, into one model. The results presented in Figure 6.7.1 and 6.7.2, suggest that after adjusting for educational attainment, women continue to display a higher likelihood than men of featuring cumulative disadvantage in these three countries, but it is only statistically significant in the Netherlands.

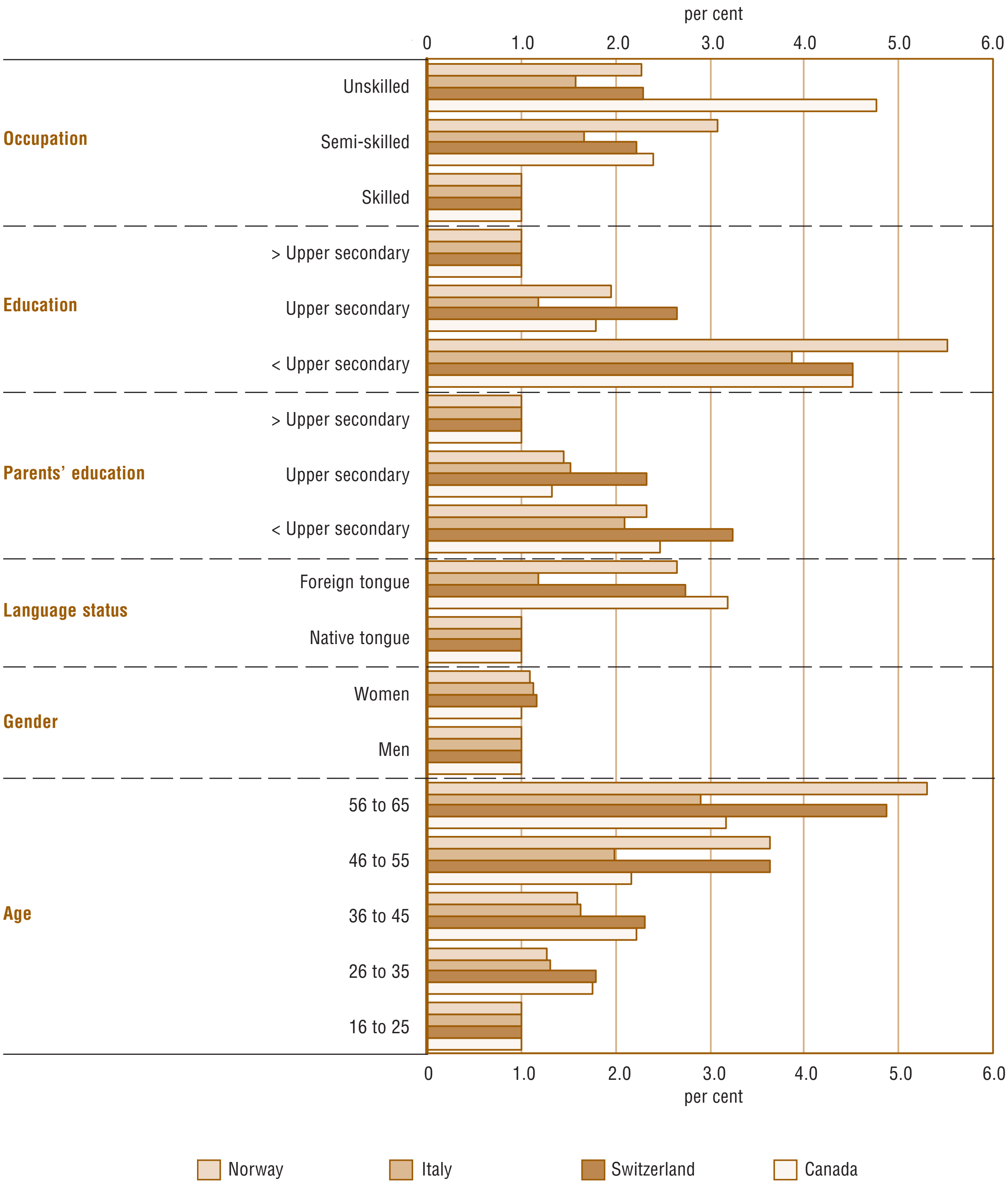
The type of occupation one is employed in is of interest because it indicates whether a person is exposed to diverse and nurturing work experiences or is limited to a narrower range of routine and low skilled tasks. This follows from practice engagement theory (see Reder, 1994) which suggests that individuals acquire, develop, maintain or lose skills depending on the nature, frequency and intensity of relevant life experiences at home, at work or in the community over their entire life course. Indeed, for Bermuda and Canada, being in an unskilled occupation is a strong predictor of disadvantage in all four skill domains, even after adjusting for other characteristics. Specifically, the odds of an unskilled worker being in this category compared to a skilled worker is 5.7 times higher in Bermuda and 4.8 times higher in Canada.

Table 6.0 ranks the demographic and socioeconomic characteristics by country so as to highlight the relative importance of the variables modelled in explaining low performance in all four skill domains. As can be seen, low levels of educational attainment are dominant in three countries (Hungary, Italy, and Norway) and a close second in four other countries (Bermuda, Canada, the Netherlands and Switzerland). As mentioned above, low skilled occupations rank first for Bermuda and Canada, whereas being aged 56 to 65 years ranks first for the Netherlands and Switzerland. Otherwise, older age categories are consistently in the top three except in New Zealand where, as previously mentioned, older and younger adults perform similarly. Language status appears to be particularly important in countries with either a relatively high proportion of foreign born adults, more than one official language, or high proportions of indigenous groups. As an indicator of social stratification, parents' education is also significant in all countries, whereas the gender bias in favour of men remains statistically significant only in the Netherlands.

Figure 6.7.1

Demographic characteristics and multiple disadvantage

Adjusted odds ratios showing the likelihood of being disadvantaged (low performance at levels 1 or 2), by number of skill domains and various demographic characteristics, 2003 and 2008

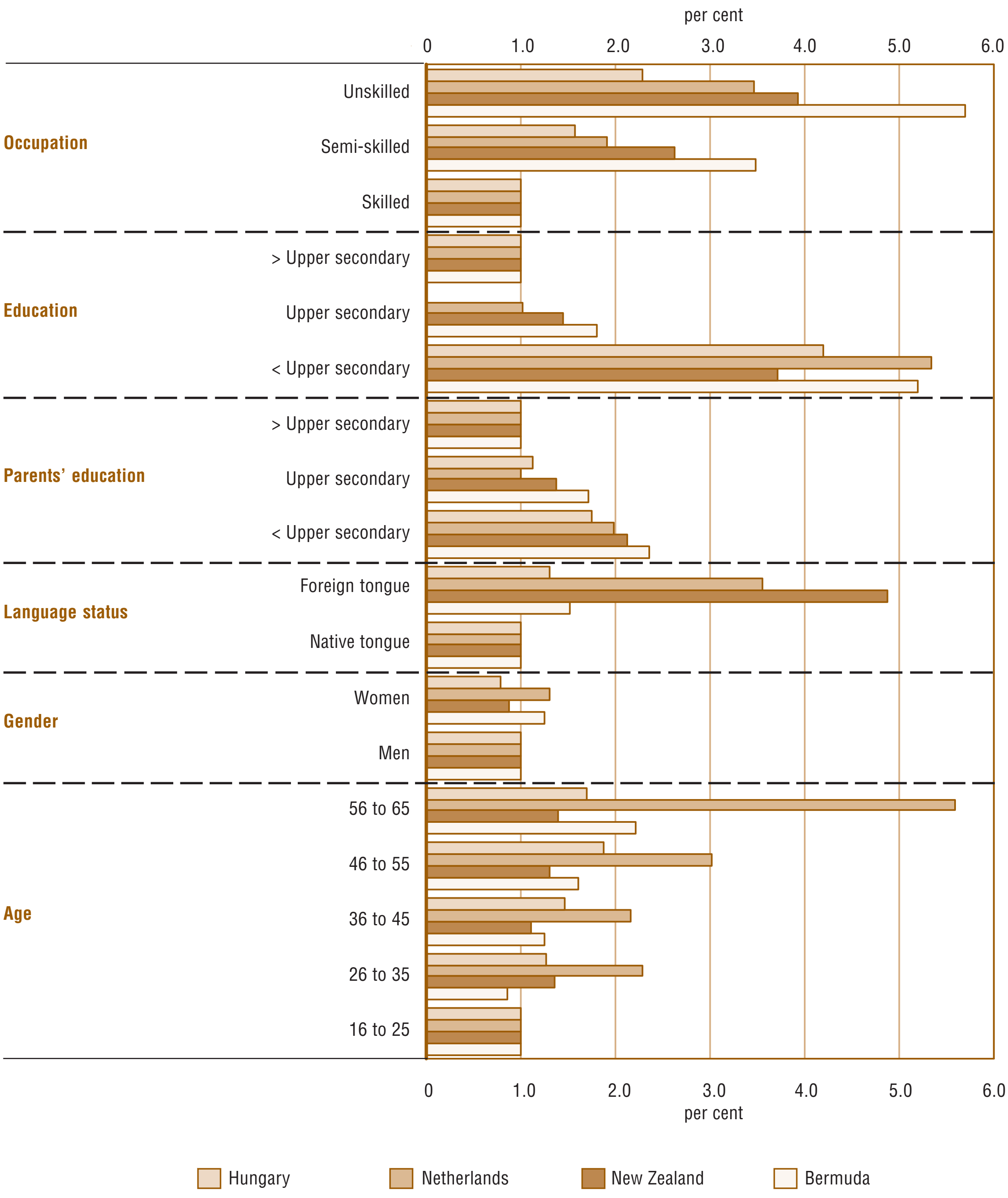


Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Figure 6.7.2

Demographic characteristics and multiple disadvantage

Adjusted odds ratios showing the likelihood of being disadvantaged (low performance at levels 1 or 2), by number of skill domains and various demographic characteristics, 2003 and 2008



Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.0

Rank order of relative importance of various demographic and socioeconomic characteristics as displayed by adjusted odds ratio by country, 2003 and 2008

	1st	2nd	3rd	4th	5th
Bermuda	Occupation (unskilled: 5.7)	Education (less than upper secondary: 5.2)	Parents' education less than upper secondary: 2.4)	Age (55 to 65: 2.2)	Age (46 to 55: 1.6)
Canada	Occupation (unskilled: 4.8)	Education (less than upper secondary: 4.5	Age 55 to 65: 3.2); language status (foreign tongue: 3.2)	Parents' education (less than upper secondary: 2.5)	Age (46 to 55: 2.2); Age (36 to 45: 2.2)
Hungary	Education (less than upper secondary: 4.2)	Occupation (unskilled: 2.3)	Age (46 to 55: 1.9);	Parents' education (less than upper secondary: 1.7)	Occupation (semi-skilled: 1.6)
Netherlands	Age (55 to 65: 5.6)	Education (less than upper secondary: 5.3)	Language status (foreign tongue: 3.6)	Occupation (unskilled: 3.5)	Age (46 to 55: 3.0)
Italy	Education (less than upper secondary: 3.9)	Age (55 to 65: 2.9)	Age (46 to 55: 2.0)	Occupation (semi-skilled: 1.7)	Occupation (unskilled: 1.6); Age (36 to 45: 1.6)
New Zealand	Language status (foreign tongue: 4.9)	Occupation (unskilled: 3.9)	Education (less than upper secondary: 3.7)	Occupation (semi-skilled: 2.6)	Parents' education (less than upper secondary: 2.1)
Norway	Education (less than upper secondary: 5.5)	Age (55 to 65: 5.3)	Age (46 to 55: 3.6)	Occupation (semi-skilled: 3.1)	Language status (foreign tongue: 2.7)
Switzerland (German/French)	Age (55 to 65: 4.9)	Education (less than upper secondary: 4.5)	Age (46 to 55: 3.6)	Parents' education less than upper secondary: 3.2)	Language status (foreign tongue: 2.7); education (upper secondary: 2.7)

Note: See Table 6.7 for complete results.
Source: Adult Literacy and Life Skills survey, 2003 and 2008.

6.7 Labour market consequences of multiple disadvantages

Whereas the preceding section examined the characteristics of low performing adults in any skill domain, the current section studies some of the consequences of having poor skills in one or more skill domains. The question is whether and to what extent low performing adults do indeed experience 'disadvantage' with respect to important economic and social outcome variables.

Unemployment

Literacy, numeracy and problem solving are among the foundation skills demanded and generally also valued on the labour market. Many researchers have suggested that the proportion of low skilled jobs is reduced in advanced industrialised countries because of a general shift toward higher skilled jobs as well as upskilling among already existing ones; for example, because of the pervasive impact of ICTs on the production of goods and services (see Green and Dickerson, 2003;

Massé, Roy, Gingras, 2000; Machin, Ryan, Van Reenen, 1996). If this is indeed the case then, by implication, adults with low skills, especially in multiple domains, would face increased difficulty in securing gainful employment. In reality, however, this relationship between skills and employment depends on a more complex set of variables, particularly the state of industrial and production structures of countries.

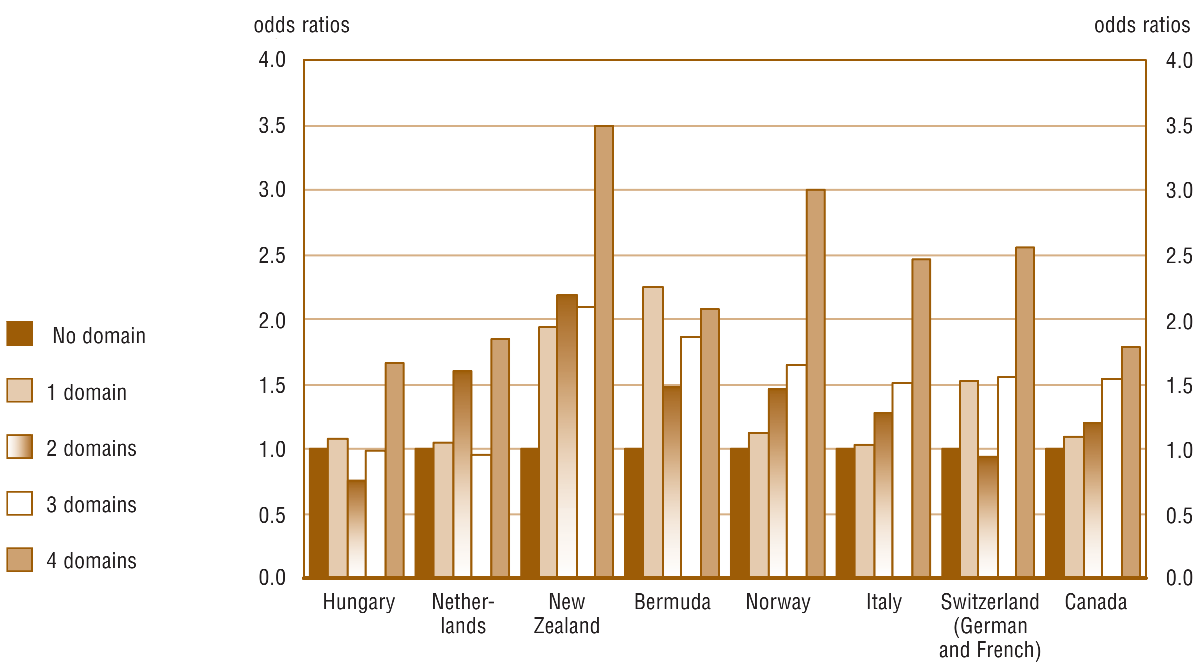
As expected, the data presented in Figure 6.8 confirm that adults who perform poorly in one or more skill domains have a high risk of being unemployed, but the patterns are not uniform across countries. In Bermuda, for example, adults who perform low in all four skill domains are less likely to be unemployed than those with low performance in one domain. This might be because Bermuda has a strongly bifurcated labour market with many high-skill jobs but also many unskilled jobs, making it relatively easier for low skilled workers to find work.

Not every skill domain has equal weight in predicting employment either, and this varies by country. For example, it can be inferred from Table 6.8 in Annex 6 that despite doing well on other domains, adults in New Zealand who perform poorly in only the numeracy domain are over two times more likely to experience unemployment compared to those with no skill disadvantage at all.

Figure 6.8

Unemployment and multiple disadvantage

Adjusted odds ratios showing the likelihood of labour force participants aged 16 to 65 years with low performance (Levels 1 or 2) being unemployed at the time of survey, by number and type of skill domains, 2003 and 2 008



Countries are ranked by odds of being unemployed of those with low performance in all 4 domains.

Note: Results are adjusted for age, gender, language status, parents' education, and education.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

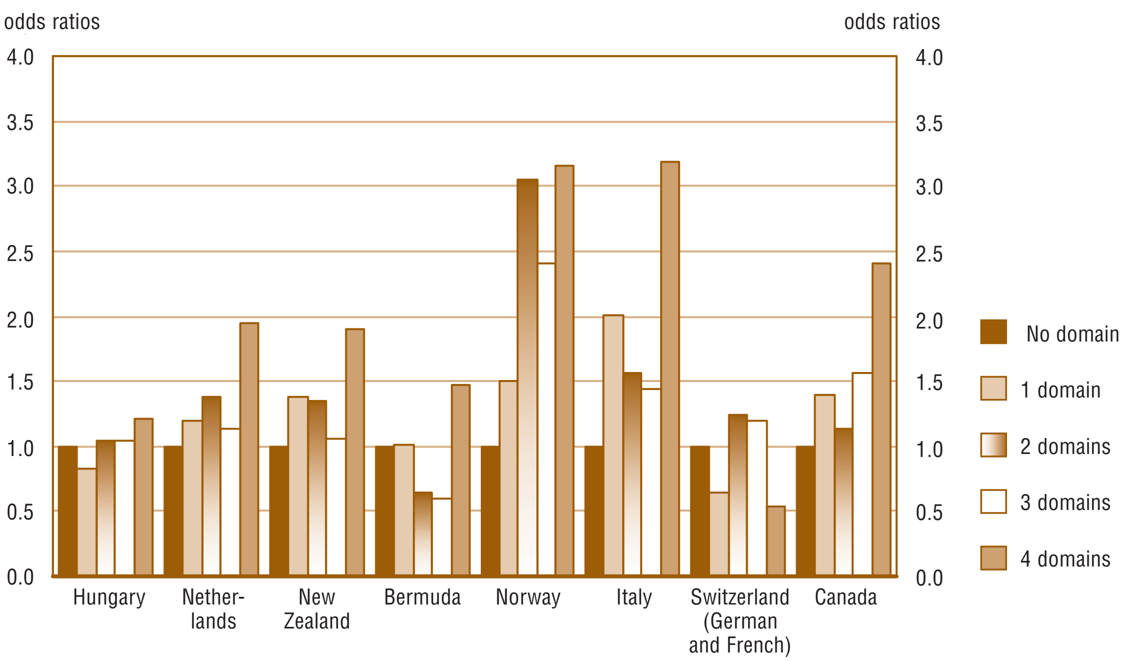
Labour force participation

As knowledge economies mature, adults with low foundation skills not only face increased risk of being unemployed but also of being left outside the labour force altogether. The empirical results indicate that this relationship varies depending on the number and type of multiple skill disadvantages and the labour market context of countries. Findings reported in Figure 6.9 show that in Canada, Italy, the Netherlands, New Zealand and Norway, the odds of not participating in the labour force is associated with low performance in all four domains. In the Netherlands and New Zealand, poor performance in numeracy either alone or in combination with another skill domain is associated with non-participation in the labour force. In contrast, the majority of Hungarians who perform poorly in any given domain or in combinations of one, two or three domains are no less likely to be in or outside of the labour force than other adults. But if they perform poorly in all four domains, then they are more likely to be found outside the labour force.

Figure 6.9

Labour force participation and multiple disadvantage

Adjusted odds ratios showing the likelihood of adults in the working age population (16 to 65 years) with low performance (Levels 1 or 2) *not* participating in the labour force at the time of survey (excluding students and retirees), by number and type of skill domains, 2003 and 2008



Source: Adult Literacy and Life Skills survey, 2003 and 2008.

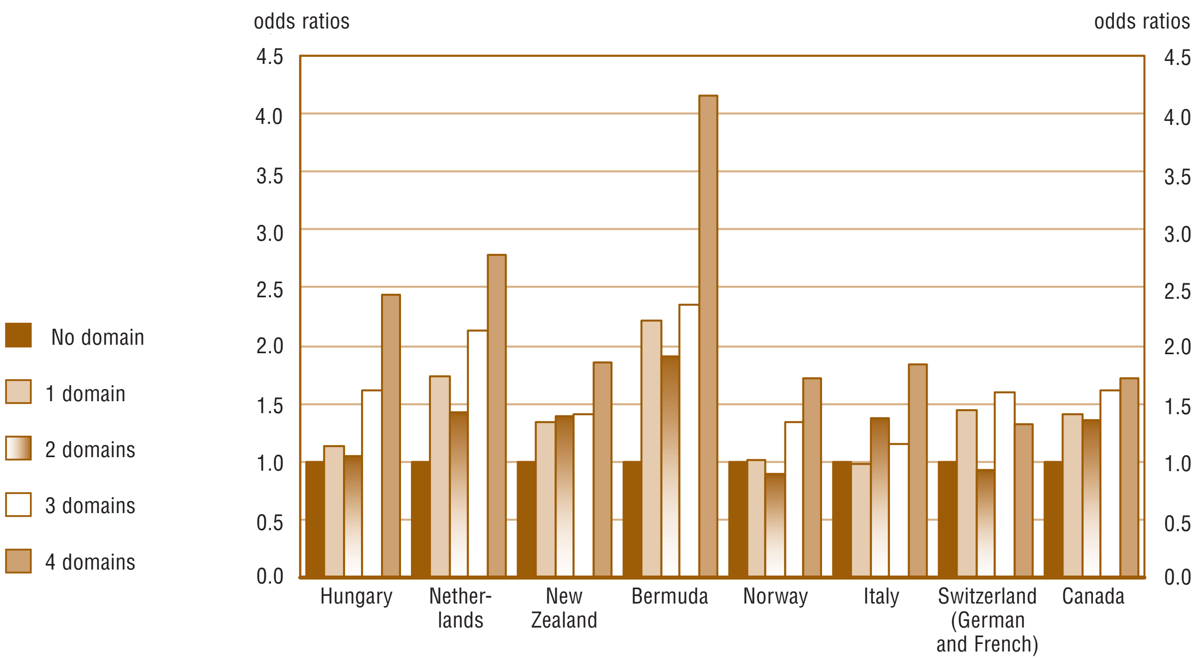
Income from work

Not surprisingly, it follows from the above that foundation skills also are associated with earnings premiums in nearly all countries surveyed. Data presented in Figure 6.10 show that adults with a disadvantage in at least one skill domain are more likely to be in the low wage category compared to adults without a skill disadvantage. This is statistically significant in Bermuda, Canada, the Netherlands and New Zealand. The higher the number of skill domains with disadvantage the higher the labour market penalty in terms of pay. Performance in the problem solving domain is particularly important in Bermuda and the Netherlands where poor performers in this domain alone are found to be four to five times more likely to be among the lowest wage earners.

Figure 6.10

Income from work and multiple disadvantage

Adjusted odds ratios showing the likelihood of labour force participants aged 16 to 65 years with low performance (Levels 1 or 2) being among the lowest wage earners, by number and type of skill domains, 2003 and 2008



Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Multiple Disadvantage and Educational Outcomes

Many OECD countries have adopted ambitious targets in terms of desired levels of educational attainment. This is connected to consistent findings about the strong link between educational attainment and labour market outcomes. The OECD's *Education at a Glance* report, for example, have for years presented comparable indicators showing that upper secondary education completion marks the minimum threshold for successful labour market entry and continued employability (e.g., OECD, 2008). As a consequence some countries are pursuing policies to reach quantitative targets for their young people that aim at upper secondary completion rates of at least 95 per cent and transition rates to tertiary education of at least 50 per cent. Without the requisite foundation skills, however, many youth and young adults face an uphill battle, not only in terms of educational attainment but also with regard to labour market success. Previous research findings have shown that early school leavers with low skill proficiencies are more likely to face difficulties entering the labour market and maintaining employment over their working careers (see OECD and Statistics Canada, 2005, Chapter 5).

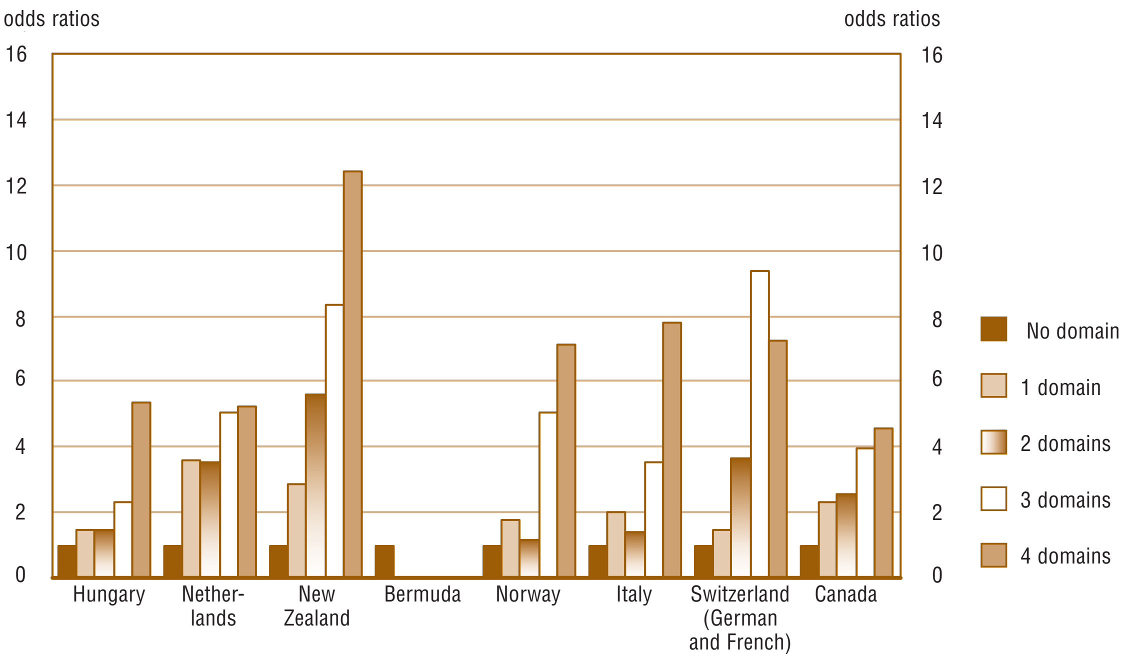
Upper secondary education

A substantial proportion of youth and young adults still do not complete upper secondary education and this phenomenon is strongly linked to disadvantage in the acquisition of foundation skills. Figure 6.11 documents that this relationship is influenced by the number of skill domains in which youth and young adults aged 16 to 30 years score low. Young adults who score poorly on all four domains are about five to 12 times more likely, depending on the country, to not complete upper secondary education than young adults who perform well on all domains. In New Zealand, doing poorly in any domain means that young people are much less likely to complete upper secondary education.

Figure 6.11

Upper secondary educational attainment and multiple disadvantage

Adjusted odds ratios showing the likelihood of youth and young adults aged 16 to 30 years with low performance (Levels 1 or 2) *not* completing upper secondary education, by number and type of skill domains, 2003 and 2008



Note: Results in Bermuda are not estimated due to low sample sizes.
Source: Adult Literacy and Life Skills survey, 2003 and 2008.

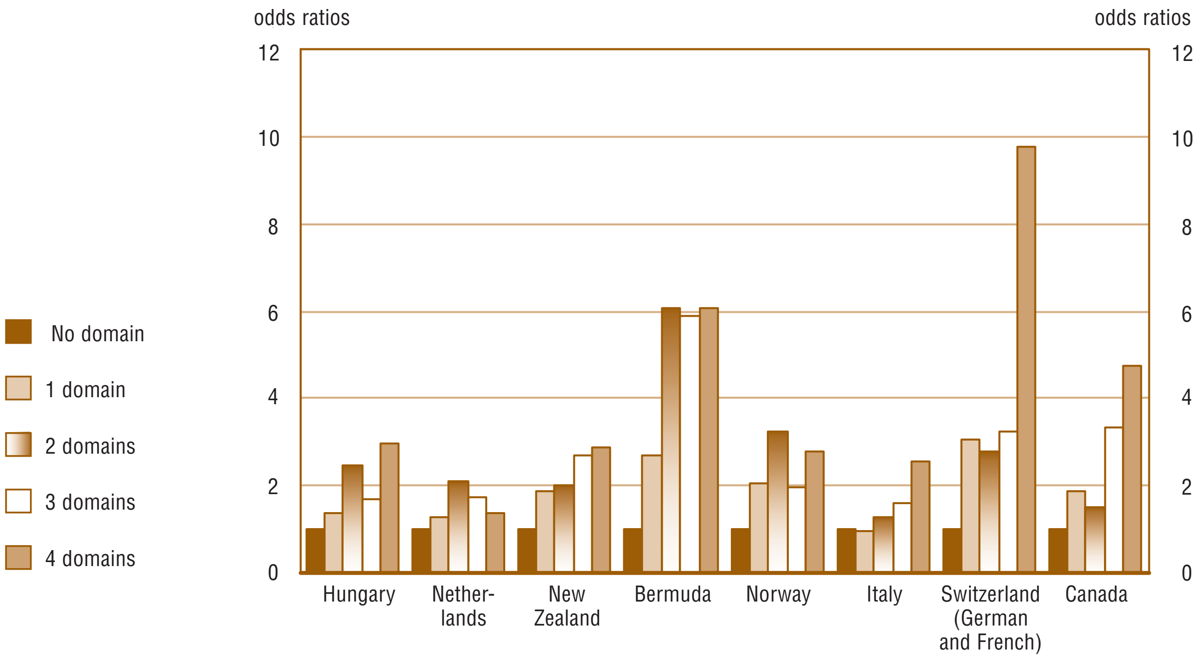
Tertiary education

The results are similar when participation in tertiary education is considered (Figure 6.12). Among youth and young adults aged 16 to 30 years in Bermuda, Canada, Hungary, New Zealand, Norway and Switzerland (French and German speaking communities) who have completed upper secondary education, poor performance in one skill domain alone reduces their chances of participating in tertiary education by about 1.3 to three times compared to those who do well in all skill domains. Poor performance in numeracy appears to play a particularly dominant role in this pattern. In Switzerland (French and German speaking communities), poor performance in prose skills alone poses an equally powerful barrier to tertiary participation.

Figure 6.12

Participation in tertiary education and multiple disadvantage

Adjusted odds ratios showing the likelihood of upper secondary graduates aged 16 to 30 years with low performance (Levels 1 or 2) *not* participating in tertiary education, by number and type of skill domains, 2003 and 2008



Source: Adult Literacy and Life Skills survey, 2003 and 2008.

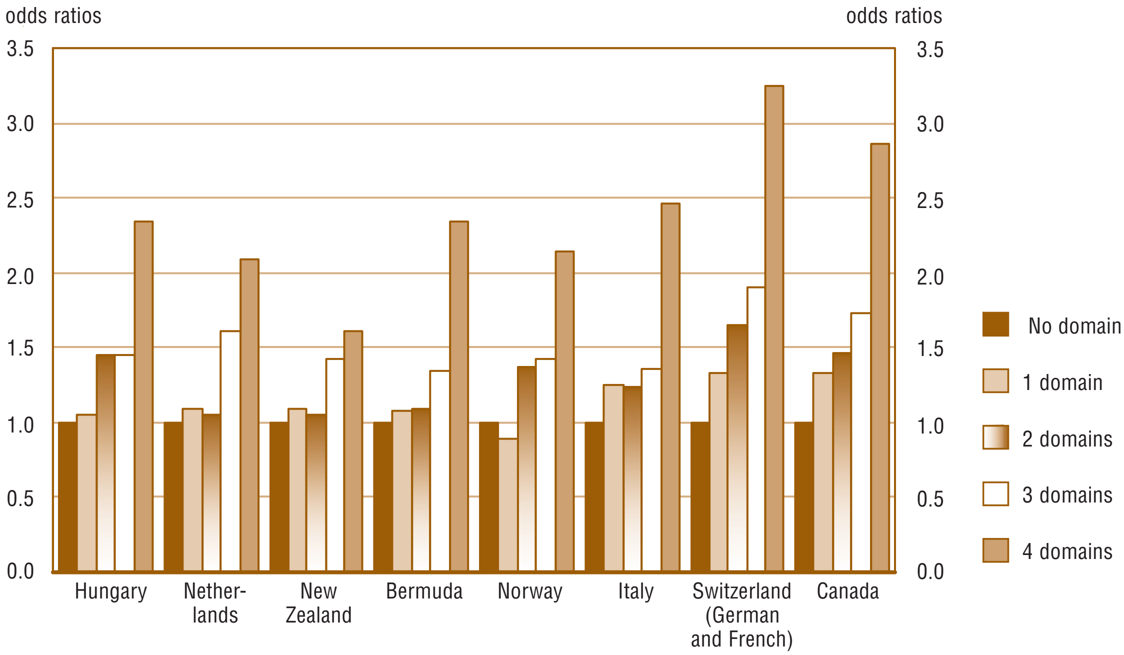
Adult education

Not only are youth and young adults who perform poorly in any given skill domain disadvantaged in terms of initial educational attainment, they are also much less likely to participate in adult education (Rubenson and Desjardins, 2009). The data analyses presented in Figure 6.13 confirm that the relationship between skill and participation to education applies to any type or form of organised learning, and over the entire life course. Adults aged 16 to 65 years who have difficulty in one or more skill domains are less likely to participate in adult education, even after controlling for a range of background variables including initial educational attainment and language status. The differences are largest for adults with low performance in all four skill domains.

Figure 6.13

Participation in adult education and multiple disadvantage

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 years with low performance (Levels 1 or 2) *not* participating in any adult education or training (excluding full time students), by number and type of skill domains, 2003 and 2008



Source: Adult Literacy and Life Skills survey, 2003 and 2008.

6.8 Multiple disadvantage and other personal and social outcomes

The analyses presented in the preceding two sections have documented that adults who score low in multiple foundation skills are at much higher risk of being disadvantaged in terms of both educational and labour market outcomes. This tendency, however, for low scorers to be disadvantaged extends into other spheres of life as well including personal health and civic engagement. These relationships are investigated below.

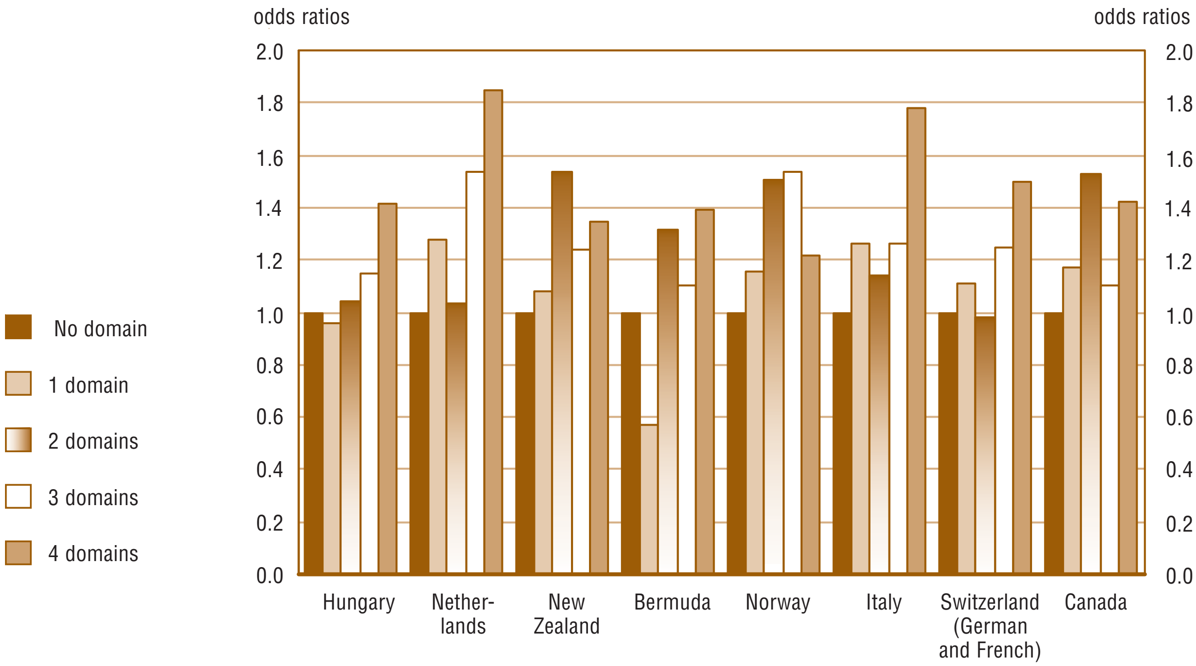
Health status

It can be inferred from Figure 6.14 that adults who score low are more likely to be in the lowest decile of self-reported health status, but for the most part, only when this occurs in more than one skill domain. Scoring low in only one skill domain does not significantly increase the odds of having the poorest health in any of the countries studied. Poor numeracy in combination with either prose or document skills have a strong link to health status in Canada, Norway and New Zealand. Otherwise, low performance in three and/or four skill domains is significantly linked to health status in all countries. Adults who perform poorly in all four domains in Italy and the Netherlands are nearly two times more likely to report the lowest level of health.

Figure 6.14

Health Status and multiple disadvantage

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 years with low performance (Levels 1 or 2) being in the lowest decile of self-reported health status, by number and type of skill domains, 2003 and 2008



Source: Adult Literacy and Life Skills survey, 2003 and 2008.

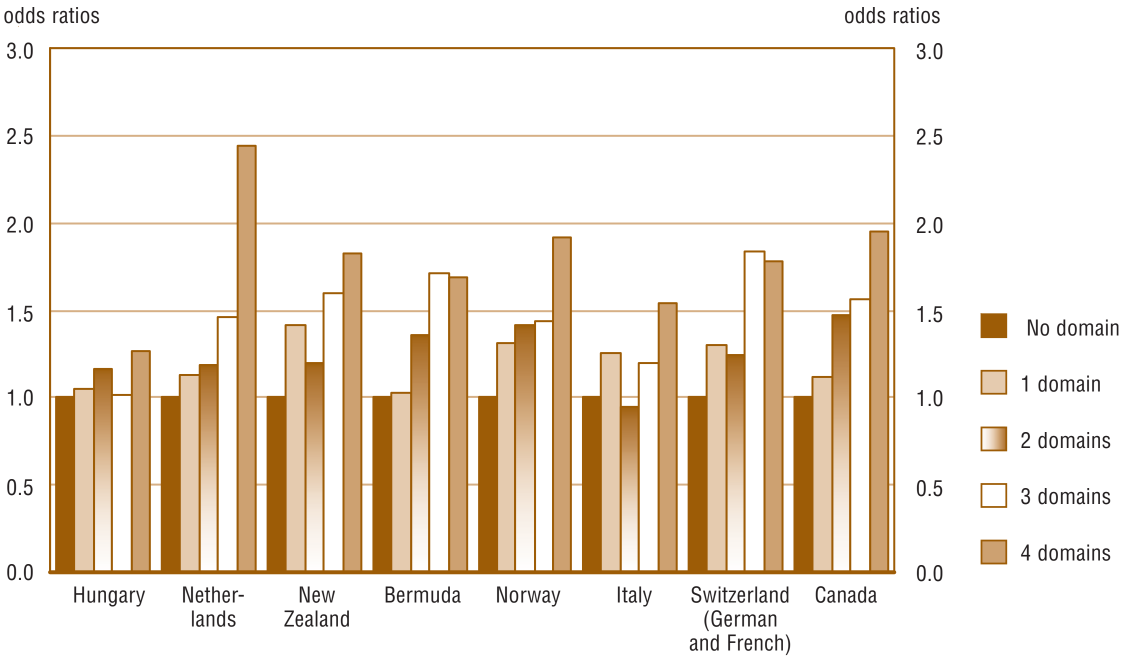
Civic engagement

Similarly, in all countries, low performers are more likely to be disadvantaged in terms of civic engagement. The data in Figure 6.15 reveal that adults who perform low in all four skill domains are about 1.3 to 2.4 times more likely to not at all participate in a range of associational activities such as: a political organisation; a sports or recreation club; a cultural, hobby or recreation club; a service club; a school or community group; a group of worship; or any other group or organisation. Alone, poor performance in problem solving substantially reduces the odds of participating in these types of activities in Switzerland (odds ratio of 1.7). In Canada, Norway, and New Zealand, the negative relationship not only holds for combinations of low performance in one, two, three or four domains, but tends to strengthen with the number of domains, although this relationship is not perfectly linear.

Figure 6.15

Community Participation and multiple disadvantage

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 years with low performance (Levels 1 or 2) *not* participating in a range of civic related activities, by number and type of skill domains, 2003 and 2008



Source: Adult Literacy and Life Skills survey, 2003 and 2008.

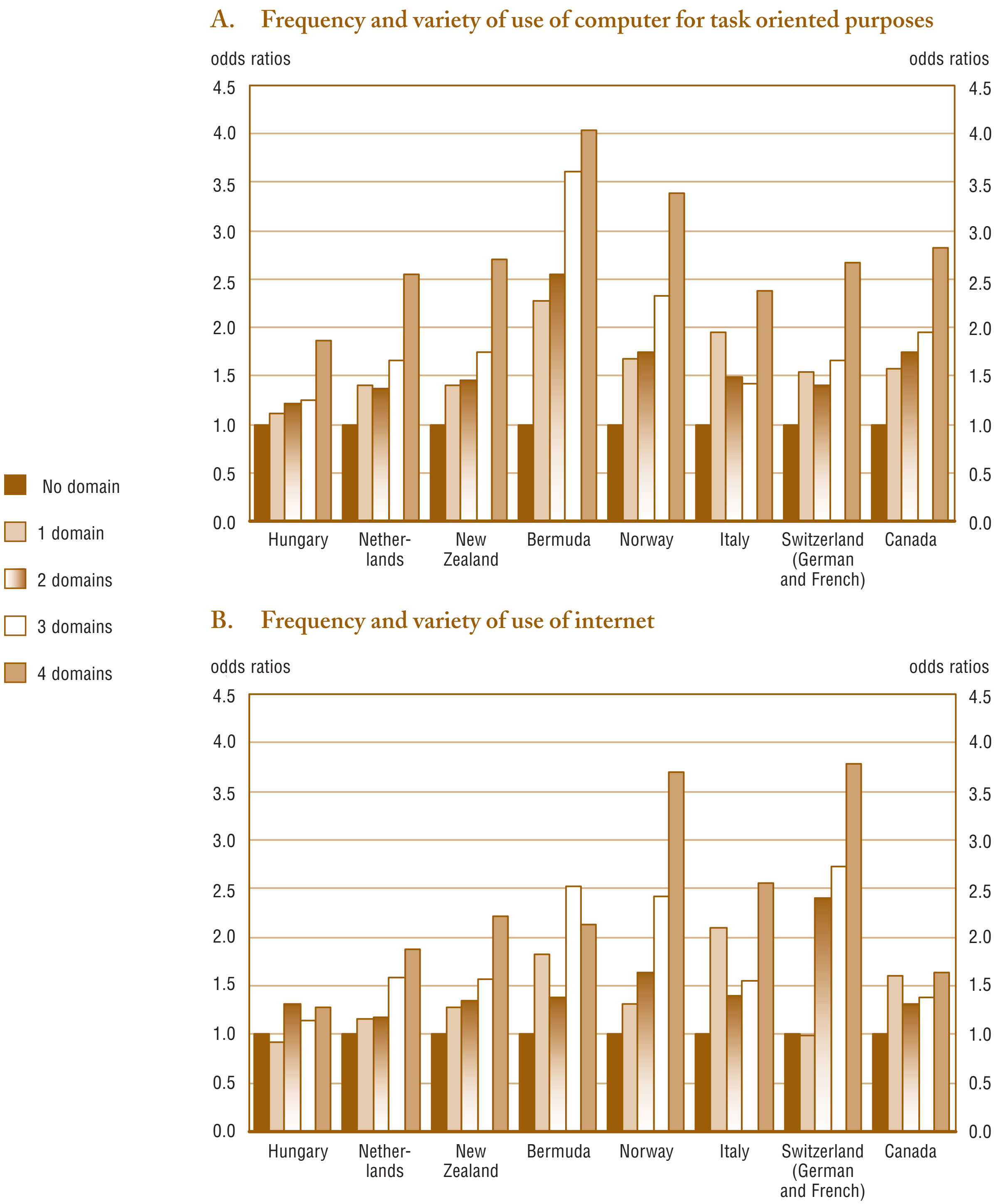
Using ICTs and internet

Finally, adults who perform poorly in any of the foundation skills measured in the ALL survey are disadvantaged when it comes to using and interacting with Information and Communication Technologies (ICTs). Figures 6.16A and 6.16B show that this risk of disadvantage increases with the number of skill domains for which there is low performance. The relationship is strong and pervasive in most countries. In Canada and Hungary the relationship between skill performance and internet use is weaker than in other countries. Otherwise, in nearly all countries difficulty in almost any given domain or combination thereof translates into a markedly reduced usage of both computers for task oriented purposes as well as the internet. This is of particular concern at a time when many OECD governments are seeking to develop access to a wide range of public services via the internet, including basic welfare and social services.

