Adult Skills in the Nordic Region

Key Information–Processing Skills Among Adults in the Nordic Region

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Content

Preface

Denmark, Estonia, Finland, Norway, and Sweden participated in the first round of the International Survey of Adult Skills together with 19 other countries. The survey is a product of the Programme for the International Assessment of Adult Competencies (PIAAC) led by the Organisation for Economic Co-operation and Development (OECD). The survey assessed the proficiency in literacy, numeracy, and problem-solving in technology-rich environments of adults aged 16–65. These key information-processing skills are relevant to adults in many social contexts and work situations, and are necessary to be fully integrated and to participate in education and training, in the labour market, and in social and civic life. These skills are also needed for economies to prosper.

In addition to the proficiency assessments, the survey collected a wide range of background information on the basic demographic characteristics of the respondents, their educational attainment, participation in education and training, labour force status, employment history, and the use of the key information-processing skills at work and in everyday life. The first international PIAAC results were published by OECD in November 2013; at the same time, the participating countries published their national reports.

This publication concentrates on the comparative results from four Nordic countries and Estonia, forming a Nordic region with many common features. It supplements the series of national and international reports by comparing the PIAAC results from five countries, as well as comparing an aggregate of these countries to other country aggregates.

This publication is the product of the Nordic PIAAC Network, consisting of members from all five countries. Cooperation between the countries started during the national implementation process of the PIAAC survey as early as 2009 at the international PIAAC meetings, as informal discussions between the persons responsible for the survey in their countries. The aim was to share experiences, information, and support in the national preparations and implementations of the survey. In 2010, the National Project Managers of the PIAAC in the five countries decided to establish an organised network, to apply for funding for it, and to produce a comparative Nordic report. The first official meeting was held in November 2010 in Örebro, Sweden and has since then been followed by six additional meetings in the participating countries.

Early on in the Nordic PIAAC Network collaboration it was decided that the joint Nordic PIAAC database would also be augmented by register data. This idea was seen as important because it would be the first time that such a large-scale international database would be supplemented by register data from the statistical offices in the participating countries. The work in defining and collecting the register data has not been without complications. There were many issues to be solved due to register data legislation, and many questions regarding contents and standardization of definitions and variables. One important result of the Nordic PIAAC Network cooperation is this unique Nordic PIAAC database with the combination of PIAAC survey data and social, educational, and labour market register data from the five countries. This database may be of interest to social and educational science researchers in general. The Nordic Network has made a set of detailed legal and technical guidelines aimed at researchers wanting to use the database.

We would like to thank the Nordic Council of Ministers for supporting and financing the work of the Nordic PIAAC Network. Without this support, it would not have been possible to carry out the project. We also want to thank the national statistical offices of Denmark, Estonia, Finland, Norway, and Sweden for their valuable cooperation, which has been essential for establishing the Nordic PIAAC database.

The majority of the chapters in this publication have been internally reviewed. Specifically, chapters 3, 4, 5, 6, 7, 9, 10 and 12 have been reviewed by an external referee.

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Summary

Anders Rosdahl

Introduction

This report presents comparative results from PIAAC for Denmark, Estonia, Finland, Norway, and Sweden. The five countries are labelled Nordic countries in this report. PIAAC (The Programme for the International Assessment of Adult competences) is an OECD investigation of key information-processing skills in literacy (reading skills), numeracy (mathematical skills) and skills in problem-solving in technology-rich environments among populations aged 16–65 years in 24 countries. Representative samples in the countries were tested in 2011–2012. For most respondents, the testing took place in their homes on an interviewer's computer. The skills are basic in the sense that a certain level of such skills is a precondition for being able to function in contemporary society (be it in any kind of education, in working life, and the labour market; in the family and other social contexts; and in relation to democratic institutions and welfare state services, such as health, income support, and care).

OECD published international PIAAC results in 2013 (OECD, 2013a; OECD, 2013b). National reports have been published in several countries including Denmark (Rosdahl, Fridberg, Jacobsen & Jørgensen, 2013), Estonia (Halapuu & Valk, 2013), Finland (Malin, Sulkunen & Laine, 2013), Norway (Bjørkeng, 2013), and Sweden (Statistics Sweden, 2013). A total of 30,000 respondents were included in PIAAC in these 5 countries. The perspective in this report is thus broader than in the national reports but more focused than the OECD publications. Iceland is not included because Iceland did not participate in PIAAC.

The skills in PIAAC are defined in the following way (OECD, 2013a):

- *Literacy*: The ability to understand, evaluate, use, and engage with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential.

- *Numeracy*: The ability to access, use, interpret, and communicate mathematical information and ideas in order to engage in and manage the mathematical demands of a range of situations in adult life.
- *Problem-solving in technology-rich environments*: The ability to use digital technology, communication tools, and networks to acquire and evaluate information, communicate with others, and perform practical tasks.

Proficiency in these domains is measured on a scale from 0 to 500. Many are concentrated around the middle levels. Fewer are placed at very low or very high levels. OECD has divided the literacy and numeracy scales into six levels (0, 1, 2, 3, 4, and 5). The skills in problem-solving are divided into five levels (no score, 0, 1, 2, and 3). The "no score" category includes persons with no computer experience and persons who failed basic computer skills testing or who did not want to do the assessment on the interviewer's computer.

There is a strong positive association between the three types of skills. If you are good (poor) in one domain, you also tend to be good (poor) in the other two domains.

The expression "key information-processing skills" is used in the report as a common label for skills in literacy, numeracy, and problem – solving in technology-rich environments.

Key information-processing skills across PIAAC countries

Table 1 gives an overview of key information-processing skills in the PIAAC couintries. The mean *literacy* proficiency in Finland (288), Sweden (279), Norway (278) and Estonia (276) is higher than the international average (273). Finland is number two of all countries. Japan is number one with a mean score of 296. Denmark (271) is slightly below the average of all PIAAC countries. With scores of approximately 250, Spain and Italy rank as the bottom countries in literacy skills.

The mean *numeracy* score is nearly the same in Sweden (279), Norway (278), and Denmark (278), somewhat less in Estonia (273), and higher in Finland (282). All five countries are placed above the international average (269). Again, Japan is number one with a mean numeracy score of 288, and Spain and Italy are placed at the bottom with scores below 250.

It is estimated that 6–9 points on the literacy and numeracy proficiency scales correspond to one year of education (OECD, 2013a). Thus, the variation between PIAAC countries is substantial with respect to these two types of basic skills.

Table 1 Countries ranked according to 1) mean score in literacy proficiency, 2) mean score in numeracy proficiency, 3) Per cent at the highest proficiency levels (2+3) in problem-solving in technology-rich environments. PIAAC 2011–2012

Level	Literacy: Mean score	Numeracy: Mean score	Problem-solving: Per cent level 2+3
Above the average	296: Japan 288: Finland 284: Netherlands 280: Australia 279: Sweden 278: Norway 276: Estonia 275: Flanders (Belgium) 274: Czech Rep. 274: Slovak Rep. 273: Canada	288: Japan 282: Finland 280: Flanders (Belgium) 280: Netherlands 279: Sweden 278: Norway 278: Denmark 276: Slovak Rep. 276: Czech Rep 275: Austria 273: Estonia 272: Germany	44: Sweden 42: Finland 42: Netherlands 41: Norway 39: Denmark 38: Australia 37: Canada
Average	273: Average 273: Korea 272: England/N. Ireland	269: Average 268: Australia	36: Germany 35: Japan 35: Flanders (Belgium) 35: England/ N. Ireland 34: Average 33: Czech Rep. 32: Austria
Below the average	271: Denmark 270: Germany 270: United States 269: Austria 269: Cyprus 267: Poland 267: Ireland 262: France 252: Spain 250: Italy	265: Canada 265: Cyprus 263: Korea 262: England/N. Ireland 260: Poland 256: Ireland 254: France 253: United States 247: Italy 246: Spain	31: United States 30: Korea 28: Estonia 26: Slovak Rep. 25: Ireland 19: Poland

Note: Col. 1 and col. 2 include 23 countries. Because of missing data at the time of reporting, Russia is not included. Only 19 countries are included in col. 3 because Cyprus, France, Italy, and Spain did not measure proficiency in problem-solving in technology-rich environments (OECD, 2013a).

The ranking of countries according to *problem-solving skills* cannot use the mean proficiency because a significant proportion of respondents could not or would not do the tests on the interviewer's computer, cf. above. This proportion is an estimate of the number of persons who did not have sufficient *technical* computer skills to do the cognitive tests on the interviewer's computer. The proportions were 12, 14, 14, and 18% in Sweden, Norway, Denmark and Finland, respectively, which is well below the international average (24%). In Estonia, 29% did not have sufficient technical computer skills.

The ranking of countries according to problem-solving skills is in table 1 based on the proportion of the population with such skills at the two highest levels (2 and 3). Persons without sufficient technical computer skills are included in the percentage base.

The proportion at the two highest levels of skills in problem-solving is well above the international average (34%) in Sweden (44%), Finland (42%), Norway (41%), and Denmark (39%). Sweden is number one among all countries, Finland number two, Norway number four, and Denmark number five.

Thus, the four Nordic countries – Sweden, Finland, Norway, and Denmark – are among the very best in terms of problem-solving skills. The proportion with problem-solving skills at the two highest levels is 28% in Estonia.

In sum, Finland, Norway, and Sweden have above-average rankings in all three domains: literacy, numeracy, and problem-solving. Denmark has an above-average ranking in two domains (numeracy and problem-solving), but a slightly below-average ranking in literacy. Estonia also has an above-average ranking in two domains (literacy and numeracy) but a below-average ranking in problem-solving skills.

Four countries (Cyprus, France, Italy, and Spain) did not measure problem-solving skills. All four ranked below the average on the two other types of skills. Of the remaining 19 countries in table 1, only the Netherlands and the three previously mentioned Nordic countries (Finland, Norway and Sweden) have an above average ranking in all three domains. Of the 19 countries, three are placed below the average in all three skill domains (Ireland, Poland and the United States).

Overall, the ranking of countries according to key information-processing skills in subcategories (such as, for example, employed persons, unemployed persons, educational groups, and categories employed in different occupations and industries) tend to be about the same as the overall ranking described previously.

Development and maintenance of key information-processing skills

The inequality in the distribution of skills within countries is generally as pronounced as the variations between them. This also holds true for the five Nordic countries for which the most important factors dividing the population into groups with high and low skills are education, age, and immigrant status.

Education: A higher level of education means better literacy, numeracy, and problem-solving skills. One explanation is, of course, that participation in education and training, in particular intellectual and non-manual, promotes development and maintenance of key information-processing skills. Second, a selection effect may also exist. Presumably, the most able and intelligent persons enrol in education, in higher education in particular. Third, education means easier access to labour markets and jobs with current and life-long learning opportunities relevant for the development and maintenance of key information-processing skills.

Age: In the age interval from 16 to approximately 30 (depending on type of skill and country), we observe that increasing age means increasing key information-processing skills. From the age of approximately 30 to 65, the opposite trend emerges: increasing age means decreasing skills. Persons aged 55–65 have, on average, a lower level of skills than the youngest group, aged 16–24 years.

The increase in the younger age categories is no doubt primarily due to an *age effect*: as young people grow older, more and more acquire vocational, study oriented, or higher education.

The decrease in skills in the interval 30–65 years may be caused by a *generation effect,* implying that differences between age categories are due to variations between generations. Younger generations are generally better educated than older generations, which may contribute to the relatively poor skills among elderly people. Younger generations also have more experience with computers, which have been taken into large-scale use only within recent decades.

The skills decrease in the interval 30–65 years may also, at least partly, be caused by an age effect; that is processes that take place in the course of lives of the individual persons. Biological factors may play a role here. Dementia may be mentioned as an extreme example. The age effect may also have social components. Economic theory argues, for example, that incentives to participate in training and education decrease as people grow older – both the employees' own incentives and the incentives of their employers to pay for supplementary training. Our societies and labour markets may function in a way which means that the opportunities to learn and maintain skills for many people decrease as they grow older.

Also, when focusing on each level of education separately, we can generally observe that basic skills decrease with increasing age; most clearly in the interval between 35 and 65 years of age. This supports the presumption that an age effect to some extent may be responsible for decreasing skills (skills loss) above a certain age. However, nothing can be said about the size of such an age effect or about the relative weight of biological and social factors.

Immigrant status: Immigrants – here defined as persons not born in the country – comprise 4.8% in Finland, 10.8% in Denmark, 12.3% in Estonia, 12.4% in Norway, and 16.8% in Sweden, according to PIAAC, which focuses on the population aged 16–65. In all Nordic countries except Estonia, immigrants conducted the PIAAC test in the language of their host country. The Russian immigrants and descendants in Estonia could conduct the test in Russian. The non-immigrants have in all countries substantial better average skills than immigrants, as measured in PIAAC. The difference in literacy scores is approximately 40–50 in Denmark, Norway, Finland, and Sweden but only half of that in Estonia. The latter result points to language difficulties being an important explanation of differences in skills between immigrants and non-immigrants.

The low educational level of many non-western immigrants in Scandinavian countries in particular only partly explains the poor proficiency of this group. Immigrants also have lower proficiency in key information-processing skills than non-immigrants when educational level is taken into consideration. This means that other factors contribute to explaining variations in skills among immigrants. PIAAC in Denmark shows that immigrants who moved to Denmark at pre-school age or at school age have a higher level of skills than other immigrants. Proficiency increases with the number of years spent in Denmark. Language used at home in the family is also of significance: immigrants using Danish as their main language at home have better measured skills than other immigrants.

In addition to educational level, age, and immigrant status, a number of other factors contribute to explaining the distribution of skills within countries or are associated with the level of skills. These are gender; employment status and employment experience; health; and parents' education.

Gender: On average, men and women in Denmark, Estonia, and Finland have approximately the same level of literacy skills. In Sweden and Norway, men have somewhat higher average literacy scores than women. The gender difference is much more pronounced with respect to numeracy and problem-solving skills: In all five countries, men perform better than women within these two domains. The gender difference in favour of men seems generally to be less among the younger age categories than among the elderly groups in the populations – consistent with the assumption that gender equality in skills has increased in recent decades.

According to PISA, girls are definitely better at reading than boys at the age of 15 (OECD, 2013a). This substantial gender difference is, however, much less or non-existent among young adults aged 16–24 in PIAAC.

Labour market status, occupation, industry, working time and size of the workplace: Employed persons have, on average, better literacy, numeracy, and problem solving skills than unemployed persons and others without employment (disregarding persons currently participating in formal education). Longer work experience means generally better skills. Thus, employment and substantial employment experience are associated with a higher level of skills. A causal relation may go both ways. Employment implies generally better opportunities to develop and maintain skills. Conversely, persons with better skills are preferred as employees. Better skilled persons may have better chances of both getting a job and keeping a job.

Different jobs and occupations require different educational and other qualifications. Therefore, it is not surprising that skills vary considerably between occupations. Persons employed in manual and unskilled work have, on average, lower key information-processing skills than persons employed in professional and managerial jobs.

Employed wage earners tend to have better or the same level of key information-processing skills as self-employed persons in Denmark, Finland, Norway, and Sweden. In Estonia, the self-employed people have, on average, better key information-processing skills than wage earners, which may be because more entrepreneurs in Estonia are relatively young.

Different industries have different kinds of jobs and personnel, which may be the main reason why skills vary between industries. The average level of literacy skills in the primary sector is, for example, lower than in the tertiary (service) sector. Also, the skill level in literacy is generally lower in the private than in the public sector, where the educational requirements are generally highest.

In most Nordic countries, persons working part time seem to have lower key information-processing skills than those working full time – a result which may primarily stem from the fact that the composition of part timers and full timers is different according to education, occupation, and industry, in particular.

Finally, our results also show that the larger the workplace (in terms of number of employees), the higher the average level of key information-processing skills among the workforce. As for the other work-related variables, the explanation may be that larger workplaces attract better-qualified people or contribute more to the development of skills (or, most likely, both).

Health: PIAAC respondents were asked to assess their own general health on a 5–point scale from "Excellent" to "Poor". There is a clear association between this self-reported health and skills in all three domains. Better self-reported health and better key information-processing skills tend go hand in hand. Poor health may in itself reduce the ability to perform well in the test situation, but poor health may also be a consequence of lacking proficiency in reading and adhering to health, life-style and working environment recommendations.

Parents' education: Even if all the factors mentioned are taken into consideration, we find an association between actual measured key information-processing skills and the educational level of the respondents' parents. Respondents with a parent or both parents who have a higher education are better skilled than respondents whose parents only have compulsory school as their highest level of education. The explanation behind this result may be sought in a complex interplay between social and heredity factors.

In conclusion, the results show that development and maintenance of key information-processing skills are a result of complex processes taking place in different contexts during the course of life. Generally, it seems that the basic patterns in the distributions of key information-processing skills and the fundamental processes tend to be the same or rather similar in the five Nordic countries on which this report focuses.

Good (poor) key information-processing skills are associated with a relatively privileged (unprivileged) status in terms of education, labour market placing, and many other factors relevant to the quality of adult life.

Skills and earnings

The rationale behind focusing on key information-processing skills is that such skills have a number of positive impacts, both at the individual and the societal levels. In this report, we have studied the economic and social outcomes of key information-processing skills for individuals.

The economic outcome is in our analysis measured by the hourly wage among employed wage earners. The analysis shows that hourly wage increases with better basic skills. This also holds when a number of other factors associated with wage are taken into consideration. It is estimated that an increase in key information-processing skills with approximately 40–50 score points is associated with a 3% increase in hourly wage in the five Nordic countries – except Estonia, where the estimated increase is 7%, although the difference is not significant. At the same time, the respondents' reported use of skills at work also has a separate and even slightly larger impact on hourly earnings. Thus, the best payoff in terms of hourly wage stems from the combined effect of proficiency in key information-processing skills *and* use of such skills in the current job.

Consistent with other economic analyses, we find that the hourly wage also varies with a number of other factors, including education, work experience, gender, immigrant status, occupation, industry, and size of the work place. Employees with higher (post-secondary) education earn considerably more, other things being equal, than persons having only compulsory schooling or less than two years of vocational training after school. The first category earns 15–18% more than the latter in Denmark, Estonia and Norway, 12% more in Finland, and 7% more in Sweden.

Increasing employment experience means better wages up until a certain number of years, which is approximately 20 years in Estonia, 30–35 in Finland and Norway, and 30–40 years in Sweden and Denmark. Men earn more than women in all contries. The difference due to gender is 5–10%, except in Estonia where the difference is much higher (33%).

Employees in skilled occupations earn more than workers in elementary occupations, and employees in the private sector earn, on average, more than employees in the public sector. Finally, our analysis shows, also consistent with other research, that the larger the size of the workplace, the higher the average hourly wage, other things being equal.

Skills and social outcomes

Our report demonstrates strong associations between proficiency in literacy, numeracy, and problem-solving in a technology-rich environment and indicators of social outcomes as they are drawn up in the survey of adult skills.

General social trust or trust in other persons is strongly associated with proficiency in all three domains of skills. Education is usually found to be highly correlated with social trust, but even when the level of education is taken into consideration, there is a significant separate relation between skills (literacy) and trust in other persons.

Volunteering (participation in voluntary work) within the past 12 months, including unpaid work for a charity, political party, trade union, or other non-profit organisations, is also strongly correlated with proficiency in literacy, numeracy, and problem-solving in technology-rich environments. However, the frequency of volunteering among those doing voluntary work does not have a simple relation to skills. The explanation might be that many highly educated persons with full-time work, who are also scoring high on the skills scales, belong to groups of the population who are not able to spend time every day on voluntary work. The highest average skills scores are found among the groups carrying out voluntary work at least once a month.

Political efficacy is measured by a question about whether the respondents find that they have a say about what the government does. This perceived influence on the political process is strongly correlated with proficiency in all three skills domains. Also level of highest completed education is strongly related to sense of political influence, but even when education is taken into consideration there is a significant positive association between skills in literacy and perceived political influence.

A high positive correlation is demonstrated between skills proficiency and self-assessed health. This relation also remains at a significant level even if the level of education, age, and other factors are taken into consideration.

The overriding impression from the analyses of the relations between skills and the different indicators of social outcomes is that the relations are very similar in the Nordic countries. The Nordic countries are also very similar when looking at the distribution of the populations on the four dimensions. Only Estonia separates out somewhat from the four other countries. The level of social trust, the level of volunteering, and the sense of political influence are all at a lower level in Estonia than in the other countries. This is as well the case for the level of self-assessed health among the population aged 16–65 years. However, the relations between skills and the four social outcome indicators are very similar in all five countries.

Weak performers

From a policy point of view, it is of particular interest to identify what we label here as "weak performers" – that is persons with a low level of key information-processing skills – because these categories most lack basic skills. For both reasons of equity and welfare, one may argue that adult education in basic reading, mathematics, and problem-solving should be focused on these groups in particular. It is of interest, therefore, to estimate the size and composition of weak performers.

In this report, weak performers in literacy and numeracy are defined as persons at proficiency levels 0 and 1 taken together. These persons score below 226 on the literacy/numeracy scales going from 0 to 500. Persons at level 1 or 0 in literacy are able to read and understand only very simple texts with uncomplicated messages requiring limited handling of information. Persons at levels 0 and 1 in numeracy are able to perform only simple mathematical operations such as counting, adding small numbers, or sorting. Their ability to understand and handle mathematical information in different contexts and forms is limited.

Weak performers in problem-solving in technology-rich environments are defined as respondents at level 0 (below 1) on the 0–500 scale, plus respondents with insufficient technical computer skills to perform the cognitive tests on the interviewer's computer.

Overall, we find that the proportion of weak performers of the population aged 16–65 tend to be lower in the five Nordic countries on which this report focuses compared to most other countries participating in PIAAC. This is consistent with the general ranking of countries presented in the beginning of this chapter.

Weak performers in literacy comprise 16% of the population aged 16–65 in Denmark, 11% in Finland, and 13% in Estonia, Norway, and Sweden. The variation is even less with respect to numeracy. Weak performers in numeracy comprise 13% in Finland and 14–15% in the other four Nordic countries. There is a considerable overlap between the two groups of weak performers. This means that approximately 10% of the population aged 16–65 are weak performers, both within literacy and numeracy. The proportion varies between 11% in Denmark and 8% in Finland. The proportion with weak performance in either literacy or numeracy varies between 19% (Denmark) and 15% (Finland).

Weak performers with respect to skills in problem-solving in technology-rich environments comprise 43% of the population in Estonia. The proportion is much lower in Finland (29%), Denmark (28%), Norway (25%), and Sweden (25%). There is a considerable overlap between weak performance in this domain and the two other domains, but it has not been possible to estimate the size of the overlap.

Table 2 gives an overview of the estimated absolute number of persons with weak performance in the five countries.

Table 2 Estimated number of weak performers aged 16–65 (1,000 persons)

Country	Litaracy	Numeracy	Literacy or numeracy	Literacy and numeracy	Problem-solving
Denmark	576	517	693	393	1,018
Finland	371	449	538	282	1,028
Estonia	117	128	163	82	384
Norway	402	478	553	327	836
Sweden	794	880	1,049	625	1,502

The composition of the weak-performing categories is different from the population at large. In general, the group of weak performers overrepresents the categories in the population with a low average level of basic skills (cf. above). This means that the following groups are overrepresented among the weak performers: low-educated persons, older age categories, immigrants, persons with poor self-reported health, persons without employment, and persons in low-skilled jobs.

This does not mean, however, that the weak performers are *only* found among these categories. The correlation between weak performance and socio-demographic characteristics is far from perfect. There are many weak performers among people who are better educated, young, non-immigrants, persons with good health, and persons in stable and relatively skilled employment. One may be tempted to say that the weak performers can be found *everywhere in our Nordic societies* despite the fact that these societies generally perform well with respect to key information-processing skills in an international comparative context (cf. above).

Overeducation

An employed person may be defined as "overeducated" if the person has a higher level of education than is necessary to become hired for the job or to be able to perform the job. Overeducation may have adverse consequences at the societal level and/or at the individual level. In this report, we have studied the incidence of overeducation and the composition of overeducated people based on the PIAAC survey data combined with national register data on each of the individual PIAAC respondents.

It seems that different measures of over-education give widely differing estimates of over-education. Self-assessment (SA) measures (i.e., overeducation as reported by the PIAAC respondents) generally show a much larger share of over-educated than job analysis (JA) does; on average the difference is approximately ten percentage points. JA is based on occupational classifications according to required educational level. The minimum level of overeducation is estimated at approximately 15–20%

in Denmark, Norway, and Sweden – and a little more in Finland and Estonia. These estimates are rather uncertain.

Even though different measures of overeducation give different estimates, the characteristics of the over-educated according to each measure are generally the same. The over-educated are usually younger, have less work experience and tenure, and are more likely to be non-native speakers compared to the well-matched.

Over-education is found to be rather persistent at the individual level in the medium-run. Of those classified as over-educated, according to JA in 2008, barely half of those individuals managed to become well-matched by 2011. The higher the age, the more persistent overeducation seems to be.

The share of each birth-cohort attaining tertiary education has risen fast in the last two decades. Therefore, it is relevant to ask whether our measured over-education is genuine or apparent. In other words, do we have true over-education leading to a waste of skills?

Genuine overeducation means that skills of the overeducated persons deteriorate because of lack of use. Some of our results point in this direction, but more research is needed to be able to draw more precise conclusions regarding the true incidence and the potential socio-economic costs of over-education.

Adult education and training

Two types of adult education and training are dealt with in PIAAC. *Formal education* results in a qualification documented in some diploma or certificate approved by educational authorities in a country, according to certain standards. Formal education comes close to the concept of "education" in everyday language. *Non-formal education* includes the following types of activities in PIAAC:

- Open or distance education.
- Organised sessions for on-the-job-training or training by supervisors or co-workers.
- Seminars or workshops.
- Other courses or private lessons.

If a respondent had participated in at least one of the four activities, the respondent was coded to have participated in "non-formal" education. The terminology in PIAAC was used for international comparative purposes. As systems for adult education and training are very different among countries, the consequence is that the PIAAC terminology does not correspond exactly to the adult education approach or system in any one country.

All analyses of adult education and training in our report deal with the age group of 30–65 years. This is done because the PIAAC questionnaire data on formal and non-formal education do not by themselves tell exactly whether the training was within or outside the regular educational system for young people in the countries.

Approximately 60% of the PIAAC respondents aged 30–65 years in the Nordic countries had participated in formal or non-formal training within the last 12 months, except in Estonia, where about 50% participated. Non-formal training is the absolute dominating type in the age interval of 30–65 years.

Most adult education and training is job related; very much takes place during working hours and is useful for the job; employers very often cover a substantial part the costs. There is a positive association between the three latter aspects of training. With some simplification the countries can be ranked in the following way according to these three criteria, which together are an indicator of employer-involvement in the training: Denmark, Norway, Finland, Sweden, and Estonia. On most dimensions, adult education and training in Denmark tend to be more related to the current job and employer than adult education and training in Estonia. The other countries tend to be placed in-between these two extremes.

Approximately half of the population aged 30–65 years participated in non-formal training, except in Estonia, where 44% participated at least once within the past 12 months. The total duration of non-formal training (for the participants) within the past 12 months is estimated to be 63 hours in Finland, 69 hours in Sweden, 74 hours in Norway and Estonia, and 81 hours in Denmark. If we take frequency and duration together, we find that the average total volume of non-formal training per person per year in the age group 30–65 years is 43 hours in Denmark, 37 hours in Sweden, 36 hours in Norway, 33 hours in Finland, and 32 hours in Estonia.

Different factors explain variations in frequency and duration of non-formal training. Non-employed persons and immigrants participate less often, but their training has a longer duration compared to employed persons and non-immigrants, respectively. Elderly persons tend to participate less often and for fewer hours than younger persons. Women participate a little more often than men, except in Norway and Sweden, but duration does not vary significantly with gender.

The probability of participation increases with higher educational levels and literacy skills. However, duration does not vary with educational level and duration decreases with increasing literacy proficiency.

Between one quarter (Denmark) and one half (Estonia) of employed persons feel that they need more training to cope well with their present job tasks at their workplaces. It is argued that this is an indicator of a real discrepancy between competencies and job-requirements. It seems that the discrepancy is somewhat higher in the public sector than in the private sector in all countries.

Between one quarter (Norway) and one third (the other countries) of the population aged 30–65 years within the last 12 months has wanted to participate in (further) training but did not. Both employer – and person-related reasons appear to be barriers for training. Lower age, higher educational level, and higher literacy proficiency increase the probability of expressing a wish to participate (further) in training.

Overall, there are more similarities than differences between the five countries with respect to behaviour and attitudes related to adult education and training.

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Introduction

Birgit Bjørkeng

The Survey of Adult Skills (PIAAC)

The Survey of Adult Skills (PIAAC), which was carried out between 2011 and 2012, was designed to directly assess the skills of the adult population in three domains; literacy, numeracy, and problem-solving in technology-rich environments. The survey is the largest assessment of adult skills to date, and the main survey contains data from 24 countries (OECD, 2013a).

The purpose of this report is to explore the skills of the adult population in a Nordic context. Using Nordic PIAAC survey data and register data, the goal is to examine the key information-processing skills among adults in the Nordic region, as well as differences and similarities across the Nordic countries.

PIAAC in the Nordic countries

Twenty-eight countries participated in at least parts of the first round of PIAAC, with 24 countries completing the Main Survey (OECD, 2013a). Four countries in what is generally referred to as the Nordic region completed the survey and reported results: Denmark, Finland, Norway, and Sweden. In 2010, the Nordic PIAAC Network was established by five member countries: Denmark, Estonia, Finland, Norway, and Sweden. While not usually regarded as part of the Nordic region, Estonia participated in the Nordic PIAAC Network because of its many similarities with the Nordic countries, and Estonian results are consequently included in this report.

The Nordic countries, including Estonia, share many characteristics that make cooperation favourable. Although the region consists of separate countries, their history is intertwined and they have many present-day links through languages, culture, and political cooperation. All five countries participating in the Nordic PIAAC Network have relatively small populations and national administrative registers that can be used as sources of statistical data, suitable for planning and administrating surveys, as well as research. An extended discussion of the common traits exhibited by the Nordic countries is provided in Chapter 1. In Chapter 2 the Nordic region is also compared to two other aggregates of countries, namely countries that participated in PIAAC and are non-Nordic EU member states or non-Nordic countries outside the EU, respectively.

The similarities mean that the Nordic countries face many of the same challenges and advantages when participating in large international surveys, such as PIAAC. The Nordic PIAAC Network was established in part to allow the countries to benefit from each other's experience related to planning and executing the PIAAC data collection process. The fact that the Nordic countries all have access to statistical data from registers was an important motivation for the creation of the Nordic PIAAC Database, which contains survey data from PIAAC as well as register data.

Of course, there are differences across the Nordic countries, too. Some of these differences will be briefly considered here, namely country differences with respect to earlier participation in surveys of adult skills and differences relating to the PIAAC samples collected in the respective countries. A thorough discussion of the cross-country differences regarding the results in PIAAC is provided in Chapter 3.

International large-scale assessment surveys among adults are relatively new in the Nordic countries, but PIAAC is not the first of these surveys carried out in the region. The predecessor International Adult Literacy Survey (IALS) was conducted between 1994 and 1998 in Denmark, Finland, Norway, and Sweden. Norway also participated in the subsequent Survey of Adult Literacy and Life Skills (ALL) in 2003. Estonia did not participate in either of these surveys but has taken part in PISA since 2006. PISA has also been conducted in the other four countries since 2000.

Table 1 Participation in IALS, ALL, and PIAAC, by country

	IALS	ALL	PIAAC
Denmark	X		X
Estonia			X
Finland	X		X
Norway	X	X	X
Sweden	X		X

All five Nordic countries started the data-collection period of PIAAC Main Survey in August 2011. Denmark, Estonia, Finland, and Norway completed the data collection in April 2012, and the data collection in Sweden continued until June 2012.

The respondents in each country answered a detailed background questionnaire and then proceeded to assessments. The assessments in Denmark, Norway, and Sweden were available only in Danish, Norwegian, and Swedish, respectively. The assessments in Estonia were available in Estonian and Russian, and in Finland they were available in Finnish and Swedish.

The response rate among the Nordic countries varied from 45% in Sweden to 66% in Finland. The response rates in Estonia, Norway, and Denmark were 63%, 62% and 50%, respectively. All countries completed comprehensive analyses of non-response to minimise bias. On average, among all participating countries, 1.4% of the respondents who took the survey could not provide enough information in the background questionnaire to impute proficiency scores because of language problems, learning disabilities, or mental disabilities.

Table 2 PIAAC response rates and number of completed cases, by country

	Response rate	Completed cases	Missing proficiency scores
Denmark	50%	7,328	0.4%
Estonia	63%	7,632	0.4%
Finland	66%	5,464	0.0%
Norway	62%	5,128	2.2%
Sweden	45%	4,469	0.0%

The first results from PIAAC show that literacy proficiency in the Nordic region is relatively high, with Finland, Sweden, Norway, and Estonia scoring above the OECD average (OECD, 2013b). The proficiency in numeracy is above the OECD average for all five Nordic countries. For problem-solving in technology-rich environments, Sweden, Finland, Norway, and Denmark are above the OECD average. Together with the Netherlands, Finland, Sweden, and Norway are the only countries that are above the OECD average in all three skill domains.

Key information-processing skills

The technological developments taking place throughout the 21st century have brought changes to many aspects of society, from activities in our everyday lives to the skills needed in the workplace. As computers and computer-based technologies have become more common, the use of college-educated labour has also increased (Autor, Levy, and Murnane, 2003). The acquisition of skills is seen as beneficial both for the individual and for society as a whole. PIAAC is designed to assess the proficiency of adults in three domains considered “key information-processing skills”; literacy, numeracy, and problem-solving in technology-rich environments (OECD, 2013b). These skill domains are cognitive foundation skills in the sense that they constitute a necessary foundation for the development of higher levels of cognitive skills. In many areas, numeracy and literacy are prerequisites for accessing the available information, and the basic skills are useful in many contexts of everyday life. This is also the case for the ability to use information and communication technology (ICT) to access and process information, and to use these tools for problem-solving. In this report, the terms information-processing skills, cognitive foundation skills (CFS), and basic skills are used synonymously to describe the skill domains covered by PIAAC.

To take into account the increasing importance of digital skills, digital text is a key feature in PIAAC. However, the literacy and numeracy assessments were available both in a computer-based and paper-based form. Among all participating countries, 74% of respondents took the computer-based version, and 21% took the paper-based version (see Table 3 for Nordic figures). The latter group had no or very low computer skills, or declined taking the computer-based assessment for other reasons.

Table 3 Percentage of respondents taking computer-based and paper-based assessments, by country

	Computer-based assessment	Paper-based assessment
Denmark	82%	12%
Estonia	68%	28%
Finland	82%	15%
Norway	84%	9%
Sweden	88%	7%

The paper-based assessment started with a core assessment of literacy and numeracy skills, and respondents who performed at or above a minimum standard in the core section were randomly assigned to paper-based literacy or numeracy assessments. The computer-based assessment also started with two core sections in which the result of the first core section determined whether the respondent would continue with the computer-based assessments or be redirected to the paper-based version. Those who performed at or above a minimum standard in the second core stage were assigned to one of three computer-based assessments: 50% received a combination of literacy and numeracy tasks, 33% received problem-solving combined with either literacy or numeracy, and 17% received only problem-solving tasks. This distribution between assessments was also used in the Nordic countries.

The methods used in PIAAC are designed to directly assess proficiency in the three skill domains covered by the survey. As a group, the respondents participating in the survey were given assessments with items covering all the three domains, but the individual respondents may not have taken the same exact test (OECD, 2013a). Using item response theory, information from the background questionnaire and from the assessments was combined to estimate the respondents' likelihood of successfully completing items of varying levels of difficulty. The respondents were then assigned 10 "plausible values" each, using multiple imputed proficiency values. These "plausible values" account for skill uncertainty at the individual level, rather than assuming that the respondent's test results accurately reflect his or her true skills.

The proficiency in all three skill domains is reported on a scale from 0–500 points. This score represents proficiency in the domain and is based on the respondent's own assessment and the assessments of other respondents with similar characteristics. Additionally, proficiency levels are assigned to the respondents. The respondents have a 67% likelihood of mastering problems associated with their proficiency levels. Descriptions of the proficiency levels for literacy, numeracy, and problem-solving in technology-rich environments are provided in the three subsequent subsections of this chapter.

Literacy

When defining the concept of literacy and method for assessment in PIAAC, the PIAAC Literacy Expert Group built upon conceptions of literacy from the previous surveys – IALS from 1994–1998 and ALL from 2003-2007–and further developed these to enable an appropriate assessment of the literacy skills required for the 21st century (OECD, 2009a).

Literacy in PIAAC is defined as:

> "the ability to understand, evaluate, use and engage with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential. Literacy encompasses a range of skills from the decoding of written words and sentences to the comprehension, interpretation, and evaluation of complex texts. It does not, however, involve the production of text (writing). Information on the skills of adults with low levels of proficiency is provided by an assessment of reading components that covers text vocabulary, sentence comprehension and passage fluency."
>
> (OECD, 2013b).

For a more in-depth description of the content of each domain, see, for example, OECD, 2012. The respondents' literacy scores are divided into five proficiency levels, described in Table 4.

Table 4 Proficiency levels in literacy

Level	Score range	Percentage of adults scoring at level (average)		Types of tasks completed successfully at each level of proficiency
		International	Nordic[1]	
Below Level 1	Below 176 points	3.3%	3.0%	The tasks at this level require the respondent to read brief texts on familiar topics to locate a single piece of specific information. There is seldom any competing information in the text and the requested information is identical in form to information in the question or directive. The respondent may be required to locate information in short continuous texts. However, in this case, the information can be located as if the text were non-continuous in format. Only basic vocabulary knowledge is required, and the reader is not required to understand the structure of sentences or paragraphs or make use of other text features. Tasks below Level 1 do not make use of any features specific to digital texts.
1	176 to fewer than 226 points	12.2%	9.9%	Most of the tasks at this level require the respondent to read relatively short digital texts or to print continuous, non-continuous, or mixed texts to locate a single piece of information that is identical to or synonymous with the information given in the question or directive. Some tasks, such as those involving non-continuous texts, may require the respondent to enter personal information onto a document. Little, if any, competing information is present. Some tasks may require simple cycling through more than one piece of information. Knowledge and skill in recognising basic vocabulary determining the meaning of sentences, and reading paragraphs of text are expected.
2	226 to fewer than 276 points	33.3%	30.8%	At this level, the medium of texts may be digital or printed, and texts may comprise continuous, non-continuous, or mixed types. Tasks at this level require respondents to make matches between the text and information, and may require paraphrasing or low-level inferences. Some competing pieces of information may be present. Some tasks require the respondent to: - cycle through or integrate two or more pieces of information based on criteria - compare and contrast or reason about information requested in the question - navigate within digital texts to access and identify information from various parts of a document.
3	276 to fewer than 326 points	38.2%	40.9%	Texts at this level are often dense or lengthy and include continuous, non-continuous, mixed, or multiple pages of text. Understanding text and rhetorical structures become more central to successfully completing tasks, especially navigating complex digital texts. Tasks require the respondent to identify, interpret, or evaluate one or more pieces of information and often require varying levels of inference. Many tasks require the respondent to construct meaning across larger chunks of text or to perform multi-step operations in order to identify and formulate responses. Often tasks also demand that the respondent disregard irrelevant or inappropriate content to answer accurately. Competing information is often present, but it is not more prominent than the correct information.

[1] Results for the individual Nordic countries are provided in Chapter 2.

Level	Score range	Percentage of adults scoring at level (average)		Types of tasks completed successfully at each level of proficiency
		International	Nordic[1]	
4	326 to fewer than 376 points	11.1%	13.7%	Tasks at this level often require respondents to perform multiple-step operations to integrate, interpret, or synthesise information from complex or lengthy continuous, non-continuous, mixed, or multiple type texts. Complex inferences and application of background knowledge may be needed to perform the task successfully. Many tasks require identifying and understanding one or more specific, non-central idea(s) in the text to interpret or evaluate subtle evidence-claim or persuasive discourse relationships. Conditional information is frequently present in tasks at this level and must be taken into consideration by the respondent. Competing information is present and sometimes seemingly as prominent as correct information.
5	Equal to or more than 376 points	0.7%	1.0%	At this level, tasks may require the respondent to search for and integrate information across multiple, dense texts; construct syntheses of similar and contrasting ideas or points of view; or evaluate evidence-based arguments. Application and evaluation of logical and conceptual models of ideas may be required to accomplish tasks. Evaluating reliability of evidentiary sources and selecting key information is frequently a requirement. Tasks often require respondents to be aware of subtle, rhetorical cues and to make high-level inferences or use specialised background knowledge.

Source: OECD, 2013b.

Numeracy

As with literacy, the definition of numeracy in PIAAC was developed using insights from the preceding surveys, IALS and ALL, but also surveys focusing on pupils, such as PISA and TIMSS (OECD, 2009b). In PIAAC, numeracy is defined as:

> "the ability to access, use, interpret and communicate mathematical information and ideas in order to engage in and manage the mathematical demands of a range of situations in adult life. To this end, numeracy involves managing a situation or solving a problem in a real context, by responding to mathematical content/information/ideas represented in multiple ways"
>
> (OECD, 2013b).

As for literacy, the respondents' numeracy scores are divided into five proficiency levels, which are described in Table 5.

Table 5 Proficiency levels in numeracy

Level	Score range	Percentage of adults scoring at level (average)		Types of tasks completed successfully at each level of proficiency
		International	Nordic	
Below Level 1	Below 176 points	5.0%	3.5%	Tasks at this level require the respondents to carry out simple processes, such as counting, sorting, performing basic arithmetic operations with whole numbers or money, or recognising common spatial representations in concrete, familiar contexts where the mathematical content is explicit with little or no text or distractors.
1	176 to fewer than 226 points	14.0%	10.6%	Tasks at this level require the respondent to carry out basic mathematical processes in common, concrete contexts for which the mathematical content is explicit with little text and minimal distractors. Tasks usually require one-step or simple processes involving counting, sorting, performing basic arithmetic operations, understanding simple per cents (such as 50%), and locating and identifying elements of simple or common graphical or spatial representations.
2	226 to fewer than 276 points	33.0%	30.7%	Tasks at this level require the respondent to identify and act on mathematical information and ideas embedded in a range of common contexts for which the mathematical content is fairly explicit or visual with relatively few distractors. Tasks tend to require the application of two or more steps or processes involving calculation with whole numbers and common decimals, per cents, and fractions; simple measurement and spatial representation; estimation; and interpretation of relatively simple data and statistics in texts, tables, and graphs.
3	276 to fewer than 326 points	34.4%	38.0%	Tasks at this level require the respondent to understand mathematical information that may be less explicit, embedded in contexts that are not always familiar, and represented in more complex ways. Tasks require several steps and may involve the choice of problem-solving strategies and relevant processes. Tasks tend to require the application of number sense and spatial sense; recognising and working with mathematical relationships, patterns, and proportions expressed in verbal or numerical form; and interpretation and basic analysis of data and statistics in texts, tables, and graphs.
4	326 to fewer than 376 points	11.4%	15.0%	Tasks at this level require the respondent to understand a broad range of mathematical information that may be complex, abstract, or embedded in unfamiliar contexts. These tasks involve undertaking multiple steps and choosing relevant problem-solving strategies and processes. Tasks tend to require analysis and more complex reasoning about quantities and data; statistics and chance; spatial relationships; and change, proportions, and formulas. Tasks at this level may also require understanding arguments or communicating well-reasoned explanations for answers or choices.
5	Equal to or higher than 376 points	1.1%	1.7%	Tasks at this level require the respondent 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 for which considerable translation or interpretation is required; draw inferences; develop or work with mathematical arguments or models; and justify, evaluate, and critically reflect upon solutions or choices.