Figure 6.16

ICTs and multiple disadvantage

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 with low performance (Levels 1 or 2) being in the lowest quartile of Information Communication Technology use, by number and type of skill domains, 2003 and 2008



Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Conclusion

This chapter has investigated the characteristics of adults who perform low in one or more skill domains and what the potential consequences of low performance in multiple domains are for them. In summary, adults who are older, part of a minority language group, come from a lower socioeconomic background and are low educated, are much more likely to perform poorly in multiple skill domains. These low performing adults are at a disadvantage vis-à-vis life chances and accordingly a wide range of economic and social outcomes. Results presented in the chapter highlight that adults with low performance in one or more domains face increased odds of being unemployed, earning low income, having difficulty accessing learning opportunities and having difficulty accessing or using ICT tools interactively for productive purposes, having poor health status, and engaging less in the community. Additionally, findings show fairly consistently that disadvantage is more pervasive when adults perform poorly in all four skill domains assessed in the ALL study. In some cases the risk of being at a disadvantage increases proportionately with the number of skill domains adults have difficulty with, but overall this is not uniform. In other cases, the relationships do not hold in certain countries suggesting that the context matters, for example, the distribution of low versus high skill jobs on the labour market or the extent of ICT use. Further, not all skill domains or combination of domains have equal weight vis-à-vis different outcomes. Finally, partial disadvantage in one or two domains tends to be biased in favour of numeracy and/or problem solving, suggesting that these are more advanced or complicated skill domains, but this does not hold uniformly.

In conclusion, data from the ALL study help to reveal that individuals who fail to achieve the critical thresholds in any given skill domain not only face higher risks of being disadvantaged in a range of labour market, educational and other personal and social outcomes, but that this disadvantage can accumulate with low performance across multiple domains. The findings also help to highlight that not all individuals are equally at risk in all four domains, suggesting that skill improvement programmes need to incorporate assessment procedures to identify learning needs at the individual level and target particular skills sets.

Endnotes

1. The United States and the Italian speaking region of Switzerland did not field the problem solving domain in the ALL survey. Therefore they are excluded from the data analyses presented in this chapter since the focus is on disadvantage in all four skill domains.
2. As an indicator, language status is similar to immigrant status but these are not necessarily the same, particularly for countries with more than one official or indigenous language. Furthermore, countries can share the same or a rather similar language.

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Annex 6

Data Values for the Figures

Table 6.1

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by country, 2003 and 2008

Country	Number and type of skill domains with low performance									
	No domain	1 domain	Prose	Document	Numeracy	Problem solving	2 domains	Prose and document	Prose and numeracy	Prose and problem solving
	per cent									
A. Four domains										
Canada	**41.5**	**13.4**	2.3	1.6	8.6	0.8	**8.4**	1.7	2.1	0.4
Switzerland	**33.6**	**16.7**	6.5	3.8	3.6	2.8	**13.6**	6.7	2.4	1.3
Italy	**9.3**	**8.0**	1.5	1.7	3.5	1.2	**8.2**	2.2	1.4	0.8
Norway	**49.7**	**14.4**	2.5	1.8	9.2	0.9	**9.5**	1.5	2.3	1.0
Bermuda	**38.0**	**14.9**	0.8	2.7	9.6	1.7	**10.6**	1.5	2.1	0.5
NewZealand	**39.9**	**13.5**	2.9	1.5	8.8	0.4	**9.1**	2.2	2.4	0.4
Netherlands	**46.4**	**13.5**	6.0	2.7	4.1	0.7	**9.7**	4.8	2.8	0.4
Hungary	**28.4**	**13.8**	3.5	2.4	5.0	2.9	**12.8**	4.1	2.0	1.4

Country	Number and type of skill domains with low performance									
	Document and numeracy	Document and problem solving	Numeracy and problem solving	3 domains	Prose, document and numeracy	Prose, document and problem solving	Prose, numeracy and problem solving	Document, numeracy and problem solving	4 domains	At least one domain
	per cent									
A. Four domains										
Canada	3.0	0.5	0.7	**11.7**	8.6	1.3	0.9	0.9	**25.0**	58.5
Switzerland	1.5	1.0	0.6	**18.3**	12.0	4.9	0.8	0.6	**17.8**	66.4
Italy	2.2	0.6	1.0	**15.4**	10.6	2.6	0.9	1.3	**59.1**	90.7
Norway	3.3	0.4	0.9	**9.9**	6.3	2.2	0.6	0.8	**16.5**	50.3
Bermuda	5.0	0.2	1.2	**14.1**	8.7	1.0	1.1	3.3	**22.4**	62.0
NewZealand	3.5	0.2	0.4	**12.2**	9.5	1.2	0.8	0.6	**25.3**	60.1
Netherlands	1.4	0.2	0.2	**12.2**	9.7	1.5	0.5	0.5	**18.3**	53.6
Hungary	2.7	1.5	1.1	**17.1**	9.8	4.8	0.9	1.6	**27.8**	71.6

Table 6.1 (concluded)

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by country, 2003 and 2008

Country	No domain	1 domain	Prose	Docu-ment	Numeracy	2 domains	Prose and document	Prose and numeracy	Document and numeracy	3 domains
	Number and type of skill domains with low performance									
	per cent									
B. Three domains										
Bermuda	**42.3**	**14.1**	2.7	2.1	9.3	**9.9**	3.0	3.1	3.9	**33.7**
Canada	**35.9**	**16.9**	7.9	4.8	4.2	**17.0**	11.7	3.3	2.0	**30.1**
Hungary	**10.5**	**9.1**	2.3	2.3	4.5	**10.6**	4.7	2.4	3.5	**69.8**
Italy	**50.6**	**15.9**	3.5	2.2	10.1	**10.7**	3.8	2.9	4.1	**22.8**
Netherlands	**39.6**	**15.2**	1.4	3.0	10.9	**14.1**	2.5	3.2	8.4	**31.1**
New Zealand	**34.5**	**11.2**	2.5	1.5	7.1	**11.4**	3.5	3.5	4.4	**42.9**
Norway	**40.3**	**14.1**	3.2	1.7	9.2	**10.8**	3.4	3.2	4.1	**34.8**
Switzerland (German and French)	**47.0**	**13.6**	6.3	2.9	4.3	**11.4**	6.3	3.2	1.9	**28.0**
Switzerland (Italian)	**31.3**	**14.9**	5.0	3.8	6.1	**16.1**	8.9	2.9	4.3	**37.6**
United States	**34.5**	**11.1**	2.5	1.5	7.1	**11.4**	3.5	3.5	4.4	**42.9**

Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.2

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by age group, by country, 2003 and 2008

Age group	No domain	1 domain	Prose	Docu-ment	Numeracy	Problem solving	2 domains	Prose and document	Prose and numeracy	Prose and problem solving
	Number and type of skill domains with low performance									
	per cent									
Canada										
16 to 25	**47.1**	**14.8**	3.3	1.3	9.5	0.8	**7.8**	1.4	2.8	0.1
26 to 35	**51.4**	**12.5**	3.0	1.4	7.5	0.6	**8.5**	1.9	2.9	0.3
36 to 45	**40.9**	**13.8**	2.2	2.0	9.0	0.7	**8.4**	1.9	2.0	0.6
46 to 55	**37.6**	**14.2**	1.7	2.3	9.0	1.2	**9.3**	1.7	1.8	0.6
56 to 65	**26.2**	**10.6**	1.0	0.8	7.8	1.0	**8.1**	1.7	0.9	0.3
Switzerland										
16 to 25	**43.2**	**21.7**	8.4	4.7	4.8	3.8	**10.2**	4.5	1.7	1.0
26 to 35	**37.5**	**17.2**	8.3	2.7	3.4	2.7	**16.0**	7.6	4.0	1.9
36 to 45	**39.3**	**15.9**	5.3	4.4	3.6	2.5	**12.9**	6.9	2.2	0.8
46 to 55	**27.0**	**16.2**	5.6	4.8	2.8	2.9	**12.8**	7.1	1.9	0.5
56 to 65	**18.4**	**12.9**	4.9	2.3	3.6	2.0	**16.0**	6.7	2.1	2.8
Italy										
16 to 25	**12.2**	**10.0**	2.8	1.6	4.0	1.6	**9.3**	2.4	1.8	0.4
26 to 35	**12.5**	**10.1**	1.6	3.0	3.9	1.6	**11.8**	3.0	2.2	1.6
36 to 45	**9.3**	**9.1**	1.5	2.3	4.4	0.9	**8.1**	2.5	1.1	0.7
46 to 55	**8.7**	**6.1**	1.1	0.9	3.0	1.2	**6.8**	1.6	1.3	0.7
56 to 65	**3.2**	**3.7**	0.7	0.4	1.8	0.9	**4.1**	1.1	0.8	0.3
Norway										
16 to 25	**57.6**	**16.9**	2.9	1.3	12.4	0.3	**10.0**	1.6	2.5	0.9
26 to 35	**61.0**	**13.7**	1.6	1.7	9.9	0.5	**7.4**	1.2	2.1	0.3
36 to 45	**56.3**	**14.3**	3.0	2.3	8.0	1.1	**9.3**	1.5	2.5	1.6
46 to 55	**40.4**	**15.7**	2.9	1.4	9.8	1.6	**9.3**	1.6	1.9	1.0
56 to 65	**28.2**	**11.1**	2.0	2.7	5.4	0.9	**12.4**	1.9	2.7	1.4

Table 6.2 (continued)

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by age group, by country, 2003 and 2008

	Number and type of skill domains with low performance									
Age group	No domain	1 domain	Prose	Document	Numeracy	Problem solving	2 domains	Prose and document	Prose and numeracy	Prose and problem solving
	per cent									
Bermuda (English)										
16 to 25	**36.4**	**20.3**	0.4	3.2	13.2	3.4	**12.2**	1.8	3.9	0.6
26 to 35	**47.5**	**15.0**	0.9	4.3	9.2	0.6	**12.8**	2.0	3.5	0.8
36 to 45	**39.6**	**16.2**	1.4	2.8	9.7	2.2	**8.7**	1.5	1.3	0.5
46 to 55	**36.5**	**11.9**	0.6	1.4	8.1	1.8	**10.3**	1.4	1.1	0.2
56 to 65	**20.8**	**9.9**	0.3	1.0	8.4	0.3	**9.2**	0.4	0.5	0.5
New Zealand										
16 to 25	**32.0**	**14.4**	4.4	1.5	8.0	0.6	**11.5**	3.4	3.7	0.5
26 to 35	**45.9**	**12.4**	3.1	0.8	8.5	0.1	**6.9**	1.9	1.9	0.4
36 to 45	**44.5**	**13.0**	2.9	1.5	8.0	0.5	**8.0**	1.3	2.3	0.4
46 to 55	**42.7**	**13.9**	1.2	1.5	10.6	0.5	**8.8**	1.9	1.6	0.3
56 to 65	**31.9**	**14.2**	2.5	2.4	9.0	0.3	**11.0**	3.0	2.5	0.2
Netherlands										
16 to 25	**53.4**	**14.9**	7.0	2.8	4.3	0.9	**9.5**	3.9	4.1	0.4
26 to 35	**58.8**	**10.5**	4.3	1.8	4.3	0.2	**7.8**	2.9	3.3	0.1
36 to 45	**51.2**	**14.2**	7.0	2.4	4.5	0.3	**9.0**	4.5	2.1	0.4
46 to 55	**40.9**	**14.2**	5.7	3.2	3.8	1.5	**11.7**	6.7	2.5	0.5
56 to 65	**26.9**	**13.0**	5.8	3.4	3.5	0.4	**10.4**	5.7	2.1	0.4
Hungary										
16 to 25	**31.1**	**15.2**	3.7	2.5	6.0	3.0	**12.8**	3.8	2.3	1.2
26 to 35	**35.9**	**15.3**	4.2	2.6	5.4	3.1	**11.3**	3.9	1.9	1.3
36 to 45	**29.1**	**14.8**	4.2	2.1	5.5	3.0	**12.8**	3.3	2.1	1.5
46 to 55	**25.1**	**12.2**	2.9	2.6	3.7	3.0	**14.3**	4.9	1.4	1.7
56 to 65	**18.9**	**11.2**	2.7	1.7	4.6	2.1	**12.9**	4.6	2.5	1.2

	Number and type of skill domains with low performance									
Age group	Document and numeracy	Document and problem solving	Numeracy and problem solving	3 domains	Prose, document and numeracy	Prose, document and problem solving	Prose, numeracy and problem solving	Document, numeracy and problem solving	4 domains	At least one domain
	per cent									
Canada										
16 to 25	3.2	0.0	0.3	**13.3**	9.7	1.0	2.2	0.4	**17.0**	52.9
26 to 35	2.0	0.4	1.0	**9.9**	7.7	1.1	0.4	0.7	**17.7**	48.6
36 to 45	3.0	0.3	0.6	**11.8**	8.8	1.4	0.9	0.7	**25.1**	59.1
46 to 55	3.9	0.7	0.7	**11.5**	8.4	1.6	0.5	1.0	**27.4**	62.4
56 to 65	2.9	1.5	0.7	**12.2**	8.7	1.1	0.4	1.9	**43.0**	73.8
Switzerland										
16 to 25	1.7	0.5	0.8	**16.0**	11.7	3.6	0.8	0.0	**8.8**	56.8
26 to 35	1.0	1.4	0.0	**15.7**	8.9	5.3	0.6	0.9	**13.6**	62.5
36 to 45	1.2	0.8	1.0	**15.1**	10.2	4.0	0.5	0.5	**16.8**	60.7
46 to 55	1.8	0.6	0.7	**21.0**	14.3	4.9	0.9	0.8	**23.1**	73.0
56 to 65	2.0	1.8	0.6	**25.3**	16.2	7.0	1.6	0.5	**27.4**	81.6
Italy										
16 to 25	3.0	0.6	1.1	**20.6**	15.9	2.0	0.6	2.0	**47.8**	87.8
26 to 35	3.0	0.6	1.4	**16.1**	10.2	2.9	1.5	1.6	**49.4**	87.5
36 to 45	2.3	0.5	1.0	**15.8**	11.4	2.8	0.8	0.7	**57.7**	90.7
46 to 55	1.1	0.9	1.1	**13.5**	8.2	3.1	1.3	1.0	**64.9**	91.3
56 to 65	1.4	0.2	0.1	**11.0**	7.8	1.6	0.4	1.2	**78.1**	96.8

Table 6.2 (concluded)

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by age group, by country, 2003 and 2008

	Number and type of skill domains with low performance									
	Document and numeracy	Document and problem solving	Numeracy and problem solving	**3 domains**	Prose, document and numeracy	Prose, document and problem solving	Prose, numeracy and problem solving	Document, numeracy and problem solving	**4 domains**	At least one domain
Age group	per cent									
Norway										
16 to 25	4.1	0.1	0.7	**7.2**	5.8	0.6	0.2	0.7	**8.3**	42.4
26 to 35	3.2	0.1	0.5	**9.7**	6.7	2.1	0.7	0.2	**8.2**	39.0
36 to 45	2.9	0.2	0.6	**8.9**	4.9	1.9	0.9	1.2	**11.3**	43.7
46 to 55	2.6	0.4	1.7	**11.0**	7.4	2.0	0.7	0.9	**23.6**	59.6
56 to 65	3.8	1.4	1.3	**13.1**	6.8	4.8	0.3	1.1	**35.2**	71.8
Bermuda (English)										
16 to 25	5.0	0.0	0.8	**13.0**	7.3	1.4	1.9	2.3	**18.2**	63.6
26 to 35	4.8	0.0	1.7	**10.5**	7.4	0.1	0.9	2.1	**14.1**	52.5
36 to 45	4.4	0.4	0.6	**15.6**	9.3	0.9	1.0	4.5	**19.8**	60.4
46 to 55	6.2	0.1	1.3	**14.9**	8.4	1.0	1.5	4.1	**26.3**	63.5
56 to 65	4.9	0.9	2.0	**17.9**	12.1	2.3	0.4	3.2	**42.2**	79.2
New Zealand										
16 to 25	3.7	0.1	0.1	**15.5**	12.1	1.2	1.9	0.3	**26.5**	68.0
26 to 35	2.2	0.1	0.4	**11.1**	9.3	0.8	0.4	0.5	**23.7**	54.1
36 to 45	3.3	0.3	0.4	**12.2**	9.0	2.0	0.7	0.6	**22.4**	55.5
46 to 55	3.9	0.2	0.9	**9.5**	6.4	1.0	0.7	1.4	**25.2**	57.3
56 to 65	4.8	0.3	0.2	**12.8**	11.4	0.7	0.3	0.4	**30.1**	68.1
Netherlands										
16 to 25	1.1	0.1	0.0	**12.2**	9.7	1.5	0.3	0.7	**10.0**	46.6
26 to 35	1.2	0.0	0.2	**9.1**	7.5	0.7	0.8	0.1	**13.7**	41.2
36 to 45	1.7	0.1	0.2	**11.1**	9.0	1.4	0.5	0.2	**14.4**	48.8
46 to 55	1.5	0.1	0.3	**13.5**	10.5	1.7	0.2	1.2	**19.8**	59.1
56 to 65	1.2	0.7	0.2	**15.2**	12.0	2.3	0.6	0.2	**34.5**	73.1
Hungary										
16 to 25	2.5	1.4	1.6	**16.0**	8.7	4.2	0.9	2.1	**24.9**	68.9
26 to 35	2.2	0.9	1.0	**16.7**	8.9	5.3	0.8	1.8	**20.8**	64.1
36 to 45	3.1	1.9	0.8	**17.8**	9.5	5.4	1.3	1.5	**25.4**	70.9
46 to 55	3.1	2.1	1.1	**15.6**	9.3	4.3	1.0	1.1	**32.7**	74.9
56 to 65	2.5	1.1	1.0	**20.3**	13.2	4.8	0.6	1.7	**36.7**	81.1

0 true zero or a value rounded to zero

Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.3

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by gender, by country, 2003 and 2008

	Number and type of skill domains with low performance									
	No domain	**1 domain**	Prose	Docu-ment	Numeracy	Problem solving	**2 domains**	Prose and document	Prose and numeracy	Prose and problem solving
Country	per cent									
Canada										
Women	**39.3**	**14.7**	0.7	1.7	11.7	0.7	**8.4**	1.1	1.3	0.2
Men	**43.7**	**12.0**	3.9	1.6	5.6	1.0	**8.4**	2.3	3.0	0.5
Switzerland (German and French)										
Women	**30.5**	**16.2**	4.6	4.9	4.4	2.3	**12.8**	6.2	2.4	0.7
Men	**36.8**	**17.2**	8.4	2.7	2.9	3.3	**14.4**	7.2	2.4	2.0
Italy										
Women	**7.8**	**7.7**	0.8	1.8	4.1	1.0	**7.4**	1.6	1.2	0.3
Men	**10.8**	**8.3**	2.3	1.7	2.8	1.5	**9.0**	2.7	1.7	1.3
Norway										
Women	**45.4**	**17.0**	1.2	2.6	12.6	0.6	**10.0**	0.9	2.0	0.4
Men	**53.9**	**11.9**	3.8	1.2	5.8	1.1	**9.0**	2.1	2.6	1.6
Bermuda										
Women	**36.3**	**17.5**	0.7	3.0	12.4	1.4	**11.4**	0.6	2.2	0.1
Men	**39.7**	**12.1**	0.9	2.5	6.8	2.0	**9.9**	2.4	2.0	1.0
New Zealand										
Women	**37.6**	**15.5**	1.8	1.5	12.0	0.2	**9.2**	1.8	2.2	0.1
Men	**42.4**	**11.5**	3.9	1.5	5.5	0.6	**9.0**	2.6	2.6	0.7
Netherlands										
Women	**43.7**	**12.4**	2.6	3.1	5.9	0.8	**8.8**	2.8	2.8	0.2
Men	**48.9**	**14.5**	9.3	2.4	2.3	0.5	**10.6**	6.8	2.7	0.5
Hungary										
Women	**30.9**	**14.1**	2.9	3.0	5.2	3.0	**12.2**	3.6	1.4	1.0
Men	**25.9**	**13.5**	4.2	1.7	4.9	2.7	**13.4**	4.7	2.6	1.8

Table 6.3 (concluded)

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by gender, by country, 2003 and 2008

	Number and type of skill domains with low performance									
	Document and numeracy	Document and problem solving	Numeracy and problem solving	**3 domains**	Prose, document and numeracy	Prose, document and problem solving	Prose, numeracy and problem solving	Document, numeracy and problem solving	**4 domains**	At least one domain
Country	per cent									
Canada										
Women	4.6	0.4	0.9	**11.8**	9.3	0.9	0.6	1.0	**25.8**	60.7
Men	1.4	0.6	0.5	**11.6**	8.0	1.7	1.2	0.7	**24.3**	56.3
Switzerland (German and French)										
Women	2.0	1.0	0.5	**20.8**	13.9	5.0	1.0	0.9	**19.8**	69.5
Men	1.0	1.0	0.8	**15.8**	10.1	4.8	0.6	0.3	**15.8**	63.2
Italy										
Women	2.6	0.6	1.1	**15.0**	10.3	2.0	1.0	1.8	**62.1**	92.2
Men	1.8	0.6	0.8	**15.8**	11.0	3.1	0.9	0.8	**56.1**	89.2
Norway										
Women	5.0	0.1	1.5	**10.3**	7.0	1.4	0.6	1.3	**17.3**	54.6
Men	1.6	0.7	0.4	**9.5**	5.6	3.0	0.6	0.2	**15.8**	46.1
Bermuda										
Women	6.4	0.1	1.9	**12.9**	8.1	0.6	0.8	3.3	**22.0**	63.7
Men	3.6	0.4	0.6	**15.4**	9.3	1.4	1.4	3.4	**22.8**	60.3
New Zealand										
Women	4.4	0.2	0.5	**13.4**	11.0	0.8	0.9	0.7	**24.3**	62.4
Men	2.6	0.2	0.4	**10.9**	8.0	1.6	0.8	0.5	**26.2**	57.6
Netherlands										
Women	2.5	0.2	0.3	**14.4**	12.2	0.9	0.6	0.7	**20.6**	56.3
Men	0.3	0.2	0.1	**10.0**	7.2	2.1	0.3	0.3	**16.0**	51.1
Hungary										
Women	3.6	1.5	1.0	**16.7**	9.4	4.3	0.8	2.1	**26.2**	69.1
Men	1.7	1.5	1.2	**17.7**	10.2	5.3	1.0	1.2	**29.6**	74.1

Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.4

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by language status, by country, 2003 and 2008

	Number and type of skill domains with low performance									
	No domain	1 domain	Prose	Docu-ment	Numeracy	Problem solving	2 domains	Prose and document	Prose and numeracy	Prose and problem solving
	per cent									
Canada										
Language of test is the same as mother tongue	44.7	14.4	2.4	1.6	9.6	0.8	8.6	1.8	2.0	0.3
Language of test is different than mother tongue	30.3	9.9	1.9	1.6	5.4	1.0	7.7	1.6	2.6	0.7
Switzerland (German and French)										
Language of test is the same as mother tongue	40.1	17.8	6.8	4.4	3.6	3.0	14.1	6.8	2.1	1.5
Language of test is different than mother tongue	16.5	18.2	7.4	2.9	5.0	2.9	14.5	7.9	4.1	1.0
Italy										
Language of test is the same as mother tongue	9.3	8.0	1.5	1.7	3.5	1.2	8.2	2.2	1.4	0.8
Language of test is different than mother tongue	9.4	7.4	1.5	2.0	2.3	1.6	11.8	2.8	4.6	0.0
Norway										
Language of test is the same as mother tongue	51.2	14.5	2.5	1.9	9.2	0.9	9.0	1.5	2.2	0.9
Language of test is different than mother tongue	27.9	13.5	2.9	1.2	8.5	0.9	17.2	2.1	3.9	2.3
Bermuda										
Language of test is the same as mother tongue	39.3	15.3	0.8	2.7	10.1	1.7	10.6	1.4	2.2	0.4
Language of test is different than mother tongue	25.7	11.1	0.7	3.5	5.4	1.5	10.9	2.0	1.4	1.7
New Zealand										
Language of test is the same as mother tongue	44.0	13.9	2.6	1.6	9.3	0.4	9.4	2.0	2.4	0.3
Language of test is different than mother tongue	19.8	12.0	4.1	1.1	6.3	0.4	7.5	3.5	2.3	0.8
Netherlands										
Language of test is the same as mother tongue	49.0	13.9	6.2	2.9	4.2	0.7	9.6	4.7	2.7	0.4
Language of test is different than mother tongue	27.6	10.0	4.8	1.3	3.6	0.3	10.4	5.2	3.4	0.4
Hungary										
Language of test is the same as mother tongue	28.5	13.9	3.6	2.3	5.1	2.9	12.8	4.1	2.0	1.4
Language of test is different than mother tongue	27.5	8.4	1.4	2.6	1.8	2.6	11.9	3.2	2.5	1.7

Table 6.4 (continued)

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by language status, by country, 2003 and 2008

	Number and type of skill domains with low performance									
	Document and numeracy	Document and problem solving	Numeracy and problem solving	**3 domains**	Prose, document and numeracy	Prose, document and problem solving	Prose, numeracy and problem solving	Document, numeracy and problem solving	**4 domains**	At least one domain
	per cent									
Canada										
Language of test is the same as mother tongue	3.4	0.5	0.6	**12.1**	8.9	1.3	1.0	0.8	**20.2**	55.3
Language of test is different than mother tongue	1.6	0.5	0.8	**10.5**	7.7	1.1	0.7	1.0	**41.6**	69.7
Switzerland (German and French)										
Language of test is the same as mother tongue	1.9	1.2	0.6	**16.9**	11.2	4.4	0.7	0.6	**11.0**	59.9
Language of test is different than mother tongue	0.4	0.3	0.9	**24.7**	15.2	7.9	1.1	0.5	**26.1**	83.5
Italy										
Language of test is the same as mother tongue	2.2	0.6	1.0	**15.3**	10.5	2.6	1.0	1.3	**59.2**	90.7
Language of test is different than mother tongue	1.9	0.0	2.5	**10.7**	10.2	0.0	0.6	0.0	**60.6**	90.6
Norway										
Language of test is the same as mother tongue	3.2	0.4	0.8	**9.7**	6.2	2.2	0.5	0.8	**15.6**	48.8
Language of test is different than mother tongue	5.0	0.4	3.4	**13.0**	7.1	3.1	1.8	1.0	**28.3**	72.1
Bermuda										
Language of test is the same as mother tongue	5.3	0.2	1.0	**13.8**	8.5	1.0	1.2	3.1	**21.1**	60.7
Language of test is different than mother tongue	2.4	0.3	3.2	**17.4**	10.9	0.9	0.0	5.6	**34.9**	74.3
New Zealand										
Language of test is the same as mother tongue	4.1	0.2	0.5	**12.1**	9.8	1.0	0.6	0.7	**20.6**	56.0
Language of test is different than mother tongue	0.7	0.0	0.2	**12.7**	8.5	2.0	2.0	0.2	**47.9**	80.2
Netherlands										
Language of test is the same as mother tongue	1.4	0.2	0.2	**12.0**	9.6	1.6	0.4	0.4	**15.4**	51.0
Language of test is different than mother tongue	1.3	0.0	0.1	**13.7**	10.4	1.2	1.1	1.0	**38.2**	72.4

Table 6.4 (concluded)

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by language status, by country, 2003 and 2008

	Number and type of skill domains with low performance									
	Document and numeracy	Document and problem solving	Numeracy and problem solving	**3 domains**	Prose, document and numeracy	Prose, document and problem solving	Prose, numeracy and problem solving	Document, numeracy and problem solving	**4 domains**	At least one domain
	per cent									
Hungary										
Language of test is the same as mother tongue	2.7	1.5	1.1	**17.0**	9.7	4.8	0.9	1.6	**27.8**	71.5
Language of test is different than mother tongue	2.6	1.9	0.0	**21.8**	12.7	4.7	1.9	2.5	**30.3**	72.5

0 true zero or a value rounded to zero

Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.5

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by parents' highest level of education, by country, 2003 and 2008

	Number and type of skill domains with low performance									
Country	No domain	1 domain	Prose	Document	Numeracy	Problem solving	2 domains	Prose and document	Prose and numeracy	Prose and problem solving
	per cent									
Canada										
Less than upper secondary	**24.7**	**12.4**	1.7	2.0	7.8	0.8	**9.3**	2.2	1.6	0.4
Upper secondary	**46.5**	**14.1**	3.0	1.3	8.8	1.0	**9.1**	1.8	3.1	0.6
Higher than upper secondary	**58.1**	**14.1**	2.5	1.2	9.9	0.5	**6.7**	1.3	1.8	0.2
Switzerland (German and French)										
Less than upper secondary	**18.6**	**13.1**	4.9	5.0	1.7	1.5	**14.7**	7.6	3.4	0.6
Upper secondary	**35.5**	**17.2**	6.3	3.9	3.7	3.3	**15.8**	7.5	2.6	1.9
Higher than upper secondary	**49.9**	**22.8**	9.6	3.7	6.0	3.4	**10.6**	5.9	1.2	1.2
Italy										
Less than upper secondary	**7.2**	**6.6**	1.2	1.5	3.0	0.9	**7.3**	2.0	1.2	0.9
Upper secondary	**15.7**	**12.7**	2.6	1.9	5.6	2.6	**11.1**	2.5	2.0	0.5
Higher than upper secondary	**23.1**	**15.3**	2.5	6.3	5.0	1.5	**14.1**	3.1	3.0	0.4
Norway										
Less than upper secondaryy	**37.2**	**14.4**	2.4	1.4	9.4	1.2	**11.1**	1.2	2.5	1.7
Upper secondary	**50.9**	**16.5**	2.4	2.2	10.9	0.9	**9.3**	1.9	2.2	1.0
Higher than upper secondary	**67.8**	**12.0**	2.7	2.0	6.8	0.5	**7.7**	1.5	2.2	0.1
Bermuda										
Less than upper secondary	**23.8**	**11.2**	0.5	2.5	6.9	1.1	**11.4**	1.9	1.8	0.7
Upper secondary	**43.0**	**16.3**	0.8	3.2	10.9	1.4	**11.0**	1.6	2.4	0.4
Higher than upper secondary	**59.5**	**17.9**	1.5	3.0	9.9	3.4	**6.9**	0.9	1.1	0.5
New Zealand										
Less than upper secondary	**24.0**	**14.5**	2.3	1.4	10.2	0.5	**9.3**	2.3	2.4	0.4
Upper secondary	**42.1**	**14.1**	2.5	1.1	10.1	0.4	**9.0**	1.5	2.8	0.2
Higher than upper secondary	**54.0**	**13.1**	3.9	2.2	6.6	0.4	**9.2**	3.5	1.7	0.7
Netherlands										
Less than upper secondary	**35.7**	**14.1**	6.7	2.4	4.1	0.9	**10.9**	5.5	3.0	0.5
Upper secondary	**53.8**	**15.1**	7.2	2.8	5.0	0.2	**10.1**	4.7	3.5	0.3
Higher than upper secondary	**66.8**	**11.2**	3.6	3.7	3.4	0.6	**7.2**	3.7	1.8	0.1
Hungary										
Less than upper secondary	**17.3**	**11.6**	1.8	1.4	5.5	3.0	**11.5**	3.6	1.4	0.8
Upper secondary	**33.4**	**15.1**	4.6	2.7	5.1	2.7	**13.8**	4.2	2.5	1.8
Higher than upper secondary	**43.1**	**15.3**	4.3	3.5	3.7	3.8	**12.5**	5.2	1.5	1.5

Table 6.5 (concluded)

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by parents' highest level of education, by country, 2003 and 2008

	Number and type of skill domains with low performance									
Country	Document and numeracy	Document and problem solving	Numeracy and problem solving	**3 domains**	Prose, document and numeracy	Prose, document and problem solving	Prose, numeracy and problem solving	Document, numeracy and problem solving	**4 domains**	At least one domain
	per cent									
Canada										
Less than upper secondary	3.3	1.0	0.9	**13.4**	9.8	1.5	0.8	1.3	**40.2**	75.3
Upper secondary	3.0	0.1	0.5	**12.4**	9.2	1.1	1.4	0.7	**17.9**	53.5
Higher than upper secondary	2.7	0.2	0.5	**8.8**	6.8	1.0	0.5	0.5	**12.2**	41.9
Switzerland (German and French)										
Less than upper secondary	1.7	0.9	0.6	**27.4**	20.1	5.4	1.3	0.6	**26.0**	81.4
Upper secondary	1.9	1.2	0.8	**17.8**	10.9	5.8	0.6	0.5	**13.7**	64.5
Higher than upper secondary	1.0	0.6	0.5	**12.0**	7.3	3.4	0.8	0.6	**4.7**	50.1
Italy										
Less than upper secondary	1.8	0.5	0.8	**14.5**	10.2	2.3	0.9	1.0	**64.3**	92.8
Upper secondary	3.6	0.6	1.9	**18.5**	11.6	3.3	1.2	2.5	**42.0**	84.3
Higher than upper secondaryy	4.6	2.1	0.9	**18.9**	13.0	3.5	0.8	1.6	**28.6**	76.9
Norway										
Less than upper secondary	2.9	0.7	2.0	**10.7**	5.6	3.0	0.9	1.1	**26.7**	62.8
Upper secondary	3.5	0.1	0.5	**11.3**	7.9	2.1	0.4	1.0	**12.1**	49.1
Higher than upper secondary	3.5	0.3	0.1	**6.3**	4.8	1.0	0.4	0.1	**6.3**	32.2
Bermuda										
Less than upper secondary	5.7	0.5	0.7	**20.4**	11.0	1.7	0.8	6.9	**33.3**	76.2
Upper secondary	5.2	0.2	1.3	**12.5**	8.4	0.8	1.5	1.9	**17.2**	57.0
Higher than upper secondary	3.4	0.3	0.7	**7.2**	5.4	0.7	0.1	1.0	**8.5**	40.5
New Zealand										
Less than upper secondary	3.5	0.1	0.6	**14.0**	11.4	0.9	0.9	0.8	**38.2**	76.0
Upper secondary	3.9	0.3	0.3	**13.7**	11.1	0.9	1.1	0.6	**21.1**	57.9
Higher than upper secondary	2.8	0.2	0.3	**8.2**	5.6	1.7	0.5	0.5	**15.6**	46.0
Netherlands										
Less than upper secondary	1.3	0.3	0.4	**14.5**	11.7	1.9	0.6	0.3	**24.7**	64.3
Upper secondary	1.4	0.1	0.0	**11.4**	9.6	1.2	0.1	0.5	**9.6**	46.2
Higher than upper secondary	1.5	0.0	0.0	**7.8**	5.6	1.1	0.3	0.8	**7.0**	33.2
Hungary										
Less than upper secondary	3.1	1.2	1.3	**18.5**	11.4	4.1	0.9	2.0	**41.1**	82.7
Upper secondary	2.7	1.5	1.2	**16.9**	9.4	5.0	0.9	1.6	**20.8**	66.6
Higher than upper secondary	1.4	2.4	0.5	**14.5**	6.2	6.8	0.6	0.9	**14.7**	56.9

0 true zero or a value rounded to zero

Note: Parents' highest level of education is defined as the higher of either the mother or father's level of education.

Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.6

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by level of education, by country, 2003 and 2008

	Number and type of skill domains with low performance									
	No domain	**1 domain**	Prose	Docu-ment	Numeracy	Problem solving	**2 domains**	Prose and docu-ment	Prose and numeracy	Prose and problem solving
Country	per cent									
Canada										
Less than upper secondary	**16.5**	**8.8**	1.7	0.9	5.8	0.4	**8.7**	1.4	2.7	0.1
Upper secondary	**36.8**	**16.0**	2.7	2.3	10.5	0.4	**9.2**	2.2	2.0	0.4
Higher than upper secondary	**56.1**	**13.6**	2.3	1.4	8.6	1.3	**7.8**	1.6	1.9	0.5
Switzerland (German and French)										
Less than upper secondary	**14.6**	**11.5**	6.4	2.5	1.7	0.9	**10.4**	5.7	2.0	0.5
Upper secondary	**31.3**	**17.1**	5.9	3.9	4.1	3.1	**15.5**	7.2	2.6	1.7
Higher than upper secondary	**53.8**	**19.8**	7.8	4.7	4.0	3.3	**11.1**	6.1	2.3	1.2
Italy										
Less than upper secondary	**3.7**	**3.9**	0.7	0.4	2.3	0.6	**4.4**	1.0	1.0	0.3
Upper secondary	**14.2**	**12.4**	2.5	3.3	4.8	1.8	**11.4**	3.8	2.0	0.7
Higher than upper secondary	**21.3**	**12.8**	2.3	2.8	5.0	2.7	**16.6**	2.2	2.2	4.3
Norway										
Less than upper secondary	**21.7**	**11.1**	1.9	1.4	7.3	0.5	**9.0**	1.2	2.3	0.2
Upper secondary	**46.5**	**16.9**	3.0	1.4	11.6	1.0	**11.4**	1.5	3.2	1.8
Higher than upper secondary	**64.5**	**12.9**	2.3	2.2	7.4	1.0	**7.3**	1.8	1.4	0.5
Bermuda										
Less than upper secondary	**3.6**	**8.7**	0.2	0.5	7.6	0.3	**6.7**	0.4	0.5	0.3
Upper secondary	**21.3**	**13.4**	0.8	2.4	8.0	2.2	**14.3**	1.9	3.3	1.0
Higher than upper secondary	**52.5**	**16.6**	0.9	3.3	10.9	1.5	**8.9**	1.4	1.6	0.3
New Zealand										
Less than upper secondary	**13.9**	**11.0**	2.4	0.9	7.5	0.2	**9.9**	2.0	3.1	0.4
Upper secondary	**36.7**	**15.7**	3.3	1.6	10.3	0.6	**10.7**	2.7	2.4	0.4
Higher than upper secondary	**57.4**	**13.5**	2.8	1.8	8.5	0.4	**7.5**	2.0	1.9	0.3
Netherlands										
Less than upper secondary	**24.0**	**12.0**	5.7	2.4	3.3	0.6	**11.4**	5.8	3.6	0.5
Upper secondary	**47.6**	**14.8**	6.9	2.1	4.8	1.0	**11.0**	5.2	3.2	0.3
Higher than upper secondary	**68.3**	**13.2**	5.1	3.8	3.9	0.4	**6.2**	3.2	1.4	0.1
Hungary										
Less than upper secondary	**13.3**	**9.6**	2.1	1.0	5.0	1.5	**10.9**	2.8	2.1	0.8
Upper secondary	**28.7**	**15.3**	4.0	2.4	5.3	3.6	**14.6**	4.6	2.3	1.9
Higher than upper secondary	**47.5**	**16.0**	4.3	4.1	4.4	3.1	**11.4**	4.9	1.3	1.2

Table 6.6 (concluded)

Per cent of adults performing at Levels 1 or 2 in one or more skill domains or no domain at all, by level of education, by country, 2003 and 2008

Country	Document and numeracy	Document and problem solving	Numeracy and problem solving	**3 domains**	Prose, document and numeracy	Prose, document and problem solving	Prose, numeracy and problem solving	Document, numeracy and problem solving	**4 domains**	At least one domain
	Number and type of skill domains with low performance									
	per cent									
Canada										
Less than upper secondary	2.7	0.9	0.8	**14.6**	10.8	1.6	1.2	1.0	**51.4**	83.5
Upper secondary	3.6	0.3	0.8	**13.3**	10.4	1.2	0.9	0.8	**24.6**	63.2
Higher than upper secondary	2.7	0.5	0.5	**9.2**	6.4	1.1	0.8	0.9	**13.3**	43.9
Switzerland (German and French)										
Less than upper secondary	0.9	1.0	0.2	**26.1**	18.2	6.3	1.2	0.4	**37.3**	85.4
Upper secondary	2.1	1.1	1.0	**19.3**	12.9	4.7	0.9	0.8	**16.8**	68.7
Higher than upper secondary	0.5	0.8	0.1	**9.9**	5.0	4.3	0.4	0.2	**5.4**	46.2
Italy										
Less than upper secondary	1.3	0.3	0.6	**11.6**	8.4	1.4	0.9	0.9	**76.5**	96.3
Upper secondary	3.2	0.7	1.0	**20.4**	14.1	3.5	1.0	1.8	**41.5**	85.8
Higher than upper secondary	3.5	1.6	2.9	**16.7**	9.1	5.1	1.3	1.3	**32.5**	78.7
Norway										
Less than upper secondary	3.7	0.9	0.7	**14.0**	9.0	2.6	1.3	1.2	**44.2**	78.3
Upper secondary	3.5	0.3	1.1	**9.7**	6.0	2.4	0.5	0.8	**15.4**	53.5
Higher than upper secondary	3.0	0.3	0.3	**8.6**	5.5	1.9	0.5	0.6	**6.7**	35.5
Bermuda										
Less than upper secondary	4.4	0.0	1.1	**14.4**	8.7	0.5	0.8	4.5	**66.5**	96.4
Upper secondary	6.1	0.2	1.9	**20.5**	11.5	1.7	2.6	4.6	**30.5**	78.7
Higher than upper secondary	4.5	0.3	0.8	**10.3**	7.0	0.6	0.2	2.4	**11.7**	47.5
New Zealand										
Less than upper secondary	3.8	0.2	0.4	**18.2**	14.9	0.8	1.6	0.8	**47.0**	86.1
Upper secondary	4.7	0.2	0.3	**13.6**	10.9	1.4	0.5	0.8	**23.3**	63.3
Higher than upper secondary	2.5	0.2	0.5	**7.7**	5.4	1.3	0.6	0.4	**13.9**	42.6
Netherlands										
Less than upper secondary	1.2	0.1	0.2	**17.7**	14.8	2.0	0.5	0.3	**35.0**	76.0
Upper secondary	1.6	0.3	0.4	**11.8**	8.9	1.6	0.5	0.7	**14.8**	52.4
Higher than upper secondary	1.3	0.1	0.0	**7.0**	5.5	0.8	0.4	0.3	**5.3**	31.7
Hungary										
Less than upper secondary	3.1	0.8	1.3	**19.2**	13.3	2.9	1.1	1.9	**47.0**	86.7
Upper secondary	2.6	1.9	1.4	**17.5**	9.2	5.8	0.9	1.7	**23.8**	71.3
Higher than upper secondary	2.2	1.4	0.3	**13.6**	6.7	5.3	0.6	1.1	**11.5**	52.5

0 true zero or a value rounded to zero

Notes: Nearly one-quarter to one-third of all adults with upper secondary or more score are disadvantaged in the problem solving domain but not the other three domains.

Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.7

Adjusted odds ratios showing the likelihood of being disadvantaged (low performance at levels 1 or 2), by number of skill domains and various demographic characteristics, 2003 and 2008

	Canada		Switzerland		Italy		Norway	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Age								
16 to 25	1.0	…	1.0	…	1.0	…	1.0	…
26 to 35	1.8***	(0.26)	1.8	(0.68)	1.3**	(0.16)	1.3	(0.28)
36 to 45	2.2***	(0.29)	2.3**	(0.91)	1.6***	(0.19)	1.6 *	(0.44)
46 to 55	2.2***	(0.22)	3.6***	(1.35)	2.0***	(0.21)	3.6***	(1.09)
56 to 65	3.2***	(0.43)	4.9***	(1.73)	2.9***	(0.44)	5.3***	(1.28)
Gender								
Men	1.0	…	1.0	…	1.0	…	1.0	…
Women	1.0	(0.07)	1.2	(0.17)	1.1	(0.10)	1.1	(0.14)
Language status								
Native tongue	1.0	…	1.0	…	1.0	…	1.0	…
Foreign tongue	3.2***	(0.04)	2.7***	(0.11)	1.2	(0.30)	2.7***	(0.14)
Parents' education								
Less than upper secondary	2.5***	(0.30)	3.2***	(1.32)	2.1***	(0.41)	2.3***	(0.54)
Upper secondary	1.3**	(0.17)	2.3**	(0.99)	1.5 *	(0.33)	1.4 *	(0.32)
More than upper secondary	1.0	…	1.0	…	1.0	…	1.0	…
Education								
Less than upper secondary	4.5***	(0.43)	4.5***	(1.68)	3.9***	(0.54)	5.5***	(1.03)
Upper secondary	1.8***	(0.19)	2.7***	(0.64)	1.2	(0.15)	2.0***	(0.38)
More than upper secondary	1.0	…	1.0	…	1.0	…	1.0	…
Occupation								
Skilled	1.0	…	1.0	…	1.0	…	1.0	…
Semi-skilled	2.4***	(0.30)	2.2***	(0.53)	1.7***	(0.18)	3.1***	(0.62)
Unskilled	4.8***	(0.71)	2.3***	(0.66)	1.6***	(0.20)	2.3***	(0.43)

Table 6.7 (concluded)

Adjusted odds ratios showing the likelihood of being disadvantaged (low performance at levels 1 or 2), by number of skill domains and various demographic characteristics, 2003 and 2008

	Bermuda		New Zealand		Netherlands		Hungary	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Age								
16 to 25	1.0	…	1.0	…	1.0	…	1.0	…
26 to 35	0.9	(0.25)	1.4 *	(0.21)	2.3***	(0.65)	1.3**	(0.13)
36 to 45	1.3	(0.28)	1.1	(0.16)	2.2***	(0.43)	1.5***	(0.18)
46 to 55	1.6**	(0.29)	1.3 *	(0.19)	3.0***	(0.59)	1.9***	(0.19)
56 to 65	2.2***	(0.51)	1.4 *	(0.24)	5.6***	(1.07)	1.7***	(0.20)
Gender								
Men	1.0	…	1.0	…	1.0	…	1.0	…
Women	1.2	(0.19)	0.9**	(0.05)	1.3***	(0.11)	0.8***	(0.05)
Language status								
Native tongue	1.0	…	1.0	…	1.0	…	1.0	…
Foreign tongue	1.5**	(0.29)	4.9***	(0.43)	3.6***	(0.72)	1.3	(0.31)
Parents' education								
Less than upper secondary	2.4***	(0.54)	2.1***	(0.30)	2.0***	(0.34)	1.7***	(0.19)
Upper secondary	1.7**	(0.36)	1.4***	(0.15)	1.0	(0.19)	1.1	(0.15)
More than upper secondary	1.0	…	1.0	…	1.0	…	1.0	…
Education								
Less than upper secondary	5.2***	(1.11)	3.7***	(0.36)	5.3***	(0.77)	4.2 *	(2.36)
Upper secondary	1.8***	(0.27)	1.4***	(0.15)	1.0	(1.22)	F	…
More than upper secondary	1.0	…	1.0	…	1.0	…	1.0	…
Occupation								
Skilled	1.0	…	1.0	…	1.0	…	1.0	…
Semi-skilled	3.5***	(0.59)	2.6***	(0.21)	1.9***	(0.22)	1.6***	(0.20)
Unskilled	5.7***	(1.38)	3.9***	(0.60)	3.5***	(0.68)	2.3***	(0.35)

… not applicable
F too unreliable to be published
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.8

Adjusted odds ratios showing the likelihood of labour force participants aged 16 to 65 years with low performance (Levels 1 or 2) being unemployed at the time of survey, by number and type of skill domains, 2003 and 2008

	Canada		Switzerland (German and French)		Italy		Norway	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**1.10**	**(0.2)**	**1.52**	**(0.7)**	**1.03**	**(0.3)**	**1.13**	**(0.4)**
Prose	1.89	(0.8)	1.51	(0.9)	0.92	(0.5)	1.94	(0.9)
Document	0.81	(0.4)	0.35	(0.4)	0.96	(0.5)	1.81	(1.3)
Numeracy	0.93	(0.2)	0.27	(0.3)	0.60	(0.2)	0.83	(0.4)
Problem solving	1.26	(0.7)	4.46	(3.5)	2.08	(1.4)	1.24	(1.4)
Low performance in 2 domains	**1.21**	**(0.2)**	**0.94**	**(0.4)**	**1.27**	**(0.4)**	**1.46**	**(0.5)**
Prose and Document	1.32	(0.4)	0.92	(0.4)	0.64	(0.4)	0.98	(0.9)
Prose and Numeracy	1.07	(0.4)	F	...	1.90	(0.9)	2.36	(1.3)
Prose and Problem solving	1.90	(1.4)	2.46	(2.5)	1.02	(0.9)	0.98	(0.8)
Document and Numeracy	1.27	(0.3)	F	...	1.44	(0.7)	1.35	(0.7)
Document and Problem solving	0.77	(0.5)	2.19	(2.5)	0.41	(0.5)	1.28	(1.5)
Numeracy and Problem solving	1.12	(0.6)	3.30	(3.8)	1.86	(1.2)	1.15	(1.4)
Low performance in 3 domains	**1.53*** **	**(0.2)**	**1.55**	**(0.7)**	**1.51**	**(0.5)**	**1.64**	**(0.8)**
Prose, Document and Numeracy	1.66**	(0.3)	1.37	(0.9)	1.18	(0.4)	0.61	(0.3)
Prose, Document and Problem solving	1.21	(0.5)	1.47	(0.7)	2.07	(1.1)	3.89	(3.3)
Prose, Numeracy and Problem solving	1.16	(0.6)	4.52	(4.8)	3.62	(2.6)	1.49	(1.5)
Document, Numeracy and Problem solving	1.19	(0.6)	0.59	(0.8)	1.81	(0.9)	4.08	(3.4)
Low performance in all 4 domains	**1.79*** **	**(0.3)**	**2.55*** **	**(0.8)**	**2.45*** **	**(0.5)**	**3.00*** **	**(1.0)**

Table 6.8 (concluded)

Adjusted odds ratios showing the likelihood of labour force participants aged 16 to 65 years with low performance (Levels 1 or 2) being unemployed at the time of survey, by number and type of skill domains, 2003 and 2008

	Bermuda		New Zealand		Netherlands		Hungary	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**2.25 ***	**(1.1)**	**1.94****	**(0.6)**	**1.04**	**(0.3)**	**1.07**	**(0.2)**
Prose	2.23	(2.6)	1.56	(0.8)	1.03	(0.5)	1.07	(0.3)
Document	2.96	(2.5)	F	...	0.47	(0.3)	0.48	(0.2)
Numeracy	1.93	(1.0)	2.31**	(0.7)	1.11	(0.5)	1.21	(0.4)
Problem solving	3.89	(3.9)	5.20	(5.0)	3.66	(2.5)	1.33	(0.3)
Low performance in 2 domains	**1.48**	**(0.6)**	**2.18*****	**(0.6)**	**1.60**	**(0.5)**	**0.76**	**(0.2)**
Prose and Document	0.46	(0.5)	1.22	(0.5)	1.34	(0.7)	0.75	(0.2)
Prose and Numeracy	1.65	(1.6)	1.87	(0.8)	1.14	(0.6)	1.00	(0.4)
Prose and Problem solving	F	...	0.72	(0.8)	1.93	(2.5)	1.59	(0.7)
Document and Numeracy	0.90	(0.9)	2.59 *	(1.2)	2.93**	(1.3)	0.44	(0.2)
Document and Problem solving	10.01	(14.0)	2.89	(3.7)	1.82	(4.0)	0.14	(0.1)
Numeracy and Problem solving	5.29**	(3.9)	6.94 *	(5.4)	8.63	(12.1)	1.38	(0.7)
Low performance in 3 domains	**1.86**	**(1.0)**	**2.09****	**(0.6)**	**0.96**	**(0.3)**	**0.98**	**(0.2)**
Prose, Document and Numeracy	1.11	(0.8)	1.97**	(0.6)	0.80	(0.2)	0.61	(0.2)
Prose, Document and Problem solving	F	...	3.24	(2.5)	1.15	(0.6)	1.43	(0.4)
Prose, Numeracy and Problem solving	6.25	(6.3)	0.74	(1.2)	5.07	(5.0)	1.20	(0.7)
Document, Numeracy and Problem solving	3.50	(3.0)	5.87**	(3.5)	2.07	(1.7)	1.71	(0.6)
Low performance in all 4 domains	**2.07**	**(1.3)**	**3.49*****	**(0.7)**	**1.85****	**(0.5)**	**1.66*****	**(0.3)**

... not applicable
F too unreliable to be published
* $p<0.10$, statistically significant at the 10 per cent level
** $p<0.05$, statistically significant at the 5 per cent level
*** $p<0.01$, statistically significant at the 1 per cent level

Notes: Results are adjusted for gender, language status, and parents' education.

Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.9

Adjusted odds ratios showing the likelihood of adults in working age population (16 to 65) with low performance (Levels 1 or 2) not participating in the labour force at the time of survey (excluding students and retirees), by number and type of skill domains, 2003 and 2008

	Canada		Switzerland (German and French)		Italy		Norway	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**1.39**	**(0.3)**	**0.65****	**(0.1)**	**2.01**	**(0.9)**	**1.50**	**(0.5)**
Prose	0.19 *	(0.1)	0.91	(0.4)	0.76	(0.6)	0.28	(0.2)
Document	1.52	(0.7)	0.34 *	(0.2)	2.02	(1.5)	2.54	(1.9)
Numeracy	1.47	(0.3)	0.90	(0.3)	2.63**	(1.2)	1.47	(0.5)
Problem solving	2.58**	(1.0)	0.40	(0.5)	0.63	(0.6)	2.75	(2.1)
Low performance in 2 domains	**1.13**	**(0.2)**	**1.24**	**(0.3)**	**1.56**	**(0.5)**	**3.04*****	**(0.9)**
Prose and Document	1.07	(0.5)	1.24	(0.3)	0.65	(0.3)	3.08**	(1.5)
Prose and Numeracy	1.23	(0.4)	1.29	(0.8)	0.97	(0.6)	3.00***	(1.1)
Prose and Problem solving	1.22	(1.1)	2.11	(2.0)	1.03	(1.4)	1.19	(1.2)
Document and Numeracy	1.43	(0.4)	2.49	(1.5)	2.39 *	(1.2)	2.48**	(1.0)
Document and Problem solving	0.21	(0.2)	0.14**	(0.1)	0.34	(0.3)	1.05	(1.3)
Numeracy and Problem solving	0.51	(0.3)	0.72	(0.9)	4.23**	(2.5)	7.47**	(5.9)
Low performance in 3 domains	**1.57****	**(0.3)**	**1.20**	**(0.2)**	**1.44**	**(0.5)**	**2.41*****	**(0.7)**
Prose, Document and Numeracy	1.82***	(0.3)	1.27	(0.3)	1.29	(0.5)	2.67***	(0.8)
Prose, Document and Problem solving	0.67	(0.5)	0.96	(0.3)	0.89	(0.4)	0.50	(0.4)
Prose, Numeracy and Problem solving	0.67	(0.4)	0.88	(0.8)	1.71	(0.9)	2.63	(1.5)
Document, Numeracy and Problem solving	1.00	(0.3)	1.79	(2.1)	3.20**	(1.5)	5.52**	(3.6)
Low performance in all 4 domains	**2.40*****	**(0.4)**	**0.54 ***	**(0.2)**	**3.18*****	**(1.0)**	**3.16*****	**(0.5)**

Table 6.9 (concluded)

Adjusted odds ratios showing the likelihood of adults in working age population (16 to 65) with low performance (Levels 1 or 2) not participating in the labour force at the time of survey (excluding students and retirees), by number and type of skill domains, 2003 and 2008

	Bermuda		New Zealand		Netherlands		Hungary	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**1.01**	**(0.4)**	**1.38 ***	**(0.2)**	**1.19**	**(0.2)**	**0.82**	**(0.2)**
Prose	0.63	(0.7)	0.77	(0.3)	0.76	(0.4)	0.66	(0.2)
Document	F	...	0.37	(0.2)	0.55 *	(0.2)	0.85	(0.3)
Numeracy	0.85	(0.4)	1.67**	(0.3)	1.86***	(0.4)	0.92	(0.3)
Problem solving	4.38**	(2.6)	1.21	(0.9)	1.79	(1.3)	0.83	(0.3)
Low performance in 2 domains	**0.64**	**(0.3)**	**1.35**	**(0.3)**	**1.37**	**(0.3)**	**1.04**	**(0.2)**
Prose and Document	F	...	1.06	(0.4)	0.92	(0.3)	0.93	(0.3)
Prose and Numeracy	1.45	(1.3)	1.81 *	(0.6)	1.70	(0.5)	0.88	(0.4)
Prose and Problem solving	4.24	(4.8)	2.14	(1.7)	3.80	(2.7)	0.49	(0.4)
Document and Numeracy	0.23	(0.2)	1.26	(0.5)	1.08	(0.4)	1.30	(0.4)
Document and Problem solving	7.54	(16.6)	0.41	(0.5)	1.34	(1.6)	1.76	(0.8)
Numeracy and Problem solving	0.54	(0.6)	1.19	(1.0)	10.15 *	(12.9)	0.54	(0.4)
Low performance in 3 domains	**0.60**	**(0.3)**	**1.06**	**(0.2)**	**1.14**	**(0.2)**	**1.05**	**(0.2)**
Prose, Document and Numeracy	0.49	(0.4)	1.18	(0.2)	0.91	(0.2)	1.46 *	(0.3)
Prose, Document and Problem solving	1.61	(1.9)	0.35	(0.2)	2.21	(1.0)	0.50**	(0.2)
Prose, Numeracy and Problem solving	0.15	(0.2)	0.52	(0.5)	4.06 *	(3.3)	0.31	(0.2)
Document, Numeracy and Problem solving	0.84	(0.9)	1.02	(0.5)	3.95	(2.9)	1.07	(0.5)
Low performance in all 4 domains	**1.47**	**(0.6)**	**1.91*****	**(0.2)**	**1.94*****	**(0.4)**	**1.21**	**(0.2)**

F too unreliable to be published
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
Notes: Results are adjusted for gender, language status, and parents' education.
Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.10

Adjusted odds ratios showing the likelihood of labour force participants aged 16 to 65 years with low performance (Levels 1 or 2) being among the lowest wage earners, by number and type of skill domains, 2003 and 2008

	Canada		Switzerland (German and French)		Italy		Norway	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**1.41*****	**(0.2)**	**1.45**	**(0.5)**	**0.97**	**(0.3)**	**1.01**	**(0.2)**
Prose	1.15	(0.3)	1.07	(0.6)	1.93	(1.2)	0.47	(0.2)
Document	2.61	(1.3)	2.30 *	(1.1)	0.71	(0.5)	1.08	(0.5)
Numeracy	1.30 *	(0.2)	1.32	(1.1)	0.65	(0.2)	1.11	(0.2)
Problem solving	1.63	(0.6)	1.17	(0.5)	1.33	(1.2)	1.62	(1.1)
Low performance in 2 domains	**1.35 ***	**(0.2)**	**0.93**	**(0.3)**	**1.38**	**(0.4)**	**0.89**	**(0.2)**
Prose and Document	1.77**	(0.5)	0.86	(0.3)	0.78	(0.4)	0.71	(0.3)
Prose and Numeracy	1.27	(0.4)	0.82	(0.6)	1.32	(0.6)	0.75	(0.4)
Prose and Problem solving	2.25	(1.6)	1.45	(0.8)	1.14	(1.4)	1.60	(1.1)
Document and Numeracy	1.49 *	(0.3)	1.40	(1.3)	1.96	(0.8)	1.07	(0.4)
Document and Problem solving	0.40	(0.3)	0.39	(0.4)	2.31	(1.8)	0.56	(0.7)
Numeracy and Problem solving	0.81	(0.3)	1.79	(1.7)	1.53	(1.2)	0.44	(0.7)
Low performance in 3 domains	**1.61*****	**(0.2)**	**1.60****	**(0.3)**	**1.15**	**(0.3)**	**1.33**	**(0.3)**
Prose, Document and Numeracy	1.55**	(0.2)	1.28	(0.4)	1.05	(0.3)	1.55	(0.4)
Prose, Document and Problem solving	1.49	(0.6)	2.54***	(0.8)	1.37	(0.6)	1.23	(0.4)
Prose, Numeracy and Problem solving	1.41	(1.1)	0.73	(1.0)	0.89	(0.7)	0.74	(0.5)
Document, Numeracy and Problem solving	2.88***	(1.1)	4.08	(3.7)	1.68	(0.8)	0.53	(0.4)
Low performance in all 4 domains	**1.72*****	**(0.2)**	**1.32**	**(0.3)**	**1.84****	**(0.5)**	**1.72****	**(0.4)**

Table 6.10 (concluded)

Adjusted odds ratios showing the likelihood of labour force participants aged 16 to 65 years with low performance (Levels 1 or 2) being among the lowest wage earners, by number and type of skill domains, 2003 and 2008

	Bermuda		New Zealand		Netherlands		Hungary	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**2.22****	**(0.6)**	**1.35****	**(0.2)**	**1.73*****	**(0.3)**	**1.14**	**(0.2)**
Prose	3.26	(3.2)	1.17	(0.4)	1.76 *	(0.5)	1.11	(0.4)
Document	4.94***	(2.5)	0.70	(0.2)	1.34	(0.6)	0.73	(0.4)
Numeracy	1.42	(0.4)	1.48**	(0.2)	1.56	(0.5)	1.05	(0.3)
Problem solving	5.20***	(2.7)	2.88	(2.2)	4.44**	(2.3)	1.66	(0.6)
Low performance in 2 domains	**1.90****	**(0.5)**	**1.40 ***	**(0.3)**	**1.43**	**(0.3)**	**1.05**	**(0.2)**
Prose and Document	3.92	(2.8)	1.12	(0.4)	1.54	(0.5)	0.72	(0.3)
Prose and Numeracy	0.42	(0.3)	1.72	(0.6)	2.05 *	(0.7)	0.51	(0.4)
Prose and Problem solving	9.93 *	(13.2)	2.08	(1.5)	0.37	(0.4)	1.65	(0.7)
Document and Numeracy	1.76 *	(0.6)	1.40	(0.4)	0.82	(0.3)	2.00**	(0.6)
Document and Problem solving	F	...	F	...	F	...	0.22	(0.2)
Numeracy and Problem solving	3.64	(3.1)	2.37	(1.2)	...	...	2.25	(1.3)
Low performance in 3 domains	**2.35*****	**(0.6)**	**1.42****	**(0.2)**	**2.12*****	**(0.4)**	**1.61****	**(0.4)**
Prose, Document and Numeracy	2.46***	(0.7)	1.35	(0.2)	2.16***	(0.4)	1.37	(0.4)
Prose, Document and Problem solving	6.92	(7.2)	1.43	(0.7)	2.28**	(0.8)	2.01**	(0.7)
Prose, Numeracy and Problem solving	2.08	(2.6)	2.26	(1.4)	1.20	(2.7)	2.48 *	(1.2)
Document, Numeracy and Problem solving	1.66	(0.7)	1.53	(0.8)	3.66	(4.0)	1.29	(0.7)
Low performance in all 4 domains	**4.15*****	**(1.0)**	**1.86*****	**(0.3)**	**2.79*****	**(0.5)**	**2.45*****	**(0.5)**

... not applicable
F too unreliable to be published
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
Notes: Results are adjusted for gender, language status, and parents' education.
Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.11

Adjusted odds ratios showing the likelihood of youth and young adults aged 16 to 30 years with low performance (Levels 1 or 2) not completing upper secondary education, by number and type of skill domains, 2003 and 2008

	Canada		Switzerland (German and French)		Italy		Norway	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**2.28****	**(0.7)**	**1.43**	**(1.4)**	**2.01**	**(0.9)**	**1.74 ***	**(0.5)**
Prose	2.55 *	(1.2)	2.30	(2.6)	1.66	(1.7)	1.93	(1.2)
Document	3.24**	(1.6)	0.19	(0.3)	0.60	(0.6)	1.78	(1.1)
Numeracy	2.00	(0.9)	2.34	(3.0)	2.44 *	(1.2)	1.75	(0.7)
Problem solving	2.65	(2.1)	F	...	3.48	(2.5)	0.59	(0.8)
Low performance in 2 domains	**2.53*****	**(0.6)**	**3.68**	**(3.5)**	**1.40**	**(0.5)**	**1.18**	**(0.5)**
Prose and Document	3.07***	(1.1)	1.22	(1.5)	0.50	(0.5)	0.55	(0.5)
Prose and Numeracy	2.52**	(1.1)	8.99	(12.8)	1.60	(1.2)	2.96	(1.8)
Prose and Problem solving	2.06	(2.3)	ne	...	1.70	(4.6)	0.25	(0.4)
Document and Numeracy	2.19**	(0.8)	10.48	(16.4)	1.74	(1.1)	0.90	(0.4)
Document and Problem solving	0.21	(0.3)	11.73	(21.8)	F	...	F	...
Numeracy and Problem solving	3.47	(2.8)	F	...	2.80	(2.1)	0.66	(0.8)
Low performance in 3 domains	**3.97*****	**(1.2)**	**9.39*****	**(7.4)**	**3.55*****	**(1.6)**	**5.08*****	**(1.7)**
Prose, Document and Numeracy	3.55***	(1.2)	8.08**	(7.7)	3.25**	(1.4)	4.23***	(1.6)
Prose, Document and Problem solving	8.03**	(5.6)	12.97***	(9.6)	2.16	(1.9)	4.50	(4.6)
Prose, Numeracy and Problem solving	3.99	(3.4)	17.38	(26.8)	5.45 *	(4.9)	14.97 *	(17.2)
Document, Numeracy and Problem solving	4.51**	(2.5)	F	...	7.37	(6.8)	15.63**	(24.8)
Low performance in all 4 domains	**4.56*****	**(1.2)**	**7.21****	**(6.5)**	**7.77*****	**(2.7)**	**7.12*****	**(2.3)**

Table 6.11 (concluded)

Adjusted odds ratios showing the likelihood of youth and young adults aged 16 to 30 years with low performance (Levels 1 or 2) not completing upper secondary education, by number and type of skill domains, 2003 and 2008

	New Zealand		Netherlands		Hungary	
	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**2.87*****	**(1.1)**	**3.56*****	**(1.3)**	**1.48**	**(0.6)**
Prose	4.30**	(2.3)	6.25***	(2.8)	2.06	(0.9)
Document	0.34	(0.4)	3.88 *	(2.6)	1.36	(0.9)
Numeracy	2.95***	(1.2)	1.43	(0.8)	1.35	(0.7)
Problem solving	F	...	F	...	1.20	(0.8)
Low performance in 2 domains	**5.57*****	**(1.8)**	**3.51*****	**(1.3)**	**1.44**	**(0.6)**
Prose and Document	3.47 *	(2.1)	3.76**	(2.0)	0.57	(0.4)
Prose and Numeracy	10.15***	(3.9)	3.92**	(2.1)	2.65	(1.5)
Prose and Problem solving	2.54	(3.3)	F	...	F	...
Document and Numeracy	4.61**	(2.6)	3.00	(3.7)	1.99	(1.0)
Document and Problem solving	F	...	F	...	1.72	(1.4)
Numeracy and Problem solving	2.49	(7.0)	5.77***	(2.5)	3.17	(2.2)
Low performance in 3 domains	**8.32*****	**(2.2)**	**5.06*****	**(1.2)**	**2.29****	**(0.8)**
Prose, Document and Numeracy	9.39 *	(7.0)	3.84	(4.9)	3.29***	(1.3)
Prose, Document and Problem solving	2.35	(6.5)	F	...	1.64	(0.7)
Prose, Numeracy and Problem solving	8.78	(10.5)	F	...	1.11	(1.3)
Document, Numeracy and Problem solving	0.47	(11.7)	5.27***	(1.6)	0.88	(0.8)
Low performance in all 4 domains	**12.44*****	**(3.2)**	**5.22*****	**(1.6)**	**5.36*****	**(1.8)**

... not applicable
F too unreliable to be published
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level

Notes: Results are adjusted for gender, language status, and parents' education.
Adults with less than upper secondary are excluded from the population base.
Results for Bermuda are not estimated due to low sample sizes.

Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.12

Adjusted odds ratios showing the likelihood of upper secondary graduates aged 16 to 30 years with low performance (Levels 1 or 2) not participating in tertiary education, by number and type of skill domains, 2003 and 2008

	Canada		Switzerland (German and French)		Italy		Norway	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**1.86****	**(0.5)**	**3.06*****	**(0.9)**	**0.95**	**(0.3)**	**2.06*****	**(0.5)**
Prose	2.11	(1.0)	4.31 *	(4.7)	0.99	(0.4)	2.85	(2.3)
Document	1.72	(0.9)	2.16	(2.3)	1.47	(0.8)	2.04	(1.7)
Numeracy	1.88**	(0.5)	4.81**	(2.6)	0.74	(0.3)	1.98**	(0.6)
Problem solving	0.98	(0.7)	1.49	(1.0)	0.85	(0.5)	1.34	(0.8)
Low performance in 2 domains	**1.50**	**(0.4)**	**2.80*****	**(1.0)**	**1.29**	**(0.4)**	**3.22*****	**(1.2)**
Prose and Document	2.53**	(0.9)	3.15**	(1.7)	0.61	(0.2)	2.22	(1.3)
Prose and Numeracy	1.26	(0.5)	1.48	(1.5)	1.97	(0.8)	2.64	(1.6)
Prose and Problem solving	1.11	(1.0)	1.07	(2.3)	3.34	(3.7)	ue	...
Document and Numeracy	1.13	(0.5)	18.44***	(23.6)	1.90	(0.8)	3.41 *	(2.5)
Document and Problem solving	0.79	(1.0)	...	...	0.39	(1.0)	3.23	(3.7)
Numeracy and Problem solving	4.11	(4.1)	...	...	1.09	(0.6)	1.94 *	(0.7)
Low performance in 3 domains	**3.34*****	**(0.7)**	**3.23****	**(1.4)**	**1.59 ***	**(0.4)**	**1.98****	**(0.6)**
Prose, Document and Numeracy	3.30***	(0.9)	7.75**	(6.8)	1.30	(0.3)	1.12	(1.8)
Prose, Document and Problem solving	2.88	(2.4)	0.27	(0.2)	2.47	(1.7)	F	...
Prose, Numeracy and Problem solving	5.47 *	(5.4)	F	...	1.30	(0.7)	F	...
Document, Numeracy and Problem solving	0.73	(0.6)	F	...	3.38**	(1.6)	2.77***	(0.9)
Low performance in all 4 domains	**4.75*****	**(0.8)**	**9.78 ***	**(16.9)**	**2.58*****	**(0.6)**	**2.78*****	**(0.9)**

Table 6.12 (concluded)

Adjusted odds ratios showing the likelihood of upper secondary graduates aged 16 to 30 years with low performance (Levels 1 or 2) not participating in tertiary education, by number and type of skill domains, 2003 and 2008

	Bermuda		New Zealand		Netherlands		Hungary	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**2.69****	**(1.1)**	**1.88*****	**(0.4)**	**1.27**	**(0.5)**	**1.35 ***	**(0.2)**
Prose	F	...	2.07	(0.9)	2.30	(1.2)	1.57	(0.5)
Document	3.21	(2.2)	1.15	(0.5)	0.43	(0.3)	1.02	(0.4)
Numeracy	2.76 *	(1.5)	2.09***	(0.5)	0.97	(0.7)	1.28	(0.4)
Problem solving	3.51	(3.3)	0.45	(0.6)	3.76	(5.7)	1.53	(0.4)
Low performance in 2 domains	**6.07*****	**(2.6)**	**2.01*****	**(0.4)**	**2.10**	**(1.1)**	**2.48*****	**(0.5)**
Prose and Document	2.15	(1.8)	2.48**	(1.1)	2.10	(2.9)	1.81**	(0.5)
Prose and Numeracy	8.71***	(5.4)	1.94	(0.8)	...	...	3.80**	(2.0)
Prose and Problem solving	...	...	0.49	(0.7)	F	...	1.58	(0.9)
Document and Numeracy	5.67**	(4.1)	2.01**	(0.7)	0.33	(1.7)	2.14	(1.2)
Document and Problem solving	10.79	(22.9)	F	...	1.76	(0.8)	4.77***	(2.8)
Numeracy and Problem solving	3.39**	(1.6)	0.88	(3.0)	1.58	(6.2)	...	...
Low performance in 3 domains	**5.89*****	**(2.5)**	**2.67*****	**(0.6)**	**1.72**	**(1.0)**	**1.67****	**(0.3)**
Prose, Document and Numeracy	...	...	3.57	(3.3)	F	...	1.28	(0.3)
Prose, Document and Problem solving	45.70***	(50.6)	0.28	(1.5)	...	...	2.25***	(0.6)
Prose, Numeracy and Problem solving	5.64	(5.2)	1.76	(2.5)	1.42	(1.0)	3.13	(4.2)
Document, Numeracy and Problem solving	6.11***	(2.4)	1.89	(2.7)	F	F	1.65	(1.1)
Low performance in all 4 domains	**6.05*****	**(2.4)**	**2.87*****	**(0.6)**	**1.38**	**(0.9)**	**2.96*****	**(0.6)**

... not applicable
F too unreliable to be published
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level

Notes: Results are adjusted for gender, language status, and parents' education.
Adults with less than upper secondary are excluded from the population base.

Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.13

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 years with low performance (Levels 1 or 2) not participating in any adult education or training (excluding full time students), by number and type of skill domains, 2003 and 2008

	Canada		Switzerland (German and French)		Italy		Norway	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**1.33*****	**(0.1)**	**1.33 ***	**(0.2)**	**1.25**	**(0.2)**	**0.89**	**(0.1)**
Prose	2.13***	(0.5)	1.33 *	(0.2)	1.58	(0.6)	0.96	(0.2)
Document	1.09	(0.3)	0.89	(0.3)	1.19	(0.4)	1.03	(0.4)
Numeracy	1.17	(0.1)	2.02 *	(0.7)	1.01	(0.2)	0.80	(0.1)
Problem solving	1.97**	(0.6)	1.31	(0.4)	1.71	(0.5)	1.57	(0.6)
Low performance in 2 domains	**1.46*****	**(0.2)**	**1.65*****	**(0.3)**	**1.24**	**(0.3)**	**1.37****	**(0.2)**
Prose and Document	1.44	(0.3)	1.30	(0.2)	1.06	(0.3)	1.07	(0.3)
Prose and Numeracy	1.55**	(0.2)	1.68	(0.8)	1.28	(0.5)	1.13	(0.3)
Prose and Problem solving	4.88***	(1.9)	2.91 *	(1.5)	0.66	(0.8)	1.41	(0.6)
Document and Numeracy	1.15	(0.2)	3.44**	(1.7)	1.81 *	(0.5)	1.51 *	(0.3)
Document and Problem solving	2.20	(1.6)	1.02	(0.7)	1.05	(0.5)	0.68	(0.6)
Numeracy and Problem solving	1.31	(0.5)	1.86	(1.6)	1.61	(0.9)	3.36 *	(2.1)
Low performance in 3 domains	**1.73*****	**(0.2)**	**1.90*****	**(0.3)**	**1.36 ***	**(0.2)**	**1.42 ***	**(0.2)**
Prose, Document and Numeracy	1.65***	(0.2)	1.84***	(0.4)	1.20	(0.3)	1.20	(0.2)
Prose, Document and Problem solving	2.24***	(0.5)	1.84***	(0.3)	1.51 *	(0.4)	1.55	(0.8)
Prose, Numeracy and Problem solving	1.58	(0.6)	3.24	(5.1)	1.99	(1.2)	2.06	(1.2)
Document, Numeracy and Problem solving	1.96 *	(0.6)	2.25 *	(1.0)	2.27 *	(1.0)	3.26**	(1.8)
Low performance in all 4 domains	**2.86*****	**(0.3)**	**3.25*****	**(0.4)**	**2.47*****	**(0.4)**	**2.14*****	**(0.3)**

Table 6.13 (concluded)

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 years with low performance (Levels 1 or 2) not participating in any adult education or training (excluding full time students), by number and type of skill domains, 2003 and 2008

	Bermuda		New Zealand		Netherlands		Hungary	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	...	**1.00**	...	**1.00**	...	**1.00**	...
Low performance in 1 domain	**1.08**	**(0.1)**	**1.10**	**(0.1)**	**1.10**	**(0.1)**	**1.05**	**(0.1)**
Prose	1.24	(0.6)	1.17	(0.2)	1.13	(0.2)	1.11	(0.2)
Document	1.12	(0.4)	0.88	(0.3)	0.77	(0.1)	1.08	(0.3)
Numeracy	0.99	(0.2)	1.10	(0.1)	1.35 *	(0.2)	1.05	(0.2)
Problem solving	1.52	(0.9)	1.51	(0.9)	1.05	(0.8)	0.98	(0.3)
Low performance in 2 domains	**1.10**	**(0.2)**	**1.05**	**(0.1)**	**1.05**	**(0.1)**	**1.45*****	**(0.1)**
Prose and Document	1.64	(0.7)	1.36	(0.4)	0.88	(0.2)	1.20	(0.2)
Prose and Numeracy	0.69	(0.4)	0.78	(0.1)	1.73**	(0.5)	2.07 *	(0.9)
Prose and Problem solving	3.60	(11.4)	1.32	(0.6)	1.69	(1.7)	1.48	(0.5)
Document and Numeracy	1.00	(0.2)	1.14	(0.2)	0.63	(0.2)	1.26	(0.3)
Document and Problem solving	0.76	(1.0)	0.75	(0.9)	0.77	(3.3)	1.86 *	(0.6)
Numeracy and Problem solving	1.44	(0.7)	0.78	(0.3)	2.97 *	(2.0)	1.79	(0.8)
Low performance in 3 domains	**1.35**	**(0.2)**	**1.43*****	**(0.1)**	**1.61*****	**(0.2)**	**1.46*****	**(0.2)**
Prose, Document and Numeracy	1.51 *	(0.3)	1.40**	(0.2)	1.57***	(0.2)	1.30 *	(0.2)
Prose, Document and Problem solving	1.90	(0.9)	1.26	(0.4)	1.72 *	(0.5)	1.67***	(0.3)
Prose, Numeracy and Problem solving	1.10	(0.8)	1.29	(0.4)	4.25 *	(3.7)	2.59	(2.2)
Document, Numeracy and Problem solving	0.99	(0.3)	2.57***	(0.9)	1.11	(1.0)	1.41	(0.5)
Low performance in all 4 domains	**2.34*****	**(0.4)**	**1.61*****	**(0.2)**	**2.09*****	**(0.3)**	**2.34*****	**(0.3)**

... not applicable
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level

Notes: Results are adjusted for age, gender, language status, parents' education, education and occupational type.
Excluded from the population base are full time students aged 16 to 19 in secondary education and full time students aged 16 to 24 in post secondary education who are not supported by union, association or employer.

Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.14

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 years with low performance (Levels 1 or 2) being in the lowest decile of self-reported health status, by number and type of skill domains, 2003 and 2008

	Canada		Switzerland (German and French)		Italy		Norway	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**1.17**	**(0.2)**	**1.11**	**(0.3)**	**1.27**	**(0.5)**	**1.15**	**(0.3)**
Prose	0.82	(0.3)	0.63	(0.2)	3.11	(2.2)	1.47	(0.7)
Document	1.01	(0.3)	1.82	(0.8)	1.22	(0.7)	0.69	(0.5)
Numeracy	1.28	(0.2)	1.51	(0.5)	0.72	(0.3)	1.23	(0.3)
Problem solving	1.24	(0.6)	0.83	(0.5)	1.32	(0.8)	0.53	(0.5)
Low performance in 2 domains	**1.53 ***	**(0.3)**	**0.98**	**(0.3)**	**1.14**	**(0.3)**	**1.50 ***	**(0.3)**
Prose and Document	1.16	(0.4)	1.28	(0.4)	1.27	(0.6)	1.19	(0.5)
Prose and Numeracy	0.76	(0.2)	0.68	(0.4)	2.08	(1.2)	2.69***	(0.9)
Prose and Problem solving	1.16	(0.6)	0.31	(0.2)	0.24	(0.3)	1.37	(0.9)
Document and Numeracy	1.81**	(0.4)	1.22	(0.6)	1.00	(0.4)	1.64 *	(0.5)
Document and Problem solving	7.79 *	(6.3)	0.31	(0.2)	1.16	(0.8)	0.68	(0.6)
Numeracy and Problem solving	0.90	(0.4)	0.95	(0.8)	0.63	(0.4)	0.07 *	(0.1)
Low performance in 3 domains	**1.10**	**(0.2)**	**1.25**	**(0.2)**	**1.26**	**(0.4)**	**1.54****	**(0.3)**
Prose, Document and Numeracy	0.92	(0.2)	1.33	(0.3)	1.25	(0.4)	1.77**	(0.4)
Prose, Document and Problem solving	1.43	(0.5)	1.12	(0.5)	1.67	(0.7)	1.28	(0.6)
Prose, Numeracy and Problem solving	0.99	(0.5)	1.48	(1.1)	0.82	(0.5)	0.62	(0.4)
Document, Numeracy and Problem solving	2.69***	(0.7)	0.65	(0.6)	0.93	(0.6)	1.00	(0.9)
Low performance in all 4 domains	**1.42*****	**(0.2)**	**1.50**	**(0.4)**	**1.78****	**(0.5)**	**1.22**	**(0.2)**

Table 6.14 (concluded)

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 years with low performance (Levels 1 or 2) being in the lowest decile of self-reported health status, by number and type of skill domains, 2003 and 2008

	Bermuda		New Zealand		Netherlands		Hungary	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**0.57****	**(0.2)**	**1.08**	**(0.2)**	**1.28**	**(0.2)**	**0.96**	**(0.2)**
Prose	0.86	(0.7)	0.66	(0.2)	0.75	(0.2)	1.50	(0.5)
Document	0.40	(0.3)	0.67	(0.2)	1.72	(0.6)	0.61	(0.3)
Numeracy	0.65	(0.2)	1.34	(0.2)	1.45	(0.3)	0.84	(0.2)
Problem solving	0.25	(0.2)	0.06	(0.1)	2.88 *	(1.8)	0.93	(0.2)
Low performance in 2 domains	**1.31**	**(0.4)**	**1.54****	**(0.3)**	**1.03**	**(0.2)**	**1.04**	**(0.2)**
Prose and Document	0.99	(0.7)	1.04	(0.3)	0.71	(0.2)	1.14	(0.3)
Prose and Numeracy	1.82	(1.1)	1.97 *	(0.7)	0.94	(0.3)	1.00	(0.4)
Prose and Problem solving	1.77	(1.8)	1.05	(0.7)	3.62**	(2.1)	0.98	(0.5)
Document and Numeracy	1.23	(0.5)	1.88**	(0.5)	1.72	(0.7)	0.72	(0.3)
Document and Problem solving	1.90	(3.2)	0.37	(0.4)	0.70	(1.0)	0.79	(0.3)
Numeracy and Problem solving	0.97	(0.6)	0.27	(0.2)	1.69	(1.8)	2.24**	(0.8)
Low performance in 3 domains	**1.10**	**(0.2)**	**1.24**	**(0.2)**	**1.53****	**(0.3)**	**1.15**	**(0.2)**
Prose, Document and Numeracy	0.91	(0.3)	1.47**	(0.2)	1.27	(0.2)	1.01	(0.2)
Prose, Document and Problem solving	0.11	(0.1)	0.71	(0.4)	2.02 *	(0.8)	1.85***	(0.4)
Prose, Numeracy and Problem solving	2.06	(1.9)	0.13**	(0.1)	2.72	(1.7)	0.47	(0.3)
Document, Numeracy and Problem solving	1.62	(0.6)	0.67	(0.4)	5.47**	(3.6)	0.86	(0.3)
Low performance in all 4 domains	**1.39**	**(0.4)**	**1.34 ***	**(0.2)**	**1.85*****	**(0.3)**	**1.41 ***	**(0.2)**

... not applicable
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
Note: Results are adjusted for age, gender, language status, parents' education, education and occupational type.
Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.15

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 years with low performance (Levels 1 or 2) not participating in a range of civic related activities, by number and type of skill domains, 2003 and 2008

	Canada		Switzerland (German and French)		Italy		Norway	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**1.12**	**(0.1)**	**1.30**	**(0.2)**	**1.25**	**(0.2)**	**1.31****	**(0.2)**
Prose	1.08	(0.2)	1.18	(0.3)	1.13	(0.3)	1.12	(0.3)
Document	1.46 *	(0.3)	0.95	(0.3)	1.45	(0.5)	0.38 *	(0.2)
Numeracy	1.07	(0.1)	1.62	(0.6)	1.08	(0.3)	1.56***	(0.2)
Problem solving	1.14	(0.3)	1.74 *	(0.5)	1.76	(0.6)	1.98	(1.0)
Low performance in 2 domains	**1.47*****	**(0.2)**	**1.24**	**(0.2)**	**0.94**	**(0.2)**	**1.41****	**(0.2)**
Prose and Document	1.31 *	(0.2)	1.31	(0.3)	0.97	(0.2)	1.04	(0.4)
Prose and Numeracy	1.65***	(0.3)	1.79**	(0.5)	1.00	(0.3)	1.16	(0.3)
Prose and Problem solving	1.72	(0.6)	2.72**	(1.2)	0.78	(0.7)	0.91	(0.5)
Document and Numeracy	1.37 *	(0.2)	0.15***	(0.1)	1.11	(0.3)	1.75**	(0.4)
Document and Problem solving	1.06	(0.9)	0.73	(0.2)	0.93	(0.3)	1.16	(1.1)
Numeracy and Problem solving	2.05***	(0.5)	0.93	(0.8)	0.67	(0.2)	2.64	(1.4)
Low performance in 3 domains	**1.56*****	**(0.1)**	**1.84*****	**(0.3)**	**1.20**	**(0.2)**	**1.43****	**(0.2)**
Prose, Document and Numeracy	1.51***	(0.1)	1.50**	(0.3)	1.20	(0.2)	1.43 *	(0.3)
Prose, Document and Problem solving	2.03***	(0.5)	2.88***	(0.7)	1.22	(0.3)	1.40	(0.4)
Prose, Numeracy and Problem solving	1.39	(0.6)	1.41	(1.0)	0.99	(0.4)	2.01 *	(0.8)
Document, Numeracy and Problem solving	1.62	(0.5)	2.18	(1.1)	1.31	(0.6)	1.22	(0.7)
Low performance in all 4 domains	**1.95*****	**(0.2)**	**1.77*****	**(0.3)**	**1.54*****	**(0.2)**	**1.91*****	**(0.4)**

Table 6.15 (concluded)

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 years with low performance (Levels 1 or 2) not participating in a range of civic related activities, by number and type of skill domains, 2003 and 2008

	Bermuda		New Zealand		Netherlands		Hungary	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**1.02**	**(0.2)**	**1.41****	**(0.2)**	**1.13**	**(0.1)**	**1.05**	**(0.1)**
Prose	1.90	(1.1)	1.03	(0.2)	0.98	(0.1)	1.08	(0.3)
Document	1.31	(0.5)	1.50	(0.4)	1.56**	(0.3)	0.72	(0.2)
Numeracy	0.80	(0.2)	1.52**	(0.3)	1.05	(0.3)	1.34	(0.3)
Problem solving	1.71	(0.7)	2.17	(1.0)	1.57	(0.8)	1.01	(0.3)
Low performance in 2 domains	**1.36**	**(0.3)**	**1.19**	**(0.2)**	**1.18**	**(0.1)**	**1.17**	**(0.2)**
Prose and Document	1.28	(0.5)	1.41	(0.4)	1.34**	(0.2)	1.08	(0.2)
Prose and Numeracy	0.97	(0.4)	1.47 *	(0.3)	0.78	(0.2)	1.71 *	(0.5)
Prose and Problem solving	0.53	(0.5)	0.75	(0.5)	3.69**	(2.1)	1.18	(0.4)
Document and Numeracy	1.76 *	(0.5)	1.04	(0.3)	1.19	(0.3)	1.39	(0.3)
Document and Problem solving	0.71	(1.0)	2.06	(1.1)	0.80	(1.4)	0.75	(0.2)
Numeracy and Problem solving	1.32	(1.1)	0.36	(0.3)	2.53	(1.7)	1.18	(0.5)
Low performance in 3 domains	**1.71*****	**(0.2)**	**1.60*****	**(0.2)**	**1.46*****	**(0.2)**	**1.02**	**(0.1)**
Prose, Document and Numeracy	1.78***	(0.3)	1.64***	(0.3)	1.58***	(0.2)	1.06	(0.2)
Prose, Document and Problem solving	2.43**	(1.0)	1.08	(0.4)	0.71	(0.2)	0.83	(0.1)
Prose, Numeracy and Problem solving	1.74	(1.1)	2.63	(1.3)	1.28	(0.8)	1.02	(0.5)
Document, Numeracy and Problem solving	1.38	(0.4)	1.08	(0.5)	2.66 *	(1.5)	1.80 *	(0.6)
Low performance in all 4 domains	**1.69*****	**(0.3)**	**1.82*****	**(0.2)**	**2.44*****	**(0.2)**	**1.27****	**(0.1)**

... not applicable
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level
Note: Results are adjusted for age, gender, language status, parents' education, education and occupational type.
Source: Adult Literacy and Life Skills survey, 2003 and 2008.

Table 6.16 A

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 with low performance (Levels 1 or 2) being in the lowest quartile of Information Communication Technology use (Frequency and variety of using computers for task oriented purposes), by number and type of skill domains, 2003 and 2008

	Canada		Switzerland (German and French)		Italy		Norway	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**1.57*****	**(0.1)**	**1.54 ***	**(0.4)**	**1.95*****	**(0.4)**	**1.68*****	**(0.3)**
Prose	2.09***	(0.5)	0.84	(0.3)	1.21	(0.4)	1.49	(0.5)
Document	1.01	(0.3)	1.37	(0.6)	1.88	(0.8)	2.58**	(1.2)
Numeracy	1.59***	(0.2)	3.16**	(1.3)	2.29***	(0.6)	1.60**	(0.3)
Problem solving	1.32	(0.3)	2.19 *	(0.9)	2.26 *	(1.0)	1.57	(0.8)
Low performance in 2 domains	**1.75*****	**(0.2)**	**1.40**	**(0.3)**	**1.49****	**(0.3)**	**1.75*****	**(0.3)**
Prose and Document	1.58 *	(0.4)	1.22	(0.4)	1.49	(0.4)	1.87	(0.7)
Prose and Numeracy	2.17***	(0.3)	1.17	(0.5)	1.44	(0.6)	1.39	(0.5)
Prose and Problem solving	1.26	(0.7)	3.64 *	(2.6)	1.29	(0.7)	1.19	(0.7)
Document and Numeracy	1.39 *	(0.3)	1.41	(0.8)	1.42	(0.4)	2.16**	(0.6)
Document and Problem solving	3.14	(2.4)	0.20	(0.2)	1.03	(0.8)	1.33	(1.7)
Numeracy and Problem solving	2.20**	(0.6)	0.64	(1.0)	2.37**	(0.9)	1.93	(1.3)
Low performance in 3 domains	**1.95*****	**(0.2)**	**1.65*****	**(0.3)**	**1.41 ***	**(0.3)**	**2.32*****	**(0.5)**
Prose, Document and Numeracy	1.83***	(0.2)	1.74***	(0.3)	1.30	(0.3)	2.26***	(0.4)
Prose, Document and Problem solving	2.51***	(0.6)	1.43	(0.7)	1.19	(0.4)	2.80 *	(1.5)
Prose, Numeracy and Problem solving	2.34**	(0.8)	1.25	(1.4)	1.48	(0.6)	1.80	(1.2)
Document, Numeracy and Problem solving	1.95**	(0.5)	1.73	(0.8)	3.28**	(1.4)	2.13	(1.4)
Low performance in all 4 domains	**2.81*****	**(0.2)**	**2.67*****	**(1.0)**	**2.38*****	**(0.4)**	**3.39*****	**(0.5)**

Table 6.16 A (concluded)

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 with low performance (Levels 1 or 2) being in the lowest quartile of Information Communication Technology use (Frequency and variety of using computers for task oriented purposes), by number and type of skill domains, 2003 and 2008

	Bermuda		New Zealand		Netherlands		Hungary	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**2.27*****	**(0.6)**	**1.41****	**(0.2)**	**1.40****	**(0.2)**	**1.11**	**(0.1)**
Prose	1.95	(1.5)	1.24	(0.3)	1.33	(0.3)	1.03	(0.2)
Document	2.90 *	(1.4)	1.15	(0.4)	1.35	(0.4)	1.35	(0.3)
Numeracy	2.21**	(0.7)	1.55**	(0.3)	1.62**	(0.3)	1.02	(0.2)
Problem solving	1.80	(1.1)	0.55	(0.3)	0.76	(0.4)	1.16	(0.3)
Low performance in 2 domains	**2.56*****	**(0.7)**	**1.45****	**(0.2)**	**1.38 ***	**(0.2)**	**1.22**	**(0.2)**
Prose and Document	3.15**	(1.6)	1.57	(0.5)	1.39	(0.3)	1.65***	(0.3)
Prose and Numeracy	1.89	(1.3)	1.35 *	(0.2)	1.40	(0.3)	1.04	(0.3)
Prose and Problem solving	9.05***	(5.8)	1.30	(0.7)	0.66	(0.4)	1.29	(0.4)
Document and Numeracy	2.63**	(0.9)	1.48 *	(0.3)	1.43	(0.5)	1.11	(0.3)
Document and Problem solving	1.90	(2.6)	4.20***	(1.9)	0.94	(2.0)	0.68	(0.2)
Numeracy and Problem solving	1.42	(1.3)	0.61	(0.4)	2.01	(3.4)	1.31	(0.6)
Low performance in 3 domains	**3.61*****	**(0.9)**	**1.75*****	**(0.2)**	**1.66*****	**(0.1)**	**1.25 ***	**(0.2)**
Prose, Document and Numeracy	3.95***	(1.2)	1.89***	(0.3)	1.78***	(0.2)	1.37**	(0.2)
Prose, Document and Problem solving	4.22 *	(3.1)	1.25	(0.3)	1.00	(0.3)	1.23	(0.3)
Prose, Numeracy and Problem solving	2.06	(1.4)	0.93	(0.4)	2.30	(1.5)	0.62	(0.3)
Document, Numeracy and Problem solving	3.29**	(1.6)	2.02 *	(0.7)	1.29	(0.7)	1.05	(0.4)
Low performance in all 4 domains	**4.05*****	**(1.2)**	**2.71*****	**(0.3)**	**2.55*****	**(0.3)**	**1.86*****	**(0.2)**

... not applicable
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level

Notes: Results are adjusted for age, gender, language status, parents' education, education and occupational type.