Source: OECD, 2013b.

Problem-solving in technology-rich environments

Problem-solving is a key aspect of achieving one's goals, and requires both an understanding of the problem, a plan for how to solve it, and taking action to reach the goal (OECD, 2009c). It usually requires tools, and in a technology-rich environment, these tools can, for example, be related to Internet-based services or software. In PIAAC, problem-solving in technology-rich environments is defined as:

> "the ability to use digital technology, communication tools, and networks to acquire and evaluate information, communicate with others, and perform practical tasks. The assessment focuses on the abilities to solve problems for personal, work, and civic purposes by setting up appropriate goals and plans, and accessing and making use of information through computers and computer networks."
>
> (OECD, 2013b).

The respondents' scores in problem-solving in technology-rich environments are divided into three proficiency levels, described in Table 6. The table also contains descriptions of the three different groups that did not take the computer-based version of the assessment. Problem-solving in technology-rich environments was not included in the PIAAC predecessors IALS or ALL.

Table 6 Proficiency levels in problem-solving in technology-rich environments

Level	Score range	Percentage of adults scoring at level (average)		Types of tasks completed successfully at each level of proficiency
		International	Nordic[2]	
No computer experience	Not Applicable	9.3%	3.8%	Adults in this category reported having no prior computer experience; therefore, they did not take part in the computer-based assessment but took the paper-based version of the assessment, which did not include the problem-solving in technology-rich environment domain.
Failed ICT Core	Not Applicable	4.9%	4.8%	Adults in this category had prior computer experience but failed the ICT core test (which assesses the basic ICT skills, such as the capacity to use a mouse or scroll through a web page) and needed to take the computer-based assessment. Therefore, they did not take part in the computer-based assessment, but took the paper-based version of the assessment, which did not include the problem-solving in technology-rich environment domain.

[2] Results for the individual Nordic countries are provided in Chapter 3.

Level	Score range	Percentage of adults scoring at level (average)		Types of tasks completed successfully at each level of proficiency
		International	Nordic[2]	
"Opted out" of taking computer based assessment	Not Applicable	10.2%	8.8%	Adults in this category opted to take the paper-based assessment without first taking the ICT core assessment, even if they reported some prior experience with computers. They did not take part in the computer-based assessment, but took the paper-based version of the assessment, which did not include the problem-solving in technology-rich environment domain.
Below Level 1	Below 241 Points	12.3%	12.7%	Tasks are based on well-defined problems involving the use of only one function within a generic interface to meet one explicit criterion without any categorical or inferential reasoning, or transforming of information. Few steps are required and no sub-goal has to be generated.
1	241 to fewer than 291 points	29.4%	30.7%	At this level, tasks typically require the use of widely available and familiar technology applications, such as e-mail software or a web browser. There is little or no navigation required to access the information or commands required to solve the problem. The problem may be solved regardless of the respondent's awareness and use of specific tools and functions (e.g., a sort function). The tasks involve few steps and a minimal number of operators. At the cognitive level, the respondent can readily infer the goal from the task statement; problem resolution requires the respondent to apply explicit criteria; and there are few monitoring demands (e.g., the respondent does not have to check whether he or she has used the appropriate procedure or made progress towards the solution). Identifying content and operators can be done through simple matching. Only simple forms of reasoning, such as assigning items to categories, are required; there is no need to contrast or integrate information.
2	291 to fewer than 341 points	28.2%	31.8%	At this level, tasks typically require the use of both generic and more specific technology applications. For instance, the respondent may have to make use of a novel online form. Some navigation across pages and applications is required to solve the problem. The use of tools (e.g., a sort function) can facilitate the resolution of the problem. The task may involve multiple steps and operators. The goal of the problem may have to be defined by the respondent, though the criteria to be met are explicit. There are higher monitoring demands. Some unexpected outcomes or impasses may appear. The task may require evaluating the relevance of a set of items to discard distractors. Some integration and inferential reasoning may be needed.
3	Equal to or higher than 341 points	5.8%	6.8%	At this level, tasks typically require the use of both generic and more specific technology applications. Some navigation across pages and applications is required to solve the problem. The use of tools (e.g., a sort function) is required to make progress towards the solution. The task may involve multiple steps and operators. The goal of the problem may have to be defined by the respondent, and the criteria to be met may or may not be explicit. There are typically high monitoring demands. Unexpected outcomes and impasses are likely to occur. The task may require evaluating the relevance and reliability of information to discard distractors. Integration and inferential reasoning may be needed to a large extent.

Source: OECD, 2013b.

The Nordic PIAAC Database

A key feature of PIAAC is that it is very suitable for comparative analysis. Effort has been made to ensure that the survey data are comparable between countries. Through the cooperation in the Nordic PIAAC Network, the participating countries also sought to use the unique supply of administrative data from registers available in the Nordic countries in these types of analyses. No register data were included in the international PIAAC data sets available through OECD, but the Nordic countries have access to large amounts of data from registers that can be used to create further analyses of the survey data.

The Nordic PIAAC database was created to collect the Nordic micro data from PIAAC in one place, merged with relevant and comparable register data from all five countries. Consequently, the database contains the international PIAAC data file, including the Background Questionnaire data, the cognitive scores for literacy, numeracy, and problem-solving in a technology-rich environment, and the test item responses. It also contains data from national registers in Denmark, Estonia, Finland, and Sweden for the reference years 2008 and 2011, and from Norway for 2011. It is planned that register variables for the reference year 2014 will be added to the database in spring 2016 and that the register data will be updated every three years.

Available register variables have been linked to each respondent and entered into the database. Several types of register data are included: demographic data, such as citizenship and marital status; data on educational attainment and current education; data on employment and industry; information about the workplace of the respondents; and information about social security. The Nordic database is located at Statistics Denmark and can be accessed through a secure remote access system. This means that data analysis is done via a server at Statistics Denmark.

Most of the analyses in this report make use only of the survey data from PIAAC, and not of the register data available in the Nordic database. Because of the large amount of time required to assemble the Nordic database, the register data were not available when the work on the analyses in this report were begun. However, Chapters 7 and 8 contain analyses for which Nordic register data from the database are included.

Utilisation the data in the Nordic database comes with a set of methodological issues. PIAAC is a large-scale assessment survey and has the same methodological issues as those associated with other such surveys; content validity in terms of the definitions of the skill domains and the items in the assessment, the measurement validity, the reliability of the measurement, and the representativeness of the survey. It is also an international survey, and ensuring comparability between countries in all aspects of the survey is challenging. For an in-depth description of the PIAAC methodology and issues, see OECD, 2013a. The unique concerns regarding the data used in this report are related to the register data in the Nordic database. Although the Nordic countries are relatively similar; their register data are not identical. The registers do not necessarily contain the same information, and collecting comparable data is challenging. Thus, the variables may look similar but have differing definitions, or the variables contain roughly the same information but do not measure the same things. The approach chosen by the Network has been to include key variables even if they are not available for all countries, to make the variables in the database as similar as possible, and to create extensive metadata, particularly in the cases for which it has not been possible to make the variables identical for all countries.

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1. An overview of the characteristics of the Nordic region

Erik Mellander and Anders Fremming Anderssen

1.1 Introduction

This chapter provides a brief description of the Nordic region, as defined below. The common characteristics of the Nordic countries will be considered, as will the institutional features tying the countries together and motivating the Nordic region as a natural aggregate of countries. As the competencies measured in PIAAC are likely to be strongly related to schooling and work experiences, special emphasis will be put on educational and training systems, and labor market properties.

1.2 Defining the Nordic region

1.2.1 The Nordic region proper

Strictly defined, the Nordic region consists of five countries, i.e., Denmark, Finland, Iceland, Norway, and Sweden, along with the autonomous areas of the Faroe Islands and Greenland under Denmark and Åland, which belong to Finland.

1.2.2 The Nordic region as defined in this report

However, in this report the Nordic region will be defined to include the following:

- Denmark, excluding the Faroe Islands and Greenland.
- Estonia.
- Finland, excluding Åland.
- Norway.
- Sweden.

The reason for excluding the Faroe Islands, Greenland, and Åland is that these areas did not participate in PIAAC. As explained in Chapter 2, Estonia has been included, in spite of the country not belonging to the Nordic region proper, because Estonia shares many properties with the Nordic countries and has cooperated extensively with the Nordic countries on all PIAAC-related matters within the framework of an (extended) Nordic network.

1.3 Geography and demography

The geographical proximity of Estonia and the Nordic countries participating in PIAAC is evident from the map in Figure 1.1.

Figure 1.1 The Nordic countries participating in PIAAC, Estonia, and other countries participating in PIAAC

UK is only represented by England and North Ireland.

Two common demographical characteristics of the Nordic PIAAC countries and Estonia are shown in Table 1.1: namely, small populations and high life expectancies. The table provides the numbers for the year 2012, i.e., when the PIAAC survey was finalized.

Table 1.1 Population sizes and life expectancies in the Nordic region in 2012

Country	Population, millions	Life expectancy. years	
		Men	Women
Denmark	5.6	78	82
Estonia	1.3	72	82
Finland	5.4	78	84
Norway	5.0	80	84
Sweden	9.5	80	84

Source: http://data.worldbank.org/indicator/SP.POP.TOTL
http://data.worldbank.org/indicator/SP.DYN.LE00.MA.IN

According to Table 1.1, the number of inhabitants is below 10 millions in all of the countries considered. Sweden and Estonia represent the extremes, with 1.3 and 9.5 million people, respectively. These two countries also represent the upper and lower ends with respect to life expectancies.

The fact that these countries all have small populations, and thus small domestic markets, implies another common feature: namely, high dependency on international trade with respect to both goods and services.

1.4 History

As noted by Ramstedt (2009), World War II was important for the formation of the concept of a Nordic region. When the Soviet Union turned against Finland in 1939, Swedish, Danish, Estonian, and Norwegian volunteers joined the Finnish troops. Large numbers of Finnish refugee children also came to Sweden. Furthermore, during the German occupation of Denmark and Norway, members of the resistance movements sought temporary protection in Swedish territory.

Although Estonia has strong historical connections to the Nordic countries, being part of Danish and Swedish kingdoms in different periods through the thirteenth to eighteenth centuries, the country's association with the contemporary Nordic region is rather recent. This association essentially dates back to the country gaining independence from the Soviet Union in 1991. Since then, Estonia has established close contacts with the Nordic countries, both bilaterally and within the framework of larger international organizations, such as the Organization of

Economic Co-operation and Development (OECD), of which Estonia became a member in 2004.

1.5 Language

Language is another important unifying factor. Danish, Norwegian, and Swedish are quite similar languages. While Finnish is very different from the other Nordic languages, there is a Swedish-speaking minority in Finland. Although this minority is shrinking rapidly, from almost 10% in 1940 to about 5% in 2012, learning Swedish in school is compulsory for Finnish pupils. This implies that the share of the population that understands Swedish is substantially larger than the share for which Swedish is their mother tongue.

Estonian is closely related to Finnish. There is also a small Swedish minority in Estonia.

Another common feature with respect to language derives from the fact that the Nordic populations (and thus the Nordic languages) are all quite small. This provides the inhabitants of the Nordic countries with strong incentives to learn major foreign languages. These incentives are supported by non-domestically produced television programs being broadcasted in the original language, with subtitles provided in the domestic language. Although research evidence is lacking, this feature is often suggested as an explanation of the good knowledge of English in the Nordic countries, compared to, e.g., other parts of Europe.

1.6 Nordic institutions

The Nordic Council is an inter-parliamentary body that was formed in 1952 for the purpose of providing a platform for joint discussions between parliamentarians in the Nordic countries. Denmark, Finland, Norway, and Sweden each have delegations of 20 representatives in the council. Estonia has had an observer membership in the council since 1991.[3]

An inter-governmental forum was also created in 1971, i.e., the Nordic Council of Ministers. Decisions taken by the Council of Ministers must be unanimous and are binding for the member states.

[3] The other Baltic states also have observer memberships in the council.

In 1952 a Nordic passport-free travel area was formed, followed by the establishment of a Nordic Passport Union in 1958. A common Nordic labor market was created in 1954 and a Nordic Convention on Social Security was implemented in 1955. Currently, the same rights and opportunities are offered in the framework of the European Union, where Estonia is included.

An agreement to strengthen cooperation among the Nordic countries with respect to education, research, and culture was signed by the Nordic Council of Ministers in 1971. Since then, the agreement has been extended and updated on several occasions. It considers both intra-Nordic cooperation and concerns relating to the Nordic region vis-à-vis other countries and regions.

1.7 Education and training

The idea of a specifically Nordic model of education has been discussed in the scientific literature. An entire issue of the *Scandinavian Journal of Educational Research* has been devoted to the topic (volume 50, no 3, 2006). In that volume, Antikainen (2006) contends that the aims of the educational systems in the Nordic countries are to ensure equality of opportunity for all students; to provide skills for work and further education and training (i.e., learning to learn); and to enable students to become engaged and participative citizens. He observes that the primary means to achieve these goals are comprehensive systems for primary and lower secondary school providing individualized teaching and support according to need; publicly funded education and absence of tuition fees; and extensive adult education and lifelong learning.

Dupriez *et al.* (2008), focusing on (more recent) youth education and applying a typology of educational systems suggested by Mons (2007), denote the education system of the Nordic countries (proper) as "the individualized integration model". They argue that the main features of this model are as follows: no tracking, almost no grade retention, infrequent ability grouping, and differentiated and individualised teaching. The same features also characterize the Estonian school system.

In the following, common characteristics of different parts of the education and training systems in the Nordic countries are briefly considered, starting with early childhood education and ending with adult education and training.

1.7.1 Early childhood education and care

For the cohorts covered by PIAAC – individuals born between 1946 and 1996 – early childhood education and care (ECEC) concerns children between six months and six years of age. While access to ECEC is essentially universal today, it was not until the late 1980s that a majority of the cohorts came to participate in ECEC.

In Denmark, Finland, Norway, and Sweden, the foundation of today's ECEC was laid in the 1970s with the development of public day care legislation and services. At that time, parental leave benefits were introduced, which could be shared between the mother and the father. An important objective of these reforms was to increase women's labor force participation (Korsvold, 2011). In Estonia, nearly universal ECEC was introduced with the same aim in the 1960s. Since 2004, the Estonian parental leave benefit system provides equal opportunities for mothers and fathers to stay home with the child for 1.5 years.

An interesting difference between PIAAC and the International Adult Literacy Survey (IALS) can be noted here: as the expansion of public childcare in the Nordic region did not take off until the 1980s, just a small share of the participants in IALS had experienced early childhood education in the context of public child care. This is especially true with respect to IALS 1994, where the youngest participants – the 16 year olds – were born in 1978. In contrast, in PIAAC there are about a dozen cohorts, i.e., individuals born during the latter half of the 1980s or later, that are likely to have attended public child care.

In all of the Nordic countries, including Estonia, the majority of ECEC is publicly funded, with the rest of the costs being covered by fees extracted from the parents. However, while the costs are primarily publicly funded, this does not mean that all child care is publicly provided. Throughout the Nordic region, private child care institutions and (publicly subsidized) home care exist as well.

The educational content in Nordic child care has been formally regulated only rather recently; Sweden was the first of the Nordic countries to implement a curriculum for early childhood education in 1998; Estonia was second to follow, adopting a national curriculum in 1999. However, in practice, early childhood learning, supported by different pedagogical approaches, became important in pre-primary school practices much earlier, at least since the very beginning of the 1990s. According to Karila (2012), between 30 and 60% of the ECEC employees in the Nordic countries proper have a tertiary education. According to recent estimates, in Estonia the corresponding proportion is 62% (www.haridussilm.ee).

1.7.2 Compulsory education

From an international perspective, children in the Nordic countries, including Estonia, start compulsory school relatively late, namely during the year they turn seven. Another common feature is that, at least since the late 1970s, the length of compulsory education in the Nordic countries has been nine years. In Estonia compulsory education lasted for eight years since the beginning of the 1960s until 1977 when it was increased to 11 years, as upper secondary education was included in compulsory education. In 1988 the length of compulsory education was changed again, this time to nine years. An overview of the Nordic reforms of compulsory schooling, leading to the introduction of nine years of schooling, is provided in Table 1.2. Rather recently, in 1997, Norway changed its school starting age to six years of age. As the age at which the students finish compulsory school was kept unchanged at 16 years of age, the reform also implied that the length of compulsory school was extended from nine to 10 years. This means that in PIAAC there are six Norwegian cohorts that have 10 years of compulsory schooling, namely the 1991–1996 cohorts.

The introduction of the nine-year compulsory education meant that tracking was abolished in Nordic compulsory education. Tuition fees, which had also been very rare beforehand, were abolished as well.

Dupriez *et al.*'s (op.cit.) characterisation of the Nordic educational system concerns compulsory education after the reforms in the 1950s (Sweden), the 1960s (Norway), and the 1970s (Finland and Denmark).[4] Before these reforms, tracking was applied in all of the Nordic countries, cf. Table 1.3.

In the Nordic region, including Estonia, compulsory schools have been and continue to be publicly funded and are forbidden to charge tuition fees.[5]

[4] The table shows that in Denmark, an educational reform was conducted in 1958 as well. This reform only affects the three oldest cohorts in PIAAC, however, i.e., 1946–1948 cohorts.
[5] In Estonia, there is a very limited number of private schools where tuition fees of ca EUR 100–200 per month are paid in addition to the public funding.

Table 1.2 Reforms extending compulsory education during the period 1949–1997

Country	Changes	Reform features	First affected cohorts	Notes
Denmark		*1958 Reform*		School already began in the seventh year before the 1958 reform and was not changed in 1958 or 1971.
	Years	4 → 7 (+3)	1948 (10 in 1958)	
	Age	11 → 14	1944 (14 in 1958)*	
		1971 Reform		
	Years	7 → 9 (+2)	1958 (13 in 1971)	
	Age	14 → 16	1955 (15 in 1971)	
Finland		*1972–1977 Reform*		School began in the seventh year. Pupils in grade six when change occurred not affect-ed. Implementation varied by region.
	Years	6 → 9 (+3)	1960 (12 in 1972)–1965 (12 in 1977)	
	Age	13 → 16	1956 (16 in 1972)–1961 (16 in 1977)	
Norway		*1960–1972 Reform*		School began in the seventh year. Pupils that began in the old system were not forced to switch to the new system. Implementation varied by region. 1977 Reform: school began in the sixth year, but still ended in the 16th year.
	Years	7 → 9 (+2)	1947 (13 in 1960)–1959 (13 in 1972)	
	Age	14 → 16		
		1997 Reform		
	Years	9 → 10 (+1)	1944 (16 in 1960)–1956 (16 in 1972)	
	Age	7 → 6		
Sweden		*1949–1962 Reform*		School began in the seventh year. Pupils that began in the old system stayed in it. However, in 1962 some municipalities included all pupils in the new system. Implementation varied by region.
	Years	7/8 → 9	1942 (7 in 1949)–1951 or 1955 (Fifth grade, i.e., 11, or 7 in 1962)	
	Age	14/15 → 15/16	1933 (16 in 1949)–1946 (16 in 1962)	
Estonia		*1958–1963 Reform*	1945 (14 in 1959)	School began in the seventh year. Step-wise reform implementation. Before 1991, education was one year shorter if conducted in Russian instead of Estonian. In 1977–88, upper sec. education was compulsory.
		7 → 8		
		14 → 15		
		1977 Reform	Ca 1963 (18 in 1981)	
		8 → 11		
		15 → 18		
		1988 Reform	1983 (15 in 1998)	
		11→ 9		
		18 → 16		

* The 1944–1947 cohorts contain individuals that in the reform year (1958) were 11–14 years old but did not receive seven years of education because they finished their compulsory education within the old regime during the years 1955–1957.

Sources: Denmark: Fort (2006), Finland: Pekkarinen *et al.* (2009), Norway: Aakvik *et al.* (2010), Sweden: Meghir and Palme (2005), Estonia: Saar (1997), Saar (2008).

Table 1.3 Tracking preceding the introduction of the nine-year compulsory school

Country	Age	Options	Notes
Denmark	15th year (Eighth grade) 14th year (Seventh grade)	*Before 1958 Reform* Leave school. Study one year to get *Realeksamen.* Apply to three-year *Gymnasium* (academic). *After 1958 Reform and before 1971 Reform* Leave school. Proceed to *Realskole*; admission based on aptitude statement.	No information about admission require-ments for the second and third options before the 1958 Reform.
Finland	11th year (Fourth grade) 13th year (Sixth grade)	*Before 1972–1977 Reform* Continue two years in primary school. Apply to five-year general secondary school (academic); admission based on entrance exam, teacher assessment, and primary grades. For students choosing the first option in fourth grade: Leave school. Continue in civic school for one or two years.	No information on the relative importance of the various admission criteria for the second option.
Norway	14th year (seventh grade)	*Before 1960–1972 Reform* Leave school. Continue in *Framhaldsskole* (vocational) for one, two, or three years. Apply to two-year *Realskole* (academic); admis-sion based on grades.	
Sweden	14th year (Seventh grade)	*Before 1949–1962 Reform* Leave school. Continue in *Folkskola* for one or two years. Apply to two-year *Realskola* (academic); admis-sion based on grades.	Applicants not admit-ted to Realskola had the option to re-apply after one or two years in Folkskola.
Estonia	15th year (Eighth grade	*Before 1958–1963 Reform* Leave school. Continue in vocational school or technical professional school (1.5–3 years). Apply to four-year upper secondary school.	

Sources: Denmark: Fort (2006), Finland: Pekkarinen *et al.* (2009), Norway: Aakvik *et al.* (2010), Sweden: Meghir and Palme (2005), Estonia: Saar (1997), Saar (2008).