Source: Adult Literacy and Life Skills survey, 2003-2008.

Table 6.16 B

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 with low performance (Levels 1 or 2) being in the lowest quartile of Information Communication Technology use (Frequency and variety of use of internet), by number and type of skill domain

	Canada		Switzerland (German and French)		Italy		Norway	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**1.61**	**(0.5)**	**1.00**	**(0.3)**	**2.09*****	**(0.5)**	**1.31**	**(0.2)**
Prose	1.71	(2.0)	0.76	(0.3)	1.27	(0.5)	1.66 *	(0.5)
Document	1.52	(2.3)	1.26	(0.4)	1.55	(0.6)	0.92	(0.9)
Numeracy	1.83 *	(0.6)	1.65	(1.1)	2.61***	(0.8)	1.36	(0.3)
Problem solving	0.39	(0.8)	0.62	(0.4)	2.98***	(1.1)	0.33	(0.3)
Low performance in 2 domains	**1.31**	**(0.6)**	**2.41*****	**(0.5)**	**1.40**	**(0.3)**	**1.64*****	**(0.3)**
Prose and Document	0.45	(0.4)	1.74 *	(0.5)	1.19	(0.5)	1.86	(0.8)
Prose and Numeracy	2.38	(1.6)	3.12**	(1.6)	0.95	(0.5)	1.57	(0.6)
Prose and Problem solving	0.08	(0.1)	4.11 *	(3.1)	0.62	(0.6)	0.79	(0.7)
Document and Numeracy	0.81	(0.5)	7.04***	(5.9)	2.22 *	(0.9)	2.39***	(0.7)
Document and Problem solving	...	...	1.96	(1.5)	1.61	(1.1)	1.16	(1.9)
Numeracy and Problem solving	1.55	(1.8)	0.19	(6.0)	1.97	(0.9)	0.91	(0.8)
Low performance in 3 domains	**1.38**	**(0.7)**	**2.73*****	**(0.7)**	**1.54****	**(0.3)**	**2.42*****	**(0.5)**
Prose, Document and Numeracy	1.55	(0.8)	2.26**	(0.8)	1.63***	(0.3)	2.10***	(0.5)
Prose, Document and Problem solving	1.09	(1.0)	3.16**	(1.5)	1.31	(0.5)	4.80***	(2.2)
Prose, Numeracy and Problem solving	1.21	(3.3)	6.61***	(2.3)	0.79	(0.5)	1.20	(0.7)
Document, Numeracy and Problem solving	0.24	(0.2)	6.87	(13.0)	2.09	(1.3)	2.00	(1.5)
Low performance in all 4 domains	**1.64**	**(0.8)**	**3.78*****	**(1.5)**	**2.55*****	**(0.5)**	**3.70*****	**(0.8)**

Table 6.16 B (concluded)

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 with low performance (Levels 1 or 2) being in the lowest quartile of Information Communication Technology use (Frequency and variety of use of internet), by number and type of skill domain

	Bermuda		New Zealand		Netherlands		Hungary	
	odds	standard error	odds	standard error	odds	standard error	odds	standard error
Performance at Level 3 or higher in all 4 domains	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**	**1.00**	**...**
Low performance in 1 domain	**1.82*****	**(0.4)**	**1.29 ***	**(0.2)**	**1.16**	**(0.1)**	**0.92**	**(0.1)**
Prose	3.11	(2.4)	1.15	(0.2)	0.80	(0.1)	0.86	(0.2)
Document	1.30	(0.6)	1.30	(0.4)	1.50	(0.4)	1.21	(0.4)
Numeracy	1.76**	(0.4)	1.28 *	(0.2)	1.63***	(0.3)	0.92	(0.2)
Problem solving	2.62 *	(1.4)	2.70	(1.6)	0.64	(0.4)	0.72	(0.2)
Low performance in 2 domains	**1.37**	**(0.4)**	**1.34 ***	**(0.2)**	**1.18**	**(0.2)**	**1.32 ***	**(0.2)**
Prose and Document	0.98	(0.6)	1.32	(0.4)	1.35	(0.3)	1.41	(0.3)
Prose and Numeracy	0.30	(0.3)	1.77**	(0.4)	1.35	(0.4)	0.67	(0.3)
Prose and Problem solving	1.33	(2.0)	0.93	(0.7)	0.49	(0.4)	0.88	(0.5)
Document and Numeracy	2.53**	(1.0)	1.22	(0.2)	0.79	(0.3)	2.39***	(0.7)
Document and Problem solving	1.35	(11.6)	2.27	(1.1)	0.52	(0.7)	1.31	(0.6)
Numeracy and Problem solving	0.40	(0.4)	0.36	(0.2)	0.61	(0.4)	1.04	(0.4)
Low performance in 3 domains	**2.52*****	**(0.6)**	**1.58*****	**(0.2)**	**1.59*****	**(0.2)**	**1.15**	**(0.2)**
Prose, Document and Numeracy	1.74 *	(0.5)	1.66***	(0.2)	1.66***	(0.2)	1.35	(0.2)
Prose, Document and Problem solving	3.76 *	(2.7)	1.46	(0.5)	1.17	(0.5)	0.87	(0.2)
Prose, Numeracy and Problem solving	12.32***	(9.6)	0.93	(0.3)	2.21	(1.7)	1.25	(0.7)
Document, Numeracy and Problem solving	3.18**	(1.4)	1.62	(0.8)	1.18	(0.6)	1.14	(0.5)
Low performance in all 4 domains	**2.14*****	**(0.5)**	**2.22*****	**(0.2)**	**1.88*****	**(0.3)**	**1.28 ***	**(0.2)**

... not applicable
* p<0.10, statistically significant at the 10 per cent level
** p<0.05, statistically significant at the 5 per cent level
*** p<0.01, statistically significant at the 1 per cent level

Notes: Results are adjusted for age, gender, language status, parents' education, education and occupational type.

Source: Adult Literacy and Life Skills survey, 2003-2008.

Chapter 7

Skill Mismatch in the Labour Market and Adult Learning

Summary

This chapter explores the issue of skill mismatch in the labour market and its relationship to adult learning. The extent and distribution of mismatch between the day to day literacy related requirements of workers and the literacy skills they have obtained is an important issue that can be addressed with the ALL data. Understanding better the interaction of the supply of, and demand for, literacy skills can have important consequences for industrial policies and labour market structures that foster demand, on the one hand, and lifelong learning policies and education structures that shape supply, on the other. According to the methodology applied to conduct the data analyses, skill mismatch is found to be on the order of about 30 to 40 per cent in all countries surveyed. As defined for the purposes of this chapter, mismatch includes both skill deficits and skill surpluses. It is found that the distribution of surplus tends to be concentrated among younger age cohorts as well as women and non-immigrants, while deficits tend to accrue to men, older adults and immigrants. Skill match-mismatch is also found to have a strong link to the incidence of participation in adult education as well as to the sources of financing that support participation.

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Skill Mismatch in the Labour Market and Adult Learning

7.1 Overview and highlights

This chapter explores the issue of skill mismatch in the labour market and its relationship to adult learning. The extent and distribution of mismatch between the day to day literacy related requirements of workers and the literacy skills they have obtained is an important issue that can be addressed with the ALL data. Understanding better the interaction of the supply of, and demand for, literacy skills can have important consequences for industrial policies and labour market structures that foster demand, on the one hand, and lifelong learning policies and education structures that shape supply, on the other. According to the methodology applied to conduct the data analyses, skill mismatch is found to be on the order of about 30 to 40 per cent in all countries surveyed. As defined for the purposes of this chapter, mismatch includes both skill deficits and skill surpluses. It is found that the distribution of surplus tends to be concentrated among younger age cohorts as well as women and non-immigrants, while deficits tend to accrue to men, older adults and immigrants. Skill match-mismatch is also found to have a strong link to the incidence of participation in adult education as well as to the sources of financing that support participation.

Key findings of these analyses are:

- The total proportion of skill matches across countries is consistently around 60 to 70 per cent, including both high- and low-skill matches.
- Approximately 10 to 30 per cent of the workforce, depending on the country, falls into the category of 'skill deficit'.
- The reserve of skills, or skills surplus, varies substantially by country. Hungary and Norway have over 30 per cent of working adults with a skills surplus whereas Italy's reserve is around 13 per cent.
- Gender differences in skill mismatch are for the most part marginal but the proportion of high-skill matches is higher for men in more than half of the countries considered, including Norway, the Netherlands, New Zealand, Switzerland and the United States.

- Generally, more women than men are in jobs that do not make full use of their literacy skills.
- Consistent with skill-age distributions, skill surpluses are generally higher among younger age cohorts. Close to 40 per cent of all youth and young adults who are in the labour market in Hungary and Norway are in a skill surplus situation. The estimate is also comparatively high in Bermuda, Canada and the Netherlands, where there are about 30 per cent of young adults in a skill surplus situation.
- For a majority of countries, significant numbers of immigrants do not have the literacy skills required in their jobs. This is especially the case in countries with high immigration rates, like Canada, New Zealand, Switzerland and the United States.
- Workers in high-skill matches tend to participate more in adult education on average than any other workers. This is followed by workers in a skill deficit situation. The lowest participation rates are among workers in a low skill match situation.
- There are more women than men in the high skill group who participate in adult education and training, which is consistent with gender differences in the overall participation rate for employed men and women.
- Employers display the highest propensity to invest in workers who are in high-skill matches. This is followed by those in deficit situations, surplus situations and low-skill matched situations.
- In a number of countries, results suggest that government financing appears to reach those in high-skill matched situations as well as those in surplus situations more than those in a skill deficit or low-skill match situation.

7.2 Skill mismatch in the labour market and adult learning

This chapter explores the issue of skill mismatch in the labour market and its relationship to adult learning. According to the methodology applied to conduct the data analyses, skill mismatch is found to be in the order of about 30 to 40 per cent in all countries surveyed. As defined for the purposes of this chapter, mismatch includes both skill deficits and skill surpluses. It is found that the distribution of surplus tends to be concentrated among younger age cohorts as well as women and non-immigrants, while deficits tend to accrue to men, older adults and immigrants. Skill mismatch is also found to have a strong link to the incidence of participation in adult education as well as to the sources of financing that support participation.

The first section introduces the concept of skill mismatch in the context of the Adult Literacy and Lifeskills survey. The second section presents comparative data on the extent of skill mistmatch. The third section considers the socio-demographic profile of who is matched or mismatched. The last section considers the relationship between skill mismatch and participation in adult learning.

7.3 Why skill mismatch matters

The extent and distribution of mismatch between the day to day literacy related requirements of workers and the literacy skills they have obtained is an important issue that can be addressed with the ALL data. Understanding better the interaction of the supply of, and demand for, literacy skills can have important consequences for industrial policies and labour market structures that foster demand, on the one hand, and lifelong learning policies and education structures that shape supply, on the other.

Remedial training for workers with "skill deficits" – those who have low skills but nevertheless engage relatively often in literacy and numeracy related activities for productive purposes – has received much attention in recent years not only because deficits reflect labour market inefficiencies which can hamper productivity growth but also because of on-going technology biased change. The latter fosters more jobs which require higher levels of literacy skills. But there are also many workers who have high levels of literacy skills but do not fully exploit them at work (Krahn and Lowe, 1998; Boothby, 1999). This has been referred to as a "skills surplus", which is presumably good for growing knowledge economies in the long run. But a lack of skill use in the workplace may be problematic in the short term because skills might be lost due to lack of use. Literacy skills are like muscles that develop if you use them, otherwise they can be lost (OECD and HRDC, 1997). Therefore, the demand for, and use of, literacy skills should not be taken for granted.

7.4 Extent of skill match-mismatch on the labour market

In this chapter, skill match-mismatch is defined by the fit between the measured literacy skills of workers and the extent to which they engage in literacy related tasks on the job. Conceptually, workers with low literacy skills who are employed in jobs requiring comparatively high engagement in literacy related tasks are said to be in a "deficit" situation, whereas workers with medium to high-skills who are employed in jobs requiring comparatively low engagement in literacy related tasks are said to be in a "surplus" situation. Empirically, persons with reading engagement scores below the median were assigned to the "low to medium-low engagement" category, and those scoring above were assigned to the "medium-high to high-engagement" category. Similarly, persons scoring at Levels 1 and 2 on the prose literacy scale were assigned to the "low-skills" category, and those scoring at Levels 3 and 4/5 were assigned to the "medium- to high-skills" category. These two variables were used to define the following four categories:

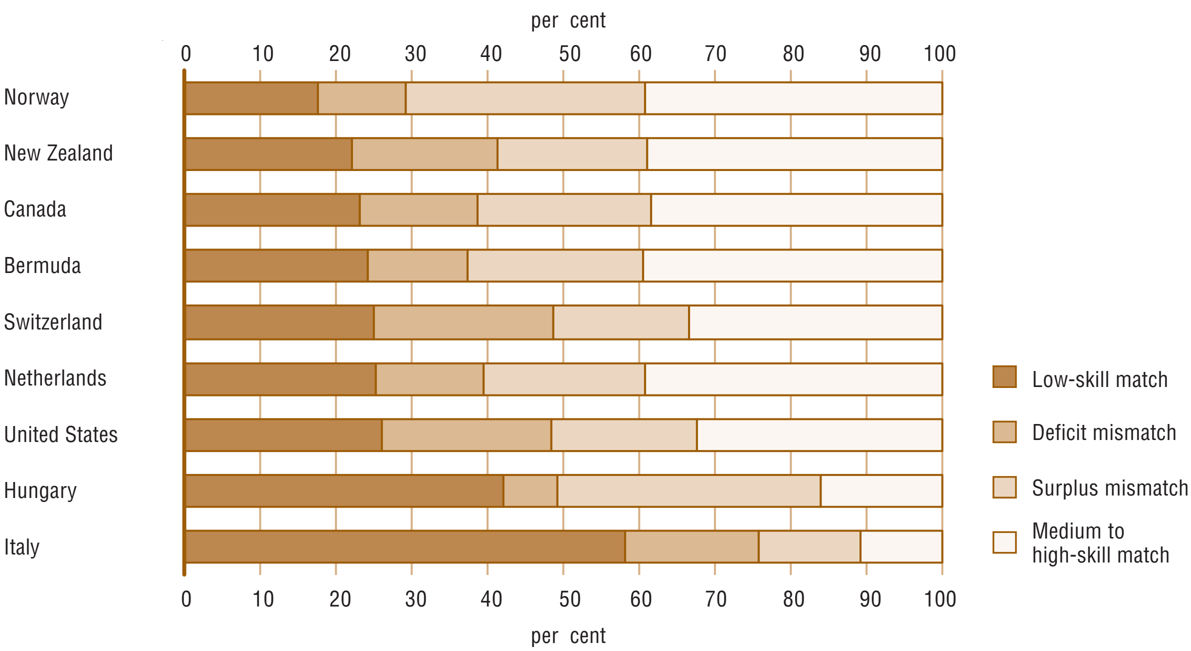
- Low-skills, low- to medium-low engagement ⇒ Low-skill match
- Low-skills, medium-high to high-engagement ⇒ Deficit mismatch
- Medium to high-skills, low- to medium-low engagement ⇒ Surplus mismatch
- Medium to high-skills, medium-high to high-engagement ⇒ Medium to high skill match

As can be seen from Figure 7.1, this categorisation results in a pattern according to which the proportion of skill matches is consistently around 60 per cent in most countries (70 per cent in Italy). This is not surprising since one would expect that over time workers with higher skills would find their way into jobs requiring more skills, whereas those with few skills would not move up. Matches include both high-skill and low-skill matches. Hungary and Italy have the highest proportions of low-skill matches with 42 and 58 per cent, respectively, of their low skill workers matched in low skill jobs. Canada, New Zealand and Norway have the lowest proportion of their work forces in low skill matches, ranging from 18 to 23 per cent. Conversely, medium to high skill matches are lowest in Hungary and Italy, but consistently around 40 per cent in Bermuda, Canada, New Zealand, the Netherlands and Norway. Switzerland and the United States are in between with about 33 per cent of their workforces in high-skill matches and 25 per cent in low-skill matches.

Figure 7.1

The distribution of skill mismatch

The distribution of skill mismatch, by country, 2003 and 2008



Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Several other notable observations can be drawn from Figure 7.1. First, the proportions of low versus high-skill matches not only provide an indication of how skilled a workforce is but also the extent of the demand for, and supply of, literacy skills (see Table 7.1 in Annex 7). By extension, the data also offer an insight into the extent of skill mismatch, namely the deficit in literacy skills as well as the surplus. Second, while mismatch is apparent in every country, the extent of it varies. Presumably, a certain level of mismatch is expected in the labour market but whether 10 per cent, for example, is normal cannot be answered with certainty. Higher rates, however, are likely to suggest a need for adjustment.

The data presented in Figure 7.1 suggest that approximately 7 to 24 per cent of the workforce, depending on the country, fall into the category of 'skill deficit'. Countries with a comparatively high skills deficit feature a high proportion of workers with low functional literacy skills who are nevertheless working in jobs that require medium-high to high-engagement in literacy related tasks. This points to labour market inefficiencies and may have negative consequences for productivity as well as workplace health and safety issues, especially as the skill profiles of occupations augment because of continued skill biased technological change, for example, through the diffusion of ICTs and personal computers in workplaces in all sectors and at all levels. The workforces in Switzerland and the United States feature the highest levels of skills deficit with about 24 and 22 per cent of workers categorised as having a relatively low level of literacy skills when considering the frequency and variety of reading tasks they are required to perform at work. Bermuda, Hungary, the Netherlands and Norway register smaller deficits.

Similarly, the reserve of skills, or skills surplus, as defined by the number of workers with medium to high functional literacy skills employed in jobs requiring low to medium-low engagement also varies substantially by country. Hungary and Norway have reserves of skill over 30 per cent whereas Italy's reserve is around 13 per cent. Overall country performances as measured by ALL tend to be related to the size of skill reserves. While a skills surplus is good for growing knowledge economies in the long run, a lack of skill use in the workplace may be problematic in the short run because it exposes workers to the risk of skill loss. Practice engagement is important to nurture and develop skills (Reder, 2009; Desjardins, 2004). By extension workers who are deprived of the opportunity to perform complex literacy tasks may lose some of their proficiency. This forms an important and complex policy issue and points to a need for considering how industrial and labour market policies can foster skill use on the job. Some comparative research has suggested that structural conditions in a given country may in fact allow employers to compete on the basis of low-skill strategies, whereas elsewhere high-skill strategies are used to pursue the production of similar goods and services (Brown, Green and Lauder, 2001).

7.5 Who is matched or mismatched?

This section investigates the demographic and socioeconomic characteristics of skill mismatch by considering interactions with variables such as gender, age, immigration and occupational status.

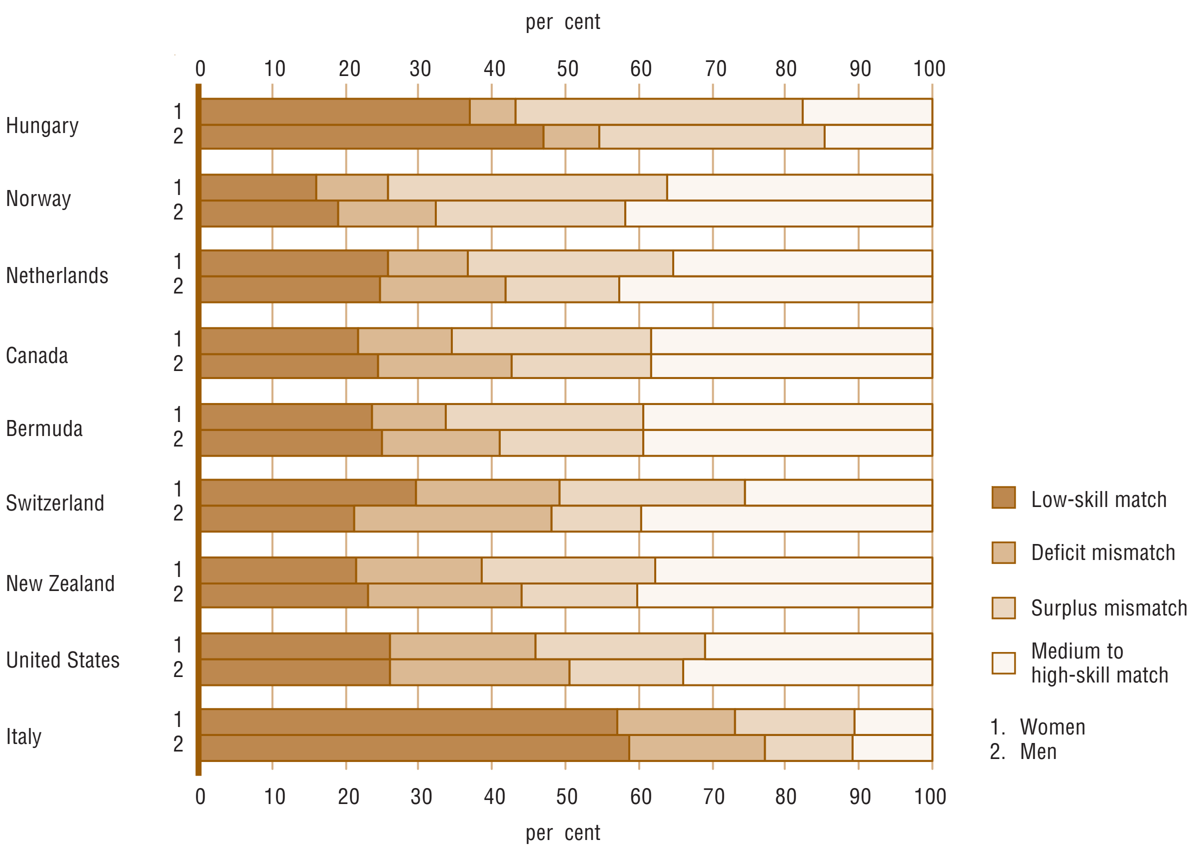
Gender

Gender differences in skill mismatch are for the most part marginal but there are some country differences revealed in Figure 7.2 that are worth noting. First, the proportion of medium to high skill matches is higher for men in more than half of the countries considered, including Norway, the Netherlands, New Zealand, Switzerland and the United States. The difference is most pronounced in Switzerland where 40 per cent of men are matched in medium to high skill jobs compared to 26 per cent of women. Men and women are equally matched in medium to high skill jobs in Bermuda, Canada and Italy, while there are more women than men who are matched in medium to high skill jobs in Hungary. Second, skill surpluses tend to be biased towards women while skill deficits tend to be biased towards men. This implies that there are generally more women than men who are in employment that does not make full use of their literacy skills. Conversely, there are more men than women who are in jobs requiring a high level of engagement in reading even if they have a low level of literacy skill.

Figure 7.2

Skill mismatch by gender

The distribution of skill mismatch, by gender and by country, 2003 and 2008



Countries are ranked by the per cent of women in a surplus mismatch situation in the workplace.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

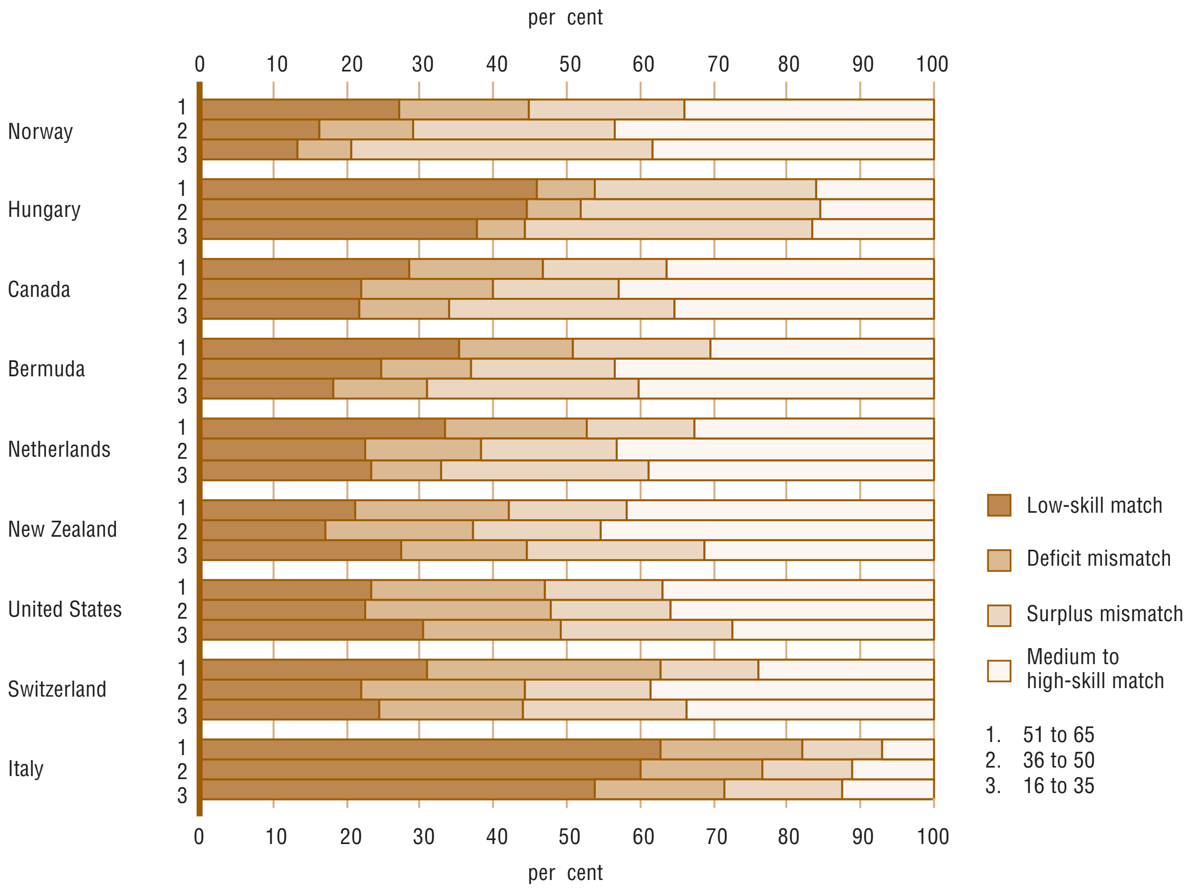
Age

Consistent with age-skill distributions, Figure 7.3 presents data suggesting that skill surpluses are generally higher among younger age cohorts. For example, around 40 per cent of all youth and young adults who are in the labour market in Hungary and Norway are in a skill surplus situation. The estimate is also comparatively high in Bermuda, Canada and the Netherlands, where there are about 30 per cent of youth and young adults in a skill surplus situation. This might be so because there are typically more youth and young adults in temporary or entry level jobs for which skill requirements are not necessarily commensurate with their area of study or level of literacy skill. The degree of matches should naturally increase with age as workers find their way into jobs that have a better fit with their level of skill. But notable levels of skill surpluses remain among older age cohorts. Hungary, for example, has the highest levels of skill surplus. It also has the lowest levels of skill deficit across all age groups. For the majority of countries, at least 15 per cent of older cohorts are in a surplus situation. Only Italy and Switzerland feature comparatively low levels of surplus among older age groups, namely 11 and 13 per cent, respectively. Along with Switzerland, the United States and New Zealand feature among the highest levels of skill deficit among older age cohorts.

Figure 7.3

Skill mismatch by age group

The distribution of skill mismatch, by age group and by country, 2003 and 2008



Countries are ranked by the per cent of youths and young adults aged 16 to 35 who are in a surplus mismatch situation in the workplace.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

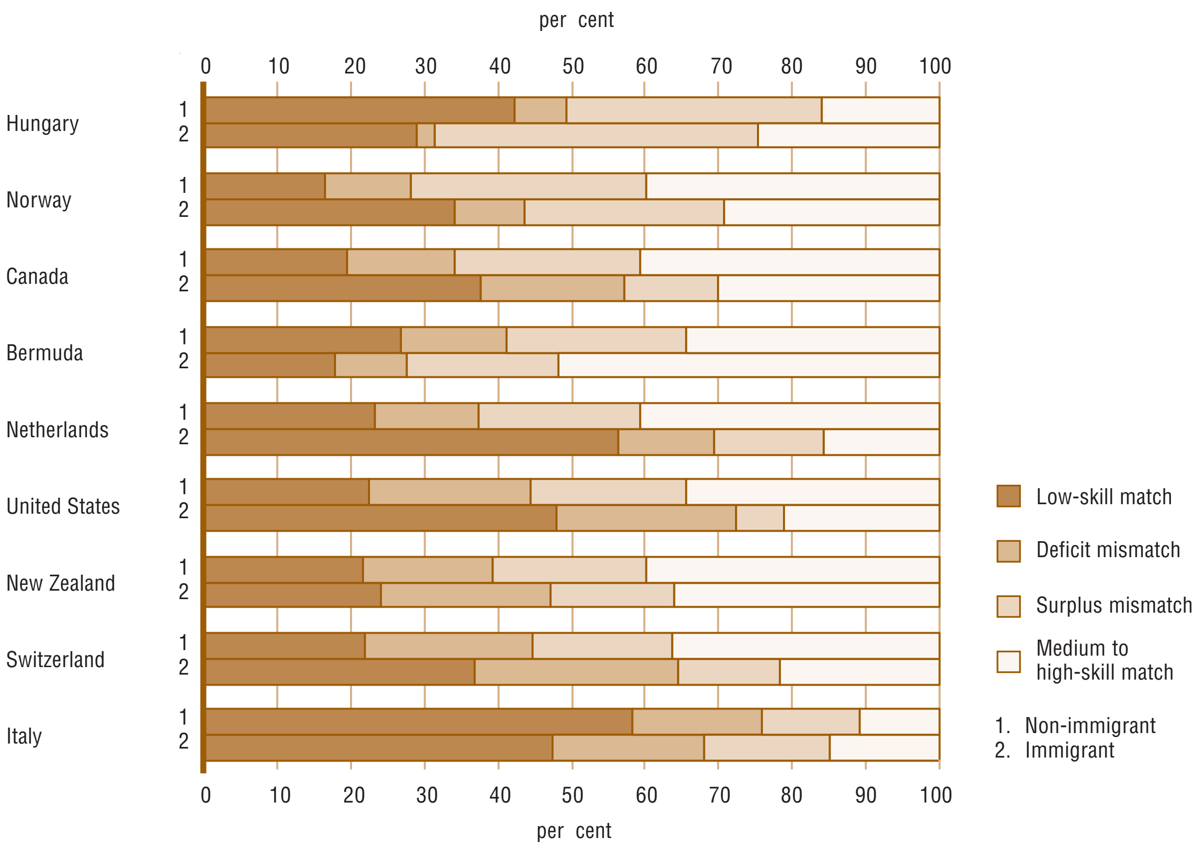
Immigration

The difference between the proportion of immigrants and non-immigrants who are seen to be in a surplus situation in the labour market can be substantial. The data in Figure 7.4 indicate that this is especially the case in Canada and the United States, where there are about 12 and 14 per cent more non-immigrants than immigrants who are in a skill surplus situation. While the reverse is observed in Italy and Hungary, there are about 4 to 7 per cent more non-immigrants than immigrants in a skill surplus situation in the remaining countries. This is not surprising since many immigrants must adapt to and develop the local language which can be crucial for demonstrating literacy skills in the host country's language. Indeed, in countries with high immigration rates, like Canada, New Zealand, Switzerland and the United States, immigrants are found to be more likely to be in a literacy deficit situation than in a literacy surplus situation.

Figure 7.4

Skill mismatch by immigration status

The distribution of skill mismatch, by immigration status and by country, 2003 and 2008



Countries are ranked by the per cent of immigrants in a surplus mismatch situation in the workplace.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

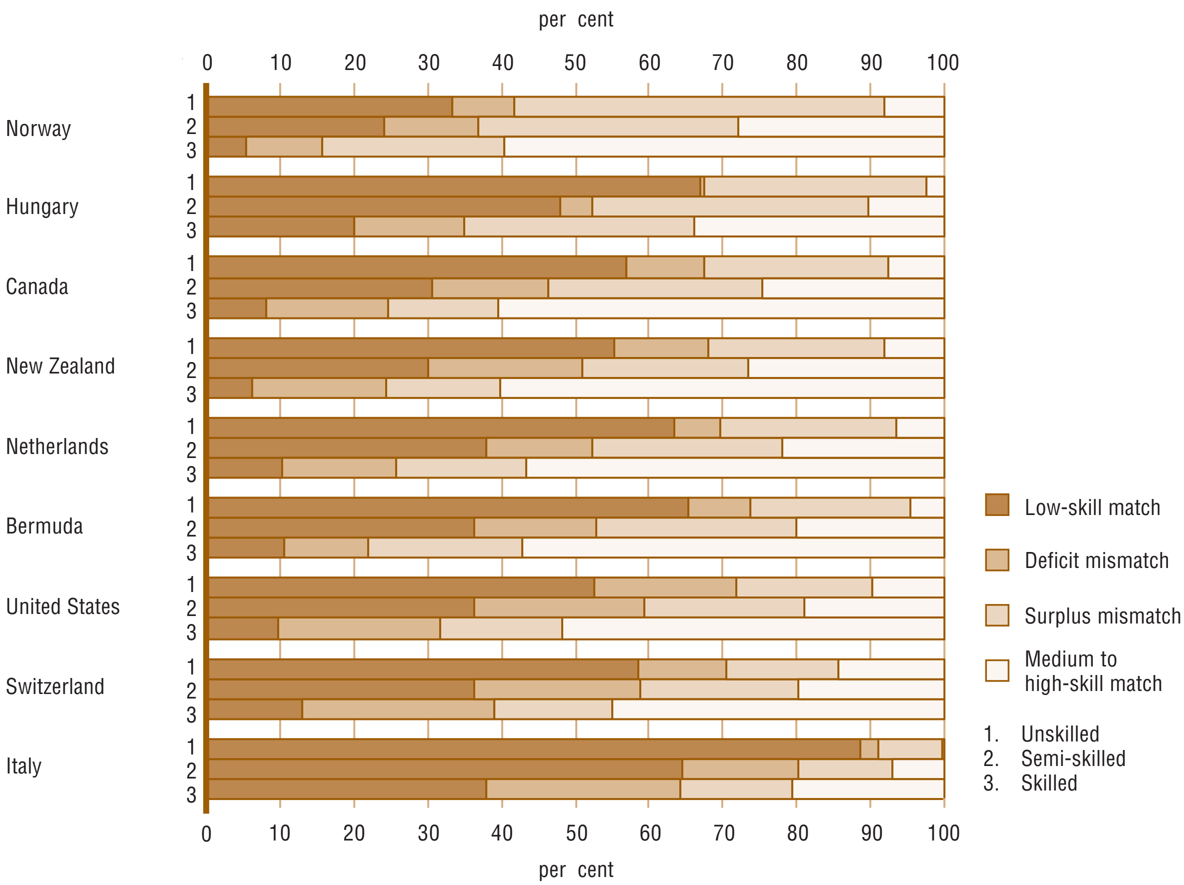
Occupation

Deficits and surpluses are apparent in every country but differences by type of occupation can be sharp. As can be seen from Figure 7.5, the tendency among unskilled occupations is for the proportion of surpluses to outnumber the proportion of deficits. Only in the United States are there as many unskilled workers who are in surplus situation as there are in a deficit situation. Hungary and Norway feature the highest proportion of workers who are in a surplus situation, particularly among the unskilled. In contrast, Italy, Switzerland and the United States feature high deficits in their skilled sectors, with 26, 26 and 22 per cent, respectively of their workers who are in skilled jobs, but score below Level 3 on the prose literacy scale. Deficits in the skilled sector are lowest in Bermuda (11%), Canada (16%), Hungary (15%), the Netherlands (16%) and Norway (10%). Among semi-skilled occupations, deficits are highest in Switzerland (23%), the United States (23%), and New Zealand (21%); and lowest in Hungary (5%), Norway (13%) and the Netherlands (14%).

Figure 7.5

Skill mismatch by occupation

The distribution of skill mismatch, by occupation and by country, 2003 and 2008



Countries are ranked by the per cent of unskilled occupations with adults in a surplus mismatch situation in the workplace.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

7.6 Participation in adult learning and skill mismatch

What is the impact of skill match-mismatch on participation in adult education and training? Previous research suggests that not everyone has equal chances to participate in adult education and training and that this can depend partly on job characteristics (OECD and Statistics Canada, 2000; Tuijnman and Boudard, 2001). Figure 7.6 offers a first glance at how participation rates in adult education and training vary with whether workers are in a skill match or mismatch situation.

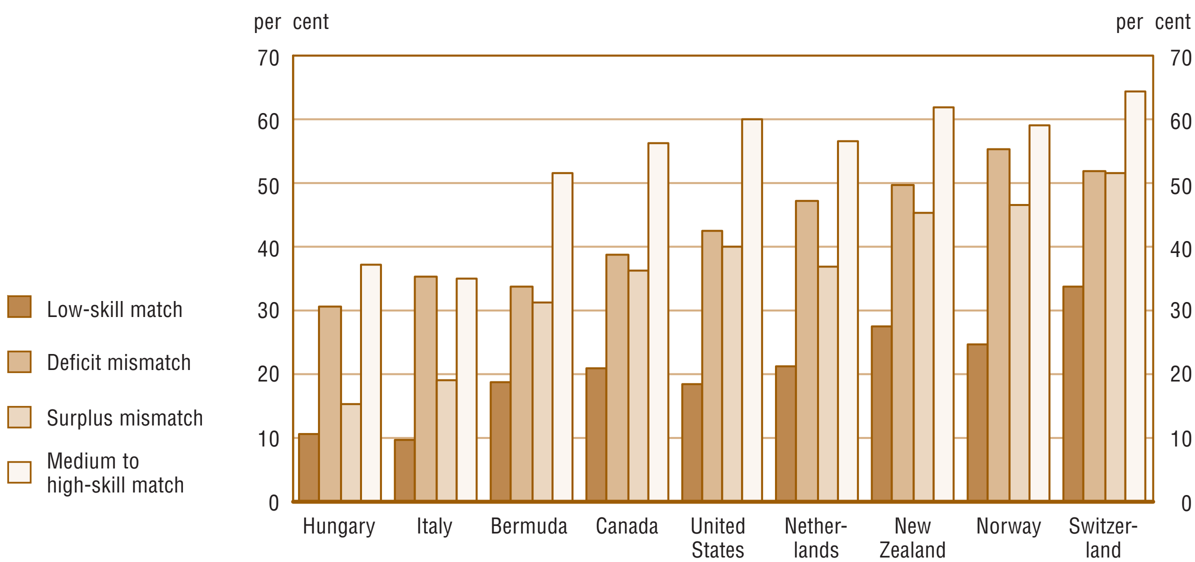
The pattern is more or less consistent. Workers in high-skill matches tend to participate more in adult education on average than any other workers. Countries with the highest participation rates among the medium to high skill match group are Switzerland (64%), New Zealand (62%), the United States (60%), Norway (59%), the Netherlands (57%) and Canada (56%). Those with the lowest participation rates among the medium to high skill match group are Italy (35%) and Hungary (37%). Only in Italy do workers in a deficit situation participate nearly to the same extent as those in medium to high skill match situation (35%). Workers in a skill deficit situation feature the second highest rate of participation followed by those in a surplus situation. The lowest participation rates are among workers in a low skill match situation. Only 10 and 11 per cent of those in a low skill match situation in Italy and Hungary, respectively, participate in adult education. The rate of participation among the low skill match group can reach as high as 34 per cent in Switzerland.

Figure 7.6

Participation and skill mismatch

Per cent of adults aged 16 to 65 years (excluding full time students aged 16 to 24) participating in adult education and training during the 12 months preceding the interview, by match-mismatch categories and by country, 2003 and 2008

A. Participation in any course or programme



Countries are ordered according to their overall participation rate in education and training.

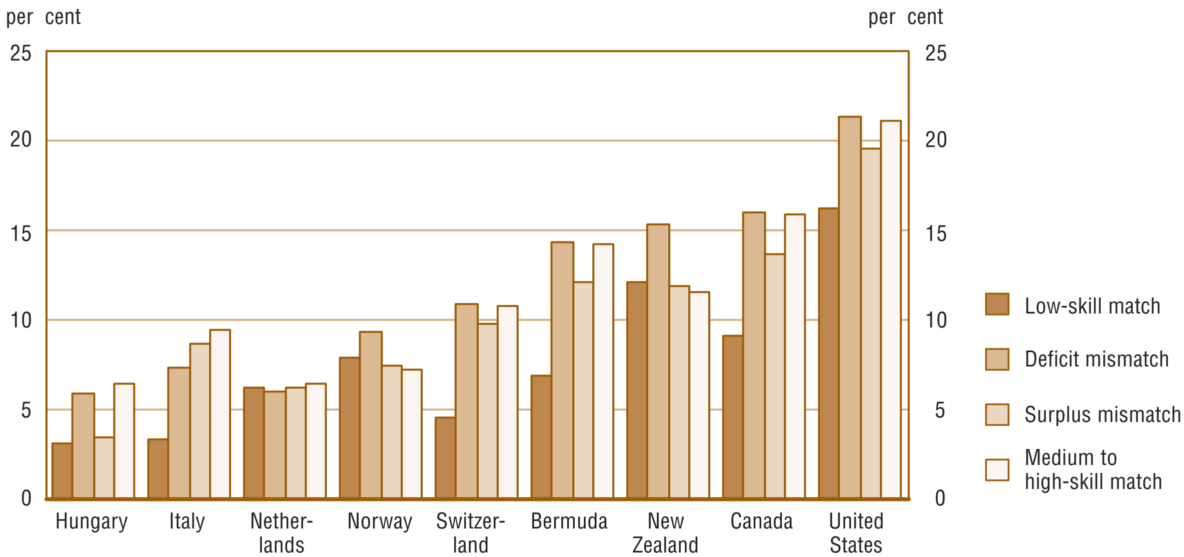
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Figure 7.6 (concluded)

Participation and skill mismatch

Per cent of adults aged 16 to 65 years (excluding full time students aged 16 to 24) participating in adult education and training during the 12 months preceding the interview, by match-mismatch categories and by country, 2003 and 2008

B. Participation in other organized learning activities



Countries are ordered according to their overall participation rate in education and training.

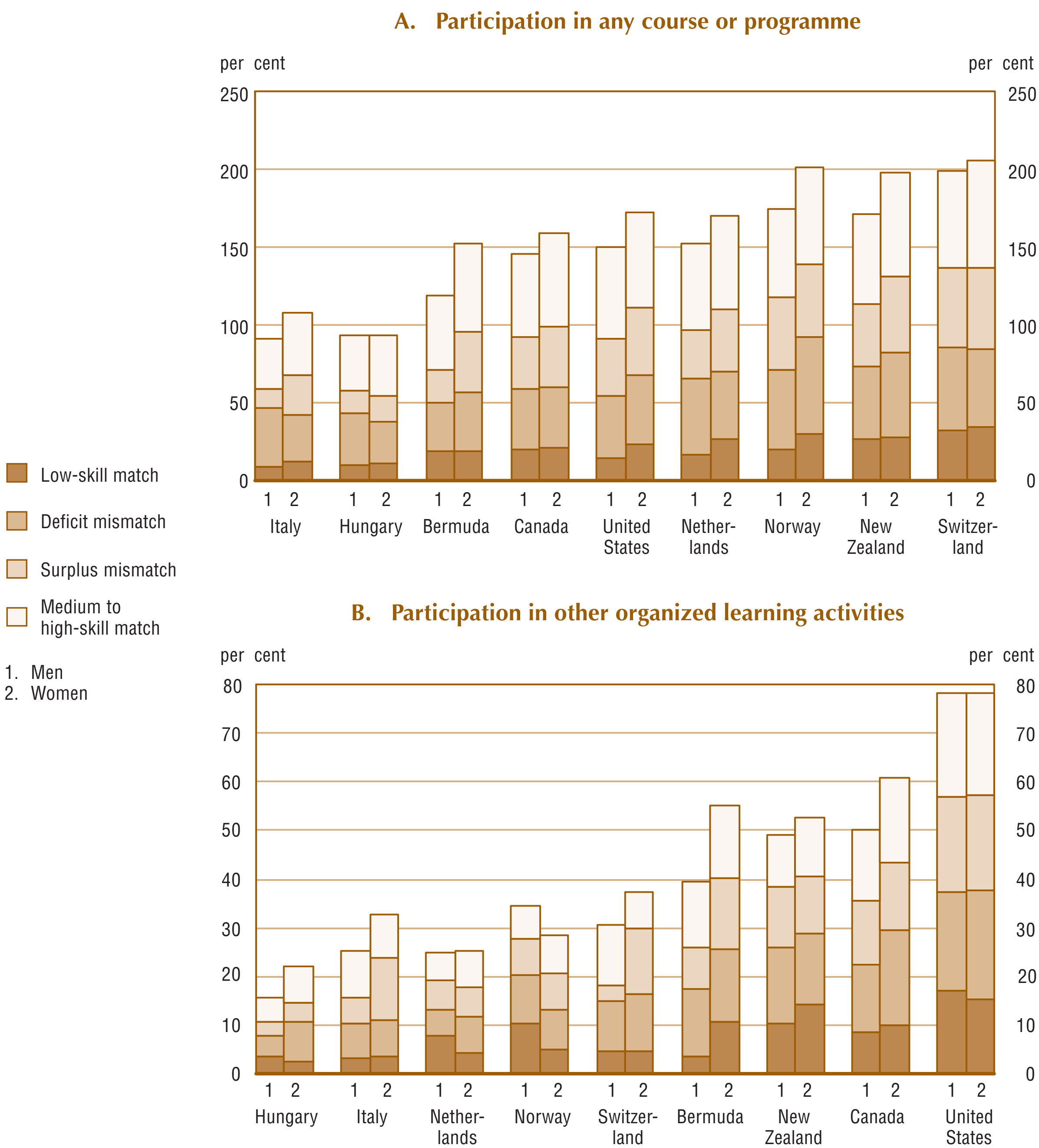
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Gender differences in the participation rates are apparent in every group and country but this does not change the overall pattern. As can be seen from Figure 7.7, there are consistently more women than men in the medium to high skill group who participate in adult education and training, which is consistent with gender differences in the overall participation rate for employed men and women. The difference in the medium to high skill match group can reach as high as 9 to 10 per cent in Bermuda and New Zealand. The same pattern more or less holds for the surplus and low skill match group. While there are no gender differences in the participation rate among the low skill match group for Bermuda and Hungary, differences that are biased towards women can be as high as 9 to 10 per cent in the Netherlands, Norway and the United States, and can be as low as 1 to 3 per cent in Canada, Italy, New Zealand and Switzerland. Similarly, while there are no gender differences in participation rates among the surplus group for Norway and Switzerland, differences that are biased toward women can reach as high as 17 per cent in Bermuda and 13 per cent in Italy. Among the deficit group, men are found to participate more than women in Italy (8% difference), Hungary (6% difference), the Netherlands (5% difference) and Switzerland (4% difference). These latter results are consistent with prior findings which suggest that men more often than women receive employer support for taking up adult education and training (see OECD and Statistics Canada, 2005).

Figure 7.7

Gender, participation and skill mismatch

Per cent of adults aged 16 to 65 years (excluding full time students aged 16 to 24) participating in adult education and training during the 12 months preceding the interview, by gender, by match-mismatch categories, and by country, 2003 and 2008



Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Depending on the fit between the job and the worker, employers as well as the adults themselves may have varying propensities to invest in further education and training. Figures 7.8 and 7.9 present data that allow for a closer look at the sources of financing by skill match-mismatch. Three findings stand out.

First, and not surprisingly, employers display the highest propensity to invest in workers who are in medium to high skill matches. This is followed by those in deficit situations, surplus situations and low-skill matched situations. Although the magnitude of propensities varies by country, the overall patterns are rather consistent. The adjusted odds ratios presented in Figure 7.9 support this conclusion. The adjusted results reveal, however, that in Italy and Norway, workers in deficit situations benefit the most from employer financing for further education and training.

Second, self financing is concentrated among workers who are in a surplus or medium to high skill match situation. Adjusted odds ratios confirm that workers in medium to high skill matches display the highest propensity to finance their own investment in adult education and training, followed by those in surplus situations, deficit situations and low-skill matched situations, respectively. This finding is consistent with prior research which suggests that private sources of investment in adult education tend to be concentrated among those who already have comparatively high levels of skill.

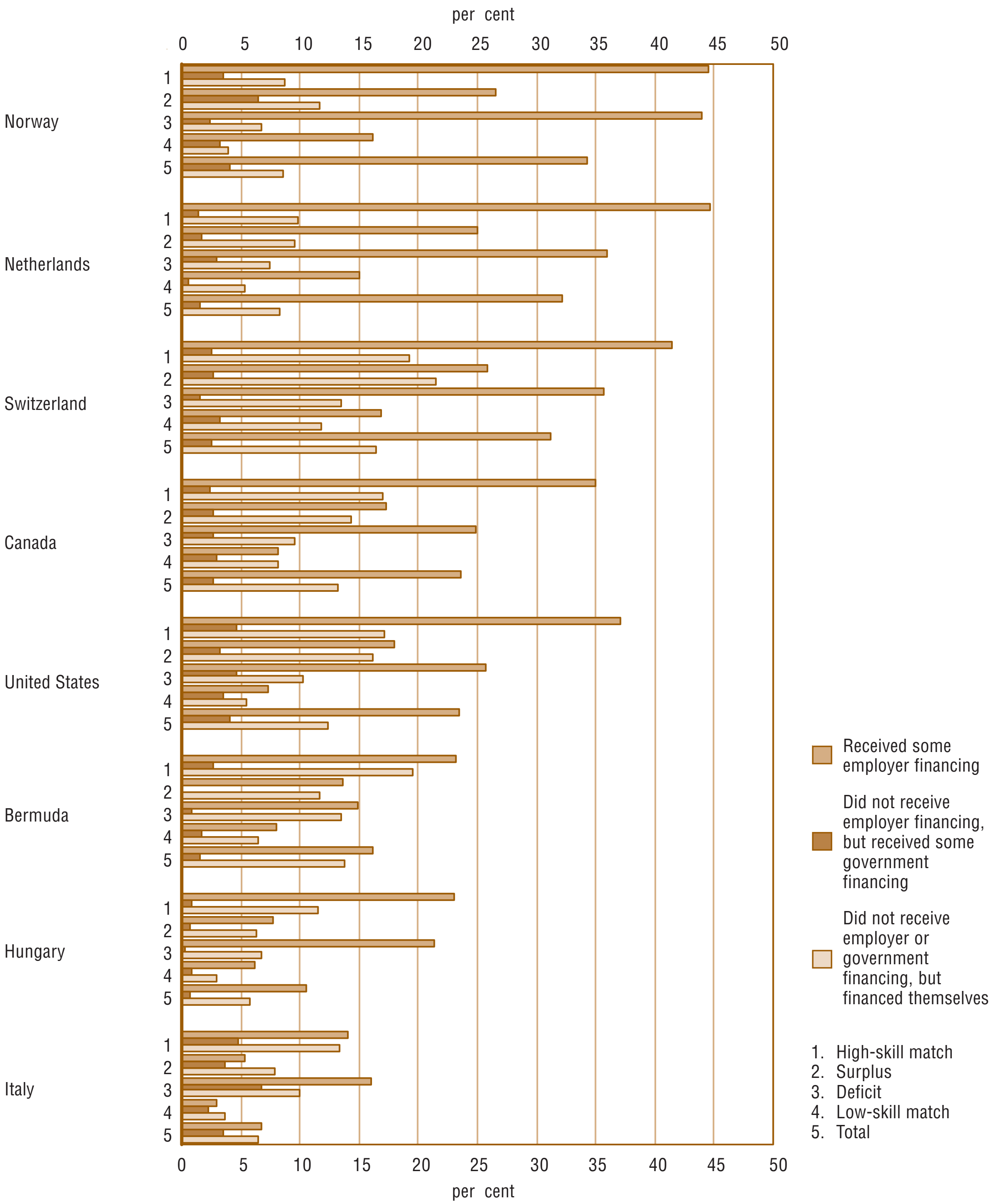
Employers have also been found to direct investment in training to those who are either already skilled, or more educated, and hence often deemed by the employer to be more trainable or efficient trainees (see for example, OECD and Statistics Canada, 2005). The data presented in Figure 7.9, however, suggest that the pattern is more complex. While the combined level of employer support directed to workers in a medium to high skill match and surplus situation exceed the employer support given to the deficit group, the latter in fact tends to attract more employer support than the surplus group. This makes sense since employers stand to benefit from productivity gains by directing support to those who need it most, namely workers in the deficit group.

Third, results presented in Figures 7.8 and 7.9 suggest that government financing appears to reach at least as much those in medium to high skill matched situations as well as those in surplus situations. This is consistent with findings that reliance on market based approaches and performance criteria used to allocate funding for targeted strategies may end up benefiting those who already have the most skills because they are most likely to succeed (Rubenson and Desjardins, 2009).

Figure 7.8

Participation, source of financing and skill mismatch

Per cent of adults aged 16 to 65 years (excluding full time students aged 16 to 24) receiving adult education and training during the 12 months preceding the interview, by source of financing,by match-mismatch categories, and by country, 2003 and 2008

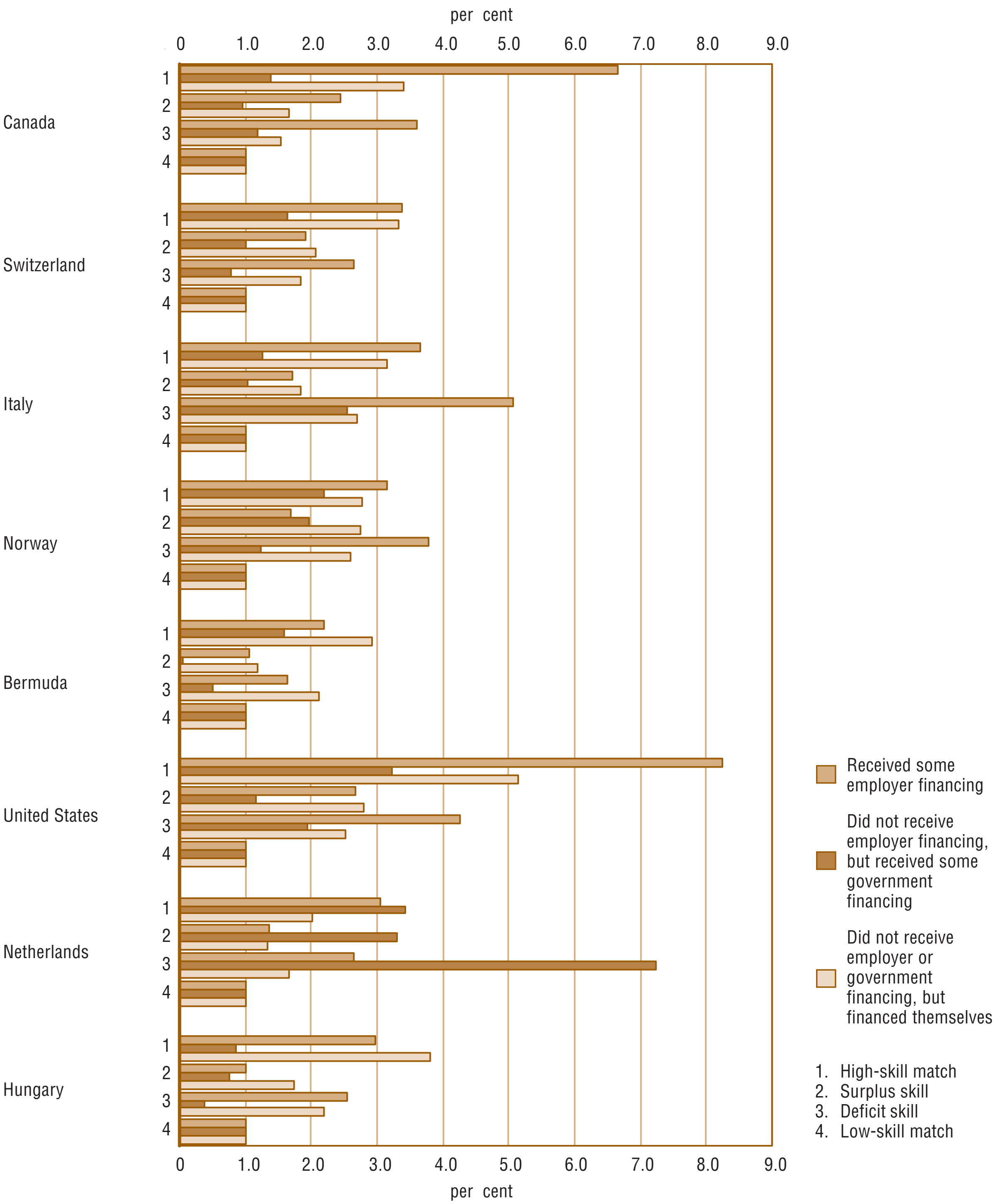


Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Figure 7.9

Effect of match-mismatch on participation in adult education

Adjusted odds ratios of adults aged 16 to 65 years (excluding full time students aged 16 to 24) receiving adult education and training during the 12 months preceding the interview, by match-mismatch, by type of financing, and by country, 2003 and 2008



Note: Adjusted for age, sex, education, occupational type, and firm size.
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

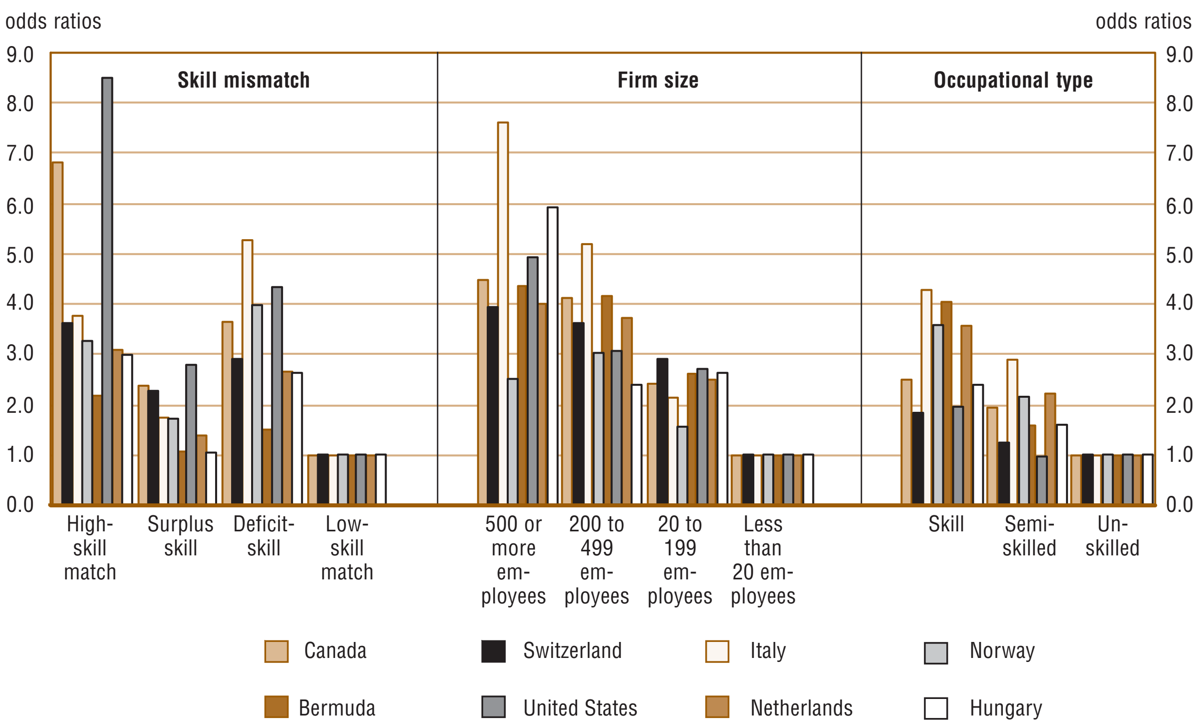
Results of a more detailed data analysis that examined the determinants of receiving employer support for participating in adult education and training are presented in Figure 7.10.1. Being in a medium to high skill match or deficit situation ranks among the strongest determinants of receiving employer financed adult education. The effect associated with the former category is very strong in Canada and the United States. It is important to note that both these categories (medium to high skill match and deficit) reflect medium to high engagement in reading practices at work, which are characteristics attached to the nature of the job. Other important determinants known from previous research are typically firm size, initial educational attainment and age, all of which are shown to also have an important relationship with participation in Figure 7.10.2. In Italy, working in a large firm is the most important determinant of receiving employer financed adult education.

Together these findings support the notion that employer support for adult education is a function of favourable job characteristics (i.e., high skill job tasks, large firm) first and foremost, but that individuals with favourable individual characteristics (i.e., highly skilled) combined with favourable job characteristics (i.e., high demand for skill) benefit the most. But this is not necessarily the case in all countries. Employers in Italy and Norway seem to target skill deficiency comparatively more.

Figure 7.10.1

Determinants of participation in employer financed adult learning

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 (excluding full time students aged 16 to 24) receiving employer financed adult education and training during the 12 months preceding the interview, by various determinants, and by country, 2003 and 2008

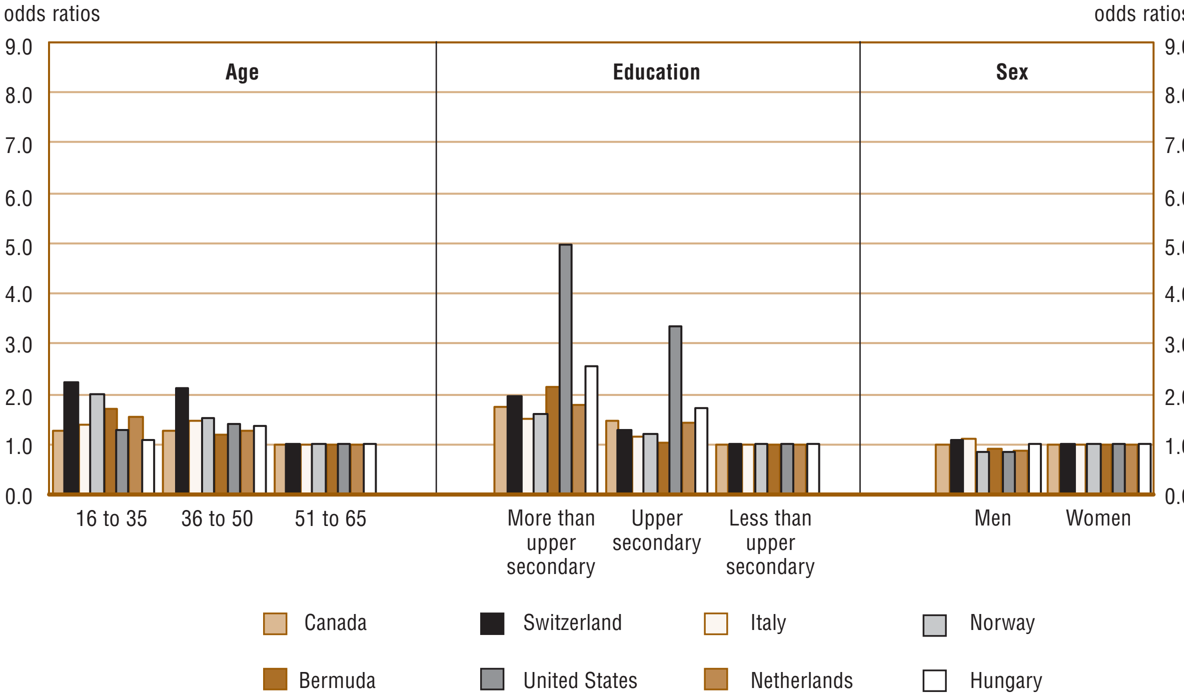


Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Figure 7.10.2

Determinants of participation in employer financed adult learning

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 (excluding full time students aged 16 to 24) receiving employer financed adult education and training during the 12 months preceding the interview, by various determinants, and by country, 2003 and 2008



Note: Adjusted for age, sex, education, occupational type, and firm size.
Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Conclusion

Literacy skills are not only a function of initial schooling but also reflect a wide range of other factors including, not least, work practices such as engagement in literacy related tasks (see Desjardins, 2004). Much attention has been focused on skills deficits in recent years but skill surpluses can also be substantial. A lack of skill use in the workplace can be detrimental to the development and maintenance of individual and national skill profiles. Thus the demand for, and use of, skills should not be taken for granted. In general, much less thought has been given to how a lack in demand for skill in the labour market restricts large population groups from engaging in value added production and the further development of skills through flexible adult learning.

Skill mismatch in the labour market is in the order of about 30 to 40 per cent. This is based on a methodology that categorises workers into four groups (high-skill match, low skill match, surplus mismatches, and deficit mismatches). Deficit and surplus mismatch range from 10 to 30 per cent, depending on the country. High rates of mismatch suggest a need for adjustment; in particular, the need for an increased effort to train or retrain persons in deficit situations. Likewise, while high levels of surplus are good for growing knowledge economies, a lack of use in the workplace may lead to skill loss.

Skill surpluses tend to be concentrated among younger age cohorts as well as women and non-immigrants. The former is linked to entry level positions and temporary, often low skill jobs that many youth and students take up early in their life careers. Women however, are a traditionally disadvantaged group more generally, but not least in labour markets, which may point to more systematic under-utilisation of skills based on other allocation mechanisms operating in the labour market.

Finally, skill match-mismatch is found to have a strong link to the incidence of participation in adult education and training as well as to the sources of financing that support such participation. More generally, private sources of financing tend to be directed toward groups that already have high levels of skills, namely the high-skill match and surplus groups. But findings presented in this chapter indicate that employers in fact direct their financial support to workers in a deficit situation more often than those in a surplus situation. In most countries, public sources of financing are found to be reaching those who already have high levels of skills more than those who need it most, namely the low-skilled.

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Annex 7

Data Values for the Figures

Table 7.1

The distribution of skill mismatch, by country, 2003 and 2008

	Demand: Characteristics of jobs		Supply: Characteristics of workers		Market outcome		Match	Mismatches		Match
	Low skill jobs	Medium to high-skill jobs	Low skill workers	Medium to high-skill workers	Matches	Mis-matches	Low-skill match	Deficit mismatch	Surplus mismatch	Medium to high-skill match
	per cent				per cent					
Canada	46	54	39	61	62	38	23	16	23	38
Switzerland	43	57	49	51	58	42	25	24	18	33
Italy	72	28	76	24	69	31	58	18	13	11
Norway	49	51	29	71	57	43	18	12	32	39
Bermuda	47	53	37	63	64	36	24	13	23	40
United States	45	55	48	52	59	41	26	22	19	33
New Zealand	42	58	41	59	61	39	22	19	20	39
Netherlands	47	53	39	61	64	36	25	14	21	39
Hungary	77	23	49	51	58	42	42	7	35	16

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 7.2

The distribution of skill mismatch, by gender and by country, 2003 and 2008

	Low-skill match	Deficit mismatch	Surplus mismatch	Medium to high-skill match
	per cent			
Canada				
Men	24	18	19	38
Women	22	13	27	38
Switzerland				
Men	21	27	12	40
Women	30	20	25	26
Italy				
Men	59	18	12	11
Women	57	16	16	11
Norway				
Men	19	13	26	42
Women	16	10	38	36
Bermuda				
Men	25	16	20	40
Women	24	10	27	40
United States				
Men	26	24	16	34
Women	26	20	23	31
New Zealand				
Men	23	21	16	40
Women	22	17	23	38
Netherlands				
Men	25	17	16	43
Women	26	11	28	35
Hungary				
Men	47	8	31	15
Women	37	6	39	18

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 7.3

The distribution of skill mismatch, by age group and by country, 2003 and 2008

	Low-skill match	Deficit mismatch	Surplus mismatch	Medium to high-skill match
	per cent			
Canada				
16 to 35	22	12	31	35
36 to 50	22	18	17	43
51 to 65	29	18	17	36
Switzerland				
16 to 35	24	20	22	34
36 to 50	22	23	17	39
51 to 65	31	32	13	24
Italy				
16 to 35	54	18	16	13
36 to 50	60	17	12	11
51 to 65	63	19	11	7
Norway				
16 to 35	13	7	41	38
36 to 50	16	13	27	44
51 to 65	27	18	21	34
Bermuda				
16 to 35	18	13	29	40
36 to 50	25	12	20	43
51 to 65	35	15	19	31
United States				
16 to 35	30	19	23	27
36 to 50	23	25	16	36
51 to 65	23	24	16	37
New Zealand				
16 to 35	27	17	24	31
36 to 50	17	20	17	45
51 to 65	21	21	16	42
Netherlands				
16 to 35	23	10	28	39
36 to 50	23	16	19	43
51 to 65	33	19	15	33
Hungary				
16 to 35	38	6	39	17
36 to 50	45	7	33	16
51 to 65	46	8	30	16

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 7.4

The distribution of skill mismatch, by immigration status and by country, 2003 and 2008

	Low-skill match	Deficit mismatch	Surplus mismatch	Medium to high-skill match
	per cent			
Canada				
Immigrant	38	20	13	30
Non-immigrant	20	15	25	41
Switzerland				
Immigrant	37	28	14	22
Non-immigrant	22	23	19	36
Italy				
Immigrant	47	21	17	15
Non-immigrant	58	18	13	11
Norway				
Immigrant	34	10	27	29
Non-immigrant	16	12	32	40
Bermuda				
Immigrant	18	10	21	52
Non-immigrant	27	14	24	35
United States				
Immigrant	48	24	7	21
Non-immigrant	23	22	21	34
New Zealand				
Immigrant	24	23	17	36
Non-immigrant	22	18	21	40
Netherlands				
Immigrant	56	13	15	16
Non-immigrant	23	14	22	41
Hungary				
Immigrant	29	2	44	25
Non-immigrant	42	7	35	16

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 7.5

The distribution of skill mismatch, by occupation and by country, 2003 and 2008

	Low-skill match	Deficit mismatch	Surplus mismatch	Medium to high-skill match
	per cent			
Canada				
Skilled	8	16	15	60
Semi-skilled	31	16	29	25
Unskilled	57	10	25	8
Switzerland				
Skilled	13	26	16	45
Semi-skilled	36	23	21	20
Unskilled	58	12	15	14
Italy				
Skilled	38	26	15	21
Semi-skilled	65	16	13	7
Unskilled	88	3	9	0
Norway				
Skilled	5	10	25	60
Semi-skilled	24	13	35	28
Unskilled	33	8	50	8
Bermuda				
Skilled	11	11	21	57
Semi-skilled	36	16	27	20
Unskilled	65	8	22	5
United States				
Skilled	10	22	17	52
Semi-skilled	36	23	22	19
Unskilled	53	19	19	10
New Zealand				
Skilled	6	18	15	60
Semi-skilled	30	21	22	27
Unskilled	55	13	24	8
Netherlands				
Skilled	10	16	18	57
Semi-skilled	38	14	26	22
Unskilled	63	6	24	7
Hungary				
Skilled	20	15	31	34
Semi-skilled	48	5	37	10
Unskilled	67	0	30	3

0 true zero or a value rounded to zero

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 7.6

Per cent of adults aged 16 to 65 (excluding full time students aged 16 to 24) receiving adult education and training during the 12 months preceding the interview, by match-mismatch categories, by country, 2003 and 2008

	A. Participation in any course or programme					B. Participation in other organized learning activities				
	Low-skill match	Deficit mismatch	Surplus mismatch	Medium to high-skill match	**Total**	Low-skill match	Deficit mismatch	Surplus mismatch	Medium to high-skill match	**Total**
	per cent					per cent				
Canada	21	39	36	56	41	9	16	14	16	14
Switzerland	34	52	52	64	**52**	5	11	10	11	**9**
Italy	10	35	19	35	**18**	3	7	9	9	**5**
Norway	25	55	47	59	**49**	8	9	8	7	**8**
Bermuda	19	34	31	52	**37**	7	14	12	14	**12**
United States	19	43	40	60	**42**	16	21	20	21	**20**
New Zealand	27	50	45	62	**49**	12	15	12	12	**13**
Netherlands	21	47	37	57	**43**	6	6	6	6	**6**
Hungary	11	31	15	37	**18**	3	6	3	7	**4**

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 7.7

Per cent of adults aged 16 to 65 (excluding full time students aged 16 to 24) receiving adult education and training during the 12 months preceding the interview, by gender, by match-mismatch categories, by country, 2003 and 2008

	A. Participation in any course or programme					B. Participation in other organized learning activities				
	Low-skill match	Deficit mismatch	Surplus mismatch	Medium to high-skill match	**Total**	Low-skill match	Deficit mismatch	Surplus mismatch	Medium to high-skill match	**Total**
	per cent					per cent				
Canada										
Men	20	39	33	54	**40**	9	14	13	15	**13**
Women	22	39	39	59	**43**	10	20	14	17	**15**
Switzerland										
Men	32	53	52	62	**52**	5	11	3	13	**9**
Women	35	50	52	69	**51**	5	12	14	8	**9**
Italy										
Men	8	38	13	32	**17**	3	7	5	10	**5**
Women	12	30	26	40	**20**	4	8	13	9	**6**
Norway										
Men	20	51	46	58	**47**	10	10	8	7	**8**
Women	31	62	47	61	**51**	5	8	7	8	**7**
Bermuda										
Men	19	31	22	47	**33**	4	14	9	14	**10**
Women	19	38	39	57	**41**	11	15	15	15	**14**
United States										
Men	14	40	37	59	**40**	17	21	19	21	**20**
Women	23	45	43	62	**44**	15	22	20	21	**19**
New Zealand										
Men	27	46	40	58	**46**	10	16	13	11	**12**
Women	28	54	49	66	**52**	14	14	11	13	**13**
Netherlands										
Men	17	49	31	55	**41**	8	5	6	6	**6**
Women	26	44	40	59	**44**	4	7	6	7	**6**
Hungary										
Men	10	33	14	36	**17**	3	4	3	5	**4**
Women	11	27	16	39	**19**	3	8	4	8	**4**

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 7.8

Per cent of adults aged 16 to 65 years (excluding full time students aged 16 to 24) receiving adult education and training during the 12 months preceding the interview, by source of financing, by match-mismatch categories, and by country, 2003 and 2008

	Low-skill match	Deficit mismatch	Surplus mismatch	Medium to high-skill match	Overall
	per cent				
A. Multiple sources of financing					
Canada					
Employer financed	8	25	17	35	24
Government financed	3	3	3	3	3
Self financed	9	11	17	21	16
Other financing	2	2	3	3	2
Switzerland					
Employer financed	17	36	26	41	31
Government financed	4	5	4	3	4
Self financed	15	22	30	30	24
Other financing	3	4	2	3	3
Italy					
Employer financed	3	16	5	14	7
Government financed	2	7	4	5	4
Self financed	4	10	8	16	7
Other financing	1	3	3	4	2
Norway					
Employer financed	16	44	27	44	34
Government financed	4	3	8	5	5
Self financed	6	9	15	13	12
Other financing	2	3	3	4	3
Bermuda					
Employer financed	8	14	13	21	15
Government financed	2	1	2	3	2
Self financed	7	14	13	21	15
Other financing	1	2	3	3	2
United States					
Employer financed	7	26	18	37	24
Government financed	4	6	4	6	5
Self financed	6	12	20	23	16
Other financing	2	2	4	2	2
Netherlands					
Employer financed	15	36	25	45	32
Government financed	1	3	2	2	2
Self financed	6	9	11	12	10
Other financing	1	1	1	1	1
Hungary					
Employer financed	6	21	8	23	11
Government financed	1	1	1	1	1
Self financed	3	11	8	15	7
Other financing	1	3	1	2	1

Table 7.8 (continued)

Per cent of adults aged 16 to 65 years (excluding full time students aged 16 to 24) receiving adult education and training during the 12 months preceding the interview, by source of financing, by match-mismatch categories, and by country, 2003 and 2008

	Low-skill match	Deficit mismatch	Surplus mismatch	Medium to high-skill match	Overall
			per cent		
B. Mutually exclusive source of financing by priority: employer, government, self, other					
Canada					
Received some employer financing	8	25	17	35	24
Did not receive employer financing, but received some government financing	3	3	3	2	3
Did not receive employer or government financing, but financed themselves	8	10	14	17	13
Did not receive employer or government financing, nor self financing, but other source	2	2	2	2	2
Switzerland					
Received some employer financing	17	36	26	41	31
Did not receive employer financing, but received some government financing	3	2	3	3	3
Did not receive employer or government financing, but financed themselves	12	14	22	19	16
Did not receive employer or government financing, nor self financing, but other source	2	1	2	1	1
Italy					
Received some employer financing	3	16	5	14	7
Did not receive employer financing, but received some government financing	2	7	4	5	4
Did not receive employer or government financing, but financed themselves	4	10	8	13	6
Did not receive employer or government financing, nor self financing, but other source	1	3	2	3	1
Norway					
Received some employer financing	16	44	27	45	34
Did not receive employer financing, but received some government financing	3	2	6	4	4
Did not receive employer or government financing, but financed themselves	4	7	12	9	9
Did not receive employer or government financing, nor self financing, but other source	1	2	2	2	2
Bermuda					
Received some employer financing	8	15	14	23	16
Did not receive employer financing, but received some government financing	2	1	0	3	2
Did not receive employer or government financing, but financed themselves	7	14	12	20	14
Did not receive employer or government financing, nor self financing, but other source	0	2	2	2	1

Table 7.8 (concluded)

Per cent of adults aged 16 to 65 years (excluding full time students aged 16 to 24) receiving adult education and training during the 12 months preceding the interview, by source of financing, by match-mismatch categories, and by country, 2003 and 2008

	Low-skill match	Deficit mismatch	Surplus mismatch	Medium to high-skill match	Overall
	per cent				
United States					
Received some employer financing	7	26	18	37	24
Did not receive employer financing, but received some government financing	4	5	3	5	4
Did not receive employer or government financing, but financed themselves	6	10	16	17	12
Did not receive employer or government financing, nor self financing, but other source	2	2	3	1	2
Netherlands					
Received some employer financing	15	36	25	45	32
Did not receive employer financing, but received some government financing	1	3	2	1	2
Did not receive employer or government financing, but financed themselves	5	8	10	10	8
Did not receive employer or government financing, nor self financing, but other source	1	1	1	1	1
Hungary					
Received some employer financing	6	21	8	23	11
Did not receive employer financing, but received some government financing	1	0	1	1	1
Did not receive employer or government financing, but financed themselves	3	7	6	12	6
Did not receive employer or government financing, nor self financing, but other source	0	2	1	2	1

0 true zero or a value rounded to zero

Notes: No data were collected on financing sources for participation in “other” adult education and training.
New Zealand did not collect and record data on financing sources in a consistent and reliable way.

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 7.9

Adjusted odds ratios of adults aged 16 to 65 years (excluding full time students aged 16 to 24) receiving adult education and training during the 12 months preceding the interview, by match-mismatch, by type of financing, and by country, 2003 and 2008

	Received some employer financing	Did not receive employer financing, but received some government financing	Did not receive employer or government financing, but financed themselves
	per cent		
Canada			
High-skill match	6.7***	1.4**	3.4***
Surplus skill	2.4***	0.9	1.7***
Deficit skill	3.6***	1.2	1.5***
Low-skill match	1.0	1.0	1.0
Switzerland			
High-skill match	3.4***	1.6	3.3***
Surplus skill	1.9***	1.0	2.1***
Deficit skill	2.7***	0.8	1.8***
Low-skill match	1.0	1.0	1.0
Italy			
High-skill match	3.7***	1.3	3.1***
Surplus skill	1.7**	1.0	1.8***
Deficit skill	5.1***	2.6***	2.7***
Low-skill match	1.0	1.0	1.0
Norway			
High-skill match	3.2***	2.2***	2.8***
Surplus skill	1.7***	2.0**	2.7***
Deficit skill	3.8***	1.2	2.6***
Low-skill match	1.0	1.0	1.0
Bermuda			
High-skill match	2.2***	1.6	2.9***
Surplus skill	1.1	0.1**	1.2
Deficit skill	1.6 *	0.5	2.1***
Low-skill match	1.0	1.0	1.0
United States			
High-skill match	8.2***	3.2***	5.1***
Surplus skill	2.7***	1.2	2.8***
Deficit skill	4.3***	1.9**	2.5***
Low-skill match	1.0	1.0	1.0
Netherlands			
High-skill match	3.0***	3.4**	2.0***
Surplus skill	1.4**	3.3**	1.3
Deficit skill	2.6***	7.2***	1.7**
Low-skill match	1.0	1.0	1.0
Hungary			
High-skill match	3.0***	0.9	3.8***
Surplus skill	1.0	0.8	1.8***
Deficit skill	2.6***	0.4	2.2**
Low-skill match	1.0	1.0	1.0

* p<0.10, statistically significant at the 10 per cent level

** p<0.05, statistically significant at the 5 per cent level

*** p<0.01, statistically significant at the 1 per cent level

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Table 7.10

Adjusted odds ratios showing the likelihood of adults aged 16 to 65 (excluding full time students aged 16 to 24) receiving employer financed adult education and training during the 12 months preceding the interview, by various determinants, and by country, 2003 and 2008

	Canada	Switzer-land	Italy	Norway	Bermuda	United States	Nether-lands	Hungary
	per cent							
Skill mismatch								
High-skill match	6.80***	3.60***	3.76***	3.23***	2.17***	8.46***	3.08***	2.96***
Surplus skill	2.39***	2.23***	1.73**	1.68***	1.08	2.76***	1.39**	1.02
Deficit skill	3.63***	2.88***	5.28***	3.93***	1.51	4.32***	2.64***	2.60***
Low-skill match	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Firm size								
500 or more employees	4.49***	3.89***	7.60***	2.49***	4.38***	4.91***	4.00***	5.88***
200 to 499 employees	4.12***	3.61***	5.18***	3.02***	4.18***	3.05***	3.71***	2.37***
20 to 199 employees	2.42***	2.86***	2.14***	1.55***	2.61***	2.67***	2.48***	2.61***
Less than 20 employees	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Occupational type								
Skilled	2.49***	1.81***	4.30***	3.55***	4.03***	1.93**	3.56***	2.36***
Semi-skilled	1.93***	1.22	2.91**	2.14***	1.57	0.93	2.21***	1.58
Unskilled	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Age								
16 to 35	1.25***	2.21***	1.39	1.98***	1.70***	1.25	1.54***	1.08
36 to 50	1.27***	2.08***	1.45 *	1.50***	1.20	1.37 *	1.27**	1.34
51 to 65	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Education								
More than upper secondary	1.74***	1.92***	1.49	1.57***	2.14**	4.93***	1.77***	2.54***
Upper secondary	1.45***	1.28	1.15	1.19	1.02	3.34***	1.43***	1.69 *
Less than upper secondary	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Sex								
Men	0.98	1.07	1.11	0.83**	0.91	0.82	0.88	0.97
Women	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

* p<0.10, statistically significant at the 10 per cent level

** p<0.05, statistically significant at the 5 per cent level

*** p<0.01, statistically significant at the 1 per cent level

Source: Adult Literacy and Life Skills Survey, 2003 and 2008.

Conclusion

Directions for the future work

The cycle of international comparative assessments of adult foundation skills, began in the early 1990s with the launch of IALS, will not end with the conclusion of the second wave of ALL. The OECD Programme for the International Assessment of Adult Competencies (PIAAC) is designed to continue this line of work.[1] In this context, this concluding chapter not only offers an overview of the main findings presented in this report but also provides a brief presentation of major themes that have emerged from the analysis of IALS and ALL data – themes that will be carried forward and deepened with PIAAC.

Main findings

This report presents comparative results of countries which participated in the second and final wave of ALL in 2007 and 2008, in particular Australia, Hungary, the Netherlands and New Zealand, together with results of countries in the first wave. It also offers a more in-depth presentation of proficiency in numeracy and problem solving than has previously been available and explores the profile and impact of proficiency across the four skill domains assessed. Moreover, it extends the understanding of the portfolio of foundation skills possessed by adults and the interactions and relationships between these skills and their antecedents and outcomes.

In many respects the findings confirm those presented previously in international reports on IALS and ALL.

- The proficiency of the adult population in the foundation skills of literacy, numeracy and problem solving varies widely between and also within countries.
- Much of the differences in the level and distribution of proficiency can be explained by social background, educational attainment and a range of variables relating to use of and engagement with literacy and numeracy and the ways adults lead their lives.

- Significant proportions of the adult population display poor levels of proficiency in one or more of the skill domains assessed and many perform poorly in all domains.
- The differences in the level and distribution of literacy, numeracy and problem solving skills are associated with large differences in economic and social outcomes.
- With some exceptions, the population mean scores in prose and document literacy changed little over the period between the administration of IALS and ALL.
- In several countries the extent of variation in the literacy proficiency of the adult population appears to have decreased during this period. For the most part this is due to improvements in performance among those at the lower end of the literacy skill distributions.
- The proficiency of the adult population is not necessarily consistent across all skill domains assessed. Some countries have strong performance in most domains (the Netherlands, Norway), whereas others show consistently average results (Australia, Canada, New Zealand). The performance of Bermuda and Switzerland fluctuates between the skill domains – they perform well in some domains but below average in others. Adults in Hungary, Italy and the United States have consistently low performance in most skill domains relative to the comparison countries.
- In most countries the mean proficiency scores in prose and document literacy are lower for older age groups than for younger ones, with the steepest decline occurring for the oldest age group. Results for New Zealand are the exception. Here, the prose and document literacy scores of the population aged 16 to 25 years are equivalent to those of the population aged 45 to 65 years.

A feature of this report is that it extends the understanding of the portfolio of foundation skills possessed by adults and the interactions and relationships between these skills and their determinants and outcomes. Two goals of this report are to initiate analysis in these areas and to offer insights and guidance for further work as part of the PIAAC analytical agenda.

Numeracy

Low proficiency in numeracy is widespread among adults. Approximately one third of adults in the participating countries score in the two lowest levels of numeracy proficiency and, in most countries, this is true of at least 50% of the adult population. Numeracy proficiency is positively related to educational attainment and negatively related to the time elapsed since leaving the education system. In all countries except Hungary, women are found to have poorer numeracy skills than men, though their level of disadvantage is lower for younger than for older age groups.

Numeracy proficiency is linked to labour market outcomes. Higher levels of numeracy skill are associated with lower unemployment rates and higher earnings in all countries. The earnings premium for numeracy appears to vary according to the knowledge intensity of occupations, being greater for workers in occupations with high rather than low knowledge intensity.

Problem solving

As in the cases of literacy and numeracy substantial variation exists in the level and distribution of problem solving skills between countries. Problem solving is found to be related to prose literacy. First, individuals require a basic threshold level of literacy if they are to succeed in demonstrating proficiency in problem solving. Second, there is a correlation between proficiency in literacy and problem solving for those adults with literacy above the threshold, although its strength varies between countries.

As expected, problem solving skills are related positively to educational attainment and negatively to age. However, in contrast to the cases of literacy and numeracy, there are no consistent gender differences in problem solving and the effects of education are less consistent.

Problem solving skills are related to individual labour market outcomes, such as employment and income. However, this degree of influence varies by country and depends primarily on the type of occupation.

Performance across skill domains

In all participating countries a large proportion of adults perform poorly in at least one of the skill domains assessed. Even in the best performing countries (the Netherlands and Norway), low performance in at least one skill domain is the reality for over half of the adult population.

A significant proportion of the adult population has low performance in more than one skill domain. In most countries between a third and one half of adults perform at low levels in at least two of the skill domains assessed, with much higher proportions observed in some countries. While increasing levels of educational attainment reduce the chances of low performance in any skill domain, a significant proportion of adults with tertiary level attainment nevertheless performed poorly in two or more skill domains.

Adults who perform poorly in one or more skill domains have increased chances of being unemployed and having low earnings compared to adults without a skill disadvantage. The larger the number of skill domains in which an individual performs poorly the greater is the labour market penalty in terms of pay.

Adults who perform poorly in multiple skill domains are much less likely than good performers to participate in adult learning and interact with Information and Communication Technologies (ICTs) of any kind, despite being among those who apparently need to engage in learning opportunities the most.

Skill match and mismatch

This report has also examined the match between the literacy skills of workers and the intensity of their engagement with literacy-related tasks in their jobs. Depending on the country, between 10% and 30% of the workforce is found to have a literacy 'deficit' relative to the requirements of their jobs. These proportions are found to be similar for literacy 'surplus'. Individuals in deficit and surplus situations co-exist in all countries.

Literacy surpluses tend to be concentrated among younger age cohorts as well as women and immigrants and, thus, may be related to their relatively recent arrival on the labour market.

Interestingly, skills match and mismatch co-vary with participation in adult education and training and the provision of financial support for training by employers. While most training and employer support is directed to workers in situations of high skills match,[2] workers in literacy deficit situations tend to receive more training and more employer support than those in skill surplus situations.

From ALL to PIAAC: Developing the key themes

While there is no plan to undertake further waves of ALL data collection with additional countries, international comparative assessments of adult skills continue with PIAAC. The latter represents a further development of the approach initiated with IALS and ALL. It broadens the range of information collected about adult foundation skills, their antecedents and outcomes, particularly in the following areas.