1.7.3 Upper secondary school

After the reforms described in Table 1.2, students in all of the Nordic countries, as a rule, start in upper secondary school during the year they turn 16. Before the reforms, the starting ages varied between 11 and 15; cf. again Table 1.2.

Both academic and vocational tracks/programs are provided. No tui-tion fees are charged for upper secondary education. This has been true for the entire period under study here, i.e., approximately from the be-ginning of the 1960s.

Cooperation among the countries in the Nordic region proper with respect to upper secondary education has taken place within the Nordic Council of Ministers. A common labor market for upper secondary school teachers was formed in 1968. In 1971 a declaration of intent was signed regarding facilitation of intra-Nordic mobility with respect to upper secondary school students and intra-Nordic recognition of study documentations and examinations. Intra-Nordic access to upper secondary education and recognition of partly and fully completed upper secondary education across the Nordic region was agreed upon in 2004 and implemented in 2008.

1.7.4 Higher education

Higher education is here defined as any kind of formal education beyond upper secondary school. The most common types of higher education in all of the Nordic countries are universities and university colleges (in Finland, university colleges are called "polytechnics", while in Estonia they are called "applied higher education institutions"). Essentially, the difference between the two is that universities are more theoretically oriented and conduct more research than the university colleges. The university colleges have a greater emphasis on vocational and professional education.

Higher education is not subject to tuition fees in Denmark, Finland, Norway, and Sweden.[6] Moreover, financial support is provided to the students in the form of study allowances and subsidized student loans.

In Estonia higher education was free of charge until the mid–1990s. Between 1995 and 2010, the number of students enrolled in institutions of higher education tripled; several private institutions were established and about half of the students had to pay tuition fees (depending on the institution as well as the curriculum and level of graduate exams).[7] Since 2013 higher education in *public* institutions, teaching in the Estonian language, is free of charge for all EU citizens. Other foreign students may have to pay depending on the curriculum.

[6] There is one exception: since the fall of 2011, foreign students in Sweden that come from outside the EU or Switzerland have to pay tuition fees. However, as this change occurred only one year before the PIAAC survey was conducted, it does not concern the analyses in this report.

[7] In 2014, there is one private university and 11 small specialised private applied higher education institutions (focusing on IT, theology, business, and services).

1.7.5 Adult education and training

Adult education and training can be classified as formal, non-formal, and informal. All of these exist in each one of the Nordic countries.

Formal adult education is characterized by two features. First, entry into formal adult education may require educational or professional qualifications. Second, once completed, it can be documented by means of a formal proof of qualification like, e.g., a diploma, grades, or a certificate. Formal adult education is carried out at all levels of education above pre-school, i.e., compulsory school, upper secondary school, and higher education.

Non-formal adult education does not require educational or professional qualifications. While the learning may take place in a formal setting, such as an educational organisation, it is not formally recognised within a curriculum or syllabus framework. Often the outcome of the non-formal adult education is not recognised either in terms of diplomas, grades, or certificates. Adult non-formal education can take on many different forms, e.g., evening classes, workshops, and community courses, and it can also include separate university courses.

Informal education and training is characterised by being integrated into daily life activities – primarily work activities, but also civil society engagements and family or leisure activities. Typically, informal learning is not structured in terms of objectives, time, and support, and does not lead to certification. On-the-job learning is the typical example; this concept covers a wide range of learning activities, from observing the work of colleagues to participation in advanced work-related courses paid for by the employer.[8]

The Nordic countries are notable for investing strongly in adult education and training. Participation in continuing education and training was measured in the IALS surveys in 1994/1995 and 1998/1999. Overall participation rates (including both the employed and the unemployed) were highest in the Nordic countries, between 58% in Finland and 48% in Norway.[9] About ten years later a similar, but somewhat less comprehensive, measure of participation in all non-formal education ranked Sweden at the top, with a participation rate of 69%, followed by Finland and Norway, both with 51%. In Estonia and Denmark the participation rates were lower, at 40 and 38%, respectively, but were still above the OECD average of 34%.[10, 11]

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[8] Advanced work-related courses might in some cases be classified as non-formal adult education; the distinction between informal education and non-formal education is not always clear-cut.

[9] Education at a Glance (1999, Table C6.2b); Estonia did not participate in the IALS.

[10] Education at a Glance (2011, Table C5.1a).

1.7.6 The labour market

With respect to the Nordic labour market, it is necessary to make a distinction between Denmark, Finland, Norway, and Sweden, on the one hand, and Estonia, on the other hand. In the following, this will be done by considering both the Nordic region as an entity, and by examining separately the countries included in the Nordic region.

The labour markets in the Nordic region are characterized by wage distributions that are relatively compressed. As a consequence, the Gini-coefficient, measuring income inequality, is low compared to the rest of the world. While during the first decade of the twenty-first century the Gini coefficients for the EU and the world were 30.4 and 39.0, respectively, for Denmark, Finland, Norway, and Sweden they were 24.8, 26.8, 25.0, and 23.0, respectively. However, Estonia's Gini coefficient was higher at 31.3.[12]

Another common feature of Denmark, Finland, Norway, and Sweden is that working conditions to a large extent are not regulated by laws but by agreements between unions and employers, called collective agreements, cf. Malmberg (2002). Through such collective agreements, low-skilled workers have been provided with better opportunities to take part in job-related adult education and training than in most other OECD countries. This is manifested in the OECD (2013, Figure 5.7) statistics that demonstrate that participation rates in adult education and training among the low-skilled in these countries are above the PIAAC average.

Again, Estonia differs from the other countries. While in Denmark, Finland, Norway, and Sweden the shares of the employees affected by the collective agreements – the collective bargaining coverage rates – were 80, 91, 70, and 88%, respectively, in 2014, the rate was only 33% in Estonia.[13] Consistent with this difference, the Estonian participation rate in adult education and training among the low-skilled is below the PIAAC average [OECD (op.cit.)].

Unemployment rates in the Nordic region are low from an international perspective. As can be seen in Table 1.4, the Nordic unemployment rate was below the OECD average both in 2006 and 2012. It can also be seen,

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[11] Presumably, the fall in the Danish participation rate, compared to the rate established in the IALS survey, is due to the fact that, by definition, participation in non-formal education excludes adult formal education.

[12] The numbers are the latest ones available, and so refer to different years, according to the following: Denmark – 2011, Estonia – 2010, the EU – 2009, Finland – 2008, Norway – 2008, Sweden – 2005, the world – 2007. The Gini coefficient is a number between 0 and 100%, where 0 corresponds with perfect equality (where everyone has the same income) and 100 corresponds with perfect inequality (where one person has all the income, and everyone else has zero income).

[13] http://www.worker-participation.eu/National-Industrial-Relations/Countries/Sweden/Collective-Bargaining

however, that in 2012 the Estonian unemployment rate, 10.3%, was above the OECD average of 8.2%.[14]

On the other hand, when it comes to labour force participation rates Table 1.4 shows that all of the countries in the Nordic region have rates exceeding the OECD average. This holds true for each of the years considered in the table, i.e., 2000, 2006, and 2012.

Public service (including health and defence) is the industry that employs the largest share of the workforce in the Nordic region, employing more than 32%.[15] The second largest industry, employing 21%, is wholesale and retail trade, transportation and storage, accommodation and food service activities. There are different educational requirements for these two industries; public services require a higher level of formal education than wholesale etc., and this seems to be the case for all OECD countries.

Table 1.4 Labour force participation and unemployment in the Nordic region and in the OECD

Country/ies		2000	2006	2012
Denmark	Labour force participation rate	80.0	80.6	78.6
	Unemployment rate	4.5	4.0	7.7
Estonia	Labour force participation rate	70.6	72.3	74.9
	Unemployment rate	13.8	6.0	10.3
Finland	Labour force participation rate	74.9	75.4	75.4
	Unemployment rate	9.8	7.7	7.8
Norway	Labour force participation rate	80.7	78.2	78.4
	Unemployment rate	3.5	3.5	3.3
Sweden	Labour force participation rate	79.0	80.3	80.3
	Unemployment rate	5.9	7.1	8.1
Nordic region	Labour force participation rate	77.1	77.3	77.5
	Unemployment rate	7.5	5.6	7.4
OECD	Labour force participation rate	69.9	70.4	70.9
	Unemployment rate	6.4	6.2	8.2

Source: http://stats.oecd.org/Index.aspx?DatasetCode=LFS_SEXAGE_I_R
http://stats.oecd.org/index.aspx?queryid=36324

[14] http://stats.oecd.org/index.aspx?queryid=36324
[15] http://dx.doi.org/10.6027/Nord2013-001

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2. Key Information-Processing Skills in the Nordic Region Compared to the Non-Nordic EU Countries and Non-Nordic & Non-EU Countries

Erik Mellander, Anders Fremming Anderssen, and Jonas Sønnesyn

2.1 Introduction

In this chapter, key information-processing skills in the Nordic region are contrasted with the corresponding skills in two other country aggregates, namely non-Nordic countries that participated in PIAAC *and* are members of the EU *or* do not belong to the EU. These two country aggregates will be denoted "non-Nordic EU" countries and "non-Nordic & non-EU" countries. In addition, the aggregate of all countries participating in PIAAC, denoted "all PIAAC", is also used as a benchmark.

The chapter begins with a motivation for why these two aggregates have been chosen as comparison groups. The skills in the Nordic region are then compared to the skills in the non-Nordic EU and the non-Nordic & non-EU countries, according to a top-down scheme. The scheme starts with a comparison of average skills, in terms of skill scores and skill levels. These averages are then broken down by age, by gender, and by both age and gender. Next, skills are related to education and participation in adult education and training. Finally, skills are considered separately for immigrants and native-borns. Within the four country aggregates, skills of 1st and 2nd generation immigrants, as measured in PIAAC, are compared to the skills of individuals born in that country.

The structure of the empirical analysis just outlined is also followed in Chapter 3, where the skills of the individual countries in the Nordic region are compared. Accordingly, the between-region (or, more correctly, between country aggregates) comparison provided in this chapter is followed by a corresponding within-region comparison of the individual Nordic countries in the next chapter.

2.2 The choice of country aggregates to which the Nordic region can be compared

A common notion is that an important consideration when forming aggregates is that the entities bundled together should be similar to one another. However, this is a misperception. A basic result from aggregation theory is that it is *not* essential for entities comprising an aggregate to be similar to one another. Instead, the important consideration is whether they are similar relative to entities *outside* the aggregate. Specifically, a valid aggregate has the property that the relations between its components are independent of the characteristics of the entities that are not included in the aggregate.[16] While, of course, this requirement is virtually impossible to satisfy literally, it is helpful in pointing out that when forming aggregates, one should look for groups for which the within-group relations are stronger than the between-group relations. In the present context, one way to proceed is to aggregate countries which fulfil two criteria. First, they should have something in common; a common denominator. Second, the common denominators should differ between aggregates. Now, consider the following common denominators: i) belonging to the Nordic region, ii) belonging to the EU and *not* to the Nordic region, and iii) belonging to *neither* the Nordic region *nor* the EU. This yields the country aggregates in Table 2.1.

[16] This aggregation result builds on the concept of separability (cf. Blackorby *et al.*, 1978).

Table 2.1 Aggregates of countries to be compared

Countries in PIAAC	Nordic region	Non-Nordic EU countries	Non-Nordic & non-EU countries	All PIAAC countries
Austria		√		√
Belgium (Flanders)		√		√
Canada			√	√
Cyprus		√		√
Czech Republic		√		√
Denmark	√			√
Estonia	√			√
Finland	√			√
France		√		√
Germany		√		√
Ireland		√		√
Italy		√		√
Japan			√	√
Korea			√	√
Netherlands		√		√
Norway	√			√
Poland		√		√
Slovak Republic		√		√
Spain		√		√
Sweden	√			√
UK (England /N. Ireland		√		√
USA			√	√

Note: Australia has been excluded in the analyses below because of a lack of data.

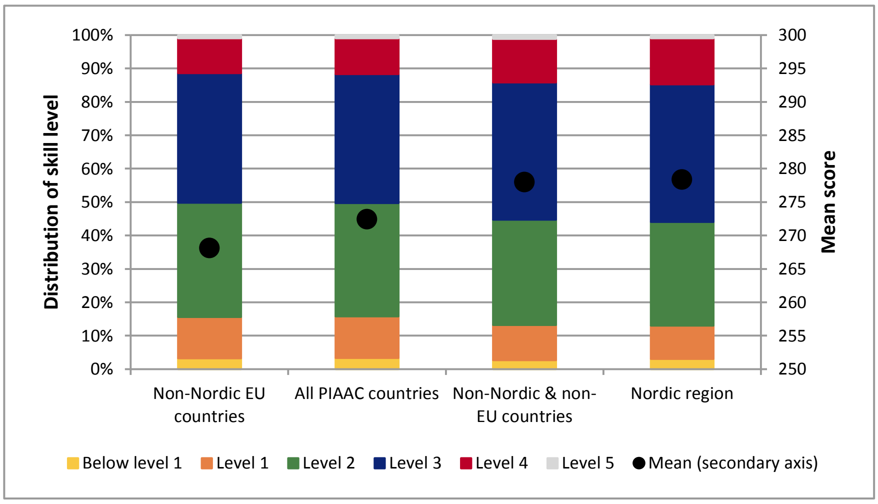
2.3 Average scores and levels of key information-processing skills

This section provides an overview of average results and distributions over proficiency levels for the three information-processing skills measured in PIAAC (i.e., literacy, numeracy, and problem-solving in technology-rich environments).

For literacy, Figure 2.1 shows that the average score is highest in the Nordic region (278.4), closely followed by the aggregate of non-Nordic & non-EU countries (278.0), i.e., Canada, Japan, Korea, and the USA. The lowest average score, well below the average score for all PIAAC countries taken together (272.4), is found in the aggregate of non-Nordic EU countries (268.1), i.e., Austria, Belgium, Cyprus, the Czech Republic, France, Germany, Ireland, Italy, the Netherlands, Poland, the Slovak Republic, Spain, and the UK.

Regarding the distributions over skill levels, it is noteworthy that in the Nordic region and in the non-Nordic & non-EU countries, more than half the adults (55.9 and 55.3%, respectively) belong to skill level 3 or higher. For the aggregates of the non-Nordic EU countries and the all-PIAAC countries, the proportion is very close to 50% (50.2 and 50.3% respectively) In relative terms, the largest difference across the country aggregates are found at the two highest skill levels (levels 4 and 5) where the span is from 14.8% in the Nordic region to 11.4% in the non-Nordic EU countries.

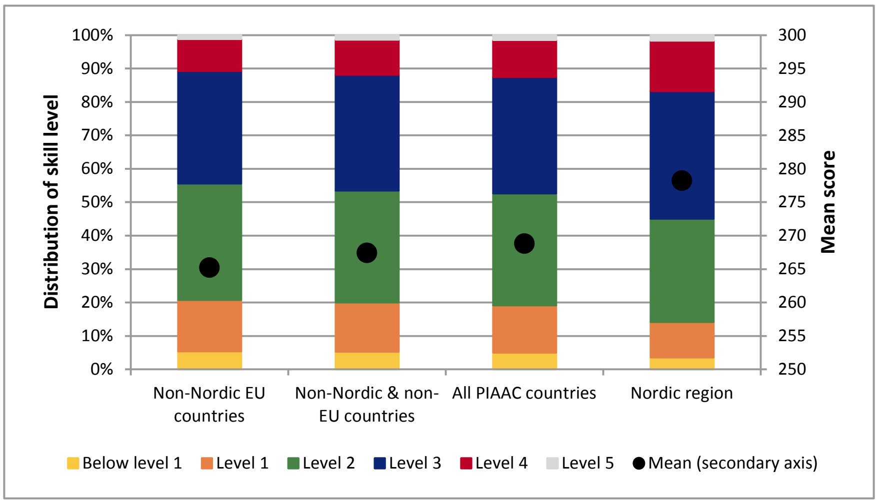
Figure 2.1 Literacy skills: mean scores (right axis) and distributions over skill levels (left axis)



Note: Country aggregates ordered according to mean scores, in ascending order.

Figure 2.2 shows that for numeracy skills, the Nordic region is more ahead of the other country aggregates than with respect to literacy skills. The average score in the Nordic region (278.2) is almost ten points higher than in countries in PIAAC taken together (268.8), which in turn is slightly higher than the average scores in the non-Nordic & non-EU countries (267.4) and the average score in the non-Nordic EU countries (265.2). Consistent with this finding, the Nordic aggregate is the only one for which more than 50% score at level 3 or higher (55%). In the other aggregates, the share ranges from 44.4% in the non-Nordic EU countries to 47.4% for all PIAAC countries. But similar to literacy skills, the largest relative differences are found in the top end of the distribution. While in the Nordic region, 16.8% belong to skill levels 4 or 5, the corresponding share is only 10.8% in the aggregates of the non-Nordic EU countries.

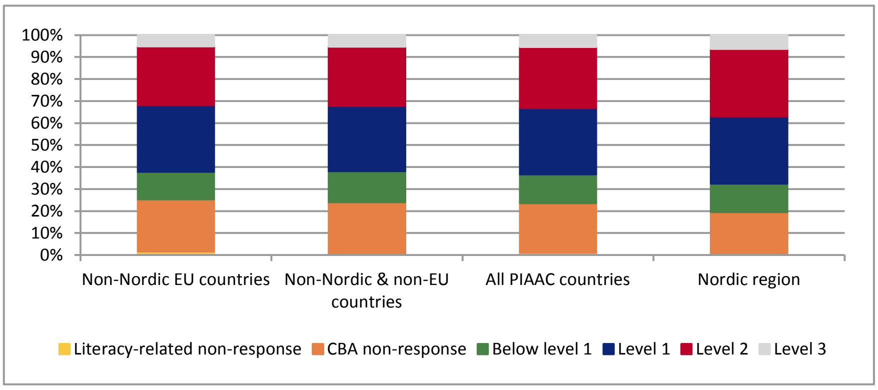
Figure 2.2 Numeracy skills: mean scores (right axis) and distributions over skill levels (left axis)



Note: Country aggregates ordered according to mean scores, in ascending order.

Finally, turning to skills in problem-solving in technology-rich environments, we see again that the Nordic region dominates the other country aggregates, although to a lesser extent than in the case of numeracy, cf. Figure 2.3. The shares performing at the two highest levels (levels 2 and 3) are 37, 33.2, 32.1, and 31.9 in the Nordic, all PIAAC, non-Nordic & non-EU, and non-Nordic EU aggregates, respectively. Unlike those for literacy and numeracy skills, the largest relative differences across the country aggregates are not found in the top but in the bottom end of the skill distribution. In particular, it should be noted that substantial shares of the respondents did not conduct computer-based assessments at all; see the categories CBA (Computer Based Assessment) non-response, and Literacy-related non-response. Taken together, these categories account for between 19.6% in the Nordic region and 25.4% in the non-Nordic EU countries, implying a relative difference of almost 30%.

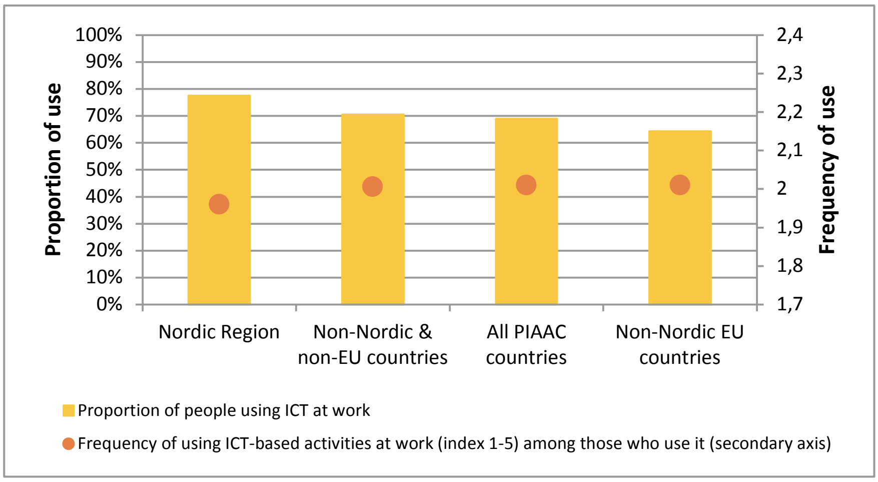
Figure 2.3 Skills in problem-solving in technology-rich environments: distributions over skill levels



Note: Country aggregates ordered according to shares performing at levels 2 or 3, in ascending order.

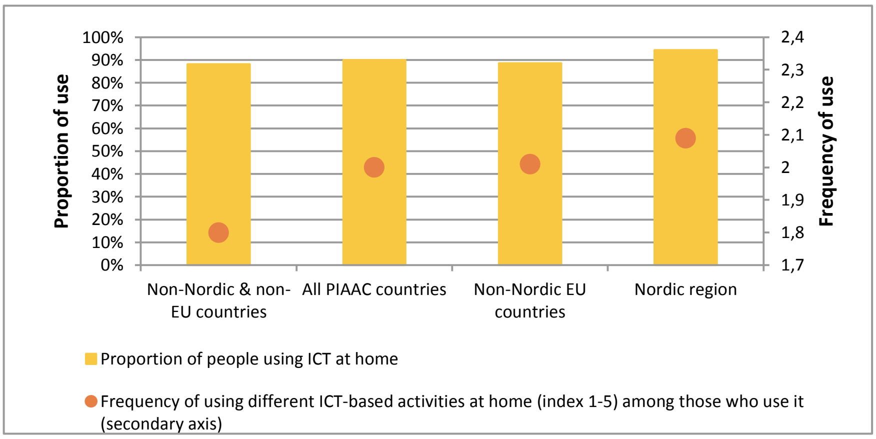
Skills in problem-solving in technology-rich environments can be developed at home, as well as at work. Presumably, the skills attained are related to the use of information and communication technologies (ICT). Figures 2.4 and 2.5 contain information about both the incidence and intensity of ICT use, at work and at home, respectively. ICT use at work appears to be more important for problem-solving skills in technology-rich environments than ICT use at home; Figure 2.4 is more congruent with Figure 2.3 than is Figure 2.5. In particular, the ranking of the country aggregates in Figure 2.4 with respect to the *incidence* of ICT use at work is in close accordance with the ranking of the country aggregates in Figure 2.3. With respect to ICT use at home, an interesting finding is that the non-Nordic & non-EU aggregate ranks at the bottom with respect to both incidence and, in particular, frequency of use, cf. Figure 2.5. These observations are in line with the fact that, according to Figure 2.3, the non-Nordic & non-EU aggregate is the one for which the largest share of the respondents either did not conduct computer-based assessments at all or performed below skill level 1. Similarly, the Nordic region, ranking highest with respect to both incidence and frequency of use of ICT at home, also had the smallest share of individuals not conducting computer-based assessments or performing below level 1.