Foundation skills and human capital

ALL increased the range of available information about adult foundation skills by assessing numeracy and problem solving in addition to the literacy domains measured in IALS. PIAAC will further broaden the data base about the portfolios of foundation skills possessed by population groups by collecting information on a range of generic skills used in work and also non-cognitive attributes.

Foundation skills for the information age

Literacy, numeracy and problem solving skills are increasingly entwined with the use of ICTs. In advanced economies many adults – if not most – access, manipulate and communicate a substantial proportion of the information they use in work and everyday life through ICTs. One of the challenges for assessments of foundation skills is the measurement of how well equipped the adult population is to operate within an ICT-rich environment.

ALL offers some insight into the relationship between foundation skills and familiarity with ICTs. In particular it demonstrates the existence of a significant relationship between literacy proficiency and familiarity with and use of ICTs.

PIAAC is designed to take one step further. Rather than assess ICT as a separate skill domain it focuses on the ability of adults to effectively access, understand, analyse and communicate information using ICT tools and applications. For example, the assessment of literacy in PIAAC includes the reading of electronic texts published on websites (PIAAC Expert Group on Literacy, 2010). More fundamentally, a new skill domain – 'problem solving in technology rich environments' – will be assessed in PIAAC (PIAAC Expert Group in Problem Solving, 2010).

Problem solving in technology rich environments is defined as the use of 'digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks.' This domain is conceived in terms of the solution of 'information problems' – i.e. problems which are themselves largely a consequence of the information environment created by new technologies; the problem solution requires the use of computer-based artefacts (e.g. tools, representational formats, computational procedures);

and/or the problems are related to the handling and maintenance of technology rich environments themselves.

Change in literacy proficiency with time

ALL offers for the first time information about change over time in the literacy proficiency profiles of adults. The evidence on loss of literacy proficiency in a number of countries and no change in others poses challenges given the general increase in the demand for skilled labour in OECD countries.

PIAAC will enlarge the knowledge base about the evolution of adult skills because it is designed to have links to IALS and ALL in the domains of both literacy and numeracy. Of the countries currently participating in PIAAC, 20 participated in either IALS or ALL and seven participated in both previous assessments. Thus information will become available on change in proficiency for a wider range of countries, covering three points in time for some, and providing the first available information on change in numeracy proficiency.

Characteristics of adults with low skills

Large proportions of adults in OECD countries and other advanced economies have low levels of proficiency in key foundation skills. Low levels of skill are closely associated with poor economic and social outcomes for individuals and population groups.

Beyond the fact that low proficiency is pervasive, little is known about the precise characteristics of the deficits of the low skilled population and, therefore, where remedial interventions should focus attention. PIAAC will increase the amount of information available about adults with poor literacy by collecting data about reading component skills. Building on previous Canadian and US work (Grenier et al., 2008) it extends this to a larger international comparative context. The skills tested represent the basic building blocks of reading competence – knowledge of basic print vocabulary and skills in sentence processing and passage fluency (Sabatini and Bruce, 2009).

Skills used in the workplace

ALL provides evidence on the existence of a relatively high incidence of mismatch between the literacy skills possessed by workers and their level of use of these skills on the job. Proficiency in literacy is only one, albeit important, component of the human capital of adults, which encompasses a bundle of skills and attributes. An important question is the extent to which this mismatch is specific to the domain of literacy or reflects a mismatch between the portfolio of skills possessed by workers and what they do in their jobs.

PIAAC will offer new insight regarding the demand for skills. Using an approach derived from the Skills Survey in the United Kingdom (Felstead et al., 2007), information will be collected about the incidence and intensity of use of a broad range of generic skills in the workplace, in addition to the use of literacy, numeracy and problem solving skills.

Endnotes

1. Information regarding PIAAC can be found at www.oecd.org/piaac.
2. Workers with high level literacy skills who work in jobs involving a high level of engagement with literacy.

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Annex A

A Construct-Centered Approach to Understanding What Was Measured in the Adult Literacy and Life Skills (ALL) Survey

Table of contents

A Construct-Centered Approach to Understanding What was Measured in the Adult Literacy and Life Skills (ALL) Survey

Overview

This annex offers a brief overview of the frameworks that were used to develop and interpret the scales used to measure prose and document literacy, numeracy, and problem solving in the Adult Literacy and Life Skills (ALL) survey. The importance of developing a framework is thought to be central in construct-based approaches to measurement. Among the things that should be included in any such framework are an agreed upon definition of what ought to be measured and the identification of characteristics that can be used in the construction and interpretation of tasks. In addition to describing these characteristics for each measure, this annex also includes sample items along with the identification of item features that are shown to contribute to item difficulty. Collectively this information provides a means for moving away from interpreting survey results in terms of discrete tasks or a single number and towards identifying levels of performance sufficiently generalized to have validity across assessments and groups.

Introduction

In 1992, the Organization for Economic Co-operation and Development (OECD) concluded that low literacy levels were a serious threat to economic performance and social cohesion on an international level (OECD, 1992). But a broader understanding of literacy problems across industrialized nations – and consequent lessons for policy makers – was hindered due to a lack of comparable international data. Statistics Canada and Educational Testing Service (ETS) teamed up to build and deliver an international comparative study of literacy.

The International Adult Literacy Survey (IALS) was the first comparative survey of adults designed to profile and explore comparative literacy distributions among participating countries. In 2000, a final report was released (OECD and Statistics Canada, 2000) which included the results from three rounds of assessments involving some 23 country/language groups representing just over 50 per cent of the world's GDP. While IALS laid an important foundation for international comparative surveys of adults, there were also calls to expand what was being measured. There was a growing concern among governments and policy makers as to what additional competencies are relevant for an individual to participate fully and successfully in a modern society and for a society to meet the challenges of a rapidly changing world. One project aimed at addressing this issue was entitled *Definition and Selection of Key Competencies* (DeSeCo) and was carried out under the leadership of Switzerland. Its goal was to lay out, from a theoretical perspective, a set of key competencies that are believed to contribute to a successful life and a well-functioning society (Rychen and Salganik, 2003).

In response to these calls for broader measures, the ALL survey commissioned the development of frameworks to use as the basis for introducing new measures into the comparative assessments of adults. Those responsible for the development of ALL recognized that the design of any reliable and valid instrument should begin with a strong theoretical underpinning that is represented by a framework that characterizes current thinking in the field. According to Messick (1994) any framework that takes a construct-centered approach to assessment design should: begin with a general definition or statement of purpose – one that guides the rationale for the survey and what should be measured in terms of knowledge, skills or other attributes; identify various performances or behaviours that will reveal those constructs, and; identify task characteristics and indicate how these characteristics will be used in constructing the tasks that will elicit those behaviours.

This annex provides an overview of the frameworks used to develop tasks that measure prose and document literacy, numeracy, and problem solving in the ALL survey. In characterizing these frameworks this annex also provides a scheme for understanding the meaning of what has been measured in ALL and for interpreting levels along each of the scales. It borrows liberally from more detailed chapters that were developed in conjunction with the ALL survey (Murray, Clermont and Binkley, in press).

Scaling the literacy, numeracy and problem solving tasks in ALL

The results of the ALL survey are reported along four scales – two literacy scales (prose and document), a single numeracy scale, and a scale capturing problem solving – with each ranging from 0 to 500 points. One might imagine these tasks arranged along their respective scale in terms of their difficulty for adults and the level of proficiency needed to respond correctly to each task. The procedure used in ALL to model these continua of difficulty and ability is Item Response Theory (IRT). IRT is a mathematical model used for estimating the probability that a particular person will respond correctly to a given task from a specified pool of tasks (Murray, Kirsch and Jenkins, 1998).

The scale value assigned to each item results from how representative samples of adults in participating countries perform on each item and is based on the theory that someone at a given point on the scale is equally proficient in all tasks at that point on the scale. For the ALL survey, as for the IALS, proficiency was determined to mean that someone at a particular point on the proficiency scale would have an 80 per cent chance of answering items at that point correctly.

Just as adults within each participating country in ALL are sampled from the population of adults living in households, each task that was constructed and used in the assessment represents a type of task sampled from the domain or construct defined here. Hence, it is representative of a particular type of literacy, numeracy or problem solving task that is associated with adult contexts.

One obvious question that arises once one looks at the distributions of tasks along each of the described scales is, what distinguishes tasks at the lower end of each scale from those in the middle and upper ranges of the scale? Do tasks, that fall around the same place on each scale share some set of characteristics that result in their having similar levels of difficulty? Even a cursory review of the items reveals that tasks at the lower end of each scale differ from those at the higher end.

In an attempt to display this progression of complexity and difficulty, each proficiency scale was divided into levels. Both the literacy and numeracy scales used five levels where Level 1 represents the lowest level of proficiency and Level 5 the highest. These levels are defined as follows: Level 1 (0 to 225), Level 2 (226 to 275), Level 3 (276 to 325), Level 4 (326 to 375) and Level 5 (376 to 500). The scale for problem solving used four levels where Level 1 is the lowest level of proficiency and Level 4 the highest. These four levels are defined as follows: Level 1 (0 to 250), Level 2 (251 to 300), Level 3 (301 to 350), and Level 4 (351 to 500).

Since each level represents a progression of knowledge and skills, individuals within a particular level not only demonstrate the knowledge and skills associated with that level but the proficiencies associated with the lower levels as well. In practical terms, this means that individuals performing at 250 (the middle of Level 2 on one of the literacy or numeracy scales) are expected to be able to perform the average Level 1 and Level 2 tasks with a high degree of proficiency. A comparable point on the problem solving scale would be 275. In ALL, as in IALS, a high degree of proficiency is defined in terms of a response probability of 80 (RP80).[1] This means that individuals estimated to have a particular scale score are expected to perform tasks at that point on the scale correctly with an 80 per cent probability. It also means they will have a greater than 80 per cent chance of performing tasks that are lower on the scale. It does not mean, however, that individuals with given proficiencies can never succeed at tasks with higher difficulty values; they may do so some of the time. It does suggest that their probability of success is "relatively" low – i.e., the more difficult the task relative to their proficiency, the lower the likelihood of a correct response.

An analogy might help clarify this point. The relationship between task difficulty and individual proficiency is much like the high jump event in track and field, in which an athlete tries to jump over a bar that is placed at increasing heights. Each high jumper has a height at which he or she is proficient – that is, the jumper can clear the bar at that height with a high probability of success, and can clear the bar at lower heights almost every time. When the bar is higher than the athlete's level of proficiency, however, it is expected that the athlete will be unable to clear the bar consistently.

Measuring prose and document literacy in ALL

Defining prose and document literacy

The National Adult Literacy Survey (NALS), which was funded by the National Center for Education Statistics (NCES) as part of its overall assessment program in adult literacy, was the largest and most comprehensive study of adult literacy ever conducted in the United States (Kirsch, Jungeblut, Jenkins and Kolstad, 1993). Like all large-scale assessments funded by NCES, NALS was guided by a committee, which was comprised of a group of nationally recognized scholars, practitioners, and administrators who adopted the following definition of literacy:

> *"Literacy is using printed and written information to function in society, to achieve one's goals, and to develop one's knowledge and potential."*

This definition captures the initial work of the committee guiding the development of the assessment and provides the basis for creating other aspects of the framework to be discussed. It was also reviewed and adopted by the countries participating in the first round of IALS and was carried forward in ALL. This definition includes several assumptions made by panel members and, thus, it is important to consider various parts of this definition in turn.

Beginning with "*Literacy is*…", the term literacy is used in preference to "reading" because it is likely to convey more precisely to a non-expert audience what the survey is measuring. "Reading" is often understood as simply decoding, or reading aloud, whereas the intention of the adult surveys is to measure something broader and deeper. Researchers studying literacy within particular contexts noted that different cultures and groups may value different kinds of literacy practices (Sticht, 1975; Heath, 1980; Szwed, 1981). Heath, for example, found that uses for reading could be described in terms of instrumental, social interactional, news-related, memory supportive, substitutes for oral messages, provision of a permanent record, and personal confirmation. The fact that people read different materials for different purposes implies a range of proficiencies that may not be well captured by signing one's name, completing a certain number of years of schooling, or scoring at an 8th-grade level on a test of academic reading comprehension.

The phrase "… *using printed and written information*" draws attention to the fact that panel members view literacy not as a set of isolated skills associated with reading and writing, but more importantly as the application of those skills for specific purposes in specific contexts. When literacy is studied within varying contexts, diversity becomes its hallmark. First, people engage in literacy behaviours for a variety of uses or purposes (Sticht, 1978; Heath, 1980; Cook-Gumperz and Gumperz, 1981; Mikulecky, 1982). These uses vary across contexts (Heath, 1980; Venezky, 1983) and among people within the same context (Kirsch and Guthrie, 1984a). This variation in use leads to an interaction with a broad range of materials that have qualitatively different linguistic forms (Diehl, 1980; Jacob, 1982; Miller, 1982). In some cases, these different types of literacy tasks have been associated with different cognitive strategies or reading behaviours (Sticht, 1978, 1982; Crandall, 1981; Scribner and Cole, 1981; Kirsch and Guthrie, 1984b).

The phrase "… *to function in society, to achieve one's goals, and to develop one's knowledge and potential*" is meant to capture the full scope of situations in which literacy plays a role in the lives of adults, from private to public, from school to work, to lifelong learning and active citizenship. "To achieve one's goals and to develop one's knowledge and potential" points to the view that literacy enables the fulfillment of individual aspirations—those that are defined such as graduation or obtaining a job, and those less defined and less immediate which extend and enrich one's personal life. The phrase "to function in society" is meant to acknowledge that literacy provides individuals with a means of contributing to as well as benefiting from society. Literacy skills are generally recognized as important for nations to maintain or improve their standard of living and to compete in an increasingly global market place. Yet, they are equally as important for individual participation in technologically advancing societies with their formal institutions, complex legal systems, and large government programs.

Identifying task characteristics

The task characteristics represent variables that can be used in a variety of ways in developing an assessment and interpreting the results. Almond and Mislevy (1998) have identified five roles that variables can take on. They can be used to limit the scope of the assessment, characterize the features that should be used for constructing tasks, control the assembly of tasks into booklets or test forms, characterise examinees' performance on or responses to tasks, or help to characterise aspects of competencies or proficiencies. IALS focused on variables that can be used to help in the construction of tasks as well as in the characterization of performance along one or more proficiency scales.

Each task in the assessment represents a piece of evidence about a person's literacy (Mislevy, 2000). While the goal of the assessment will be to develop the best possible picture of an individual's skills and abilities, the test cannot include an infinite number of tasks nor can an infinite number of features of those tasks be manipulated. Therefore, decisions need to be made about which features should be part of the test development process. Three task characteristics were identified and used in the construction of tasks for the IALS. These characteristics include:

Adult contexts/content. Since adults do not read written or printed materials in a vacuum, but read within a particular context or for a particular purpose, materials for the literacy assessment are selected that represent a variety of contexts and contents. This is to help ensure that no one group of adults is either advantaged or disadvantaged due to the context or content included in the assessment. Six adult context/content categories have been identified as follows:

- Home and family: may include materials dealing with interpersonal relationships, personal finance, housing, and insurance.
- Health and safety: may include materials dealing with drugs and alcohol, disease prevention and treatment, safety and accident prevention, first aid, emergencies, and staying healthy.
- Community and citizenship: may include materials dealing with staying informed and community resources.
- Consumer economics: may include materials dealing with credit and banking, savings, advertising, making purchases, and maintaining personal possessions.

- Work: may include materials that deal in general with various occupations but not job specific texts, finding employment, finance, and being on the job.
- Leisure and recreation: may include materials involving travel, recreational activities, and restaurants.

Materials/texts. While no one would doubt that a literacy assessment should include a range of material, what is critical to the design and interpretation of the scores that are produced are the range and specific features of the text material which are included in constructing the tasks. A key distinction among texts that is at the heart of the IALS survey is their classification into continuous and non-continuous texts. Conventionally, continuous texts are formed of sentences organized into paragraphs. In these texts, organization occurs by paragraph setting, indentation, and the breakdown of text into a hierarchy signalled by headings that help the reader to recognize the organization of the text. The primary classification of continuous texts is by rhetorical purpose or text type. For IALS, these included: expository, descriptive, argumentative, and injunctive.

Non-continuous texts are organized differently than continuous texts and so allow the reader to employ different strategies for entering and extracting information from them. On the surface, these texts appear to have many different organizational patterns or formats, ranging from tables and schedules to charts and graphs, and from maps to forms. However, the organizational pattern for these types of texts, which Mosenthal and Kirsch (1998) refer to as documents, is said to have one of four basic structures: a simple list; a combined list; an intersected list; and a nested list. Together, these four types of documents make up what they have called matrix documents, or non-continuous texts with clearly defined rows and columns. They are also closely related to other non-continuous texts that these authors refer to as graphic, locative, and entry documents.

The distinction between continuous and non-continuous texts formed the basis for two of the three literacy scales used in IALS. Continuous texts were the basis for tasks that were placed along the prose scale while non-continuous texts formed the basis for tasks along the document scale. The quantitative scale included texts that were both continuous and non-continuous. The distinguishing characteristic for this scale was that respondents needed to identify and perform one or more arithmetic operations based on information contained in the texts. This scale was replaced in ALL with the numeracy scale, which is discussed in more detail later in this annex.

Processes/strategies. This task characteristic refers to the way in which examinees process text to respond correctly to a question or directive. It includes the processes used to relate information in the question (the given information) to the necessary information in the text (the new information) as well as the processes needed to either identify or construct the correct response from the information available. Three variables used to investigate tasks from national and international surveys will be summarized here. These are: type of match, type of information requested, and plausibility of distracting information.

Type of match

Four types of matching strategies were identified: locating, cycling, integrating, and generating. *Locating* tasks require examinees to match one or more features of information stated in the question to either identical or synonymous information provided in the text. *Cycling* tasks also require examinees to match one or more features of information, but unlike locating tasks, they require respondents to engage in a series of feature matches to satisfy conditions stated in the question.

Integrating tasks require examinees to pull together two or more pieces of information from the text according to some type of specified relation. For example, this relation might call for examinees to identify similarities (i.e., make a comparison), differences (i.e., contrast), degree (i.e., smaller or larger), or cause-and-effect relations. This information may be located within a single paragraph or it may appear in different paragraphs or sections of the text. In integrating information, examinees draw upon information categories provided in a question to locate the corresponding information in the text. They then relate the text information associated with these different categories based upon the relation term specified in the question. In some cases, however, examinees must *generate* these categories and/or relations before integrating the information stated in the text.

In addition to requiring examinees to apply one of these four strategies, the type of match between a question and the text is influenced by several other processing conditions which contribute to a task's overall difficulty. The first of these is the number of phrases that must be used in the search. Task difficulty increases with the amount of information in the question for which the examinee must search in the text. For instance, questions that consist of only one independent clause tend to be easier, on average, than those that contain several independent or dependent clauses. Difficulty also increases with the number of responses that examinees are asked to provide. Questions that request a single answer are easier than those that require three or more answers. Further, questions which specify the number of responses tend to be easier than those that do not. For example, a question which states, "List the 3 reasons…" would be easier than one which said, "List the reasons…". Tasks are also influenced by the degree to which examinees have to make inferences to match the given information in a question to corresponding information in the text, and to identify the requested information.

Type of information requested

This refers to the kinds of information that readers need to identify to answer a test question successfully. The more concrete the requested information, the easier the task is judged to be. In previous research based on large-scale assessments of adults' and children's literacy (Kirsch and Mosenthal, 1994; Kirsch, Jungeblut, and Mosenthal, 1998), the type of information variable was scored on a 5-point scale. A score of one represented information that was the most concrete and therefore the easiest to process, while a score of five represented information that was the most abstract and therefore the most difficult to process.

For instance, questions which asked examinees to identify a person, animal, or thing (i.e., imaginable nouns) were said to request highly concrete information and were assigned a value of one. Questions asking respondents to identify goals, conditions, or purposes were said to request more abstract types of information. Such tasks were judged to be more difficult and received a value of three. Questions that required examinees to identify an "equivalent" were judged to be the most abstract and were assigned a value of five. In such cases, the equivalent tended to be an unfamiliar term or phrase for which respondents had to infer a definition or interpretation from the text.

Plausibility of distractors

This concerns the extent to which information in the text shares one or more features with the information requested in the question but does not fully satisfy what has been requested. Tasks are judged to be easiest when no distractor information is present in the text. They tend to become more difficult as the number of distractors increases, as the distractors share more features with the correct response, and as the distractors appear in closer proximity to the correct response. For instance, tasks tend to be judged more difficult when one or more distractors meet some but not all of the conditions specified in the question and appear in a paragraph or section of text other than the one containing the correct answer. Tasks are judged to be most difficult when two or more distractors share most of the features with the correct response and appear in the same paragraph or node of information as the correct response.

Characterizing prose literacy tasks

There are 55 tasks ordered along the 500-point prose literacy scale representing 19 IALS prose literacy tasks and 36 new prose literacy tasks designed and developed for the ALL survey. These tasks range in difficulty value from 169 to 439. One of the easiest tasks (receiving a difficulty value of 188 and falling in Level 1) directs the reader to look at a medicine label to determine the "maximum number of days you should take this medicine." In terms of our process variables, type of match was scored as easy because the reader was required to locate a single piece of information that was literally stated in the medicine label. The label contained only one reference to number of days and this information was located under the label dosage. Type of information was scored as easy because it asked for a number of days and plausibility of distractor was judged to be easy because there is no other reference to days in the medicine label.

MEDCO ASPIRIN 500

INDICATIONS: Headaches, muscle pains, rheumatic pains, toothaches, earaches. RELIEVES COMMON COLD SYMPTOMS.

DOSAGE: ORAL. 1 or 2 tablets every 6 hours, preferably accompanied by food, for not longer than 7 days. Store in a cool, dry place.

CAUTION: Do not use for gastritis or peptic ulcer. Do not use if taking anticoagulant drugs. Do not use for serious liver illness or bronchial asthma. If taken in large doses and for an extended period, may cause harm to kidneys. Before using this medication for chicken pox or influenza in children, consult with a doctor about Reyes Syndrome, a rare but serious illness. During lactation and pregnancy, consult with a doctor before using this product, especially in the last trimester of pregnancy. If symptoms persist, or in case of an accidental overdose, consult a doctor. Keep out of reach of children.

INGREDIENTS: Each tablet contains
500 mg acetylsalicicylic acid.
Excipient c.b.p. 1 tablet.
Reg. No. 88246

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1600 Industrial Blvd., Montreal, Quebec H9J 3P1

0 67736 11079

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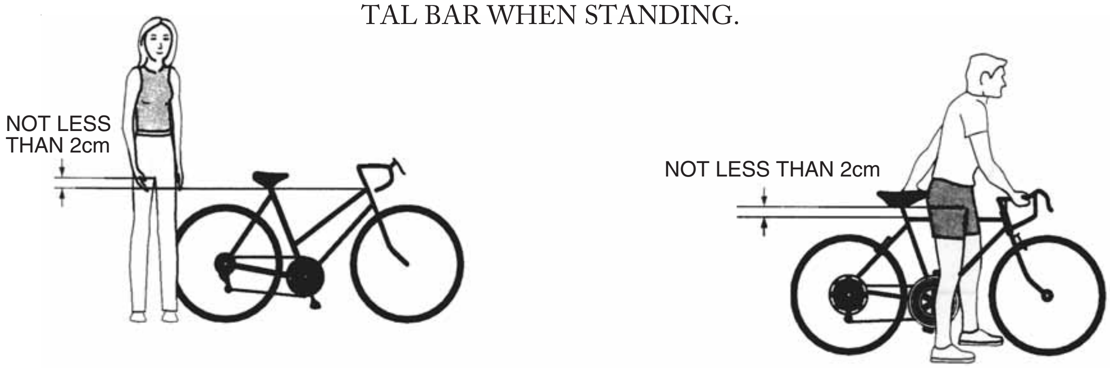
A second prose literacy task directs the reader to look at an article about impatiens. This task falls in the middle of Level 2 and has a difficulty value of 254. It asks the reader to identify "what the smooth leaf surfaces and the stems suggest about the plant." Again, the task directed the reader to locate information contained in the text so it was scored easy for type of information. The last sentence in the second paragraph under the heading *Appearance* states: "The smooth leaf surfaces and the stems indicate a great need of water." Type of information was scored as being moderate because it directs the reader to identify a condition. Plausibility of distractor was scored as being moderate also because the same paragraph contained a sentence which serves to distract a number of readers. This sentence states, "… stems are branched and very juicy, which means, because of the tropical origin, that the plant is sensitive to cold."

PROPER FRAME FIT

RIDER MUST BE ABLE TO STRADDLE BICYCLE WITH AT LEAST 2 cm CLEARANCE ABOVE THE HORIZONTAL BAR WHEN STANDING.



NOTE: Measurement for a female should be determined using a men's model as a basis.

PROPER SIZE OF BICYCLE

FRAME SIZE	LEG LENGTH OF RIDER
430mm	660mm-760mm
460mm	690mm-790mm
480mm	710mm-790mm
530mm	760mm-840mm
560mm	790mm-860mm
580mm	810mm-890mm
635mm	860mm-940mm

OWNER'S RESPONSIBILITY

1. **Bicycle Selection and Purchase:** Make sure this bicycle fits the intended rider. Bicycles come in a variety of sizes. Personal adjustment of seat and handlebars is necessary to assure maximum safety and comfort. Bicycles come with a wide variety of equipment and accessories . . . make sure the rider can operate them.
2. **Assembly:** Carefully follow all assembly instructions. Make sure that all nuts, bolts and screws are securely tightened.
3. **Fitting the Bicycle:** To ride safely and comfortably, the bicycle must fit the rider. Check the seat position, adjusting it up or down so that with the sole of rider's foot on the pedal in its lowest position the rider's knee is slightly bent. **Note:** Specific charts illustrated at left detail the proper method of deter-mining the correct frame size.

The manufacturer is not responsible for failure, injury, or damage caused by improper completion of assembly or improper maintenance after shipment.

Tasks which fall at higher levels along the scale present the reader with more varied demands in terms of the type of match that is required and in terms of the number and nature of distractors that are present in the text. One such task (with a difficulty value of 281 or the beginning of Level 3) refers the reader to a page from a bicycle's owner's manual to determine how to ensure the seat is in the proper position. Type of information was scored as moderate because the reader needed to identify and state two conditions that needed to be met in writing. In addition, they were not told how many features they needed to provide from among those stated. Type of information was also scored as moderate also because it involved identifying a condition and plausibility of distractor received a score indicating it was relatively easy.

A somewhat more difficult task (318), one near the top of Level 3, involves an article about cotton diapers and directs the reader to "list three reasons why the author prefers to use disposable rather than cotton diapers." This task is made more difficult because of several of our process variables. First, type of match was scored as difficult because the reader had to provide multiple responses, each of which required a text-based inference. Nowhere in the text does the author say, "I prefer cotton diapers because…". These inferences are made somewhat more difficult because the type of information being requested is a "reason" rather than something more concrete. This variable also was coded as difficult because of its abstractness. Finally, plausibility of distractor was scored as moderate because the text contains information that may serve to distract the reader.

An additional task falling in Level 4 on the Prose literacy scale (338) directs the reader to use the information from a pamphlet about hiring interviews to "write in your own words one difference between the panel and the group interview." Here the difficulty does not come from locating information in the text. Rather than merely locating a fact about each type of interview, the reader needs to integrate what they have read to infer a characteristic on which the two types of interviews differ. Experience from other surveys of this kind reveal that tasks in which readers are asked to contrast information are more difficult, on average, than tasks in which they are asked to find similarities. Thus, type of match was scored as complex and difficult. Type of information was scored as being difficult as well because it directs the reader to provide a difference. Differences tend to be more abstract in that they ask for the identification of distinctive or contrastive features related in this case to an interview process. Plausibility of distractor was judged as being easy because no distracting information was present in the text. Thus this variable was not seen as contributing to the overall difficulty of this task.

The Hiring Interview

Preinterview

Try to learn more about the business. What products does it manufacture or services does it provide? What methods or procedures does it use? This information can be found in trade directories, chamber of commerce or industrial directories, or at your local employment office.

Find out more about the position. Would you replace someone or is the position newly created? In which departments or shops would you work? Collective agreements describing various standardized positions and duties are available at most local employment offices. You can also contact the appropriate trade union.

The Interview

Ask questions about the position and the business. Answer clearly and accurately all questions put to you. Bring along a note pad as well as your work and training documents.

The Most Common Types of Interview

One-on-one: Self explanatory.

Panel: A number of people ask you questions and then compare notes on your application.

Group: After hearing a presentation with other applicants on the position and duties, you take part in a group discussion.

Postinterview

Note the key points discussed. Compare questions that caused you difficulty with those that allowed you to highlight your strong points. Such a review will help you prepare for future interviews. If you wish, you can talk about it with the placement officer or career counsellor at your local employment office.

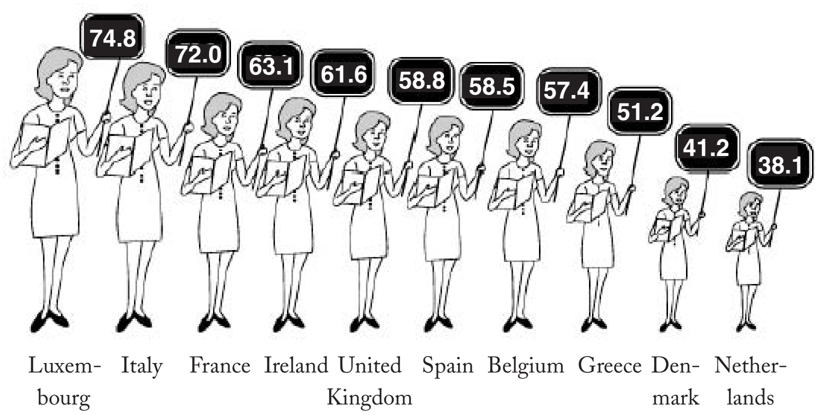
The most difficult task on the prose literacy scale (377) falls in the lower range of Level 5 and required readers to look at an announcement from a personnel department and to "list two ways in which CIEM (an employee support initiative within a company) helps people who lose their jobs because of departmental reorganization." Type of match was scored difficult because the question contained multiple phrases that the reader needed to keep in mind when reading the text. In addition, readers had to provide multiple responses and make low text-based inferences. Type of information received a moderate score because readers were looking for a purpose or function and plausibility of distractor was scored as relatively difficult. This task is made somewhat more difficult because the announcement is organized around information that is different from what is being requested in the question. Thus while the correct information is listed under a single heading, this information is embedded under a list of headings describing CIEM's activities for employees looking for other work. Thus, this list of headings in the text serves as an excellent set of distractors for the reader who does not search for or locate the phrase in the question containing the conditional information – those who lose their jobs because of a departmental reorganization.

Characterizing document literacy tasks

There are 54 tasks ordered along the 500-point document literacy scale. These 54 tasks comprise 19 items from IALS and 35 new tasks developed for ALL. Together, these tasks range in difficulty value from 157 to 444. A Level 1 document literacy task with a difficulty value of 188 directs the reader to identify from a chart the percentage of teachers from Greece who are women. The chart shown here displays the percentage of teachers from various countries who are women. In terms of our process variables, type of match was judged to be easy because the reader was required to locate a single piece of information that was literally stated in the chart; type of information was judged to be relatively easy because it was an amount; and plausibility of distractor is also judged to be relatively easy because there are distractors for the requested information.

FEW DUTCH WOMEN AT THE BLACKBOARD

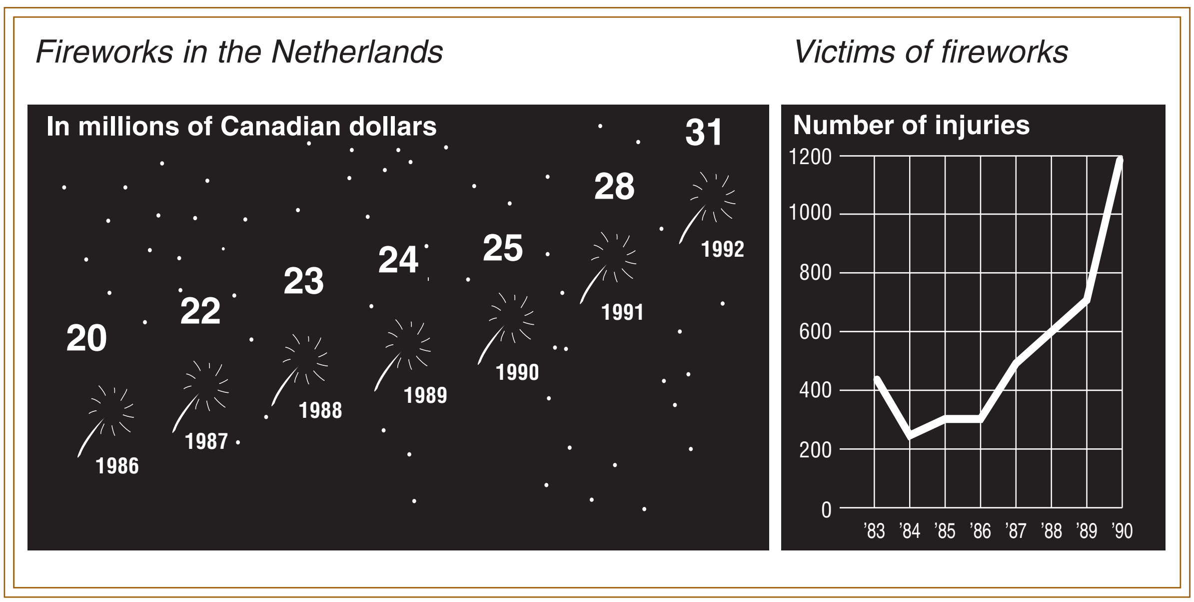
There is a low percentage of women teachers in the Netherlands compared to other countries. In most of the other countries, the majority of teachers are women. However, if we include the figures for inspectors and school principals, the proportion shrinks considerably and women are in a minority everywhere.



Percentage of women teachers (kindergarten, elementary, and secondary).

A second document task involving this same chart directs the reader to identify the country other than the Netherlands in which women teachers are in the minority. This item falls in the middle of Level 2 and received a difficulty value of 234. This task was made a bit more difficult than the first because rather than searching for a country and locating a percentage, the reader had to know that minority means less than 50 per cent. Then they had to cycle through to identify the countries in which the percentage of women teachers were less than 50 per cent. In addition, they had to remember the condition "other than the Netherlands"; otherwise they might have chosen it over the correct response. As a result, type of match was scored as moderately difficult; type of information as easy because the requested information is a country or place; and plausibility of distractor as relatively easy because there are distractors associated with the requested information.

A somewhat more difficult task, with a difficulty value of 295 and falling in the middle of Level 3 directs the reader to look at charts involving fireworks from the Netherlands and to write a brief description of the relationship between sales and injuries based on the information shown. Here the reader needs to look at and compare the information contained in the two charts and integrate this information making an inference regarding the relationship between the two sets of information. As a result, it was judged as being relatively difficult in terms of type of match. Type of information also was judged to be relatively difficult because the requested information is asking for a pattern or similarity in the data. Plausibility of distractor was scored moderately difficult primarily because both given and requested information is present in the task. For example, one of the things that may have contributed to the difficulty of this task is the fact that the sales graph goes from 1986 to 1992 while the injuries graph goes from 1983 to 1990. The reader needed to compare the information from the two charts for the comparable time period.



Another set of tasks covering a range of difficulty on the document scale involved a rather complicated document taken from a page in a consumer magazine rating clock radios. The easiest of the three tasks, receiving a difficulty value of 287 and falling in Level 3, asks the reader "which two features are not on any basic clock radio." In looking at the document, the reader has to cycle through the document, find the listing for basic clock radios, and then determine that a dash represents the absence of a feature. They then have to locate the two features indicated by the set of dashes. As a result, type of match was judged as being relatively difficult because it is a cycle requiring multiple responses with a condition or low text-based inference. Type of information was scored as relatively easy because its features are an attribute of the clock radio and plausibility of distractor is relatively easy because there are some characteristics that are not associated with other clock radios.

A somewhat more difficult task associated with this document and falling in the lower end of Level 4 received a difficulty value of 327. It asks the reader "which full-featured clock radio is rated highest on performance." Here the reader must make a three-feature match (full-featured, performance, and highest) where one of the features requires them to process conditional information. It is possible, for example, that some readers were able to find the full-featured radios and the column listed under performance but selected the first radio listed assuming it was the one rated highest. In this case, they did not understand the conditional information which is a legend stating what the symbols mean. Others may have gone to the column labelled overall score and found the highest numerical number and chosen the radio associated with it. For this reason, plausibility of distractor was scored as moderately difficult. Type of information was judged as being easy because the requested information is a thing.

The most difficult task associated with this document, with a difficulty level of 408, and falling in Level 5 asks the reader to identify the average advertised price for the basic clock radio receiving the highest overall score. This task was made more difficult because the reader had to match four rather than three features; they also had to process conditional information and there was a highly plausible distractor in the same node as the correct answer. As a result of these factors, type of match was judged to be relatively difficult, type of information relatively easy and plausibility of distractor as having the highest level of difficulty.

BLOCK-1

RATINGS

⊙ ◓ ○ ◒ ●
Better ⟵ ⟶ Worse

Clock radios

Listed by types; within types, listed in order of overall score. Differences in score of 4 points or less were not deemed significant.

1 Brand and model. If you can't find a model, call the company. Phone numbers are listed on page 736.

2 Price. The manufacturer's suggested or approximate retail price, followed by the average advertised price.

3 Dimensions. To the nearest centimetre.

4 Overall score A composite, encompassing all our tests and judgments. A "perfect" radio would have earned 100 points.

5 Convenience. This composite judgment reflects such things as the legibility of the display, the ease of tuning the radio and setting the alarm, and the presence or absence of useful features.

6 Performance. An overall judgment reflecting performance in our tests of: sensitivity and selectivity; tuning ease; capture ratio, the ability to bring in the stronger of two stations on the same frequency; image rejection, the ability to ignore signals from just above the band, resistance to interference from signals bouncing off aircraft and such.

7 Sensitivity. How well each radio received a station with little interference.

8 Selectivity. How well each radio received clearly a weak station next to a strong one on the dial.

9 Tone quality. Based mainly on computer analysis of the speaker's output and on listening tests, using music from CDs. No model produced high-fidelity sound.

10 Reversible time-setting. This useful feature makes setting clock and alarm times easy. If you overshoot the desired setting, you simply back up.

11 Dual alarm. Lets you set two separate wake-up times.

1 Brand and model	2 Price	3 Dimensions HxWxD cm	4 Overall Score	5 Convenience	6 Performance	7 Sensitivity	8 Selectivity	9 Tone quality	10 Reversible time-setting	11 Dual alarm	Warranty months	Advantages	Disadvantages	Comments
Full-featured clock radios														
RCA RP-3690	$50/$40	8x25x18	86	⊙	◓	◓	◓	⊙	✔	✔	12	A,B,D,H,J,L,O,T,U		*A*
Sony ICF-C303	50/45	5x20x15	84	⊙	◓	⊙	○	◒	✔	✔	12	C,E,F,I,N,T		C
Panasonic RC-X220	50/45	10x28x13	82	◓	◓	◓	◓	○	✔	✔	12	A,G,K,M,O,S,T,U	b,c	*A*
Realistic 272	50/30	5x28x15	79	◓	○	◓	◓	◒	✔	✔	3	A,G,H,K,O,T		*D*
Magnavox AJ3900	65/—	15x38x13	78	○	⊙	◓	⊙	◓	—	✔	3	D,G,K,M,O,R,T	b,g	*B*
Emerson AK2745	39/20	8x28x15	70	○	◒	◒	◒	○	✔	✔	3	G,O	g	*K*
Soundesign 3753	20/20	8x23x13	62	○	◒	●	○	○	✔	✔	3	J,Q	d,h	*J*
Basic clock radios														
Realistic 263	28/18	10x20x10	74	○	◓	◓	○	◒	—	—	3	A,D,H,O,P,U	h	—
Soundesign 3622	12/10	5x20x13	68	◒	◓	⊙	◒	◒	—	—	3	U	d	*L*
Panasonic RC-6064	18/15	5x20x13	67	◒	◓	⊙	○	○	—	—	12	—	b,c	—
General Electric 7-4612	13/10	5x20x13	66	◒	○	⊙	◒	○	—	—	12	A,D	a,g	—
Lloyds CR001	20/15	5x18x13	64	◒	○	⊙	○	◒	—	—	3	U	—	—
Sony ICF-C240	15/13	5x18x15	63	◒	○	○	○	○	—	—	12	—	f,g	—
Emerson AK2720	19/10	5x20x13	61	◒	○	◓	●	○	—	—	3	O,T	e	*K*
Gran Prix D507	15/10	5x18x10	54	◒	●	○	●	●	—	—	3	—	d	—
Clock radios with cassette player														
General Electric 7-4965	60/50	10x30x15	85	◓	◓	◓	◓	◓	✔	✔	12	A,D,G,H,K,O,S,T	—	*B,E*
Panasonic RC-X250	[1]	10x33x13	76	◓	◓	○	◓	◓	✔	✔	12	A,G,K,O,R,U	b,c	*A,H*
Sony ICF-CS650	75/65	15x28x15	74	○	◓	⊙	○	◒	✔	✔	12	G,R,T,U	c,f,i	A,F,H
Soundesign 3844MGY	40/30	13x30x13	62	○	●	●	●	◒	—	—	3	G,K,J,S,U		*F,G,I,M*

[1] *Discontinued. Replaced by* **RC-X260**, *$79 list and $60 average advertised sale price.*

Features in Common
All: • Permit snooze time of about 8 min. • Retain time settings during short power failures.
Except as noted, all have: • Battery backup for clock and alarm memory. • Red display digits 1 cm. high. • Sleep-time radio play for up to 60 min. before automatic shutoff. • Switch to reset alarm.

Keys to Advantages
A – Alarm works despite power failure.
B – Shows actual time plus up to 2 alarm times.
C – Twin alarms settable for 2 different stations.
D – Tone alarm has adjustable volume control.
E – Memory needs no battery.
F – Digital tuner with presettable stations.
G – Tuner can receive in stereo.
H – Battery-strength indicator.
I – Illuminated tuning dial.
J – Illuminated tuning pointer.
K – Earphone jack.
L – Nap timer.
M – Audio input for tape deck or CD player.
N – Display can show date and time.
O – Display has high/low brightness switch.
P – Display has larger digits than most.
Q – Night light—adjusts for room light.
R – Bass-boost tone control.
S – Treble-cut tone control.
T – Better than most in tuning ease.
U – Better than most in image rejection.

Key to Disadvantages
a – Possible to reset time by accident.
b – Controls for time-setting or dimmer inconveniently located on radio's bottom or rear.
c – Display dimmer than most in brightly lit room.
d – Radio volume must be turned completely down for alarm buzzer to sound.
e – Lacks alarm buzzer; radio is sole alarm.
f – Lacks indication alarm is set.
g – Lacks alarm-reset button.
h – Time-setting lacks fast reverse.
i – No slow forward, fast reverse for time setting.

Key to Comments
A – Display shows green digits.
B – Display shows blue digits.
C – Display uses LCD (liquid crystal) digits.
D – Terminals for external antenna.
E – 3-position graphic equalizer.
F – Cassette player lacks Record function.
G – Cassette player lacks Rewind function.
H – Model permits wake-up to cassette play.
I – Cassette-deck flutter worse than most.
J – Warranty repairs cost $3 for handling.
K – Warranty repairs cost $3.50 for handling.
L – Warranty repairs cost $6 for handling.
M – Warranty repairs cost $10 for handling.

1-7

Measuring numeracy in ALL

Defining numeracy in ALL

The conception of numeracy developed for ALL is built upon recent research and work done in several countries on functional demands of different life contexts, on the nature of adults' mathematical and statistical knowledge and skills, and on how such skills are applied or used in different circumstances. In light of the general intention of the ALL survey to provide information about a diverse set of life skills, this framework defines numeracy as follows:

> *Numeracy is the knowledge and skills required to effectively manage and respond to the mathematical demands of diverse situations.*

This definition implies that numeracy is broader than the construct of quantitative literacy defined by IALS[2]. Further, adult numeracy should be viewed as different from "knowing school mathematics". Although a universally accepted definition of "numeracy" does not exist (Baker and Street, 1994), an examination of some perspectives on the meaning of adult numeracy shows that they contain many commonalities. Below are two examples, both from work in Australia:

> *Numeracy is the mathematics for effective functioning in one's group and community, and the capacity to use these skills to further one's own development and of one's community (Beazley, 1984).*

> *Numeracy involves abilities that include interpreting, applying and communicating mathematical information in commonly encountered situations to enable full, critical and effective participation in a wide range of life roles (Queensland Department of Education, 1994).*

All these definitions are quite similar, in their broad scope, to the ALL definitions of prose and document literacy presented in a prior section. Many conceptions of numeracy emphasize the practical or functional application and use of mathematical knowledge and skills to cope with the presence of mathematical elements in real situations. Adults are expected to possess multiple ways of responding flexibly to a mathematical situation in a goal-oriented way, dependent on the needs and interests of the individual within the given context (i.e., home, community, workplace, etc...), as well as on his or her attitudes and beliefs toward numeracy (Gal, 2000; Coben, O'Donoghue and FitzSimons, 2000).

Thus, numeracy involves more than just applying arithmetical skills to information embedded in printed materials, which was the focus of assessment in IALS. Adult numeracy extends to a possession of number sense, estimation skills, measurement and statistical literacy. Given the extent to which numeracy pervades the modern world, it is not necessarily just commonly encountered situations that require numerate behaviour, but also *new* situations.

Another important element in defining numeracy is the role of communication processes. Numeracy not only incorporates the individual's abilities to use and apply mathematical skills efficiently and critically, but also requires the person to be able to interpret textual or symbolic messages as well as to communicate mathematical information and reasoning processes (Marr and Tout, 1997; Gal, 1997).

Definitions of numeracy explicitly state that numeracy not only refers to operating with numbers, as the word can suggest, especially to those familiar with conceptions of children's numeracy, but covers a wide range of mathematical skills and understandings. Further, in recent years there has been much discussion and debate about the relationship between mathematics and numeracy and about the concept of "critical" numeracy (Frankenstein, 1989; Steen, 2001). Johnston, for example, has argued that:

> ***To be numerate is more than being able to manipulate numbers, or even being able to 'succeed' in school or university mathematics. Numeracy is a critical awareness which builds bridges between mathematics and the real-world, with all its diversity (Johnston, 1994).***

Many authors argue that a discussion of functional skills should also address supporting or enabling attitudes and beliefs. In the area of adults' mathematical skills, "at homeness" with numbers or "confidence" with mathematical skills is expected, as these affect how skills and knowledge are actually put into practice (Cockroft, 1982; Tobias, 1993).

The brief definition of numeracy developed for ALL and presented earlier above is complemented by a broader definition of *numerate behaviour* which was developed by the ALL Numeracy Team to serve as the basis for the development of numeracy items for ALL:

> ***Numerate behaviour is observed when people manage a situation or solve a problem in a real context; it involves responding to information about mathematical ideas that may be represented in a range of ways; it requires the activation of a range of enabling knowledge, factors and processes.***

This conception of numerate behaviour implies that in order to assess people's numeracy, it is necessary to generate tasks and items which vary in terms of contexts, the responses called for, the nature of the mathematical information involved, and the representations of this information. These task characteristics are elaborated below. This conception is much broader than the definition of quantitative literacy used in IALS. Its key elements relate in a broad way to situation management and to a need for a range of responses (not only to responses that involve numbers). It refers to a wide range of skills and knowledge (not only to application of arithmetical knowledge and computational operations) and to the use of a wide range of situations that present respondents with mathematical information of different types (not only those involving *numbers* embedded in *printed* materials).

The item development process aimed to ensure that a certain proportion of the item pool would place a minimum reading burden on the respondents, i.e., that some of the stimuli would be text-free or almost so, allowing even respondents with limited mastery of the language of the test to comprehend the situation described. Other parts of the item pool included items requiring varying amounts of essential texts as dictated by the situation which the item aimed to represent.

As implied by the literature and ideas reviewed earlier, the nature of a person's responses to the mathematical and other demands of a situation will depend critically on the activation of various enabling knowledge bases (understanding of the context; knowledge and skills in the areas of mathematics, statistics and literacy), on reasoning processes and on their attitudes and beliefs with respect to numeracy. In addition, numerate behaviour requires the integration of mathematical knowledge and skills with broader literacy and problem solving skills along with the prior experiences and practices that each person brings to every situation. It is clear that numerate behaviour will involve an attempt to engage with a task and not delegate it to others or deal with it by intentionally ignoring its mathematical content.

Identifying task characteristics

Four key characteristics of numerate behaviour were used to develop and represent the numeracy tasks built for ALL – type of purpose/context, type of response, type of mathematical or statistical information, and type of representation of mathematical or statistical information. Each of these is described next.

Type of purpose/context. People try to manage or respond to a numeracy situation because they want to satisfy a purpose or reach a goal. Four types of purposes and goals are described below. To be sure, these are not mutually exclusive and may involve the same underlying mathematical themes.

Everyday life

The numeracy tasks that occur in everyday situations are often those that one faces in personal and family life, or revolve around hobbies, personal development, or interests. Representative tasks are handling money and budgets, comparison shopping, planning nutrition, personal time management, making decisions involving travel, planning trips, mathematics involved in hobbies like quilting or wood-working, playing games of chance, understanding sports scoring and statistics, reading maps and using measurements in home situations such as cooking or home repairs.

Work-related

At work, one is confronted with quantitative situations that often are more specialized than those seen in everyday life. In this context, people have to develop skills in managing situations that might be narrower in their application of mathematical themes. Representative tasks are completing purchase orders, totalling receipts, calculating change, managing schedules, using spreadsheets, organizing and packing different shaped goods, completing and interpreting control charts or quality graphs, making and recording measurements, reading blueprints, tracking expenditures, predicting costs and applying formulas.

Societal or community

Adults need to know about processes happening in the world around them, such as trends in crime, wages and employment, pollution, medical or environmental risks. They may have to take part in social or community events, or in political action. This requires that adults can read and interpret quantitative information presented in the media, including statistical messages and graphs. They may have to manage situations like organizing a fund-raiser, planning fiscal aspects of a community program, or interpreting the results of a study about risks of the latest health fad.

Further learning

Numeracy skills enable a person to participate in further study, whether for academic purposes or as part of vocational training. In either case, it is important to be able to know some of the more formal aspects of mathematics that involve symbols, rules, and formulas and to understand some of the conventions used to apply mathematical rules and principles.

Type of responses. In different types of real-life situations, people may have to respond in one or more of the following ways. (The first virtually always occurs;

others will depend on the interaction between situational demands and the goals, skills, dispositions, and prior learning of the person):

Identify or locate some mathematical information present in the task or situation confronting them that is relevant to their purpose or goal.

Act upon or react to the information in the situation. Bishop (1988), for example, proposed that there are six modes of mathematical actions that are common in all cultures: counting, locating, measuring, designing, playing and explaining. Other types of actions or reactions may occur, such as doing some calculations ("in the head" or with a calculator), ordering or sorting, estimating, measuring, or modeling (such as by using a formula).

Interpret the information embedded within the situation (and the results of any prior action) and comprehend what it means or implies. This can include making a judgment about how mathematical information or known facts actually apply to the situation or context. Contextual judgment may have to be used in deciding whether an answer makes sense or not in the given context, for example, that a result of "2.35 cars" is not a valid solution to how many cars are needed to transport a group. It can also incorporate a critical aspect, where a person questions the purpose of the task, the validity of the data or information presented, and the meaning and implications of the results, both for them as an individual and possibly for the wider community.

Communicate about the mathematical information given, or the results of one's actions or interpretations to someone else. This can be done orally or in writing (ranging from a simple number or word to a detailed explanation or analysis) and/or through drawing (a diagram, map, graph).

Type of mathematical or statistical information. Mathematical information can be classified in a number of ways and on different levels of abstraction. One approach is to refer to fundamental "big ideas" in the mathematical world. Steen (1990), for example, identified six broad categories pertaining to: quantity, dimension, pattern, shape, uncertainty, and change. Rutherford and Ahlgren (1990) described networks of related ideas: numbers, shapes, uncertainty, summarizing data, sampling and reasoning. Dossey (1997) categorized the mathematical behaviours of quantitative literacy as: data representation and interpretation, number and operation sense, measurement, variables and relations, geometric shapes and spatial visualization, and chance. The ALL Numeracy Team drew from these and other closely tied categorizations (e.g., National Council of Teachers of Mathematics, 2000) to arrive at a set of five fundamental ideas that characterize the mathematical demands facing adults in diverse situations at the beginning of the 21st century.

Quantity and number

Quantity is described by Fey (1990) as an outgrowth of people's need to quantify the world around us, using attributes such as: length, area and volume of rivers or land masses; temperature, humidity and pressure of our atmosphere; populations and growth rates of species; motions of tides; revenues or profits of companies, etc…

Number is fundamental to quantification and different types of number constrain quantification in various ways: whole numbers can serve as counters or estimators; fractions, decimals and per cents as expressions of greater precision, or as indications of parts-of-whole which are useful when comparing proportions.

Positive and negative numbers serve as directional indicators. In addition to quantification, numbers are used to put things in order and as identifiers (e.g., telephone numbers or zip codes). Facility with quantity, number, and operation on number requires a good "sense" for magnitude and the meaning of very large or very small numbers, and sometimes a sense for the relative magnitude of different proportions.

Money and time management, the ubiquitous mathematics that is part of every adult's life, depends on a good sense of number and quantity. Contextual judgment comes into play when deciding how precise one should be when conducting certain computations or affects the choice of which tool (calculator, mental math, a computer) to use. A low level numeracy task might be figuring out the cost of one can of soup, given the cost of four for $2.00; a task with a higher cognitive demand could involve "harder numbers" such as when figuring out the cost per kilo while buying 0.783 kg of cheese for 12,95 Euros.

Dimension and shape

Dimension includes "big ideas" related to one, two and three dimensions of "things". Understanding of dimensions is called for when encountering or generating spatial or numerical descriptions of objects, making projections, or working with lengths, perimeters, planes, surfaces, location, etc… Facility with each dimension requires a sense of "benchmark" measures, direct measurement, and estimations of measurements.

Shape is a category describing real or imaginary images and entities that can be visualized (e.g., houses and buildings, designs in art and craft, safety signs, packaging, knots, crystals, shadows and plants). Direction and location are fundamental qualities called upon when reading or sketching maps and diagrams. A basic numeracy task in this fundamental aspect could be shape identification whereas a more complex task might involve describing the change in the size or volume of an object when one dimension is changed, such as when choosing between different boxes for packaging certain objects.

Pattern, functions and relationships

It is frequently written that mathematics is the study of patterns and relationships. Pattern is seen as a wide-ranging concept that covers patterns encountered all around us, such as those in musical forms, nature, traffic patterns, etc… It is argued by Senechal (1990) that our ability to recognize, interpret and create patterns is the key to dealing with the world around us. The human capacity for identifying relationships and for thinking analytically underlies mathematical thinking. Algebra – beyond symbolic manipulation – provides a tool for representing relationships between amounts through the use of tables, graphs, symbols and words. The ability to generalize and to characterize functions, relationships between variables, is a crucial gateway to understanding even the most basic economic, political or social analyses. A relatively simple pattern-recognition task might require someone to describe the pattern in a sequence of given numbers or shapes, and in a functional context to understand the relationship between lists or variables (e.g., weight and volume of objects); having to develop a formula for an electronic spreadsheet would put a higher level of demand on the individual.

Data and chance

Data and chance encompass two related but separate topics. *Data* covers "big ideas" such as variability, sampling, error, or prediction, and related statistical topics such as data collection, data analysis, and common measures of center or spread, or the idea of a statistical inference. Modern society demands that adults are able to interpret (and at times even produce) frequency tables, basic charts and graphs, information about averages and medians, as well as identify questionable statistical claims (Gal, 2002).

Chance covers "big ideas" related to probability and relevant statistical concepts and tools. Few things in the world are 100 per cent certain; thus the ability to attach a number that represents the likelihood of an event (including risks or side-effects) is a valuable tool whether it has to do with the weather, the stock-market, or the decision to use a certain drug. In this category, a simple numeracy skill might be the interpretation of a simple pie chart or comprehension of a statement about an average; a more complex task would be to infer the likelihood of occurrence of an event based upon given information.

Change

This term describes the mathematics of how the world changes around us. Individual organisms grow, populations vary, prices fluctuate, objects traveling speed up and slow down. Change and rates of change help provide a narration of the world as time marches on. Additive, multiplicative or exponential patterns of change can characterize steady trends; periodic changes suggest cycles and irregular change patterns connect with chaos theory. Describing weight loss over time is a relatively simple task, while calculating compounded interest is a relatively complex task.

Type of representation of mathematical information. Mathematical information in an activity or a situation may be available or represented in many forms. It may appear as concrete objects to be counted (e.g., sheep, people, buildings, cars, etc…) or as pictures of such things. It may be conveyed through symbolic notation (e.g., numerals, letters, or operation signs). Sometimes, mathematical information will be conveyed by formulas, which are a model of relationships between entities or variables.

Further, mathematical information may be encoded in visual displays such as *diagrams* or *charts*; *graphs*, and *tables* may be used to display aggregate statistical or quantitative information. Similarly, *maps* of real entities (e.g., of a city or a project plan) may contain numerical data but also information that can be quantified or mathematized.

Finally, a person may have to extract mathematical information from various types of texts, either in prose or in documents with specific formats (such as in tax forms). Two different kinds of text may be encountered in functional numeracy tasks. The first involves mathematical information represented in textual form, i.e., with words or phrases that carry mathematical meaning. Examples are the use of number words (e.g., "five" instead of "5"), basic mathematical terms (e.g., fraction, multiplication, per cent, average, proportion), or more complex phrases (e.g., "crime rate cut by half") that require interpretation. The second involves cases where mathematical information is expressed in regular notations or symbols (e.g., numbers, plus or minus signs, symbols for units of measure, etc…), but is surrounded by text that despite its non-mathematical nature also has to be interpreted in order to provide additional information and context. An example is a bank deposit slip with some text and instructions in which numbers describing monetary amounts are embedded.

Characterizing numeracy tasks

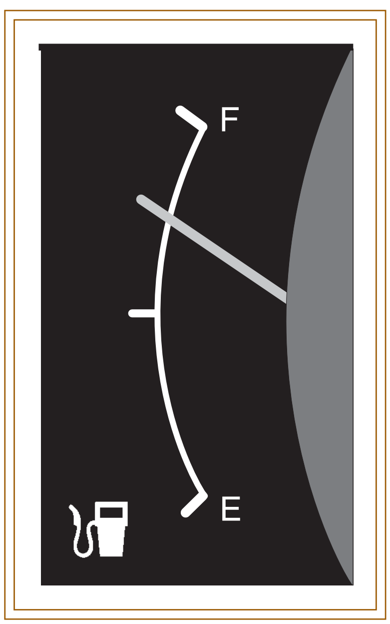
A total of 40 numeracy tasks were selected and used in the ALL survey. These tasks range along the numeracy scale from 174 to 380 and their placement was determined by how well adults in participating countries responded to each task. Described below are sample tasks that reflect some of the conceptual facets of the numeracy construct and scale design principles described earlier, such as computations, spatial and proportional reasoning, measurement, and statistical knowledge.

As expected, the easiest task on the numeracy scale required adults to look at a photograph containing two cartons of coca cola bottles (174). They were directed to find the total number of bottles in the two full cases being shown. Part of what made this task easy is the fact that content was drawn from everyday life and objects of this kind would be relatively familiar to most people. Second, what adults were asked to do was apparent and explicit – this tasked used a photograph depicting concrete objects and required the processing of no text. A third contributing factor is that respondents could approach the task in a variety of ways that differ in sophistication, such as by multiplying rows and columns, but also by simple counting. This task requires that adults make a conjecture since the full set of bottles in the lower case is not visible, but as can be seen from the low difficulty level of the task, this feature did not present a problem for the vast majority of adults in all participating countries.

A second task that was also quite easy directed adults to look at a short text depicting the results of an election involving three candidates and determine the total number of votes cast. This task received a difficulty value of 192, falling in Level 1 on the numeracy scale. Again, respondents were asked to deal with a realistic type of situation where simple numerical information is displayed in a simple column format showing the name of each candidate and the number of votes that the candidate received. No other numerical information was present that can be a distractor. Finding the total number of votes cast in the election requires a single addition operation that is made explicit in the question by the use of the keyword "total", and the computation involves relatively small whole numbers.

A more complex numeracy task falling in the middle of Level 2 and receiving a difficulty value of 248 directs adults to look at a gas (petrol) gauge. This gauge has three lines or ticks on it with one showing an "F", one showing an "E" and the third in the middle between the two. A line on the gauge, representing the gauge's needle, shows a level that is roughly halfway between the middle tick and the tick indicating "F", suggesting that the tank is about three-quarters full. The directive states that the tank holds 48 gallons and asks the respondent to determine "how many gallons remain in the tank." This task is drawn from an everyday context and requires an adult to interpret a display that conveys quantitative information but carries virtually no text or numbers. No mathematical information is present other than what is given in the question.

What makes this task more difficult than the previous ones described above is the fact that adults must first estimate the level of gas remaining in the tank, by converting the placement of the needle to a fraction. Then they need to determine how many gallons this represents from the 48 gallon capacity stated in the question or directive. Thus, this task requires adults to apply multiple operations or procedures to arrive at a correct response, without specifying what the operations may be. Nonetheless, this task, like many everyday numeracy tasks, does not require an exact computation but allows an approximation that should fall within reasonable boundaries.



A somewhat more difficult numeracy task, falling at the top of Level 2 and receiving a difficulty value of 275, requires adults to look at a diagram of a container on which there are four markings or lines; respondents are asked to draw a line on the container indicating where one-third would be. The top line is marked "1" while the middle line is marked with "1/2". There are two other lines with no markings - one line midway between "1" and "1/2" and another midway between the line marked "1/2" and the bottom of the container. To respond correctly, adults need to mark a line on the container that is between the line marked "1/2" and the line below it indicating where one-quarter would be (although this line does not say "1/4" – this has to be inferred). Here the context may be less familiar to the respondent but again the visual image used is simple and realistic with virtually no text; the response expected does not involve writing a symbol or text, just drawing a line in a certain region on the drawing of the container. To answer this task correctly, adults need to have some working knowledge of fractions and a sense for proportions: they have to be familiar with the symbols for "1/2" and "1/3", know how to order fractions in terms of their relative size and be able to relate them to the existing markings on the container.

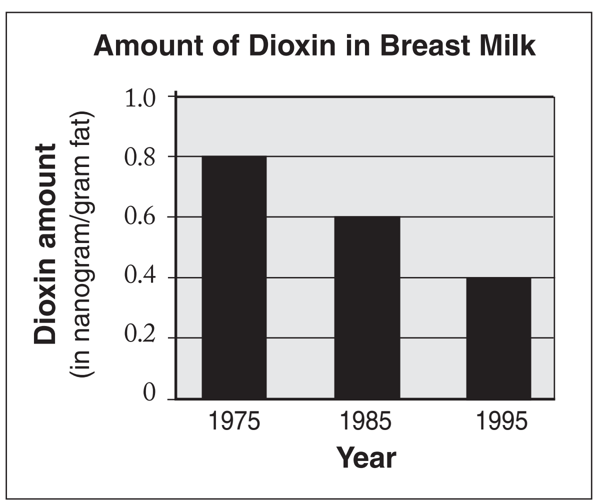
Some numeracy tasks were developed around a short newspaper article titled "Is breast milk safe?" which relates to environmental hazards and food safety. The article contained two brief text paragraphs describing a toxin, Dioxin, found in fish in the Baltic Sea plus a graph with bars indicating the levels of Dioxin found at three points in time, namely 1975, 1985, and 1995, in the breast milk of North European women. One question asked adults to describe how the amount of Dioxin changed from 1975 to 1995, i.e., provide a straightforward interpretation of data presented in a graph. Adults were not required to actually calculate the amount of change over each of the periods, just describe in their own words the change in the levels of Dioxin (e.g., decreased, increased, stayed the same).

This task received a difficulty value of 280, the lower end of Level 3. The graph clearly indicates that the amount of Dioxin decreased over each of the three time periods, yet some adults have difficulty coping with such a task, which is based on a stimulus with a structure that commonly appears in newspapers, i.e., brief text plus a graph. The increased difficulty level of this item may be attributable in part to the need for adults to generate their own description, to the moderate amount of dependence on text needed to comprehend the context to which the graph refers, or to the need to understand the direction of the decimal values on the vertical axis (which is common in reporting on concentrations of contaminating chemicals).

Is breast milk safe?

Since the 1970s, scientists have been worried about the amount of Dioxin, a toxin in fish caught in the Baltic sea. Dioxin tends to accumulate in breast milk and can harm newborn babies.

The diagram shows the amount of Dioxin in the breast milk of North European women, as found in studies done from 1975 to 1995.



A second and more difficult task using this same stimulus directed adults to compare the per cent of change in Dioxin level from 1975 to 1985 to the per cent of change in Dioxin level from 1985 to 1995, determine which per cent of change is larger, and explain their answer. This task was considerably more difficult for adults in participating countries and received a difficulty value of 377 on the numeracy scale. Here the necessary information is embedded within the graph and requires a level of transformation and interpretation. To arrive at a correct response, adults have to look at the rate of change expressed in per cents, not just the absolute size of the change. Further, they have to work with per cents of entities smaller than one (i.e., the decimal values on the vertical axis) and realize that the base for the computation of per cent change shifts for each pair. It seems that the need to cope with such task features, use formal mathematical procedures, or deal with the abstract notion of rate of change, adds considerable difficulty to such tasks.

The most difficult numeracy task in this assessment, receiving a difficulty value of 380 (Level 5), presented adults with an advertisement claiming that it is possible for an investor to double an amount invested in seven years, based on a 10 per cent fixed interest rate each year. Adults were asked if it is possible to double $1000 invested at this rate after seven years and had to support their answer with their calculations. A range of responses was accepted as correct as long as a reasonable justification was provided, with relevant computations. Respondents were free to perform the calculation any way they wanted, but could also use a "financial hint" which accompanied the advertisement and presented a formula for estimating the worth of an investment after any number of years. Those who used the formula had to enter information stated in the text into variables in the formula (principal, interest rate and time period) and then perform the needed computations and compare the result to the expected amount if $1000 is doubled.

All respondents could use a hand-held calculator provided as part of the assessment. This task proved difficult because it involved per cents and the computation, whether with or without the formula, required the integration of several steps and several types of operations. Performing the computations without the formula required understanding of compound interest procedures. This task allowed adults to use a range of reasoning strategies, including informal or invented procedures. Yet, like the previous task involving the comparison of rates of change, it required the use of formal mathematical information and deeper understanding of non-routine computational procedures, all of which may not be familiar or accessible to many adults.

Measuring problem solving in ALL

Defining problem solving in ALL

Research on problem solving has a long tradition within both academic psychology and applied human resources research. A very general definition of problem solving that reflects how it is generally understood in the psychological literature (Hunt, 1994; Mayer, 1992; Mayer and Wittrock, 1996; Smith, 1991) is presented here:

> ***Problem solving is goal-directed thinking and action in situations for which no routine solution procedure is available.*** **The problem solver has a more or less well-defined goal, but does not immediately know how to reach it. The incongruence of goals and admissible operators constitutes a problem. The understanding of the problem situation and its step-by-step transformation, based on planning and reasoning, constitute the process of problem solving.**

One major challenge while developing a framework for problem solving that is to be used in a survey such as ALL is how best to adapt the psychological literature to the constraints imposed by a large-scale international comparative study. In order to do this, a decision was made to focus on an essential subset of problem solving – analytical problem solving. Our notion of analytical problem solving is not to be confused with the intuitive everyday use of the term or with the clinical-psychological concept in which problem solving is associated with the resolution of social and emotional conflicts. Nevertheless, social context is also relevant for our definition of analytical problem solving, for example when problems have to be approached interactively and resolved through co-operation. Motivational factors such as interest in the topic and task-orientation also influence the problem-solving process. However, the quality of problem solving is primarily determined by the comprehension of the problem situation, the thinking processes used to approach the problem, and the appropriateness of the solution.

The *problem* itself can be characterized by different aspects:

- The *context* can reflect different domains, which may be of a theoretical or a practical nature, related to academic situations or to the real world. Within these domains, problems can be more or less authentic.
- The *scope* of a problem can range from working on limited, concrete parts of a task to planning and executing complex actions or evaluating multiple sequences of actions.
- The problem can have a well-defined or an ill-defined goal, it can have transparent (explicitly named) or non-transparent constraints, and involve few independent elements or numerous interconnected ones. These features determine the *complexity* of the problem.

How familiar the context is to the target population, whether the problem involves concrete tasks or complex actions, how well the goal is defined, how transparent the constraints are, how many elements the problem solver has to take into account and how strongly they are interconnected – are all features that will determine the level of problem-solving competency required to solve a certain problem. The empirical difficulty, i.e., the probability of giving a correct solution, will depend on the relation between these problem features on the one hand, and the subjects' competency level on the other hand.

The *cognitive processes* that are activated in the course of problem solving are diverse and complex, and they are likely to be organized in a non-linear manner. Among these processes, the following five components may be identified:

1. Searching for information, and structuring and integrating it into a mental representation of the problem ("situational model").
2. Reasoning, based on the situational model.
3. Planning actions and other solution steps.
4. Executing and evaluating solution steps.
5. Continuous processing of external information and feedback.

Baxter and Glaser (1997) present a similar list of cognitive activities labelled "general components of competence in problem solving": problem representation, solution strategies, self-monitoring, and explanations. Analytical problem solving in everyday contexts, as measured by the ALL problem-solving instrument, focuses on the components 1 to 3 listed above (and to some extent 4).

One of the most important insights of recent research in cognitive psychology is that solving demanding problems requires at least some knowledge of the domain in question. The concept of a problem space through which a General Problem Solver moves by means of domain-independent search strategies (Newell and Simon, 1972) proved to be too simple to describe how problem situations are understood and the process of finding a solution. Efforts to identify a general, domain-independent competence for steering dynamic systems (operative intelligence) within the framework of complex problem-solving research were also unsuccessful; performance on such systems can only partially be transferred to other systems (Funke, 1991). However, research on grade 3 to grade 12 students showed that problem-solving skills clearly improve under well-tuned training conditions and that a substantial transfer across different problems can be achieved (Reeff et al. 1989, 1992, 1993; Regenwetter, 1992; Regenwetter and Müller, 1992; Stirner, 1993).

Problem solving is dependent on knowledge of concepts and facts (declarative knowledge) and knowledge of rules and strategies (procedural knowledge) in a given subject domain. Although it is evident from past research that declarative knowledge in the problem domain can substantially contribute to successful problem-solving strategies, procedural knowledge is crucial as well. The amount of relevant previous knowledge available could also account for the relation between intelligence and problem-solving performance, as shown in the work of Raaheim (1988) and Leutner (1999). People with no relevant previous knowledge at all are unable to explore the problem situation or plan a solution in a systematic manner and are forced to rely on trial and error instead. Those who are already very familiar with the task are able to deal with it as a matter of routine. General intellectual ability, as measured by reasoning tasks, plays no role in either of these cases. When problem solvers are moderately familiar with the task, analytical reasoning strategies can be successfully implemented.

The approach taken for the assessment of problem solving in ALL relies on the notion of (moderately) familiar tasks. Within a somewhat familiar context the problems to be solved are inexplicit enough so as not to be perceived as pure routine tasks. On the other hand, the domain-specific knowledge prerequisites are sufficiently limited as to make analytical reasoning techniques the main cognitive tool for solving the problems.

Identifying task characteristics

How can contextualized, real-life problems be defined and transformed into a set of assessment tasks? After reviewing the various approaches that have been taken in previous research to measure problem solving, a decision was made to use a project approach in ALL. The project approach has the potential to be a powerful means for assessing analytical problem solving skills in real world, everyday contexts for several reasons. Solving problems in project-like settings is important and relevant for adults in both their professional and their private life. In addition, the project approach has been successfully implemented in other large-scale assessments, and it can be realized as a paper-and-pencil-instrument, which is of crucial importance for contemporary large-scale surveys. Furthermore, the project approach uses different problem-solving stages as a dimension along which to generate the actual test items. Following Pólya (1945, 1980), the process of problem solving has been frequently described in terms of the following stages:

- Define the goal.
- Analyze the given situation and construct a mental representation.
- Devise a strategy and plan the steps to be taken.
- Execute the plan, including control and – if necessary – modification of the strategy.
- Evaluate the result.

The different action steps define the course of action for an "everyday" project. One or more tasks or items are generated to correspond to each of these action steps. Respondents are expected to work on individual tasks that have been identified as steps that need to be carried out as a part of their project (a sample project, for example, might involve "planning a reunion" or "renovating a clubhouse"). Embedding the individual tasks in a project is believed to yield a high degree of context authenticity. Although they are part of a comprehensive and coherent project, the individual tasks are designed so that they can be solved independently of one another and are expected to vary in complexity and overall difficulty for adults.

Since assessing problem solving skills in large-scale assessments is a relatively new endeavour, it might be helpful to provide a detailed account of the construction process. Table A.1 provides an overview of the problem solving steps as they correspond to the action steps identified above. Different components and aspects of each of the problem solving steps are listed.

Table A.1

Problem-solving steps and instantiations

Define the goals	• Set goals. • Recognize which goals are to be reached and specify the essential reasons for the decision. • Recognize which goals/wishes are contradictory and which are compatible. • Assign priorities to goals/wishes.
Analyze the situation	• Select, obtain and evaluate information. ⇒ What information is required, what is already available, what is still missing, and what is superfluous? ⇒ Where and how can you obtain the information? ⇒ How should you interpret the information? • Identify the people (e.g. with what knowledge and skills) who are to be involved in solving the problem. • Select the tools to be used. • Recognize conditions (e.g. time restrictions) that need to be taken into account.
Plan the solution	• Recognize which steps need to be taken. • Decide on the sequence of steps (e.g. items on the agenda). • Coordinate work and deadlines. • Make a comparative analysis of alternative plans (recognize which plan is suitable for reaching the goals). • Adapt the plan to changed conditions. • Opt for a plan.
Execute the plan	• Carry out the individual steps (e.g., write a letter, fill in a form, make calculations).
Evaluate the results	• Assess whether and to what extent the target has been reached. • Recognize mistakes. • Identify reasons for mistakes. • Assess consequences of mistakes.

The construction of a pool of assessment tasks that could be mapped back to these five action steps involved several phases of activities. First was the identification of appropriate projects that would be suitable for adults with varying educational backgrounds and relevant to the greatest number of people in the target group. Next, developers had to identify and sketch out the problem situation and the sequence of action steps that relate back to the model. Third, they had to develop a pool of items that were consistent with the action steps and that tapped into particular processes including the development of correct responses and appropriate distractors for multiple choice items and solution keys and scoring guides for open-ended tasks.

Characterizing problem solving tasks

ALL included a total of 4 projects involving 20 tasks in the assessment of problem solving. These resulted in 19 scorable items that ranged from 199 to 394 along the scale and, like the literacy and numeracy tasks, their placement was determined by the patterns of right and wrong responses among adults in participating countries. Rather than release one of the four projects that were used in ALL, we will characterize the hypothesized proficiency scale for analytical problem solving that was tested using pilot data and present an example from the pilot data that was not used in the main assessment[3]. Similar models have been described within the frameworks of other large-scale assessments of problem-solving competencies such as the project test for Hamburg/Germany (Ebach, Klieme and Hensgen, 2000) and the PISA 2003 assessment of cross-curricular problem solving (OECD, in press).

In ALL, four levels of problem-solving proficiency are postulated:

Level 1

At a very elementary level, concrete, limited tasks can be mastered by applying content-related, practical reasoning. At this level, people will use specific content-related schemata to solve problems.

Level 2

The second level requires at least rudimentary systematical reasoning. Problems at this level are characterized by well-defined, one-dimensional goals; they ask for the evaluation of certain alternatives with regard to transparent, explicitly stated constraints. At this level, people use concrete logical operations.

Level 3

At the third level of problem-solving proficiency, people will be able to use formal operations (e.g., ordering) to integrate multi-dimensional or ill-defined goals, and to cope with non-transparent or multiple dependent constraints.

Level 4

At the final and highest level of competency, people are capable of grasping a system of problem states and possible solutions as a whole. Thus, the consistency of certain criteria, the dependency among multiple sequences of actions and other "meta-features" of a problem situation may be considered systematically. Also, at this stage people are able to explain how and why they arrived at a certain solution. This level of problem-solving competency requires a kind of critical thinking and a certain amount of meta-cognition.

The following example illustrates a concrete realization of a project. For this purpose a project that is not included in the final ALL instrument is introduced and one typical problem-solving task is shown. The project is about "Planning a trip and a family reunion".

In the introductory part of the project, the respondent is given the following summary describing the scenario and overall problem:

> *"Imagine that you live in City A. Your relatives are scattered throughout the country and you would like to organize a family reunion. The reunion will last 1 day. You decide to meet in City B, which is centrally located and accessible to all. Since you and your relatives love hiking, you decide to plan a long hike in a state park close to City B. You have agreed to be responsible for most of the organization."*

The respondent is then given a list of steps he or she needs to work through, in this example the following list:

- *Set the date for the reunion*
- *Consider your relatives' suggestions for the hike*
- *Plan what needs to be done before booking your flight*
- *Answer your relative's questions about traveling by plane*
- *Book your flight*
- *Make sure your ticket is correct*
- *Plan the trip from City B to the airport*

The first task of this project "Set the date for the reunion" is a good example of a typical problem-solving task and is shown here as it would appear in a test booklet.

Example task: Set the date for the reunion

The family reunion should take place sometime in July.

You asked all your relatives to tell you which dates would be suitable. After talking to them, you made a list of your relatives' appointments during the month of July. Your own appointment calendar is lying in front of you. You realize that some of your relatives will have to arrive a day early in order to attend the family reunion and will also only be able to return home on the day after the meeting.

Please look at the list of your relatives' appointments and your own appointment calendar.

List of your relatives' appointments in July 1999

Henry	Karen	Peter	Janet	Anne	Frank
Vacation in City E beginning on July 26; Appointment on July 11	Every day of the week is okay except Thursdays and on July 16	Business appoint-ments on July 2, July 13, and between July 27 and 29	Doesn't have any appoint-ments	Unable to attend reunion on July 5, July 20, or July 24	Has to be away sometime during the 1st full week in July on business, but will find out the exact dates shortly before

Henry, Karen, and Peter could arrive on the same day as the reunion whereas Janet, Anne, and Frank can only arrive on the afternoon before and return home on the day after the reunion.

Example task (cont.)

Your appointment calendar for July 1999

July 1999

Thurs.	1	Meeting with David
Fri.	2	
Sat.	3	
Sun.	4	
Mon.	5	
Tue.	6	
Wed.	7	
Thurs.	8	
Fri.	9	
Sat.	10	*Hike in City C*
Sun.	11	
Mon.	12	
Tue.	13	
Wed.	14	
Thurs.	15	
Fri.	16	
Sat	17	
Sun.	18	
Mon.	19	
Tue.	20	
Wed.	21	
Thurs	22	
Fri.	23	
Sat.	24	
Sun.	25	
Mon.	26	
Tue.	27	
Wed.	28	Vacation
Thurs	29	Vacation
Fri.	30	Vacation
Sat.	31	

Question 1. Which of the following dates are possible for the family reunion?

Please select all possible dates.

- a July 4
- b July 7
- c July 14
- d July 18
- e July 25
- f July 29

This project illustrates nicely how the action steps logic is actually "translated" into a concrete thematic action flow. The underlying plot – planning a trip and a family reunion – constitutes a very typical everyday-type of action that presumably a large majority of people in different countries will be able to relate to. The action steps themselves and their sequence can deviate from the normative complete action model, as is the case here. The normative model is used as a guideline that is adapted to each specific context. In this case, for example, the task "Consider your relatives' suggestions for the hike" corresponds approximately to the action step "Analyze the situation", the task "Plan what needs to be done before booking your flight" corresponds to the action step "Plan the solution", and "Book your flight" is a typical example for the action step "Execute the plan".

The example task gives a first indication of item structures and formats. The tasks typically start off with a short introduction to the situation, followed by varying types and amounts of information that need to be worked through. In the example task, in order to set the date for the family reunion, the respondent needs to process, compare and integrate the information provided in the list of the relatives' appointments, including the addendum to this list, and their own appointment calendar. Here the information is mostly textual and in the form of tables. The answer format is a multiple-choice format with more than one correct response alternatives, although the number of correct response alternatives is not specified.

Conclusion

This annex offers a brief overview of the frameworks that have been used for both developing the tasks used to measure prose and document literacy, numeracy and problem solving in ALL as well as for understanding the meaning of what is being reported with respect to the comparative literacy proficiencies of adults. The frameworks identify a set of variables that have been shown to influence successful performance on a broad array of tasks. Collectively, they provide a means for moving away from interpreting survey results in terms of discrete tasks or a single number, and towards identifying levels of performance sufficiently generalized to have validity across assessments and groups. As concern ceases to center on discrete behaviours or isolated observations and focuses more on providing meaningful interpretations of performance, a higher level of measurement is reached (Messick, 1989).

Endnotes

1. The 80 per cent criterion was drawn from the education literature on mastery learning to reflect a level of performance at which someone is judged to be proficient or competent. Some have argued that this is too high a standard and a response probability of 60 or even 50 per cent should be used. Lowering the criteria to 50 per cent would mean that an adult would be expected to perform tasks at a given level of proficiency with 50 per cent accuracy – hardly a standard we should accept as indicating someone is proficient at something. Would you visit a dentist that fixed the correct tooth 50 per cent of the time? How many employers would hire someone knowing they had a 50/50 chance of performing tasks correctly?
2. Quantitative literacy was defined in IALS as the knowledge and skills needed to apply arithmetic operations either alone or sequentially, using numbers embedded in printed materials.
3. This is the first time problem solving was used in an international survey of adult skills. It is expected that there will be subsequent rounds of ALL and at least some countries will want to measure problem solving using these materials. Therefore, it is important that these four projects be kept confidential for any future use.

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Annex B

Scale Estimation and Linking Methods

Table of contents

Scale Estimation and Linking Methods

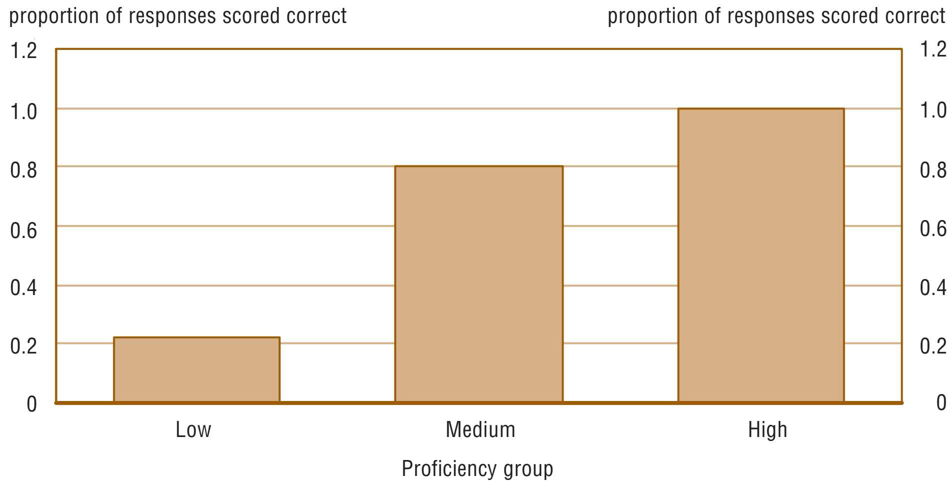
Estimation and scaling of proficiency estimates in ALL

The estimation and scaling of proficiency estimates in Adult Literacy and Life Skills Survey (ALL) relied on the application of Item Response Theory. Item Response Theory (IRT) assumes that the proportion of respondents with a specific proficiency level who correctly respond to a specific item depends wholly on the relationship between the item characteristics and degree of proficiency in the test domain. In other words, the response to a single item is independent of other traits, other respondents, or the other items included in the test. Essentially, respondents with greater proficiency are expected to perform better on each item than those with lower proficiency.

This principle is an extension of the classical index of discrimination, which describes the accuracy with which an item measures proficiency. The classical index of discrimination is calculated by comparing the proportion of correct responses between high and low proficiency respondents. If the proportion of correct responses from medium performers were also included, the results for a typical item would look like Figure B.1. As proficiency increases, the proportion of correct responses for that group also increases. As the difference between adjacent bars increases, the item is said to be more accurate, because the item can better differentiate between the individuals of higher or lower proficiency; i.e. highly skilled individuals will be more likely to provide a correct response to this item compared to the less skilled individuals.

Figure B.1

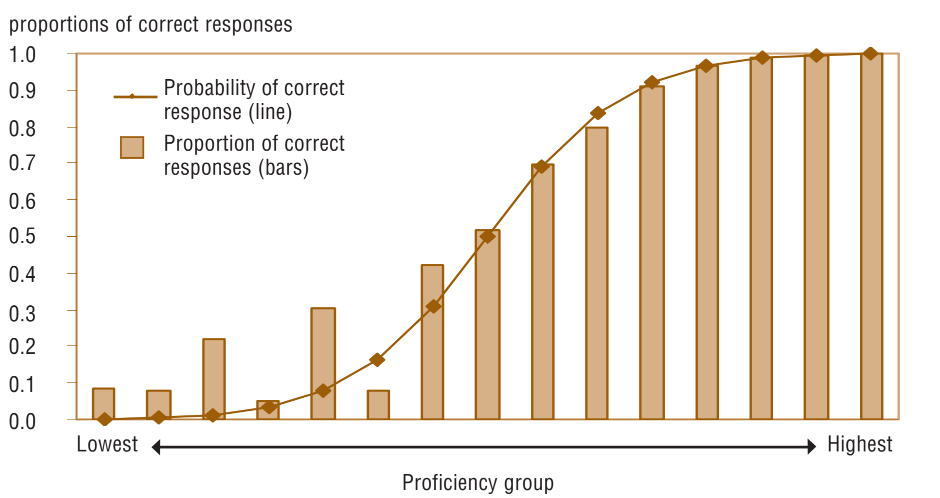
Expected proportions of correct responses for different groups of proficiency



If more than three categories are used to group respondents, a detailed graph might look like Figure B.2. In Figure B.2, more estimates are being produced from the data, so there is a greater chance of sampling error in each of the estimates, producing irregularities and occasionally higher proportions of correct responses for lower proficiency respondents. Statistically, we can reduce the sampling error by assuming that the relationship should be smooth and monotonic (increasing only) and statistically fitting a curve to the results. This curve, which is called an Item Response Function (IRF), describes the probability of correct response for every level of proficiency (Lord, 1980).

Figure B.2

The relationship between estimated proportions (vertical bars) and conditional probability (line)

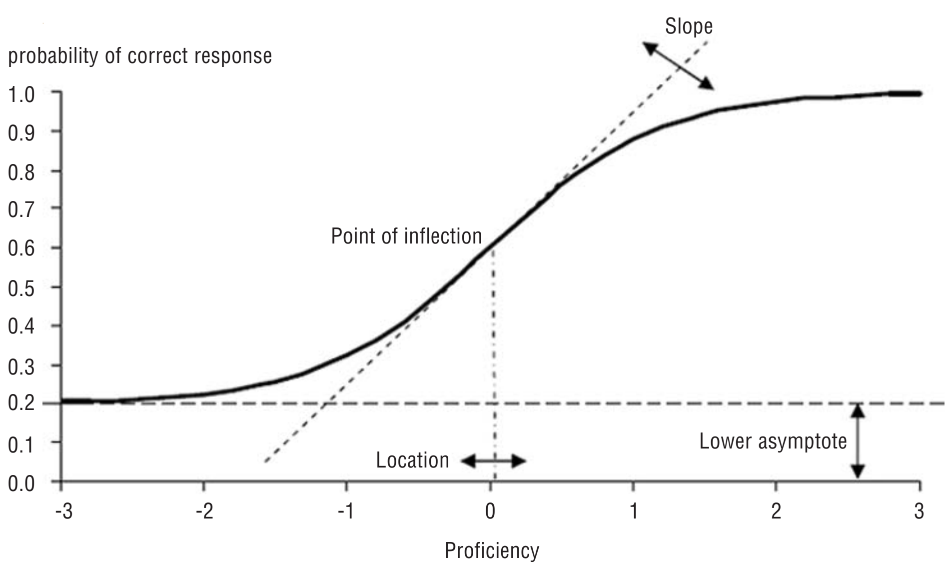


The slope of the IRF curve changes as the location on the proficiency scale moves from low proficiency to high proficiency. The point where the slope is the steepest is called the *point of inflection*. The shape of each IRF is determined by up to three properties, which are referred to as *item parameters*: first, the *lower asymptote,* second, the sl*ope* at the point of inflection, and third, the *location* of the point of inflection on the proficiency scale. These three parameters are illustrated in Figure B.3 where proficiency is described using the standard scale with a mean of 0 and a standard deviation of 1. Each parameter also has a conceptual definition:

1. The lower asymptote describes the chance that respondents who cannot generate the correct answer (i.e., who do not have the skill level required to answer the item successfully) will produce a response that will be scored 'correct.' This parameter may be constrained when item construction practically eliminates the chance of guessing correctly, for example, with open-ended items. For both IALS and ALL, all lower asymptotes were constrained to equal 0.
2. The slope of the IRF line, for each specific value of student proficiency, describes the ability of an item to discriminate between individuals whose proficiency is below or above that value. Steeper slopes indicate greater discrimination. An item with a steep slope discriminates strongly at the point of inflection, whereas an item with a smooth and horizontally elongated curve discriminates poorly.
3. The location of the item indicates the level of proficiency for which the item provides the greatest accuracy. Items that accurately measure lower levels of proficiency tend to be less difficult than items that accurately measure higher proficiency. Consequently, easier items tend to have a point of inflection that is located closer to the "low proficiency" end of the scale.

Figure B.3

Parameters of an item response function



Likelihood of response patterns

If the proficiency of a respondent is already known, the IRF for each item produces a single estimate describing how likely an observed response to the item is to occur. If the response to an item is correct, this likelihood is equal to the value of the IRF at the location of the respondent's proficiency. If the response is incorrect, the likelihood is equal to 1 minus the value of the IRF. The likelihood of a complete response pattern is the product of the individual item likelihoods, evaluated at a specific proficiency value. A single response pattern will produce different likelihoods, conditional on the value of the respondent's proficiency.