Figure 2.4 Shares of employed individuals using ICT at work (left axis), and frequency of use (index 1–5) (right axis)



Note: Country aggregates ordered according to frequency of use, in ascending order.

Figure 2.5 Shares of employed individuals using ICT at home (left axis), and frequency of use (index 1–5) (right axis)



Note: Country aggregates ordered according to frequency of use, in ascending order.

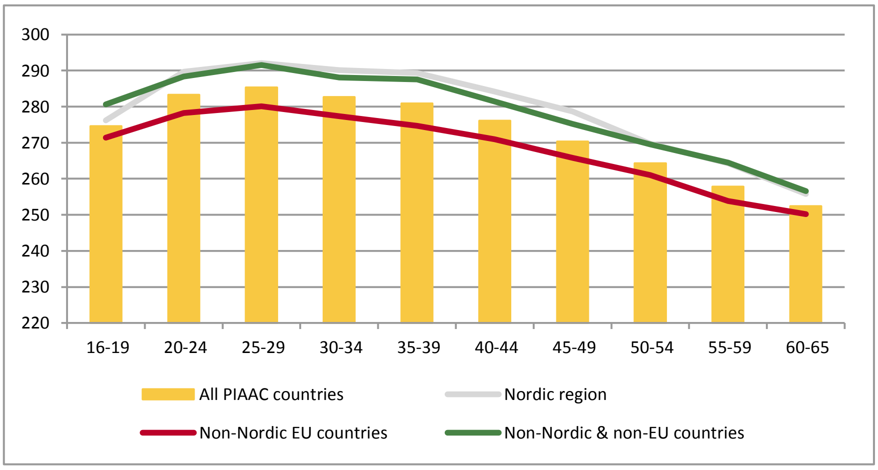
Summary: The Nordic region performs better than the aggregate of all PIAAC countries on literacy, numeracy, and problem-solving in technology-rich environments. Moreover, the Nordic region also ranks higher than both the non-Nordic EU countries and the non-Nordic & non-EU countries on all of the three skills. The Nordic advantage is larger with respect to numeracy than with respect to literacy. For problem-solving in technology-rich environments, the difference, to the advantage of the Nordic region, is especially large with respect to the shares of respondents not conducting computer-based tests at all. In general, these shares are negatively related to the use of ICT at home. Outside the Nordic region, the non-Nordic EU countries consistently perform worse than the other country aggregates on all skills. The non-Nordic & non-EU countries perform better than the aggregate of all PIAAC countries on literacy; otherwise only better than the non-Nordic EU countries.

2.4 Skills by age

The fact that the PIAAC survey covers a large number of cohorts (50 altogether) is one of its main characteristics compared to other international surveys assessing skills and knowledge, like, e.g., PISA and TIMSS. In this section, the country aggregates are broken down by age groups.

Figure 2.6, showing literacy skills by age groups, exhibits a hump-shaped relation between skills and age for all the country aggregates considered. Moreover, for each of the country aggregates, the turning point, indicating the end of the upward sloping part of the age profile, occurs at the age group consisting of 25–29 year-olds. The Nordic region and the non-Nordic & non-EU countries dominate the other two aggregates. With respect to the youngest cohort, the 16–19 year-olds, the non-Nordic & non-EU countries perform slightly better than the Nordic region. The aggregate of all PIAAC countries performs slightly worse than the Nordic countries and the non-Nordic & non-EU countries in all age groups. Finally, the non-Nordic EU countries consistently display the poorest performance.

Figure 2.6 Literacy skill scores by age groups



The skill-age patterns for numeracy differ somewhat from those for literacy, cf. Figure 2.7. In particular, the dominance of the Nordic region over the other country aggregates is prominent. For each and every age group, there are distinct differences compared to all other country aggregates in favour of the Nordic region. For the two youngest age groups, the differences are smaller than for the older age groups, however. Another difference compared to Figure 2.6 is that differences between the aggregates of all PIAAC countries, the non-Nordic EU countries, and the non-Nordic & non-EU countries are very small.

Figure 2.7 Numeracy skill scores by age groups

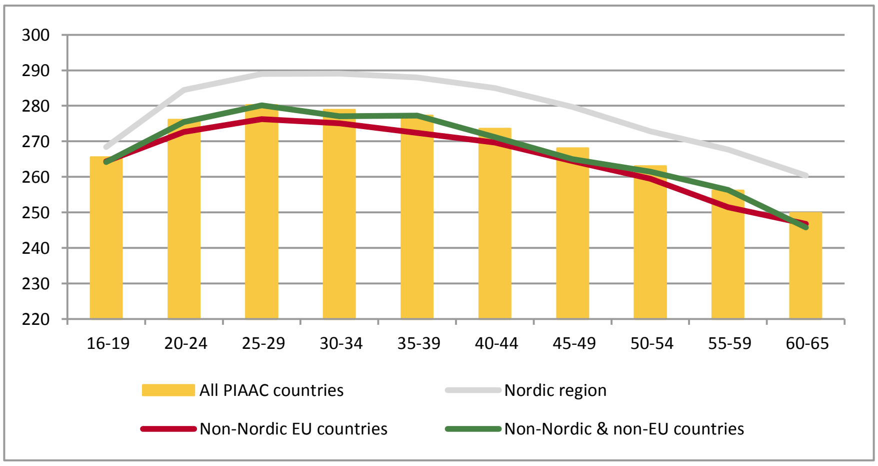
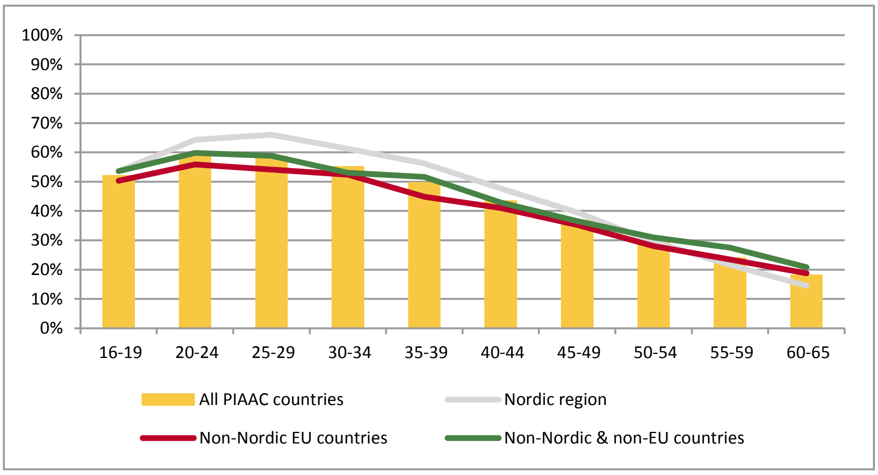


Figure 2.8 shows the shares performing at the two highest skill levels in problem-solving in technology-rich environments, by age groups. Although Figure 2.8, which concerns skill levels, is not directly comparable to Figures 2.6 and 2.7, which measure skill scores, several interesting qualitative differences can be noted. First, for all aggregates but the Nordic region, problem-solving skills appear to be highest in the next-to-youngest age group (20–24 year olds), while for literacy and to a large degree for numeracy, the highest skills were found in the group aged 25–29. Second, problem-solving skills seem to decline faster with age than literacy and numeracy skills. Third, the Nordic region distinctly dominates the other regions only with respect to the age interval 20–39. For individuals aged 50–65, the aggregate of non-Nordic & non-EU countries performs better than the Nordic region, and better than all of the other country aggregates as well. Furthermore, for the oldest age group, the Nordic region is, in fact, performing worse than all of the other aggregates.

Figure 2.8 Shares, in %, performing at skill levels 2 or 3 in problem-solving in technology-rich environments

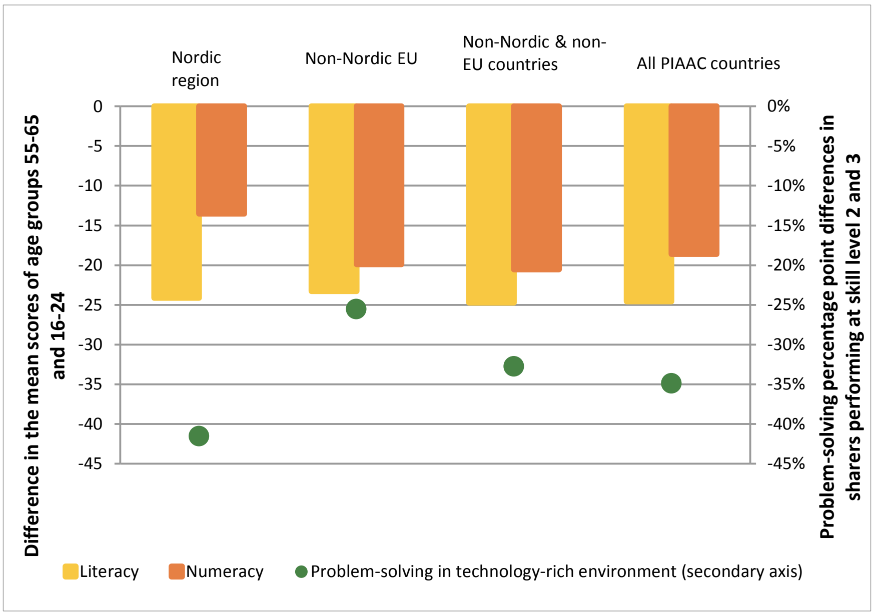


Additional information about age-skill differences is provided in Figure 2.9. This figure focuses on the skill variation associated with the bottom and the top ends of the age distribution, by means of the differences in results between 55–65 year olds and 16–24 year olds.

For literacy and numeracy, the differences are measured in terms of score points. In line with Figure 2.6, for literacy, the largest difference is found in the non-Nordic & non-EU countries. However, the variation across county aggregates is quite small. In all, the aggregates 16–24 year olds score about 24 points higher than 55–65 year olds. For numeracy, the variation across aggregates is slightly larger and the ranking is different. The smallest difference is found in the Nordic region- close to 14 points- and the largest is observed for the aggregate of non-Nordic & non EU countries- just above 20 points, which accords well with Figure 2.7.

As expected, large age-skill differences are found with respect to problem-solving in technology-rich environments. Moreover, variation across country aggregates is quite substantial. The largest age differential prevails in the Nordic region, which comes as no surprise given the Nordic age profile in Figure 2.8. The Nordic share of 16–24 year olds performing at skill levels 2 or 3 is almost 42%age points larger than the corresponding share for 55–65 year olds. For the non-Nordic EU countries, the difference is only 26 percentage points.

Figure 2.9 Differences between 55-65 and 16-24 year olds in information-processing skills: literacy and numeracy score point differences (left axis); problem-solving percentage point differences in proportions performing at skill levels 2 and 3 (right axis)



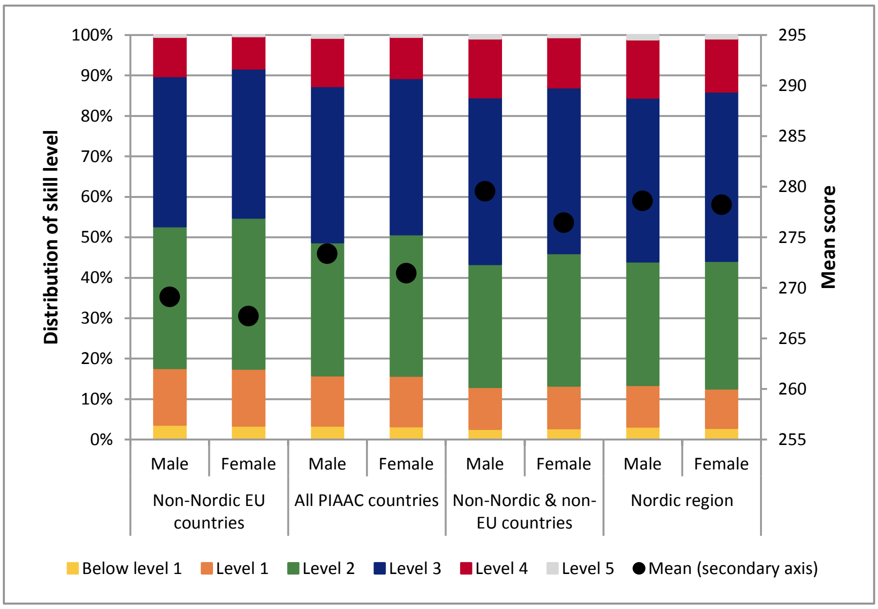
Summary: Age is very important for the key information-processing skills and most important for skills in problem-solving in technology-rich environments. The shares performing at the highest skill levels (levels 2 and 3) in problem-solving decline very rapidly with age. The Nordic region exhibits the largest difference between the 16–24 and 55–65 year olds: the share at level 2 or 3 differs by almost 42 percentage points. The Nordic region dominates the other country aggregates in problem-solving for the 16–39 year olds but ranks worst for the 55–65 year olds; the non-Nordic & non-EU aggregate ranks highest for the 50–65 year olds. For literacy skills, the Nordic region is the best performing aggregate over the 20–49 age span while the non-Nordic & non-EU countries rank highest with respect to 16–19 and, again, for the 50–65 year olds. The differences are, however, relatively small. The aggregate of non-Nordic EU countries consistently shows the worst performance in literacy, below the PIAAC average in every age group. For numeracy skills, the Nordic region strongly dominates the other country aggregates, except for the youngest age group (16–19 year olds), for whom the advantage is smaller.

2.5 Skills by gender

In skill surveys of youth, such as PISA, females are generally found to perform better in literacy than males, see, e.g. OECD (2014). Judging from Figure 2.10, that gender difference does not seem to persist into adulthood, however. Indeed, outside the Nordic region, the female youth advantage in literacy appears to be replaced by a small male adult advantage in terms of mean scores, although this male advantage is not statistically significant. The figure indicates that the primary reason for the somewhat higher male scores is that the shares at the highest skill levels (levels 4 and 5) are consistently higher among males than among females, across all the country aggregates. The smallest gender differences, both with respect to mean scores and the distributions over skill levels, are found in the Nordic region. For the mean scores, the difference is 0.4 score points to the male's advantage, while the skill level proportions differ by at most 1.3 percentage points.

The gender differences are very small for the other country aggregates, too. With respect to mean scores, the largest difference is found in the non-Nordic & non-EU countries, where it equals 3.1 score points. Furthermore, Figure 2.10 shows that the male and female distributions across skill levels are very similar as well.

Figure 2.10 Literacy mean scores (right axis) and proportions on skill levels (left axis), by gender

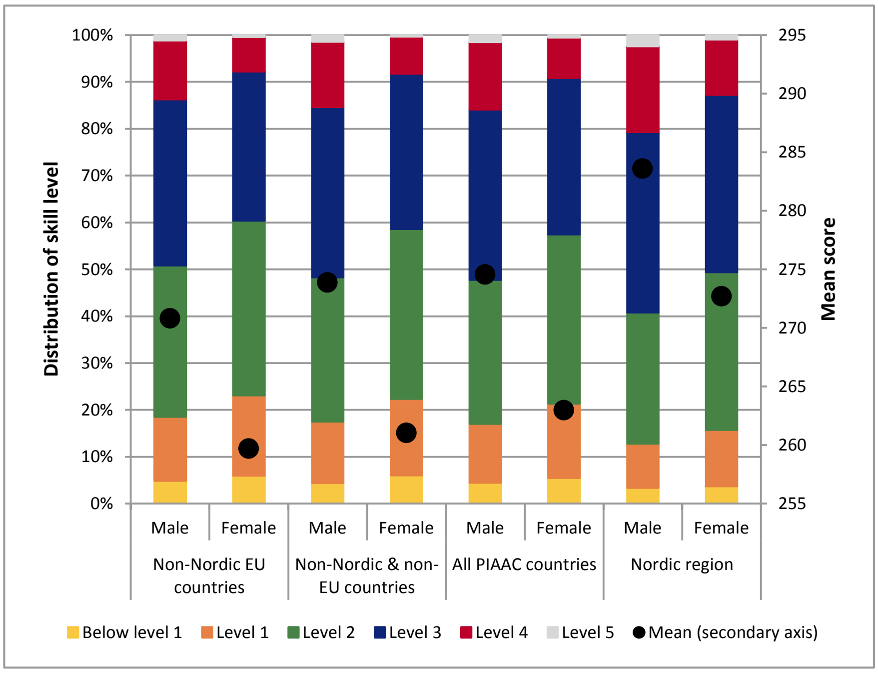


Note: Country aggregates are ordered by the averages of the male and female means, in ascending order.

With respect to numeracy skills, in contrast, the males clearly outperform the females in all country aggregates considered, cf. Figure 2.11. In terms of mean scores, the male advantage is largest in the aggregate of the non-Nordic & non-EU countries, 12.8 score points, closely followed by the all PIAAC aggregate, the non-Nordic EU countries and the Nordic region, where the differences are 11.5, 11.1 and 10.9 score points, respectively.

Furthermore, the females perform worse than the males at every skill level – at the three lowest skill levels the female shares are consistently higher than the corresponding male shares, while the reverse is true with respect to three highest skill levels. This holds for all of the country aggregates.

Figure 2.11 Numeracy mean scores (right axis) and proportions on skill levels (left axis), by gender

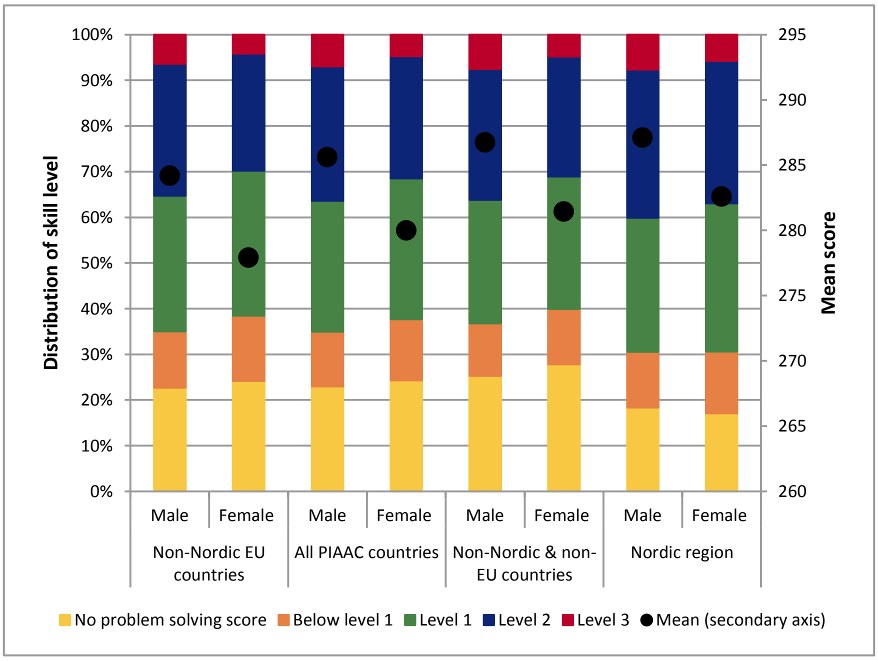


Note: Country aggregates are ordered by the averages of the male and female means, in ascending order.

From a gender perspective, the results in problem-solving in technology-rich environments are in between the results for literacy and numeracy, see Figure 2.12. The differences in the average scores, to the advantage of males, range between 4.5 in the Nordic region to 6.3 in the non-Nordic EU countries.

However, focussing on differences in mean scores across the country aggregates can be misleading. As previously noted, the shares of respondents without scores in problem-solving vary across the different groups of countries, being lowest in the Nordic regions and highest in the non-Nordic & non-EU countries. Moreover, when the shares without scores are partitioned by gender, the Nordic region deviates from the other country aggregates. In the Nordic region, the shares of females without scores are somewhat lower than the corresponding scores for males. In the other country aggregates, the gender differences are reversed, i.e., the shares for males without scores are lower than the corresponding scores for females. The shares of males at the highest skill levels (levels 2 and 3) are consistently higher than the female shares in all of the country aggregates.

Figure 2.12 Mean scores (right axis) and proportions on skill levels in problem-solving in technology-rich environments (left axis), by gender



Note: Country aggregates are ordered by the averages of the male and female means, in ascending order.

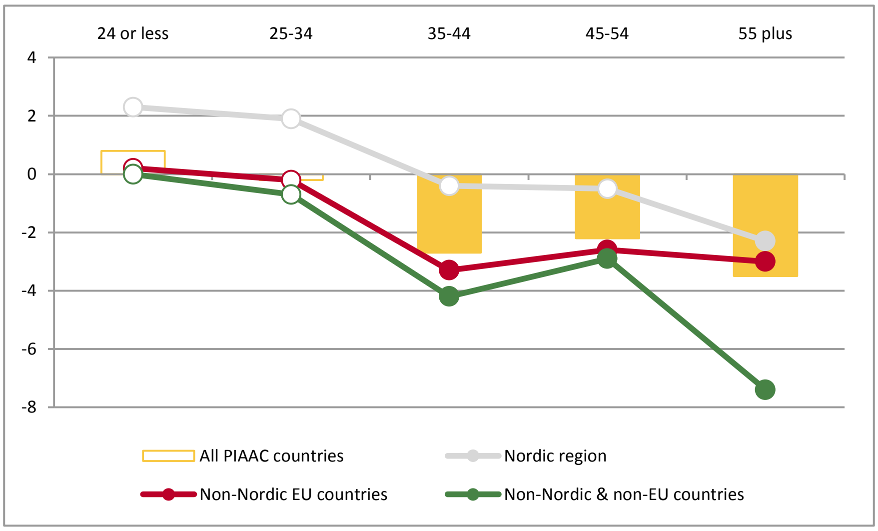
Summary: Skills differ by gender, the differences being largest with respect to numeracy and smallest with respect to literacy. In literacy, in contrast to youth surveys like PISA, the difference in average scores is to the male's advantage, although very small. In numeracy, on the other hand, the male advantage is very clear, and similar across the country aggregates–10 score points, or more. With respect to problem-solving in a technology-rich environment, the proportions of males without scores are lower than the corresponding proportions of females, except in the Nordic region. Moreover, the shares of males at the highest skill levels (levels 2 and 3) are consistently higher than the female shares in all of the country aggregates.