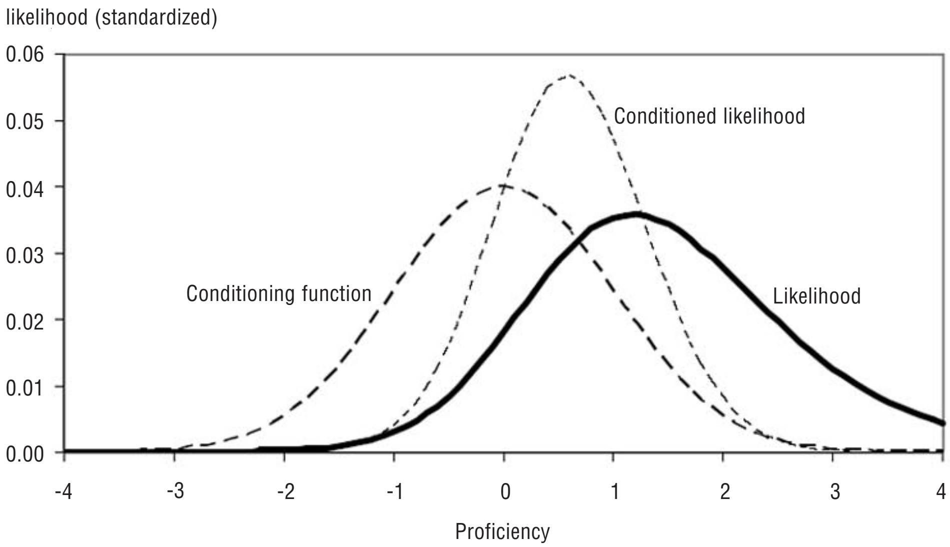
If the respondents perform consistently across items, the items are accurate measures of the test domain, and a sufficient number of items have been administered, then high likelihood values will only occur around a very narrow range of proficiency. However, if any of these conditions does not hold, then all likelihood values for a response pattern will be relatively low, and a wide range of proficiency levels will have similar likelihoods. If the likelihoods for all proficiency scores are low, then the test provides insufficient information to accurately estimate scores.

When the items administered to a respondent are insufficient to produce accurate estimates, other information may be used to *condition* the likelihood functions. Conditioning uses information about a larger population of respondents to estimate the likelihood that a respondent with specific characteristics will have a specific level of proficiency (e.g., respondents with lower education are generally less likely to have high proficiency in reading). Combined with the likelihood information associated with the item responses, conditioning can produce more accurate descriptions of individual proficiency than using item responses alone.

The effects of conditioning are illustrated in Figure B.4, where the likelihood function for an individual respondent prior to conditioning is compared to the distribution of proficiency for all respondents with similar characteristics. In this figure, the vertical scales of all functions have been standardized to appear on the same graph, by setting the definite integral across the observed range to equal 1. The conditioned likelihood function (also known as the *posterior distribution*) is the product of the individual likelihood function and the conditioning (or *prior*) distribution. The spread of the conditioned likelihood function is narrower than either of the other functions, suggesting that it is a more accurate representation of individual proficiency than either of the original functions.

Figure B.4

Examples of an unconditioned likelihood function (solid line), a conditioning function (dashed line) and a conditioned likelihood function (dotted line)



The main purpose of conditioning is to reduce the bias on score estimation that is introduced by using the set of items for all respondents. Because respondents have different degrees of proficiency, not all respondents will correctly answer the same number of items. As a result, the scores of respondents whose proportion of correct responses deviates significantly from 0.50 will be based on less information than those respondents with raw scores of 0.50. Respondents who have raw scores less than 0.50 will tend to have their scores underestimated, because the test does not balance the information about the upper limit of their score with information about the lower limit of their score. The reverse is true for respondents with raw scores greater than 0.50. By introducing a conditioning function, information about the entire population of respondents replaces information that otherwise would have come from having either more extremely easy or extremely difficult items.

Estimation of proficiency scores and plausible values

If the proficiency of respondents is not already known, then the conditional likelihood for a response pattern may be used to estimate the proficiency of a specific respondent. For individuals, the best estimate is the proficiency that produces the highest likelihood, known as the *maximum likelihood* estimate.

When conditioning is used, information about individuals' proficiency from unknown item responses – representing either missing response data or hypothetical responses to a larger set of items – is estimated by information based on the distribution of item responses for a population of similar respondents. If the information were directly observed for each respondent, there would be variation in the observed information between respondents. However, the conditioning process uses the same information for entire groups of respondents with equivalent conditioning characteristics. Because the maximum likelihood estimate only reports a single location on the likelihood function, it does not adequately capture the uncertainty associated with applying a population estimate to a single respondent. As a result, the maximum likelihood estimates have less variability than the true estimates would have had if the complete set of observations were available. Accordingly, statistics that depend on accurate estimation of population variability, such as comparisons of group averages, percentiles, and statistical tests of significance, will produce incorrect results if performed on the maximum likelihood estimate (or any other single 'best' estimate).

In order to avoid the artificial reduction in variability introduced by conditioning, the uncertainty in both the test-based likelihood function and the conditioning distribution can be represented with multiple imputations that span the plausible range of proficiency for the respondent. Each imputation, or *plausible value*, is selected randomly, where proficiency estimates with higher values on the conditioned likelihood function have a greater probability of selection. Although each plausible value is not optimal for each individual respondent, each set of plausible values for the entire sample will produce more accurate statistics at population and subpopulation levels than maximum likelihood or other 'best' estimates at the individual level.

Rotated booklet design

The promoters of a survey generally hope to collect as much information as possible, a goal that is truncated by the practical limitations of the collection process.

On average, ALL interviews lasted an hour and a half, which was deemed the maximum duration that could be imposed on respondents without risking substantial respondent fatigue or an increased dropout rate. The first half of the interview was devoted to the questionnaire and the second half to the tests. The number of test questions that could be presented to the respondent in approximately three-quarters of an hour was insufficient to cover the four domains ALL intended to measure. However, all respondents were assigned skill scores in the four domains[1] using statistical imputation.

The validity of the statistical imputation procedure rests on satisfaction of the following conditions:

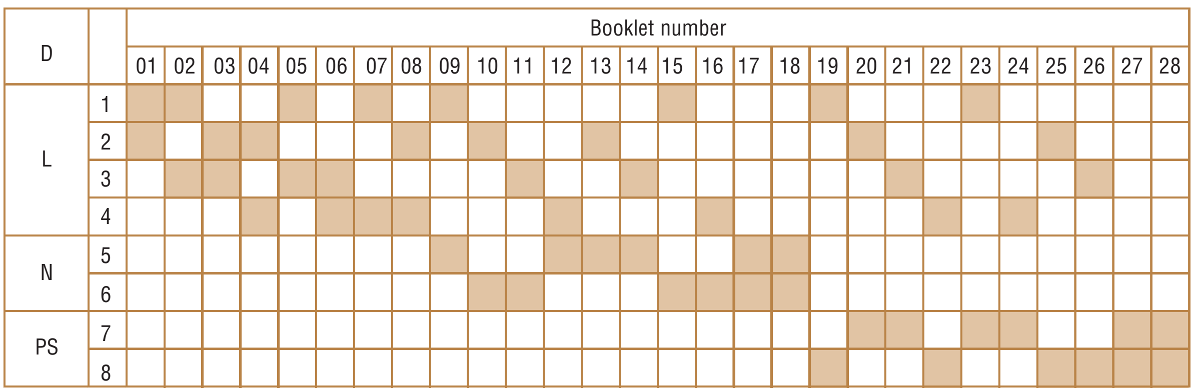
1. Non-observed data (more generally referred to as missing data) must be random, in the sense that their absence is not related to any characteristic would be correlated with the data if they were observed.[2] In the literature, missing data of this type are called "MAR" (missing at random).
2. The questions in the sample must be distributed in such a way as to obtain enough overlaps between questions to infer correlations.
3. The data must be processed using an IRT model which, distinguishing skill from the difficulty of the questions, serves to determine the probability of a correct response by a respondent answering a given question.

When these conditions are met, it becomes possible not to ask all the questions to all the respondents. This allows us to increase the total number of questions well beyond what could be presented to a single respondent and thereby cover a number of domains, which would otherwise have been impossible.[3] Since the third condition was discussed earlier, we will see below how the first two conditions were met.

In all, there were 160 questions (or items)[4]: 52 in prose literacy, 48 in document literacy, 41 in numeracy and 19 in problem solving. The 100 literacy questions were divided into four blocks (Blocks 1 to 4), the 41 numeracy questions into two blocks (Blocks 5 and 6) and the 19 problem solving questions into two blocks as well (Blocks 7 and 8). Combined in pairs, the 8 blocks constituted the 28 booklets below. Each respondent was presented a single booklet, and each booklet was presented to the same number of respondents, with the booklets being assigned randomly, thus satisfying the first condition.

Figure B.5

Distribution of 8 blocks in 28 booklets



Note: Literacy = blocks 1 to 4, Numeracy = blocks 5 and 6, Problem Solving = blocks 7 and 8.
B = Blocks D = Document; L = Literacy; N = Numeracy; PS = Problem Solving.

All possible combinations of block pairs are achieved between literacy blocks (6 booklets), between the literacy and numeracy blocks (8 booklets), and between literacy and problem solving blocks (8 booklets). These combinations total 22 booklets, supplemented by booklets 5 and 8, which duplicate booklets 2 and 4 with the order of the blocks reversed; booklets 17 and 18, composed of two numeracy blocks with the order of the blocks reversed; and booklets 27 and 28 on problem solving. No booklets contained both problem solving and numeracy. This configuration of the booklets leads to an overlap in the questions which satisfies the second condition.

Each respondent had to complete one, and only one, test booklet, thus answering the questions in two of the existing blocks. Each respondent was assigned performance scores in all four domains tested. Information in each domain represented by the empty squares in the booklet composition diagram is filled through the conditioning and imputation process. Booklets were assigned to respondents randomly, which satisfies the MAR assumption described above.

Parameter estimation

The parameters of an item response function are estimated directly from response data. The estimation of parameters follows what is conceptually an iterative two-stage process. First, provisional likelihood functions are estimated for respondents. Then, these likelihood functions are used to estimate provisional item parameters. The two stages constitute an estimation cycle, and each cycle will increase the accuracy of the provisional estimates. Estimation cycles are repeated until the successive cycles do not increase the accuracy of results (when the absolute change in provisional estimates of item parameters between cycles is less than 0.005).

The procedure is greatly simplified using the technique of *marginal maximum likelihood*, which does not estimate a single score for each respondent (for an introduction to the topic, see Bock & Aitkin, 1981 or Dempster, Laird & Rubin, 1977). Instead, each respondent is assigned to several predetermined proficiency scores. Each score has an associated weight that is proportional to the value of the respondent's likelihood function at that proficiency score. This weight is used to estimate the average item score, calculated across all respondents, for each of the predetermined proficiency scores in the set[5]. Since all item scores are either 0 or 1, the average item score is the proportion of correct response for each proficiency score.

Differential item functioning

In order for the score estimates to be valid representations of proficiency, the relationship between proficiency and probability of correct response described by each item must be true. In some populations, however, the IRF's may not provide an accurate description. For example, some items, after translation, become more complex – and therefore, difficult – because of linguistic differences unavoidable in translation. An item may also have a different relationship to proficiency across populations as a result of cultural bias and improper item construction or administration.

The relationships between the proficiency estimates and item response probability are compared across all countries. These relationships were calculated by using the estimates of proficiency produced using all items and the proportion of correct responses in each country separately (as in Figure B.2). If a relationship is different for a specific country, that item may be allowed unique item parameters for the country with the divergent relationship. This method allows the information in the item responses to be used to estimate proficiency without biasing the estimates with an incorrect IRF. Items that show idiosyncratic relationships across more than three of the participating countries are dropped from the assessment and are not used to calculate proficiency.

Linking the ALL literacy scale to IALS

Many of the test items used in ALL had previously been used in the International Adult Literacy Survey (IALS) to measure the concepts of Prose and Document literacy previously measured in IALS. Overall, the ALL survey included 55 Prose items and 54 Document items, including items in the Core booklet. These included 19 Prose items and 20 Document items from IALS. Numeracy and problem solving are new domains, so there are no common items for these domains between IALS and ALL. The common literacy items were distributed across item blocks such that each block contained an approximately equal number of items from both literacy domains in IALS (shown in Table B.1). The blocks themselves were distributed among all 28 test booklets as illustrated in Figure B.5. The uniform and balanced distribution of common items across all blocks allowed for a statistical linkage between the IALS and ALL scale at the item level.

Table B.1

Distribution of common (IALS) and unique (ALL) item blocks used for linking scales

	Block				
Source and literacy scale	0 (Core)	1	2	3	4
IALS					
Prose literacy skills	1	4	5	4	5
Document literacy skills	1	4	7	5	2
ALL					
Prose literacy skills	1	9	8	9	9
Document literacy skills	1	10	6	8	10

The item level linkage was performed by combining the response data from IALS with the response data from ALL and simultaneously calibrating all test items. By constraining the common items to retain the same statistical properties as in IALS during estimation, the remaining items were similarly constrained to be estimated on the same provisional scale as IALS.

After plausible values were drawn for each respondent using the method described earlier in this appendix, the results were transformed to the 0 to 500 reporting scale used for IALS with the transformation constants in Table B.2. The formula used to produce the final results is θ=Aθ^*+B, where θ^* is the provisional scale established using the item level linkage of IALS and ALL.

Table B.2

Transformation constants applied to the provisional literacy scales to produce the reported scales

Literacy scale	A	B
Prose literacy skills	51.67	269.16
Document literacy skills	52.46	237.50

The degree to which valid comparisons may be made between the literacy scores from IALS and ALL depends on the degree of similarity between the two instruments in terms of content coverage, accuracy, and methodology used to determine the scores. Succinct descriptions of qualitatively different types of linkages are described in Mislevy (1992) and Linn (1993). In brief, the similarity in content, composition, and administration between the two assessments, as well as the stability of the statistical models used to estimate proficiency scores, produce a very strong linkage. This linkage will support valid inferences regarding changes in literacy between populations and subpopulations of respondents in IALS and ALL, as if the two surveys had used the same assessment instrument.

The domains of Numeracy and Problem Solving used items that are not linked to a previous assessment. However, the methodology used to establish these numeric scales is the same as that used for the literacy scales. The constants used to establish the problem solving and numeracy scales are reported in Table B.3.

Table B.3

Transformation constants applied to the provisional numeracy and problem solving scales to produce the reported scales

Scale	A	B
Numeracy skills	58.77	269.57
Problem solving skills	54.86	273.62

Endnotes

1. For all the domains dealt with in each respondent's respective sample.
2. They are therefore missing for a specific reason characterizing one or more sub-groups.
3. However, this entails increasing the number of interviews.
4. This figure does not include the first six basic questions in the Core booklet asked to all respondents in order to eliminate those respondents potentially unable to pass the simplest parts of the full test.
5. All respondents are also weighted by their sample weights.

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Annex C

Adult Literacy and Life Skills Survey Methodology

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Adult Literacy and Life Skills Survey Survey Methodology

Survey methodology

Each participating country was required to design and implement the Adult Literacy and Life Skills (ALL) survey according to the standards provided in the document '*Standards and Guidelines for the Design and Implementation of the Adult Literacy and Life Skills Survey.*' These ALL standards established the minimum survey design and implementation requirements for the following project areas:

1. Survey planning
2. Target population
3. Method of data collection
4. Sample frame
5. Sample design
6. Sample selection
7. Literacy assessment design
8. Background questionnaire
9. Task booklets
10. Instrument requirements to facilitate data processing
11. Data collection
12. Respondent contact strategy
13. Response rate strategy
14. Interviewer hiring, training, supervision
15. Data capture
16. Coding
17. Scoring
18. All data file--format and editing
19. Weighting
20. Estimation
21. Confidentiality
22. Survey documentation
23. Pilot Survey

Assessment design

The participating countries, with the exception of the state of Nuevo Leon in Mexico, implemented an ALL assessment design. Nuevo Leon assessed literacy using the International Adult Literacy Survey (IALS) assessment instruments.

In both ALL and IALS a Balanced Incomplete Block (BIB) assessment design was used to measure the skill domains. The BIB design comprised a set of assessment tasks organized into smaller sets of tasks, or blocks. Each block contained assessment items from one of the skill domains and covers a wide range of difficulty, i.e., from easy to difficult. The blocks of items were organized into task booklets according to a BIB design. Individual respondents were not required to take the entire set of tasks. Instead, each respondent was randomly administered one of the task booklets.

ALL assessment

The ALL psychometric assessment consisted of the domains Prose, Document, Numeracy, and Problem Solving. The assessment included four 30-minute blocks of Literacy items (i.e., Prose AND Document Literacy), two 30-minute blocks of Numeracy items, and two 30-minute blocks of Problem-Solving items.

A four-domain ALL assessment was implemented in Australia, Bermuda, Canada, Hungary, Italy, Netherlands, New Zealand, Norway, and the French and German language regions of Switzerland. The United States and the Switzerland Italian language region carried out a three-domain ALL assessment that excluded the Problem Solving domain. In addition to the mentioned assessment domains, these participating countries assessed the use of information and communication technology via survey questions incorporated in the ALL Background Questionnaire.

The blocks of assessment items were organized into 28 task booklets in the case of the four-domain assessment and into 18 task booklets for the three-domain assessment. The assessment blocks were distributed to the task booklets according to a BIB design whereby each task booklet contained two blocks of items. The task booklets were randomly distributed amongst the selected sample. In addition, the data collection activity was closely monitored in order to obtain approximately the same number of complete cases for each task booklet, except for two task booklets in the three-domain assessment containing only Numeracy items that required a larger number of complete cases.

IALS assessment

The state of Nuevo Leon, Mexico carried out an IALS assessment. The IALS assessment consisted of three literacy domains: Prose, Document, and Quantitative. In addition, the ALL Background Questionnaire was used in Nuevo Leon. The use of information and communication technology was assessed via survey questions incorporated in the ALL Background Questionnaire.

IALS employed seven task booklets with three blocks of items per booklet. The task booklets were randomly distributed amongst the selected sample. In addition, the data collection activity was monitored in order to obtain approximately the same number of complete cases for each task booklet.

Target population and sample frame

Each participating country designed a sample to be representative of its *civilian non-institutionalized persons 16 to 65 years old (inclusive)*.

Countries were also at liberty to include adults over the age of 65 in the sample provided that a minimum suggested sample size requirement was satisfied for the 16 to 65 year age group. Canada opted to include in its target population adults over the age of 65. All remaining countries restricted the target population to the 16 to 65 age group.

Exclusions from the target population for practical operational reasons were acceptable provided a country's survey population did not differ from the target population by more than five per cent, i.e. provided the total number of exclusions from the target population due to undercoverage was not more than five per cent of the target population. All countries indicate that this five-per cent requirement was satisfied.

Each country chose or developed a sample frame to cover the target population. The following table shows the sample frame and the target population exclusions for each country:

Table C.1

Sample frame and target population exclusions

Country	Sample frame	Exclusions
Australia	An area-based private dwelling frame that consists of a list of Geographic areas called Census Collector Districts (CDs).	Residents of special dwellings; overseas residents temporarily in Australia; members of non-Australian defense forces and their dependents; non-Australian diplomatic staff and the non-Australian members of their households; residents of very remote areas.
Bermuda	Land Valuation List • an up-to-date listing of all Bermuda housing units.	Persons residing in institutions; visitors to Bermuda (i.e., persons staying less than 6 months).
Canada	Census of Population and Housing database, reference date of May 15, 2001 • households enumerated by the Census long-form (20% sample).	Long-term institutional residents; members of the armed forces; individuals living on Indian Reserves; residents of sparsely populated regions.
Hungary	Census of Population and Housing database.	Homeless people, prisoners.
Italy	Polling list – a list of individuals aged 18 and over that are resident in Italy and have civil rights.	None.
Netherlands	Municipal Basic Administration (GBA) as collected by the National Statistical Office (CBS) on a monthly basis.	Persons living in institutions; persons illegally in the country.
New Zealand	Census Meshblocks (as developed for the New Zealand Census by Statistics New Zealand).	Persons living in non-private dwellings such as prisons, retirement homes, hospitals, university residences etc.; persons living in remote rural areas and on off-shore islands (except Waiheke Island which is included).
Norway	Norwegian Register of Education (2002 version).	Permanent residents in institutions; individuals for whom education level is unknown.
Nuevo Leon, Mexico	Census of Population and Housing database, reference year 2000.	Persons residing in institutions; members of the Mexican Navy.
Switzerland	Register of private telephone numbers (September 2002).	Persons living in institutions; people living in very isolated areas; persons with no private telephone number.
United States	Area Frame – 1,883 Primary Sampling Units covering all counties in the 50 states in the United States plus Washington, DC.	Full-time military personnel, residents in institutionalized group quarters.

Sample design

Each participating country was required to use a probability sample representative of the national population aged 16 to 65. Of course, the available sampling frames and resources varied from one country to another. Therefore, the particular probability sample design to be used was left to the discretion of each country. Each country's proposed sample design was reviewed by Statistics Canada to ensure that the sample design standards and guidelines were satisfied.

Each country's sample design is summarized below. The sample size and response rate for each country can be found in the section following this one.

Australia

The sample was based on the population master sample which is the standard household survey design used in the Australian Bureau of Statistics. The population master sample, redesigned and selected once every 5 years, is a stratified, multi-stage cluster sample design. Stratification is based on 8 states/territories and 17 area types within each state/territory. Area types are based on part of state (i.e., state capital city or balance of state), region, population density and remoteness.

The ALL sample included four stages of sampling. The first stage sampling units were Census Collection Districts (CDs), the second stage sampling units were blocks (which are small areas within CDs), the third stage sampling units were clusters of dwellings, and the final stage units were the eligible household members.

The ALL sample was allocated proportionally to the standard ABS household survey sample. As in the standard ABS household surveys, the sample was allocated within states to ensure equal probability of selection for all households in the state. The allocation of sample between states is a compromise between accurate national estimates and usable estimates for the smaller states. As such, the probability of selection was different between states.

The first stage of selection involved selecting CDs systematically from an ordered list, with probability proportional to size (PPS), and without replacement. The list of CDs was ordered using 'serpentine ordering,' a method of ranking CDs in an attempt to maximize the geographical distance between selected CDs, thereby attempting to increase the heterogeneity of individual samples. The second stage of selection was a PPS selection of one block without replacement from each selected CD. In the third stage, a cluster of dwellings in the block was selected using systematic equal probability sampling. At the final stage, one person within the selected household was randomly selected from the list of in-scope household members.

Bermuda

A two-stage stratified probability design was employed. In stage one Bermuda's Land Valuation List of dwellings was stratified by parish, i.e., geographic region. Within each parish, a random sample of dwellings was selected with probability proportional to the number of parish dwellings. At stage two, one eligible respondent was selected using a Kish-type person selection grid.

Canada

A stratified multi-stage probability sample design was used to select the sample from the Census Frame. The sample was designed to yield separate samples for the two Canadian official languages, English and French. In addition, Canada increased the sample size in order to produce estimates for a number of population subgroups. Provincial ministries and other organizations sponsored supplementary samples to increase the base or to target specific subpopulations such as youth (ages 16 to 24 in Québec and 16 to 29 in British Columbia), adults aged 25 to 64 in Québec, linguistic minorities (English in Québec and French elsewhere), recent and established immigrants, urban aboriginals, and residents of the northern territories.

In each of Canada's ten provinces the Census Frame was further stratified into an urban stratum and a rural stratum. The urban stratum was restricted to urban centers of a particular size, as determined from the previous census. The remainder of the survey frame was delineated into primary sampling units (PSUs) by Statistics Canada's Generalised Area Delineation System (GArDS). The PSUs were created to contain a sufficient population in terms of the number of dwellings within a limited area of reasonable compactness. In addition, the Census Frame was ordered within each geographic region by highest level of education prior to sample selection, thus ensuring a representation across the range of educational backgrounds.

Within the urban stratum, two stages of sampling were used. In the first stage, households were selected systematically with probability proportional to size. During the second stage, a simple random sample algorithm was used by the CAPI application to select an individual from the eligible household adults. Three stages were used to select the sample in the rural stratum. In the first stage, Primary Sampling Units were selected with probability proportional to population size. The second and third stages for the rural stratum repeated the same methodology employed in the two-stage selection for the urban stratum.

Hungary

A stratified two-stage sample design was employed to yield a sample of persons selected Proportional to Population Size (PPS).

The population was stratified into seven regions and twenty counties. This stratification took into consideration the regional and county demographic characteristics and other conditions (e.g. rate of active and inactive population, unemployment rate) that varied from one region to another. In each county, the population was further stratified into three types of settlements: city, town, and village. Subsequently, the sample was selected in two stages:

Stage1: a PPS sample of settlements,

Stage2: a random selection of addresses from the settlements selected at stage 1. The list of addresses in each selected settlement were obtained from the Ministry of Interior files from the 2001 Census, the most up-to-date and precise data for the population of Hungary at the time of sample selection. The addresses to be contacted for interview were selected from these files.

Italy

A stratified three-stage probability design was used to select a sample using municipal polling lists. Italy was stratified geographically into 22 regions. In general the sample was allocated proportionally to the 22 regions. However, the regions Piemonte, Veneto, Toscana, Campania, and Trento were oversampled to satisfy an objective to produce separate estimates in these five regions.

At the first stage, municipalities were the primary sampling units. Within each geographic region the municipalities were stratified, based on the municipality population size, into self-representing units and non-self-representing units. The self-representing units, i.e., the larger municipalities and metropolitan municipalities, were selected with certainty in the sample. In the non-self-representing stratum in each region, two municipalities were selected with a probability proportional to the target population size. In total, 256 municipalities were selected from the self-representing and non-self-representing strata.

The second stage of the sample design defined 'sex sub-lists' as the secondary sampling unit. The polling list for each selected municipality comprised a number of sub-lists that were stratified by gender, referred to as 'sex sub-lists.' The polling list included the household address of Italian residents aged 18 to 65. The same number of sex sub-lists was systematically selected for each gender. A total of 1,326 sex sub-lists (663 in the male stratum and 663 in the female stratum) were selected.

At the third stage of sample design, a sample of 18 to 65 year old individuals was systematically selected from the secondary sampling units. Subsequently, at the household contact phase, all 16 to 17 year olds living in the household of a selected 18 to 65 year old were included in the sample.

Netherlands

The sample design in the Netherlands was a stratified, multi-stage systematic cluster design.

In the first stage, the country was stratified into 4 regions; North, East, West, and South. Within each stratum, a sample of municipalities was selected with probability proportional to municipality population size. This was achieved by ordering the municipalities within a stratum by population size and by systematically selecting the sample of municipalities using a random starting point and a fixed sampling interval. The population data were based on the municipality data, Gemeentelijke Basis Administratie (GBA), from the national statistical office, Centraal Bureau voor Statistiek (CBS).

In the second stage, within each selected municipality a systematic sample of postal code areas was drawn. The company, Experian, provided information about credit score (i.e. the percentage of households having debts within a postal code area) and purchasing power for the postal code areas (6 digits). The postal code areas were ordered by credit score and then by purchasing power. From a random starting point and with a fixed sampling interval (in terms of households), the households were drawn.

In the third stage within each selected postal code area one household was randomly selected. Data came from the Experian database on household information (based on CENDRIS, the current owner of the Post Office central database). This database is updated on a monthly basis.

In the fourth stage one eligible individual within the selected household was randomly selected.

New Zealand

The sample design was a stratified probability design with three stages of sampling – replicate, dwelling, and household member. The population was categorized into three strata - main stratum (everyone 16 to 65 eligible), Mãori and Pacific stratum (only Mãori and Pacific eligible), and Pacific stratum (only Pacific people eligible).

(a) Stage 1: The Replicate

From the 38,000 meshblocks which formed the basis of New Zealand's 2001 Census of Population and Dwellings, those with 9 or fewer dwellings were eliminated, leaving 32,115 meshblocks with 10 or more dwellings. The coverage of permanent private dwellings was 98.6 per cent. The probability of selection for each meshblock was proportional to the number of dwellings in the meshblock. A total of 896 meshblocks were selected, and subsequently allocated to 32 replicates made up of 28 meshblocks per replicate. Each replicate contained meshblocks distributed north to south in approximately the same manner, and was thus a mini national probability sample.

(b) Stage 2: The Dwelling

For the main stratum, dwellings were selected as follows. The sample interval was derived for each meshblock as the number of dwellings in the meshblock divided by 15. The sample interval thus differed according to the size of the meshblock. Beginning from a randomised starting point, interviewers selected dwellings according to the meshblock's sample interval.

In addition to the dwellings in the main stratum, up to an additional 21 dwellings per meshblock were also sampled for the Mâori and Pacific, and the Pacific strata. In 4 of these dwellings, residents of either Mãori or Pacific ethnicity were eligible for selection. In the remaining 17 dwellings only residents of Pacific ethnicity were eligible. The sample interval was 1 for these dwellings once the main stratum dwellings were set aside.

(c) Stage 3: The Respondent

For the main stratum, one person per household was selected from all eligible household members using a Kish grid. For the two ethnic strata, the ethnicity of the household members (Mãori or Pacific for stratum two, Pacific for stratum three) was an additional eligibility criterion prior to selection using the Kish grid.

Norway

The sample was selected from the 2002 version of the Norwegian Register of Education using a two-stage probability sample design.

The design created 363 Primary Sampling Units (PSUs) from the 435 municipalities in Norway. These PSUs were grouped into 109 geographical strata. Thirty-eight strata consisted of one PSU that was a municipality with a population of 25,000 or more. At the first stage of sample selection, each of these 38 PSUs was included with certainty in the sample. The remaining municipalities were allocated to 79 strata. The variables used for stratification of these municipalities were industrial structure, number of inhabitants, centrality, communication structures, commuting patterns, trade areas and (local) media coverage. One PSU was selected with probability proportional to size from each of these 79 strata.

The second stage of the sample design involved the selection of a sample of individuals from each sampled PSU. Each selected PSU was stratified by three education levels defined by the Education Register. The sample size for each selected PSU was determined by allocating the overall sample size to each selected PSU with probability proportional to the target population size. The PSU sample was then allocated with 30 per cent from the low-education group, 40 per cent from the medium-education group and 30 per cent from the high-education group. Individuals for whom the education level (84,318 persons) was not on the Education Register were excluded from the sampling.

Nuevo Leon, Mexico

The sample design was a stratified probability design with two stages of sampling within each stratum.

The 51 municipalities in Nuevo Leon were grouped geographically into three strata: Stratum 1 – Census Metropolitan Area of Monterrey, consisting of 9 municipalities; Stratum 2 – the municipalities of Linares and Sabinas Hidalgo; Stratum 3 – the remaining 40 municipalities of Nuevo Leon. The initial sample was allocated to the three strata proportional to the number of dwellings in each stratum.

At the first stage of sample selection, in each stratum a simple random sample of households was selected. The second sampling stage consisted of selecting one person belonging to the target population from each selected household using a Kish-type person selection grid.

Switzerland

The sample design was a stratified probability design with two stages of sampling. Separate estimates were required for Switzerland's three language regions (i.e., German, French, Italian). Thus, the three language regions are the primary strata. Within the language regions, the population was further stratified into the metropolitan areas represented by the cantons of Geneva and Zurich and the rest of the language regions. At the first stage of sampling, in each stratum a systematic sample of households was drawn from a list of private telephone numbers. In the second stage, a single person belonging to the target population was selected from each household using a Kish-type person selection grid.

United States

A stratified multi-stage probability sample design was employed in the United States.

The first stage of sampling consisted of selecting a sample of 60 primary sampling units (PSUs) from a total of 1,883 PSUs that were formed using a single county or a group of contiguous counties, depending on the population size and the area covered by a county or counties. The PSUs were stratified on the basis of the social and economic characteristics of the population, as reported in the 2000 Census. The following characteristics were used to stratify the PSUs: region of the country, whether or not the PSU is a Metropolitan Statistical Area (MSA), population size, percentage of African-American residents, percentage of Hispanic residents, and per capita income. The largest PSUs in terms of a population size cut-off were included in the sample with certainty. For the remaining PSUs, one PSU per stratum was selected with probability proportional to the population size.

At the second sampling stage, a total of 505 geographic segments were systematically selected with probability proportionate to population size from the sampled PSUs. Segments consist of area blocks (as defined by Census 2000) or combinations of two or more nearby blocks. They were formed to satisfy criteria based on population size and geographic proximity.

The third stage of sampling involved the listing of the dwellings in the selected segments, and the subsequent selection of a random sample of dwellings. An equal number of dwellings was selected from each sampled segment.

At the fourth and final stage of sampling, one eligible person was randomly selected within households with fewer than four eligible adults. In households with four or more eligible persons, two adults were randomly selected.

Sample size

A sample size of 5,400 completed cases in each official language was recommended for each country that was implementing the full ALL psychometric assessment (i.e., comprising the domains Prose and Document Literacy, Numeracy, and Problem-Solving).

A sample size of 3,420 complete cases in each official language was recommended if the Problem Solving domain was excluded from the ALL assessment.

A sample size of 3,000 complete cases was recommended for the state of Nuevo Leon, Mexico, which assessed literacy skills with the psychometric task booklets of the International Adult Literacy Survey (IALS).

Table C.2 shows the final number of respondents (complete cases) for each participating country's assessment language(s).

Table C.2

Sample size by assessment language

Country	Assessment Language	Assessment Domains [1]	Number of Respondents [2]
Australia	English	P, D, N, PS	7,922
Bermuda	English	P, D, N, PS	2,696
Canada	English	P, D, N, PS	15,694
	French	P, D, N, PS	4,365
Hungary	Hungarian	P, D, N, PS	5,635
Italy	Italian	P, D, N, PS	6,853
Netherlands	Dutch	P, D, N, PS	5,617
New Zealand	English	P, D, N, PS	7,131
Norway	Bokmal	P, D, N, PS	5,411
Nuevo Leon, Mexico	Spanish	P, D, Q	4,786
Switzerland	French	P, D, N, PS	1,765
	German	P, D, N, PS	1,892
	Italian	P, D, N	1,463
United States	English	P, D, N	3,420

1. P = Prose, D = Document, N = Numeracy, PS = Problem Solving, Q = Quantitative.
2. A respondent's data is considered complete for the purposes of the scaling of a country's psychometric assessment data provided that at least the Background Questionnaire variables for age, gender and education have been completed.

Data collection

The ALL survey design combined educational testing techniques with those of household survey research to measure literacy and provide the information necessary to make these measures meaningful. The respondents were first asked a series of questions to obtain background and demographic information on educational attainment, literacy practices at home and at work, labour force information, information communications technology uses, adult education participation and literacy self-assessment.

Once the background questionnaire had been completed, the interviewer presented a booklet containing six simple tasks (Core task). Respondents who passed the Core tasks were given a much larger variety of tasks, drawn from a pool of items grouped into blocks, each booklet contained 2 blocks which represented about 45 items. No time limit was imposed on respondents, and they were urged to try each item in their booklet. Respondents were given a maximum leeway to demonstrate their skill levels, even if their measured skills were minimal.

Data collection for the ALL project took place during the years 2002 to 2008, depending on the country. Table C.3 presents the collection periods for each participating country.

Table C.3

Survey collection period

Country	Collection date
Australia	July 2006 through January 2007
Bermuda	March through August 2003
Canada	March through September 2003
Hungary	July 2007 through February 2008
Italy	May 2003 through January 2004
Netherlands	July 2007 through January 2008
New Zealand	August 2005 and April 2007
Norway	January through November 2003
Nuevo Leon, Mexico	October 2002 through March 2003
Switzerland	January through November 2003
United States	January through June 2003

To ensure high quality data, the ALL Survey Administration Guidelines specified that each country should work with a reputable data collection agency or firm, preferably one with its own professional, experienced interviewers. The manner in which these interviewers were paid should encourage maximum response. The interviews were conducted in home in a neutral, non-pressured manner. Interviewer training and supervision was to be provided, emphasizing the selection of one person per household (if applicable), the selection of one of the 28 main task booklets (if applicable), the scoring of the core task booklet, and the assignment of status codes. Finally the interviewers' work was to have been supervised by using frequent quality checks at the beginning of data collection, fewer quality checks throughout collection and having help available to interviewers during the data collection period.

The ALL took several precautions against non-response bias, as specified in the ALL Administration Guidelines. Interviewers were specifically instructed to return several times to non-respondent households in order to obtain as many responses as possible. In addition, all countries were asked to ensure address information provided to interviewers was as complete as possible, in order to reduce potential household identification problems.

Countries were asked to complete a debriefing questionnaire after the Main study in order to demonstrate that the guidelines had been followed, as well as to identify any collection problems they had encountered. Table C.4 presents information about interviews derived from this questionnaire.

Table C.4

Interviewer information

Country	Number of languages	Number of interviewers	Average assignment size	Interviewer experience
Australia	1	295	49	Professional interviewers with at least 2 years experience.
Bermuda	1	105	40	No specific information provided.
Canada	2	317	62	Professional interviewers with at least 2 years experience.
Hungary	1	175	32	Professional interviewers with at least 2 years experience.
Italy	1	150	45	Professional interviewers, most of whom had at least 2 years experience.
Netherlands	1	277	35	Professional interviewers, approximately one fifth of them had no previous survey experience.
New Zealand	1	160	45	Professional interviewers, but interviewer experience not recorded.
Norway	1	320	30	A third of the interviewers had at least 2 years experience, the others were trained specifically for this survey.
Nuevo Leon, Mexico	1	209	29	Approximately 70% of interviewers had 2 years of experience.
Switzerland	3	110	60	No specific information provided.
United States	1	106	64	Professional interviewers approximately a quarter of whom had no previous survey experience.

Data processing

As a condition of their participation in the ALL study, countries were required to capture and process their survey data files using procedures to ensure logical consistency and acceptable levels of data capture error. Specifically, countries were advised to conduct complete verification of the captured scores (i.e. enter each record twice) in order to minimize error rates. Because the process of accurately capturing the task scores is essential to high data quality, 100 per cent keystroke verification was required.

Each country was also responsible for coding the industry, occupation, and education variables using standard coding schemes such as the International Standard Industrial Classification (ISIC), the International Standard Classification for Occupation (ISCO) and the International Standard Classification for Education (ISCED). Coding schemes were provided by Statistics Canada for all open-ended items, and countries were given specific instructions about the coding of such items.

In order to facilitate comparability in data analysis, each ALL country was required to map its national dataset into a highly structured, standardized record layout. In addition to specifying the position, format and length of each field, the international record layout included a description of each variable and indicated the categories and codes to be provided for that variable. Upon receiving a country's file, Statistics Canada performed a series of range checks to ensure compliance with the prescribed record layout format. As well, flow edits and consistency edits were also run on each country's file. When anomalies were detected in a country's file, the country was notified of the problem and requested to resolve the edit issues, and to subsequently submit a cleaned file.

Scoring of tasks

Persons charged with scoring in each country received intensive training in scoring responses to the open-ended items using the ALL scoring manual. As well, they were provided a tool for capturing closed-format questions. Table C.5 provides a summary of the scoring operations.

Table C.5

Scoring operations summary

Country	Scoring start[1]	Number of scorers	Average scoring time per booklet
Australia	Middle	9	12 min.
Bermuda	Middle	5	20 min.
Canada	Middle	18 [2]	13 min.
Hungary	Middle	9	20 min.
Italy	Beginning	9	15 min.
Netherlands	Middle	7	12 min.
New Zealand	Beginning	12	20 min.
Norway	Middle	17	8 min.
Nuevo Leon, Mexico	Middle	12	...
Switzerland	Beginning	11	22 min.
United States	Beginning	7	12 min.

... not applicable

1. Indicates that the scoring started at the beginning, middle or end of collection.
2. Includes 15 scorers, 2 people to capture problem solving closed format questions and 1 person to capture scoring sheets.

To aid in maintaining scoring accuracy and comparability between countries, the ALL survey introduced the use of an electronic bulletin board, where countries could post their scoring questions and receive scoring decisions from the domain experts. This information could be viewed by all countries so that scoring could be adjusted.

To further ensure quality, countries were monitored as to the quality of their scoring in two ways.

First, within a country, at least 20 per cent of the tasks had to be re-scored. Guidelines for intra-country rescoring involved rescoring a larger portion of booklets at the beginning of the scoring process to identify and rectify as many scoring problems as possible. As a second phase, they were to select a smaller portion of the next third of the scoring booklets; the last phase was viewed as a quality monitoring measure, which involved rescoring a smaller portion of booklets regularly to the end of the re-scoring activities. The two sets of scores needed to match with at least 95 per cent accuracy before the next step of processing could begin. In fact, most of the intra-country scoring reliabilities were above 95 per cent. Where errors occurred, a country was required to go back to the booklets and rescore all the questions with problems and all the tasks that belonged to a problem scorer.

Second, an international re-score was performed. The main goal of the re-score was to verify that no country scored consistently differently from another.

For Bermuda, Canada, Italy, Norway, Nuevo Leon-Mexico, Switzerland, and the United States, each country had 10 per cent of its sample re-scored by scorers in another country. For example, a sample of task booklets from the United States was re-scored by the persons who had scored Canadian English booklets, and vice-versa. Inter-country score reliabilities were calculated by Statistics Canada and the results were evaluated by the Educational Testing Service based in Princeton. Again, strict accuracy was demanded: a 90 per cent correspondence was required before the scores were deemed acceptable. Any problems detected had to be re-scored.

For Australia, Hungary, the Netherlands, and New Zealand, each country was required to score a standard set of 400 Canadian English booklets. Inter-country score reliabilities were calculated by Statistics Canada and the results were evaluated by the Educational Testing Service.

Table C.6 displays the achieved levels of inter-country score agreement for each domain.

Table C.6

Scoring – per cent reliability by domain

Country pairing (rescoring country – original country)	Psychometric domain: Prose and document	Psychometric domain: Numeracy	Psychometric domain: Problem solving	Total
	per cent			per cent
Canada English – Canada French	95	95	92	95
Canada French – Canada English	95	97	94	95
Norway – Canada	91	93	91	92
Canada – United States	94	97	...	95
United States – Canada	95	97	...	95
United States – Bermuda	91	94	...	90
Bermuda – United States	93	95	...	93
Canada French – Switzerland	95	98	97	96
Switzerland – Canada French	94	96	94	95
Switzerland – Italy	96	98	96	96
Italy – Switzerland	93	97	93	94
Canada – Bermuda	...	...	83	83
Canada – Nuevo Leon, Mexico	91	95 [1]	...	92
Australia	97	98	93	96
Hungary	94	96	93	94
Netherlands	91	93	93	92
New Zealand	96	97	94	96

... not applicable
1. Quantitative literacy.

Survey response and weighting

The following table summarizes the sample sizes and response rates for each participating country.

Table C.7

Sample size and response rate summary

Country	Population aged 16 to 65	Initial sample size (16 to 65)	Out-of-scope cases[1]	Number of respondents[2] (16 to 65)	Response rate[3] (16 to 65)
	number	number	number	number	per cent
Australia	13,552,370	14,311	4,238	7,922	79
Bermuda	43,274	4,049	745	2,696	82
Canada	21,960,683	35,270	4,721	20,059	66
Hungary	6,760,050	9,178	18,356	5,635	63
Italy	38,765,513	16,727	971	6,853	44
Netherlands	10,974,940	12,734	719	5,617	47
New Zealand	2,634,442	28,702	17,565 [4]	7,131	64
Norway	2,945,838	9,719	16	5,411	56
Nuevo Leon, Mexico	2,382,454	6,000	36	4,786	80
Switzerland	1,161,735	18,282	5,310	5,120	40
United States	184,260,910	7,045	1,846	3,420	66

1. Out-of-scope cases are those that were coded as residents not eligible, unable to locate the dwelling, dwelling under construction, vacant or seasonal dwelling, or duplicate cases.
2. A respondent's data is considered complete for the purposes of the scaling of a country's psychometric assessment data provided that at least the Background Questionnaire variables for age, gender and education have been completed.
3. The response rate is calculated as *number of respondents* divided by the *initial sample size minus the out-of-scope cases*.
4. The reason for the relatively large number of out-of-scope cases in New Zealand is that a screening methodology was used to 'oversample' the Mâori and Pacific populations. In the screened portions of the sample, only Mâori and Pacific people were treated as in scope.

Each participating country in ALL used a multi-stage probability sample design with stratification and unequal probabilities of respondent selection. Furthermore, there is a need to compensate for the non-response that occurred at varying levels. Therefore, the estimation of population parameters and the associated standard errors is dependent on the survey weights.

All participating countries used the same general procedure for calculating the survey weights. However, each country developed the survey weights according to its particular probability sample design.

In general, two types of weights were calculated by each country, population weights that are required for the production of population estimates, and jackknife replicate weights that are used to derive the corresponding standard errors.

Population weights

For each respondent record the population weight was created by first calculating the theoretical or sample design weight. Then a base sample weight was derived by mathematically adjusting the theoretical weight for non-response. The base weight is the fundamental weight that can be used to produce population estimates. However, in order to ensure that the sample weights were consistent with a country's known population totals (i.e., benchmark totals) for key characteristics, the base sample weights were ratio-adjusted to the benchmark totals.

Table C.8 provides the benchmark variables for each country and the source of the benchmark population counts.

Jackknife weights

It was recommended that 10 to 30 jackknife replicate weights be developed for use in determining the standard errors of the survey estimates. Switzerland produced 15 jackknife replicate weights. The remaining countries produced 30 jackknife replicate weights.

Table C.8

Benchmark variables by country

Country	Source of benchmark counts	Benchmark variables
Australia	Estimated resident population based on 2006 Census of Population and Housing	Age, Gender, State, Part of State (State Capital City/Balance of State)
Bermuda	Census 2000	Age, Gender, Education level
Canada	Census Demography Counts, June-2003	Province, Census geographic area (i.e., CMA/CA), Age, Gender
Hungary	2005 and 2006 demographic data from the Hungarian Central Statistical Office (KSH)	Age, Gender, Education level, Geographic area
Italy	ISTAT Multipurpose Survey 2002	Region, Age, Gender, Education level, Employment status
Netherlands	Municipal Basic Administration (GBA) as Collected by the National Statistical Office (CBS) and Experian database	Age, Education, Purchasing power, House property
New Zealand	2006 Census of Populations and Dwellings	Age, Gender, Education Level
Norway	Norwegian Register of Education (2002 version)	Age, Gender, Education level
Nuevo Leon, Mexico	Census of Population and Housing (2000)	Age, Gender, Education level
Switzerland	Swiss Labor Force Survey (SAKE)	Language region, Age, Gender, Education level, Immigrant status
United States	2003 Current Population Survey, March Supplement	Census region, Metropolitan Statistical Area (MSA) status, Age, Gender, Race/ethnicity, Immigrant status

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