2.6 Skills broken down by both age and gender

To provide information regarding to what extent gender differences vary across cohorts, skills are in this section broken down by both age and gender. Overall, Figures 2.13–15 show that there is substantial variation in gender differences across age groups and that this variation is systematic: the gender differences are smallest for the youngest and inversely related to age. This is indicative of gender equality increasing over time.

For literacy, Figure 2.13 shows that females outperform males only in the Nordic region, and only females 16–34. However, these differences are not statistically significant. In contrast, for older age groups, there are significant differences in the advantage of the males. In the Nordic region, this is true only for 55–65 year olds, while for the other three aggregates it holds for 35–65 year olds.

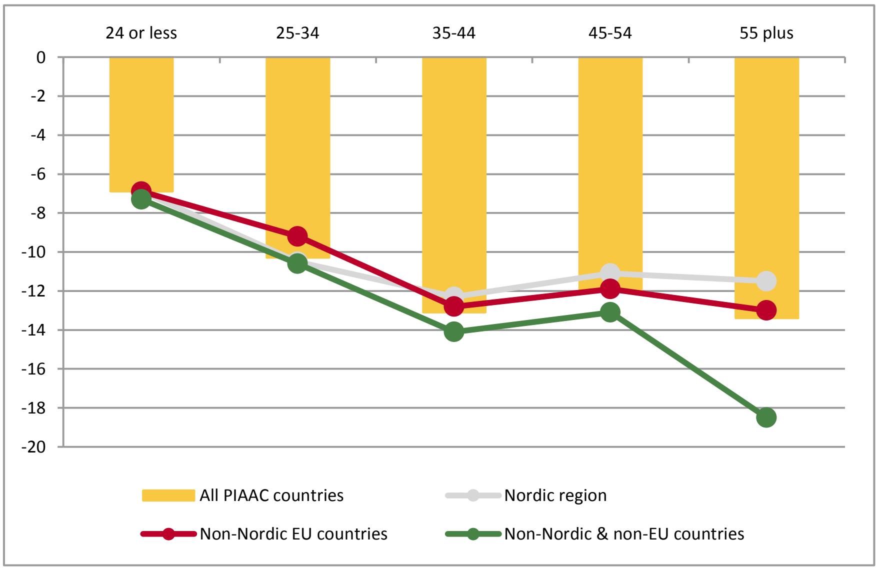
Figure 2.13 Female–male difference in literacy scores, by age



Note: Differences that are statistically different from zero at the 5% significance level are marked by filled circles and bars.

With respect to numeracy, Figure 2.14 shows that the female – male differences are all significant, to the females' disadvantage. Moreover, for the age groups 35–44, 45–54, and 55–65, the differences are also large in magnitude, between 11.1 and 18.5 points. The variation across country aggregates is small. It can be noted, however, that the difference between the aggregates increases by age. The differences are largest with respect to the age group of 55–65, especially when we compare the non-Nordic & non-EU countries with the other aggregates.

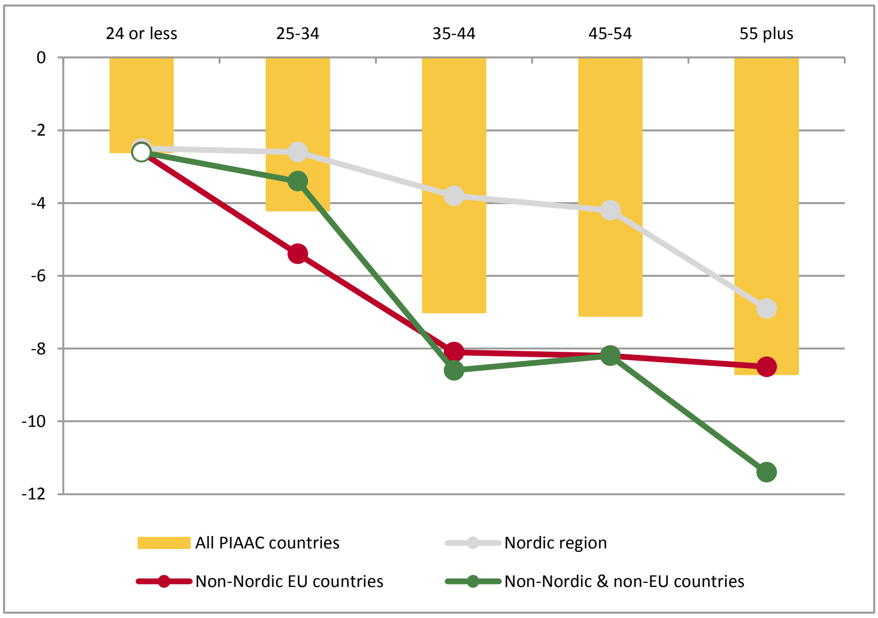
Figure 2.14 Female – male differences in numeracy scores, by age



Note: Differences that are statistically different from zero at the 5% significance level are marked by filled circles and bars.

Figure 2.15 shows that, similar to numeracy skills, the female – male differences in skills in problem-solving in technology-rich environments are all to the females' disadvantage, albeit smaller than in the case of numeracy. However, the differences across country aggregates are much larger in Figure 2.15 than in Figure 2.14. The non-Nordic EU countries and the non-Nordic & non-EU countries show the largest differences, the former especially for the age group 25–34 and the latter especially for the age group 55 plus. For the age group 35–54, the Nordic countries show a substantially smaller difference than the other aggregates.

Figure 2.15 Female – male difference in scores in problem-solving, by age



Note: Differences that are statistically different from zero at the 5% significance level are marked by filled circles and bars.

Summary: Gender differences are inversely related to age, being smallest for the youngest cohorts and largest for the oldest age groups, consistent with gender equality increasing over time. However, for none of the skills are there statistically significant differences to the females' advantage. The largest gender differences, up to 18 score points, are found with respect to numeracy skills. The variation across country aggregates is most marked with respect to skills in numeracy for which the largest differences are found in the non-Nordic & non-EU countries and the smallest in the Nordic region.

2.7 Education and skills

Before turning to the relationship between education and skills in adulthood, a brief overview of youth skills, educational attainments, and training in the different country aggregates is in place, cf. Table 2.2. The table reveals a pattern that is very consistent across the various indicators reported: the best outcomes are found in the non-Nordic & non-EU countries, while the non-Nordic EU countries exhibit the worst outcomes, the Nordic region ranking in-between these two extremes. The only exception concerns the share of 25–65 year olds with upper secondary education. This share is marginally higher (1 percentage point) in the Nordic region than in the non-Nordic & non-EU countries. Also, with respect to the incidence of training among 25–64 year olds, there is no information for the non-EU countries.

The largest differences across the country aggregates concern higher educational attainment. The proportion of adults with higher education is at least 60% higher in the non-Nordic & non-EU countries than in the non-Nordic EU countries among individuals that are 35–65 years old. Given this background information, we next proceed to examine the distributions over different levels of education, across the country aggregates.

Table 2.2 Indicators describing outcomes of lower secondary education and participation in up-per-secondary and higher and adult education

	Mean score in PISA reading			Proportion of adults (25–65) with at least upper secondary education	Proportion of adults with higher education					Proportion of adults (25–64) participating in formal and non-formal adult education during last year (AES 2011)*	
	2000	2006	2012		25–64	25–34	35–44	45–54	55–64	Total	For personal interest
Nordic region	516	507	505	84	37	41	40	35	30	59,2	14,5
Non-Nordic EU countries	500	490	500	76	27	35	30	24	20	40,4	17,5
Non-Nordic & non-EU	523	523	521	83	43	54	49	40	32	-	-
OECD	500	492	505	78	32	39	34	28	24	40,3	19,2**

Notes: *For adults participating for personal interest, the proportion of adults participating in non-job-related, non-formal education and training among all participants is calculated.
**Instead of an OECD average, the EU28 average is given because these data are based on the 2011 Adult Education Survey. Source: www.oecd.org; Eurostat.org

Figure 2.16 shows that, in general, the distributions over educational levels differ across the aggregates primarily with respect to shares at the lowest level (ISCED 1–2) and the shares at the two highest levels (ISCED 5B and ISCED 5A–6), with one exception. The exception is found in the non-Nordic & non-EU aggregate for which the share with ISCED 3–4, general education, is much larger than the corresponding shares in the other country aggregates, while the share with ISCED 3–4, vocational education, is much smaller. The reason is the well-known feature that upper secondary education is more general and theoretically oriented in the USA and in Canada than in Europe. This also applies to Korea and Japan and, accordingly, to the entire non-Nordic & non-EU aggregate.

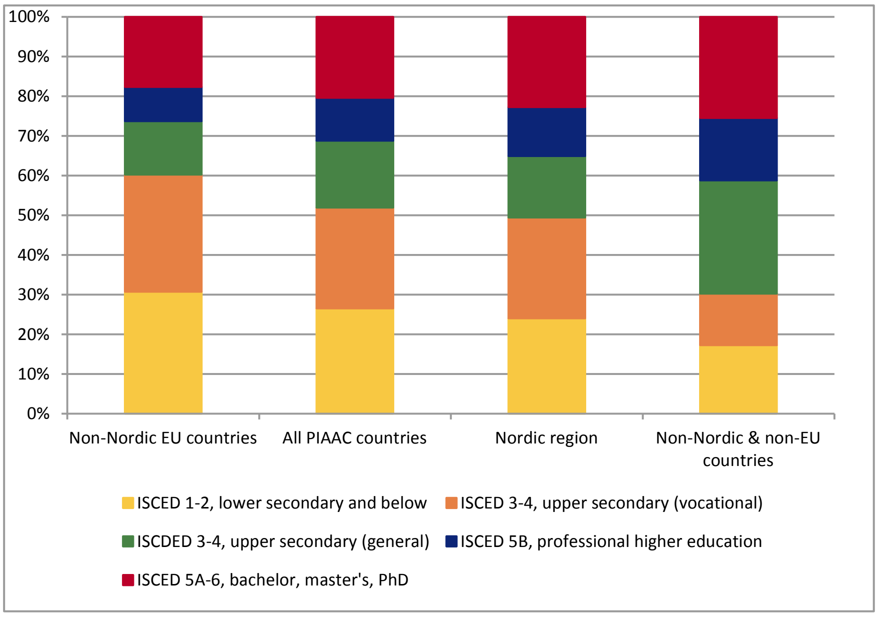
However, the *sum* of the shares of the two ISCED 3 categories are very similar across the country aggregates, ranging from 40.9% in the Nordic region to 42.8% in the non-Nordic EU countries.

With respect to the two highest levels of education, the non-Nordic & non-EU aggregate stand out: 41.2% have either of these levels of education. The lowest share is found in the non-Nordic EU aggregate, 26.3%, while the shares in the Nordic region and in the all PIAAC aggregate is 35.1 and 31.2%, respectively.

The ranking of the country aggregates with respect to shares at the lowest level of education mirrors the ranking at the upper end of the distribution. Specifically, the smallest share with ISCED 1–2 level of education is found in the non-Nordic & non-EU aggregate (17.3%), the largest in the non-Nordic EU countries (30.6%), and the Nordic region and the all PIAAC aggregate ranking in-between (with 24.0 and 26.5%, respectively).

Comparing Table 2.2 and Figure 2.16, remembering that Table 2.2 does not include 16–24 year olds, we see that, nevertheless, qualitatively they are in agreement. The rankings of the country aggregates with respect to the proportions with at least upper secondary education and with higher education are roughly the same.

Figure 2.16 Proportion of adults at five different levels of education



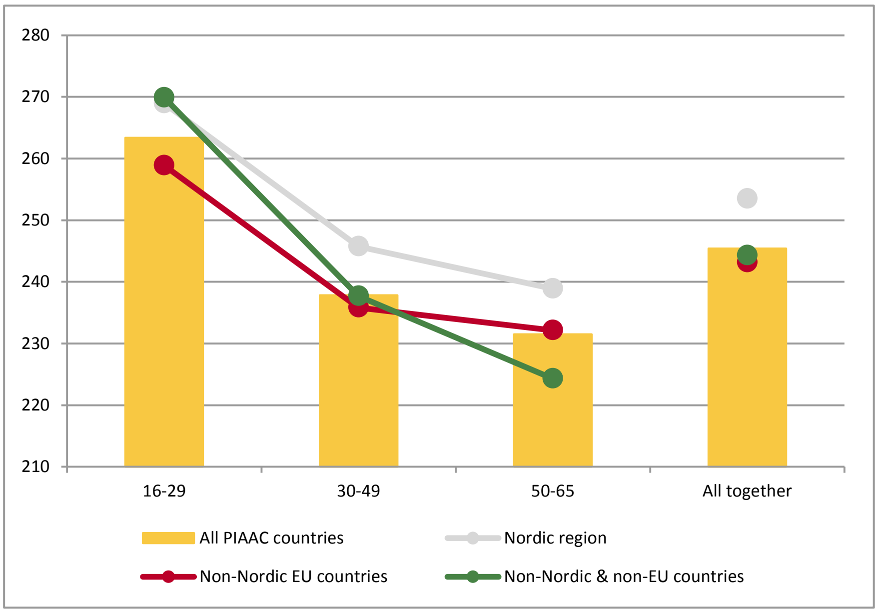
Note: The country aggregates are ordered according to the shares of ISCED 5B + ISCED 5A–6, in ascending order.

In Figures 2.17a–f, average performance in literacy by age groups is considered for each of the five educational levels considered in Figure 2.16, and by country aggregates. It is instructive to start by considering Figure 2.17f, for which the results are not broken down by country aggregates, but only by age and educational level. The important result in Figure 2.17f is that the lines in the diagram, pertaining to successively higher levels of education, do not cross, although the scores are the same for the 16–29 year olds with professional higher education (ISCED 5B) and upper secondary, general, education (ISCED 3–4, general). Otherwise, a higher level of education invariably corresponds to higher scores in literacy across age groups, as one would hope. On the other hand, the differences between the levels of education are not overly large. The lowest average score in the figure is well above the lower limit for skill level 2 (226 points), while the highest average score is well below the upper limit for skill level 3 (326 points).

Returning to Figure 4.17a, we see that, among individuals with the lowest levels of education (ISCED 1–2), there are large differences across age groups. In the all PIAAC aggregate, the 16–29 year olds score just above 25 points higher on average, i.e., about half of a standard deviation, than the 30–49 year olds, and an additional 6 points higher than the 50–65 year olds. There are non-negligible differences across country aggregates, too. Except for the age group 16–29, the Nordic region shows the highest scores across age groups. The largest differences between age groups are found in the non-Nordic & non-EU countries– 32 points between 16-29 and 30-49 year olds and an additional 13 points between 30–49 and 50–65 year olds.

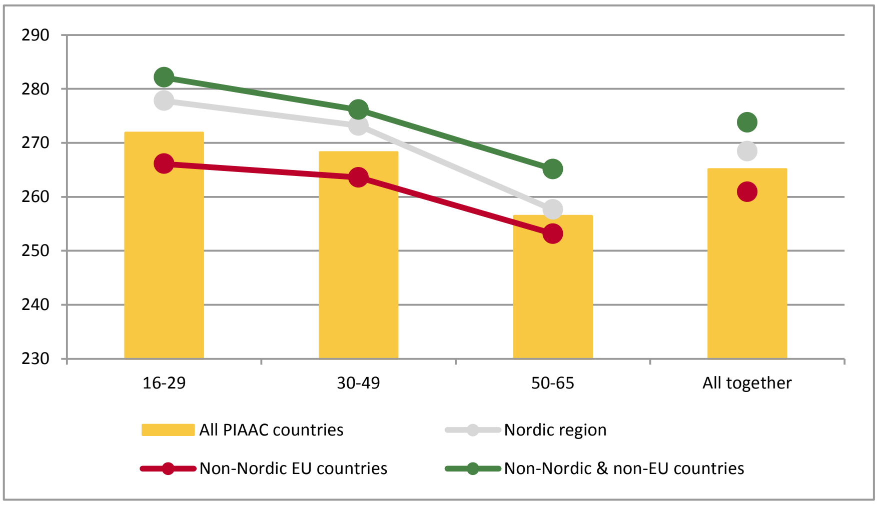
Figure 2.17b and Figure 2.17d concern different levels of education but similar *types* of education: vocational educations. The two figures also share a common feature, which cannot be found in Figures 2.17a and 2.17c, namely that the skill differences between the 16–29 year olds and 30–49 year olds are very small in all of the country aggregates. Moreover, within the country aggregates, the skill differences between the 16–29 year olds and the 50–65 year olds also are smaller than with respect to the general educations in Figures 2.17a and 2.17c. Accordingly, it seems that skills obtained through vocational educations are maintained better over time than are general skills. Of course, it is an open question whether this is due to properties of the educations themselves or whether the differential can be explained in terms of the extent to which the competencies are put to use at work.

Figure 2.17a Mean literacy scores among adults with at most lower secondary education, by age groups



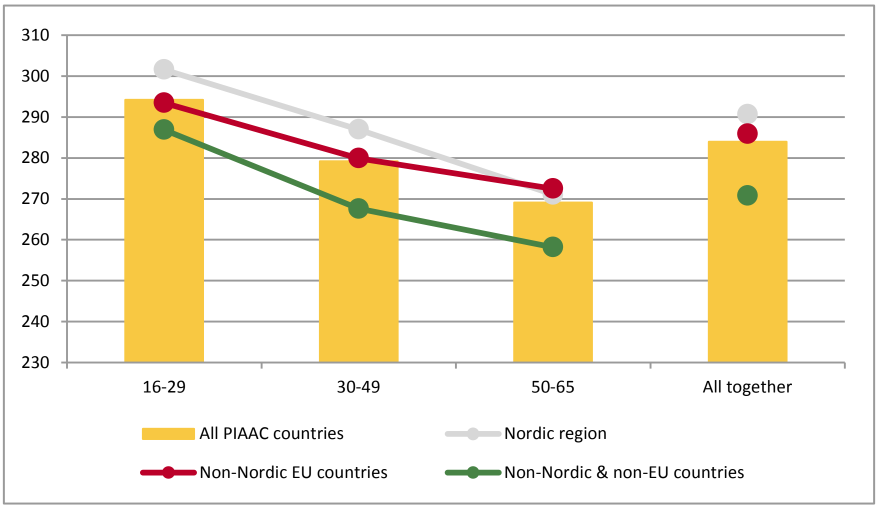
Note: Confidence intervals around the point estimates, not provided in the figure, vary somewhat in magnitude but by country aggregate, the *largest* intervals are as follows: Nordic region: 3.87; non-Nordic EU countries: 1.85; non-Nordic & non-EU countries: 3.44; all PIAAC countries: 1.58.

Figure 2.17b Mean literacy scores among adults with upper secondary (ISCED 3–4), vocational, education, by age groups



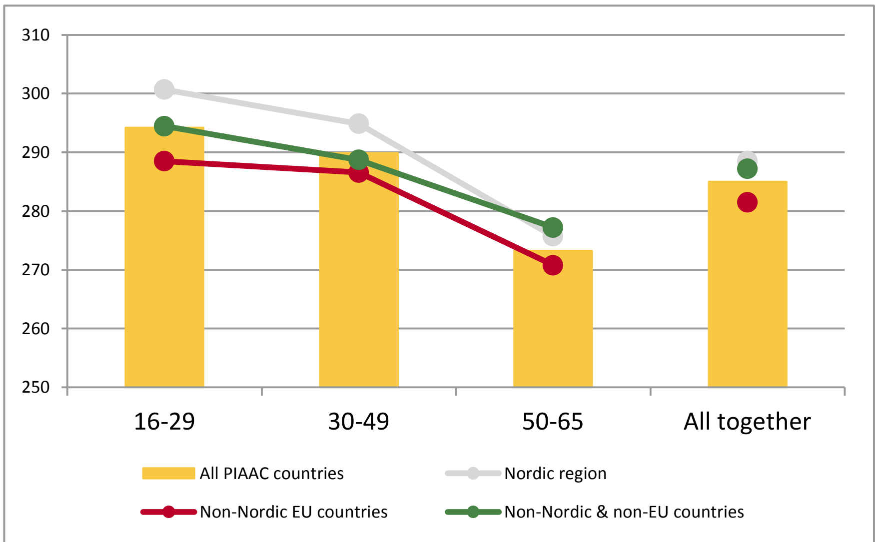
Note: Confidence intervals around the point estimates, not provided in the figure, vary somewhat in magnitude, but by country aggregate, the largest intervals are as follows: Nordic region: 2.60; non-Nordic EU countries: 2.53; non-Nordic & non-EU countries: 3.74; all PIAAC countries: 1.73.

Figure 2.17c Mean literacy scores among adults with upper secondary (ISCED3–4), general, education, by age groups



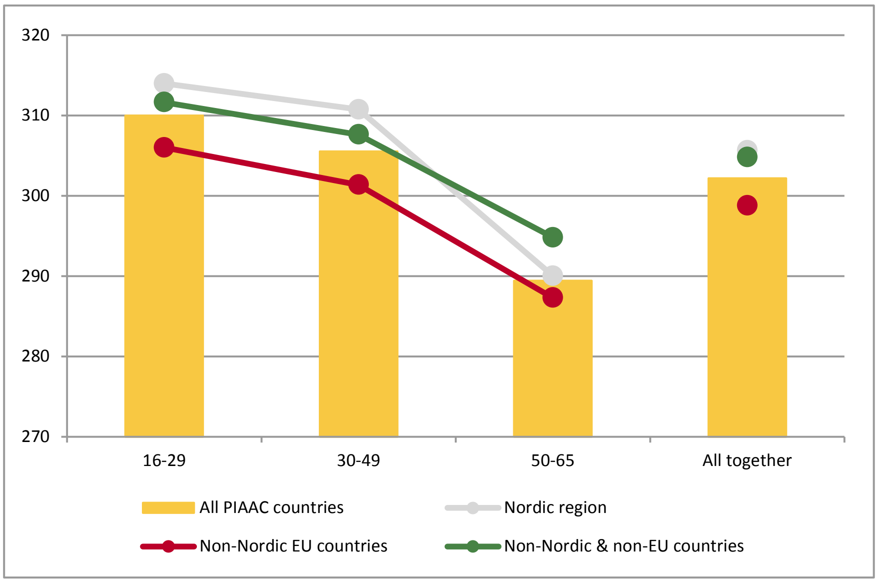
Note: Confidence intervals around the point estimates not provided in the figure, vary somewhat in magnitude, but by country aggregate, the *largest* intervals are as follows: Nordic region: 4.46; non-Nordic EU countries: 4.7; non-Nordic & non-EU countries: 2.43; all PIAAC countries: 2.64.

Figure 2.17d Mean literacy scores among adults with professional higher education (ISCED 5B), by age groups



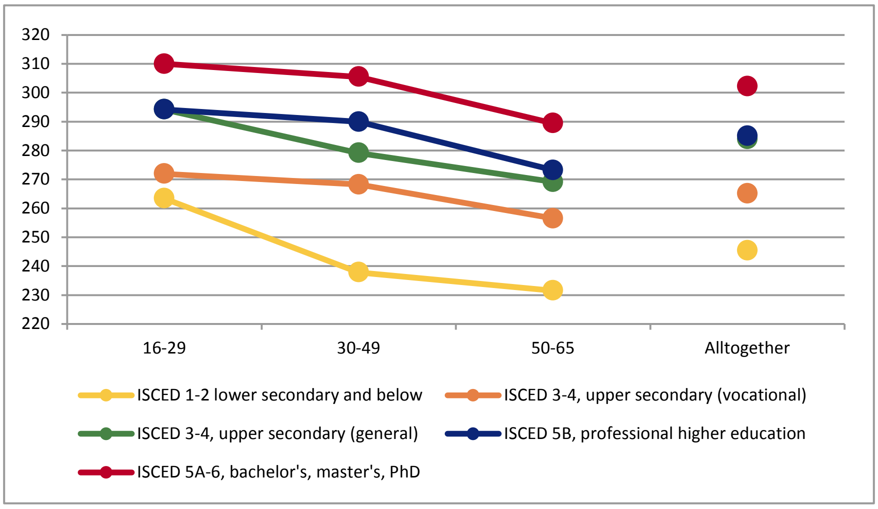
Note: Confidence intervals around the point estimates not provided in the figure vary somewhat in magnitude, but by country aggregate, the *largest* intervals are as follows: Nordic region: 4.75; non-Nordic EU countries: 3.82; non-Nordic & non-EU countries: 3.78; all PIAAC countries: 2.41.

Figure 2.17e Mean literacy scores among adults with Bachelor's, Master's, or PhD degrees (ISCED 5A, ISCED 6), by age groups



Note: Confidence intervals around the point estimates not provided in the figure vary somewhat in magnitude, but by country aggregate, the *largest* intervals are as follows: Nordic region: 3.22; non-Nordic EU countries: 1.73; non-Nordic & non-EU countries: 2.37; all PIAAC countries: 1.37.

Figure 2.17f Mean literacy scores by educational levels and age groups



Note: Confidence intervals around the point estimates not provided in the figure vary somewhat in magnitude, but by country aggregate, the *largest* intervals are as follows: ISCED1–2: 1.58; ISCED 3–4, vocational: 1.73; ISCED 3–4, general: 2.64; ISCED 5B: 2.41; ISCED 5A–6: 1.37.

Regarding differences across country aggregates, Figures 2.17a–e show that the most noteworthy is that the non-Nordic EU aggregate generally performs worse than the other aggregates. The Nordic region and the non-Nordic & non-EU countries take turns dominating the other aggregates, depending on education level and age group.

Disregarding differences across age categories, Table 2.3 summarises the relative performances of the country aggregates in literacy at different levels of education. It does so by relating the mean literacy scores by educational level to the PIAAC average, i.e., the all PIAAC aggregate.

Table 2.3 Performance of country aggregates in literacy relative to PIAAC average, by educational level

	Below PIAAC average	Above PIAAC average
ISCED 1–2, lower secondary and below	Non-Nordic EU countries, non-Nordic & non-EU countries	Nordic region
ISCED 3–4, upper secondary vocational	Non-Nordic EU countries	Nordic region, non-Nordic & non-EU countries
ISCED 3–4 upper secondary general	Non-Nordic & non-EU countries	Nordic region, non-Nordic EU countries
ISCED 5B, Professional higher education	Non-Nordic EU countries	Nordic region, non-Nordic & non-EU countries
ISCED 5A–6, Bachelor's, Master's, PhD	Non-Nordic EU countries	Nordic region, non-Nordic & non-EU countries

Summary: Across the country aggregates, the distributions over educational levels differ primarily with respect to the highest levels (at least college) and the lowest level (lower secondary). The non-Nordic & non-EU aggregate features by far the largest share at the highest level, 41%, and the smallest share at the lowest level, 17%. At the other extreme are the non-Nordic EU countries whose corresponding shares are 26 and 31%, respectively. For the non-Nordic EU countries, the comparatively poor educational background is mirrored by the poorest performance among the country aggregates considered. Disregarding age, the Nordic region performs best in all education groups except for upper secondary vocational education, where the non-Nordic & non-EU countries perform the best.

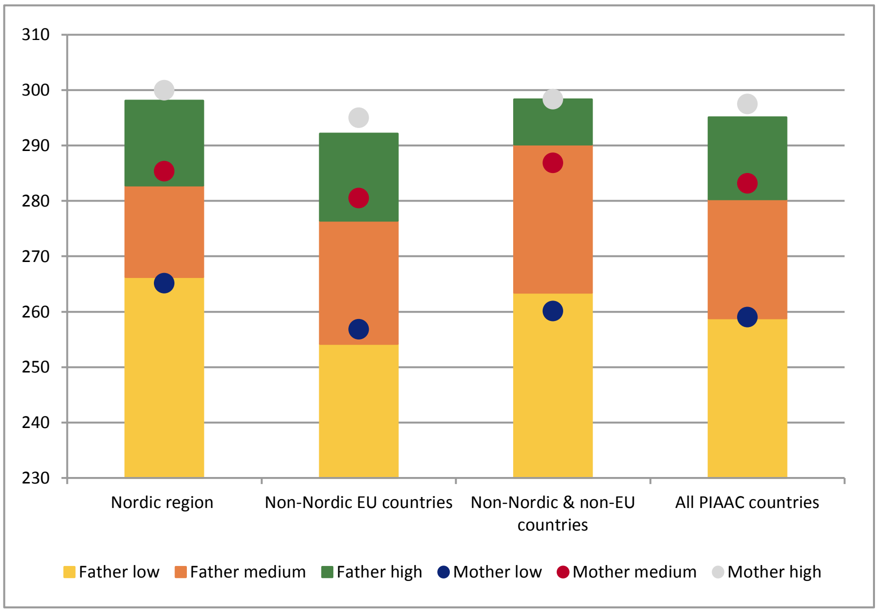
2.8 Skills and parental background

Figure 2.18 shows that there is a close, positive relationship between an individual's literacy skills and the educational levels of her/his parents. This holds with respect to both the mother's and the father's level of education. The mother's education is associated with slightly higher skills on the part of the child than the father's level of education, but the difference is small.

There are small but systematic differences across the country aggregates. At most levels of maternal/paternal education, the respondent's literacy score is highest in the Nordic region and lowest in the non-Nordic EU countries. In the Nordic region, average literacy skills vary between 265 points, when the parents have lower-secondary education, to close to 300 points, when the parents have university-level education. The corresponding numbers for the non-Nordic EU countries are 254 points and 295 points, respectively.

In contrast to the respondents in the non-Nordic EU countries, the respondents in the non-Nordic & non-EU countries in general have literacy scores above the PIAAC average, conditional upon the mother's/father's level of education. It should be emphasised, however, that the differences are not very large; across the country aggregates, the largest difference does not exceed 12 score points.

Figure 2.18 Mean literacy scores by educational levels of respondent's parent



Note: Low education equals ISCED 1, 2, and 3C short; medium education equals ISCED 3 (excluding 3c short) and 4; high education equals ISCED 5 and 6.

2.9 Skills of immigrants and natives, as measured in PIAAC

Unfortunately, PIAAC does not allow analyses of skill differences per se between foreign-born individuals and individuals born in the country under study, except in a small number of cases. The reason is that, as a rule, the PIAAC survey was conducted only in the respective countries official languages. Accordingly, in Denmark, for example, the survey was conducted only in Danish. This implies that differences in results between domestically born Danes and individuals who have immigrated to Denmark will be due to both skill differences and differences arising from misunderstandings and/or lack of comprehension, stemming from language difficulties.

The confusion created by the difficulties in separating key information-processing skills from language skills is further aggravated by the fact that the handling of respondents with language difficulties differ across countries. In some countries, respondents who are unable to conduct the test because of language problems are always assigned imputed scores. In other countries, no results at all are recorded for some of the respondents with language difficulties; see further OECD (2013, p. 58).

For the reasons given, it is important to emphasise that the discussion about skill differences between immigrants and natives concerns skill differences *as measured in PIAAC*. This qualification applies to all cases in which some of the respondents have had to participate in the survey without having the possibility to use their mother-tongues while doing so.[17]

Table 2.4 provides information about the shares of the two types immigrants considered in PIAAC, by country aggregate. It can be seen that while both the shares of 1st and 2nd generation immigrants are larger in the Nordic region than in the other country aggregates, the differences are not very large. In particular, the smallest share of 1st generation immigrants, found in the non-Nordic EU countries, is 9.74%, as compared to the Nordic share of 11.48%. The smallest share of 2nd generation immigrants, recorded for the non-Nordic EU countries, is 2.33% while the corresponding Nordic share is 3.23%.

[17] In a few countries, PIAAC has been carried in multiple languages. Some examples are Canada (English and French), Estonia (Estonian and Russian), and Finland (Finnish and Swedish).

Table 2.4 Population shares of 1st and 2nd generation immigrants

	1st generation immigrants as proportion (%) of overall population	2nd generation immigrants as proportion (%) of overall population
Nordic region	11,48	3,23
Non-Nordic EU countries	9,74	2,33
Non-Nordic & non-EU countries	10,25	3,10
All-PIAAC countries	10,29	2,80

Notes: 1. 1st generation immigrants are individuals born abroad.

2. 2nd generation immigrants are native-born individuals, *both* of whose parents are born abroad.

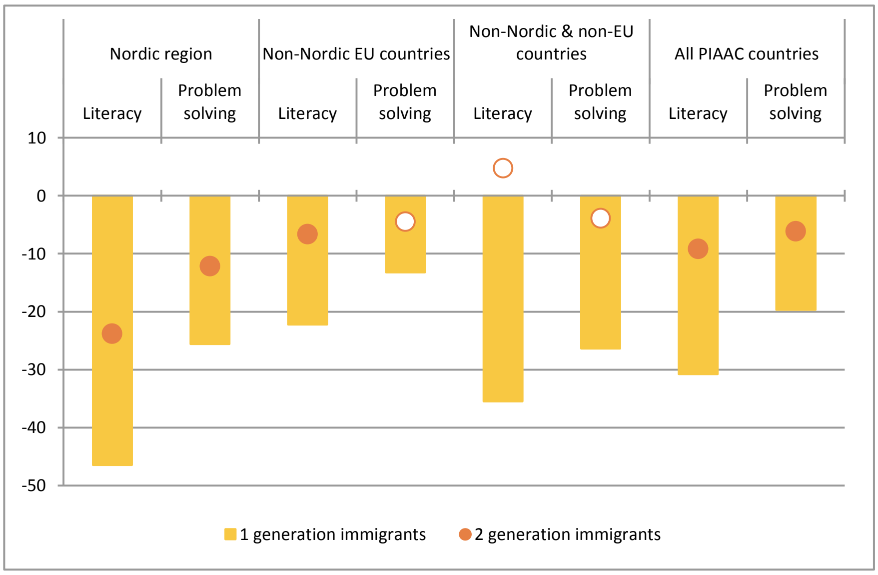
3. Native-born individuals with one parent who was born abroad are treated as natives.

The discussion above has shown that age, gender, education, and parent's education are all strongly related to skills. Accordingly, to the extent that these characteristics differ between immigrants and natives, it is important to control for them when comparing the skills of immigrants and natives. Figure 2.19 thus documents immigrant – native differences that have been so adjusted by means of regression analysis.

The figure shows that with respect to both literacy skills and problem-solving skills, the largest adjusted differences are found in the Nordic region. For literacy, the difference for 1st generation immigrants is huge **–** close to 50 score points. This corresponds to one standard deviation in skills and also to one skill level. For 2nd generation immigrants, the difference is about half as large. The differences estimated for problem-solving are approximately half the size of the corresponding literacy differences.

The differences estimated for the non-Nordic EU countries are below the corresponding PIAAC averages, while the differences for the non-Nordic & non-EU countries are above.

Figure 2.19 Differences between 1st and 2nd generation immigrant's scores in literacy and problem-solving in technology-rich environments and the corresponding scores of native-borns



Note: Differences are adjusted by regression analysis for age, gender, education, and parent's education. Filled points denote statistical significant results (*t* value ≥ +-1.96).

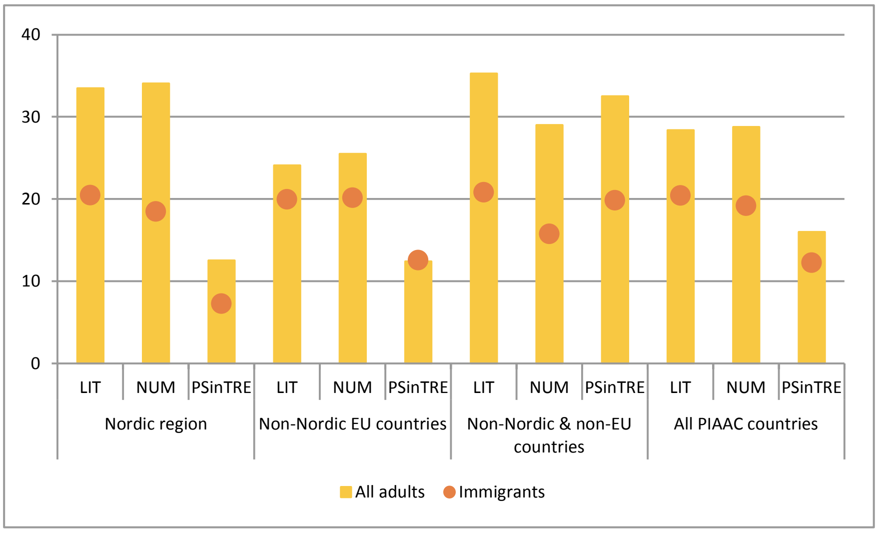
Although Figure 2.19 clearly demonstrates large differences in skills, as measured in PIAAC, between natives and immigrants, it cannot say to what extent these differences are due to linguistic and cultural factors – some of the immigrants may speak the language of the country to which they have immigrated. In some cases, it may even be their mother tongue.

An attempt to focus more directly on language differences is made in Figure 2.20, which shows the mean skill score differences between those who speak the same language at home as the assessment language versus those who do not. It does so for all adults and for immigrants. This can be viewed as a way to control for differences with respect to "distance" between one's own culture and the culture of the country where the PIAAC survey takes place. Differences with respect to these distances should be smaller among immigrants than among all adults, as the latter group will include both natives – with no cultural distances – and immigrants with positive cultural distances. To the extent that both linguistic and cultural factors affect the mean skill score, one would expect the mean skill score differences to be smaller in the immigrant group than among all adults. This is also precisely what Figure 2.20 shows: the differences are smaller for the immigrants than for all adults. This holds for all the country aggregates and for all the skills, except for problem-solving in the non-Nordic EU countries, where the score differences are basically the same among the immigrants and all adults.

Furthermore, when comparing skills, we find that, in general, the differences are smallest when it comes to problem-solving in technology-rich environments (PSinTRE). This is also to be expected. Skills in PSinTRE should be less affected by linguistic and cultural factors than numeracy and, in particular, literacy skills.[18]

Across the country aggregates, the differences between all adults and immigrants with respect to literacy are largest in the non-Nordic & non-EU countries, although the Nordic region follows closely. Regarding numeracy, the differences are largest in the Nordic region, but of almost the same magnitudes in the non-Nordic & non-EU countries. For problem-solving, the non-Nordic & non-EU countries stand out with differences that are not only very large compared to the corresponding differences in the other country aggregates, but also large compared to the skill differences found for literacy and numeracy.

Figure 2.20 Differences between the mean scores across all adults/immigrants whose language is the same as language of assessment vs. another language



Note: Differences are adjusted for education by regression analysis. Filled points denote statistically significant results (*t* value ≥ +-1.96).

[18] However, the large mean score differences for PSinTRE skills in the non-Nordic & non-EU countries constitute an interesting deviation from this general pattern, which deserves further study.

Summary: The shares of 1st and 2nd order immigrants are rather similar with respect to size across the country aggregates studied – on average, 1st and 2nd generation immigrants account for about 10 and 3%, respectively. Nevertheless, the variation across country aggregates in native-immigrant skill differences, as measured in PIAAC, is substantial. The largest differences are found with respect to literacy in the Nordic region, where natives on average score almost 50 points higher (= one skill level) than 1st order immigrants. The corresponding PIAAC average is about 30 points. The non-Nordic & non-EU aggregate and the non-Nordic EU aggregate are slightly above and slightly below the PIAAC average, respectively. For 2nd generation immigrants, the differences are about half the size of those for 1st order immigrants. When language, rather than immigrant background, is focused, the differences between those whose mother tongue was vs. was not the language of assessment amount to approximately 30 score points in literacy and numeracy in all of the country aggregates except in the non-Nordic EU countries, where the difference was somewhat smaller. When the comparison is further constrained to individuals who are also immigrants, the differences in mean scores are reduced from 30 to 20 points in literacy and numeracy.

2.10 References

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3. Differences and Inequities in the Distributions of Information-Processing Skills in the Nordic Countries

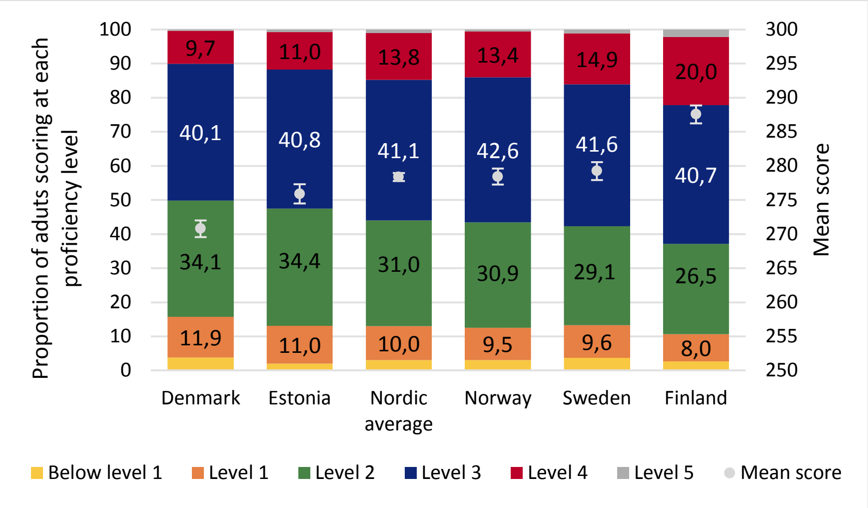
Aune Valk

Nordic countries, as described in the previous chapter and as perceived by many people, are homogeneous areas with similar languages, attitudes, social systems, etc. However, in contrast to the previous chapter, this chapter seeks to identify the differences and inequities in the distributions of information-processing skills in the Nordic countries. We will look at the differences both across and within countries. The chapter starts with a general comparison of countries across the three skill domains, followed by the analysis in selected relevant demographic groups. Earlier findings (OECD, Statistics Canada 2011; OECD 2013) consistently point to age, gender, education, immigration, and language status as key determinants of population skill levels across countries. We will consider each of these factors in turn.

3.1 Level and distribution of information-processing skills

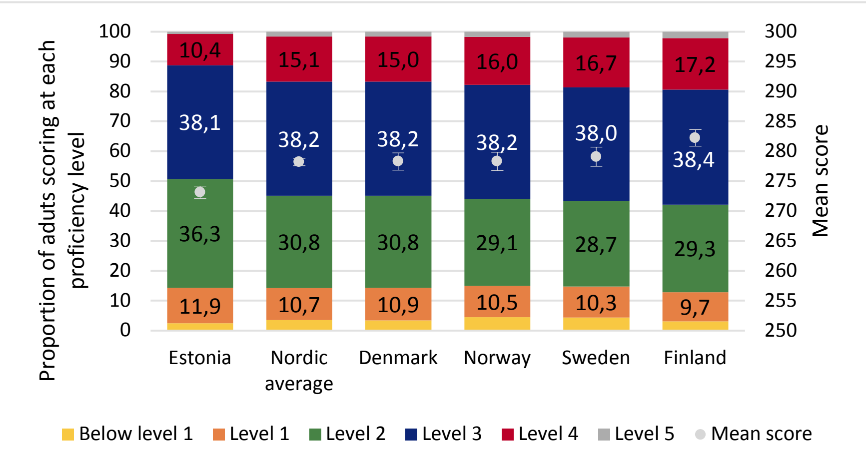
First, the mean scores and proportions of people at each proficiency level are presented, by skill domain, across countries. With respect to literacy (see Figure 3.1), Norway and Sweden are close to the Nordic average, with Finnish adults scoring above the average while the mean scores of Estonian and Danish adults are below the Nordic average. Regarding numeracy (Figure 3.2), Denmark, Norway, and Sweden all perform at the level of the Nordic average while Finland scores slightly above it and Estonia below it. For both literacy and numeracy, the differences between countries mainly concern the proportion of adults with very high skills (levels 4 and 5). For instance, in case of literacy, this proportion is almost twice as large in Finland as in Denmark and Estonia. The proportion of people with very low skills (level 1 and below), however, is very similar across countries, ranging from 11%–13% in literacy and 13%–15% in numeracy. The only exception is Denmark, which has slightly more (16%) people with very low literacy skills.

Figure 3.1 Literacy among Nordic adults, mean scores, and proficiency levels



Note: Countries are ranked in ascending order of the mean score.

Figure 3.2 Numeracy among Nordic adults, mean scores, and proficiency levels



Note: Countries are ranked in ascending order of the mean score.

It is interesting to note that although Estonia has some of the lowest mean scores in numeracy and literacy as well as small proportions of people at high proficiency levels, there are significantly fewer people with very low (below level 1) skills as compared to the other countries. Thus, the distribution of skills appears to be more compressed in Estonia. Applying the formula of GINI index,[19] the inequality of literacy skills distribution is found to be the lowest (1.4) in Estonia and the highest in Denmark (11.3), with Norway (8.0), Finland (8.6), and Sweden (9.4) in between. For numeracy, however, the skills GINI index is the lowest (i.e., skills are the most equally distributed) in Norway (3.2) followed by Finland (8.8), Estonia (9.6), Sweden (10.2), and Denmark (11.4). Equality of skills distribution is not an aim in itself, but it could reflect and cause other inequalities in society.

Regarding problem-solving in technology-rich environments (below also PS in TRE) (see Figure 3.3), the four traditional Nordic countries have very similar results, with Sweden scoring slightly better (more people on levels 2 and 3[20]) and Denmark slightly lower than Finland and Norway. Estonia differs from the other countries with high proportions of people who lack computer experience or refused to take the CBA, and significantly fewer people on levels 2 and 3. The proportion of people with low levels of skill in the problem-solving domain (level 1 and below) is, however, very similar across all five countries.

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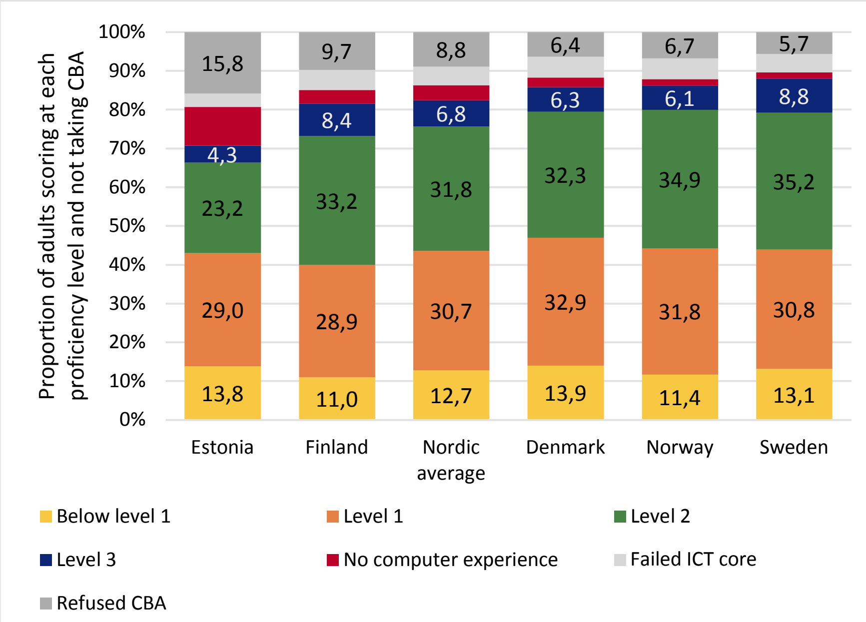
[19] The Gini coefficient (also known as the Gini index or Gini ratio) is a measure of statistical dispersion intended to represent the income distribution of a nation's residents, and is the most commonly used measure of inequality. It was developed by the Italian statistician and sociologist Corrado Gini and published in his 1912 paper "Variability and Mutability". Here, the formula proposed by Deaton (1997, 139). $G = \frac{N+1}{N-1} - \frac{2}{N(N-1)u}(\sum_{i=1}^{n} P_i X_i)$ is used where u is mean skills score of the population, P_i is the skills rank P of person i, with skills score X, such that the best skilled person receives a rank of 1 and the least skilled a rank of N. For calculation first plausible value was used.

[20] In different countries, different proportions of people participated in computer-based assesment and in the assessment of problem-solving in technology-rich environments. For comparative reasons, the proportion of people at the two highest levels (levels 2 and 3) of PS in TRE is usually presented instead of the mean score.

Figure 3.3 Problem-solving skills in technology-rich environments among Nordic adults, by proficiency levels



Note: Countries are ranked in descending order of the share of people who did not solve tasks in computer and therefore did not get the score in problem solving. People who had no computer experience, who failed ICT core assessment, or who refused to participate in computer-based assessment did not get a score in problem-solving in technology-rich environment.

It can be concluded that although the picture is rather homogeneous, Finland (and in some cases Sweden) tends to score above, and Estonia (and in some cases Denmark) tends to score below the Nordic average, while Norway best represents the typical Nordic skills pattern.

3.2 Skills and age

Besides education, which will be tackled in the 5th part of the chapter, age is one of the strongest correlates of information-processing skills. Age differences are related to age, cohort, and period effects, as explained by the PIAAC initial report (OECD, 2013: 195). Cohort effects include differences both in quality and length of education among different generations, and the extensiveness of skills use. To present age-related trends in detail, the figures (3.4–3.6) are based on five-year age groups. The discussion about statistically significant differences, however, for reasons of brevity, concerns ten-year groups (16–24, 25–34, 35–44, 45–54, 55–65).

The biggest differences in literacy and numeracy skills across countries appear in the 20/25–40 age span: in this range, Finnish adults score clearly better in both literacy and numeracy than the adults in the other countries. It is also notable that Estonian 35–50 year olds score distinctly worse in numeracy compared to their age-mates in other countries.

Regarding literacy, Finnish adults are above the Nordic group's averages in all age groups except the oldest (55–65). Norwegian adults show the opposite pattern: adults up to 34 are below while older adults are at or above the Nordic average in the same age groups. Swedes in most age groups are similar to the Nordic average, except that the oldest score slightly higher than individuals of the same age in the other Nordic countries. Danes have lower literacy skills than the Nordic average in all age groups. Estonian youth (16–24) are above, elderly people (55–65) equal to, and prime-aged individuals below the Nordic average in the respective age groups.

Figure 3.4 Mean literacy scores across age categories

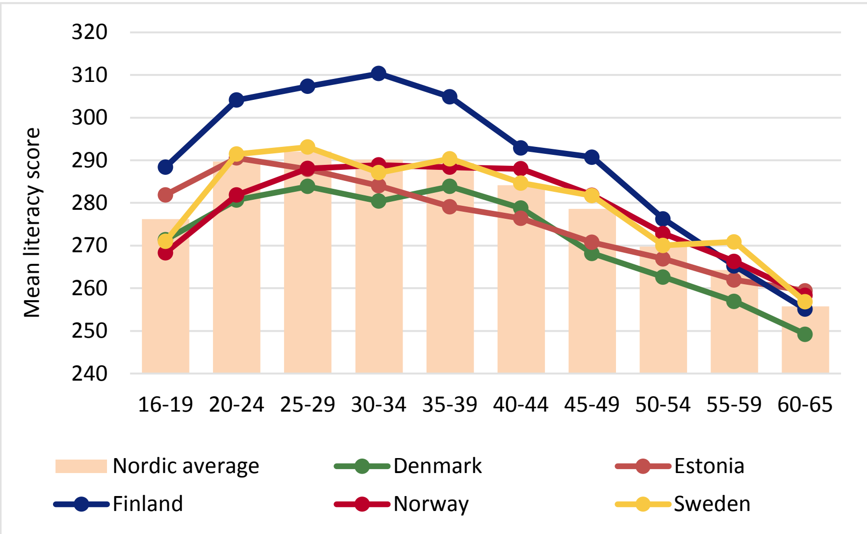
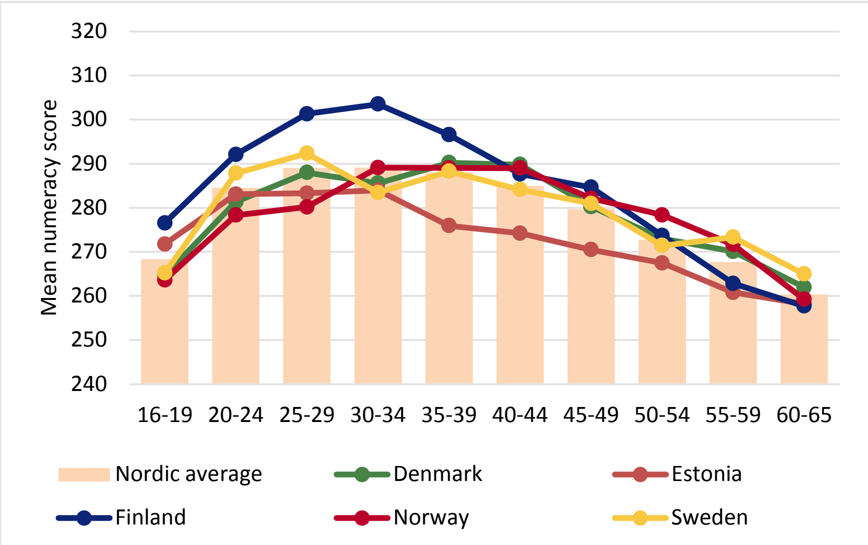


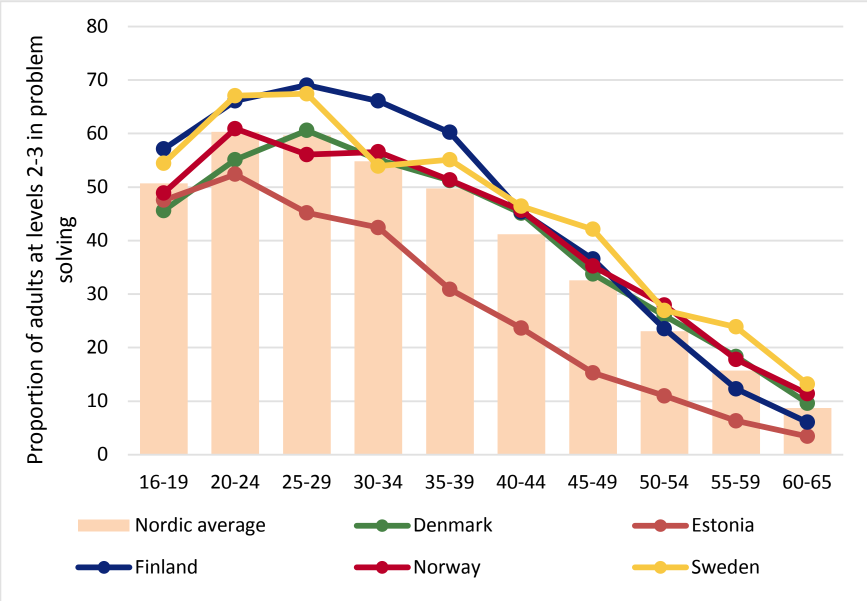
Figure 3.5 Mean numeracy scores across age categories



In Finland, numeracy results are comparatively better among younger age groups and in Norway among older age groups. In Sweden, numeracy skills are similar to Nordic averages in most age groups. Danish adult's numeracy skill profiles are rather similar to Norwegian (and Swedish) patterns, being comparatively better in the older age groups. Estonian's numeracy skills are below the Nordic averages in all age groups, except for the youngest age group.

Problem-solving skills across age groups are very similar across the four traditional Nordic countries: Finland, Denmark, Norway, and Sweden (cf. Figure 3.6). Sweden and Finland partly perform slightly better than Denmark and Norway, but there is no clear pattern. Estonia's youngest and oldest respondents show results that are rather similar to the corresponding age groups in the other four countries, but among 25–60 year olds, Estonia clearly performs worse than the other four countries.

Figure 3.6 Share of adults scoring at levels 2 and 3 in problem-solving in technology-rich environments, by age groups

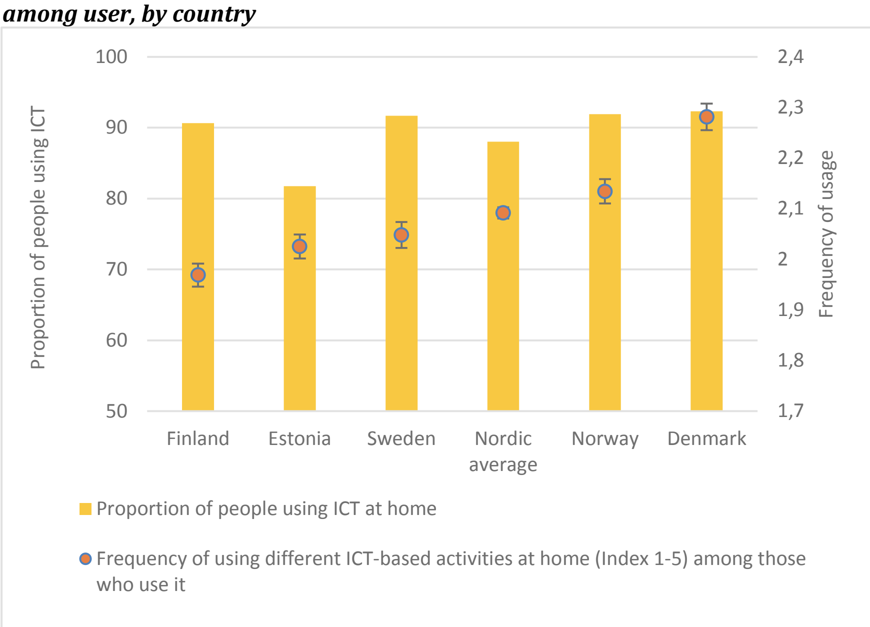


There are several possible explanations for these patterns. The differences are likely to be related to the quality of education. For instance, 35+ year-old Estonians obtained their education either during the Soviet era or in the transition period when the educational system went through radical changes that may have affected the outcomes. That Finland has outperformed the other countries in PISA is also reflected in PIAAC literacy and numeracy scores for individuals younger than 40 and has been explained by changes in the educational system in the 1970s. Another explanation relates skill level to skill use at work and at home, as shown in the PIAAC first international report (OECD, 2013). Most likely, the Estonian labour market encompasses a much larger proportion of people doing work that requires less skill utilisation. As the country-differences are the most pronounced with respect to the PS in TRE that presupposes good command of computer-use besides problem-solving skills, the frequency of ICT usage at work and at home deserves consideration (cf. Figures 3.7 and 3.8). According to Figure 3.7, there are 15–20 percentage points fewer people in Estonia who use ICT at work than in the other Nordic countries. However, the figure also shows that among those who do use ICT at work, the frequency of usage is highest in Estonia. The proportion of people using ICT at home differs less across countries (cf. Figure 3.8). Here, the share of users is about 10 percentage points lower in Estonia as in the other countries, where about 91–92% of the people use computers at home.

Figure 3.7 Share of employed individuals using ICT at work, and frequency of usage among users, by country

Note: Countries are ranked in ascending order of the frequency of usage among those using ICT at work

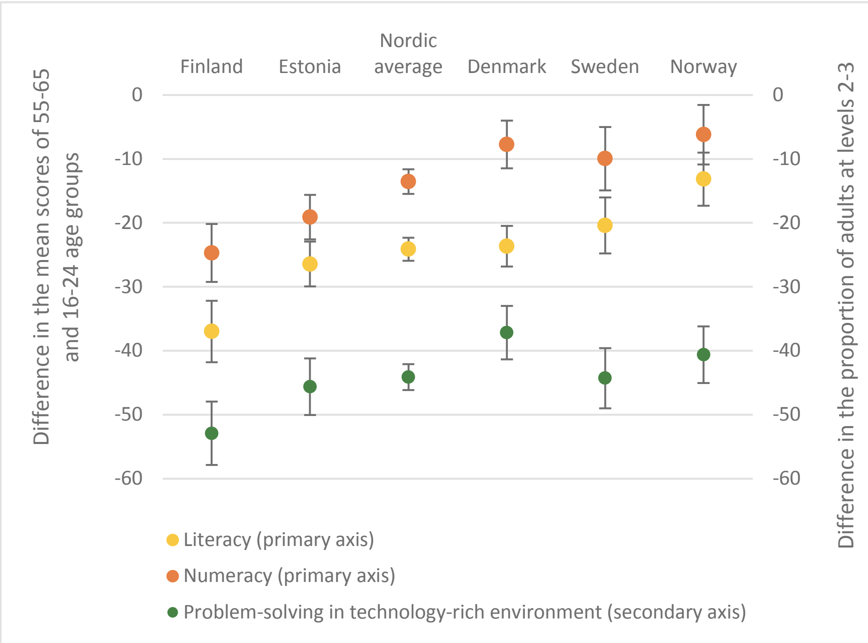
Figure 3.8 Shares of individuals using ICT at home, and frequency of usage among user, by country



Note: Countries are ranked in ascending order of the frequency of usage among those using ICT at home.

Comparing performance in the tails of the age distribution, we find that for all skill domains, the differences are largest in Finland, followed by Estonia (cf Figure 3.9). For literacy and numeracy, the smallest differences across the youngest and oldest age groups occur in Norway (in numeracy, the Swedish and Danish age differences are very similar to the Norwegian differences). For problem-solving in technology-rich environments, Denmark exhibits the smallest difference in skills between 16–24 and 55–65 year olds. In general, Sweden has age-related skill differences close to the Nordic averages. Among Finnish and Estonian adults, the age differences are mostly above the Nordic averages while the age-related skill differences among Danish and Norwegian adults are smaller than in the Nordic region as a whole. In all countries, numeracy scores vary less with age than literacy scores, which, in turn, vary less than the share of adults performing well in problem-solving in technology-rich environments.

Figure 3.9 Differences of the information-processing skills of people aged 16–24 and 55–65



Note: Countries are ranked in ascending order of the difference of the mean literacy proficiency of people aged 16–24 and 55–65. For numeracy and literacy, the differences of the mean scores are calculated For problem-solving in technology-rich environments, the difference in proportion (in percentage points) of adults at level 2 and 3 is presented.

3.3 Skills and gender

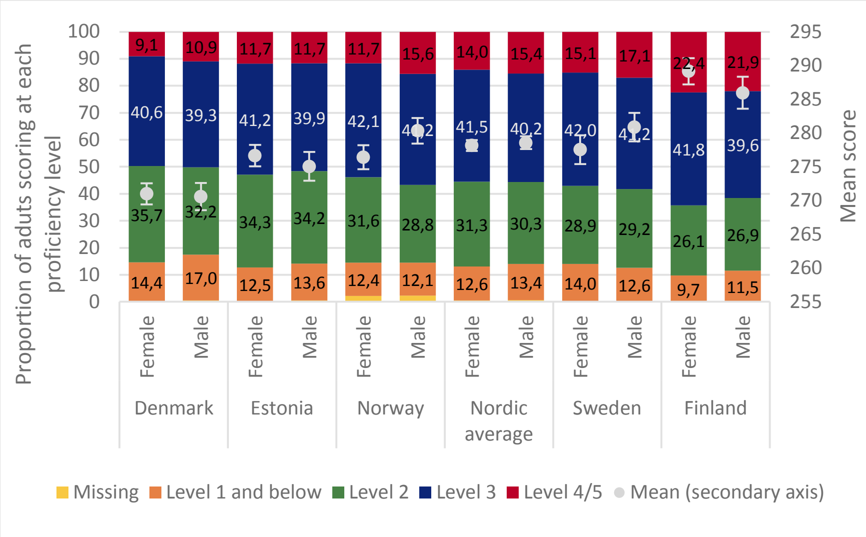
Nordic countries are world leaders in the area of gender equality. The Nordic Council of Ministers declares this to be a key part of the Nordic identity and there is a vision to act as a gender equality role model for other countries. "Nordic gender-equality policy is designed to make an impact on developments not only in the Nordic Region, but also in the EU and other relevant international arenas" (Norden, 2014).[21] There is also a Nordic- Baltic co-operation in this field.

In literacy, gender differences in the mean scores across the Nordic countries are smaller (0.4) than the average across the other participating countries in PIAAC (2.3). Only in Norway are men performing statistically significantly better than women. With regard to numeracy, however, gender equality does not prevail, neither in the Nordic countries (the difference in mean scores is 11.0, to the men's advantage) nor in the other PIAAC countries (where the average difference between men and women is 11.7 score points). Among the Nordic countries the gender difference in numeracy is the biggest in Norway, followed by Sweden. The smallest differences can be found in Denmark (in case of literacy) and in Estonia (in case of numeracy), cf. Figures 3.10 and 3.11.

Comparing literacy scores across countries it appears that Finnish men and women and Swedish and men score higher than the Nordic average for the respective gender. The standards set by these groups (and Norwegian men) are so high that women in Norway, Estonia, and Denmark, and men in Estonia and Denmark, fall below the Nordic average. Numeracy scores are more equal across the countries: only Finnish men and women score higher than the corresponding Nordic averages, while Estonian men and women and Norwegian women score below it.

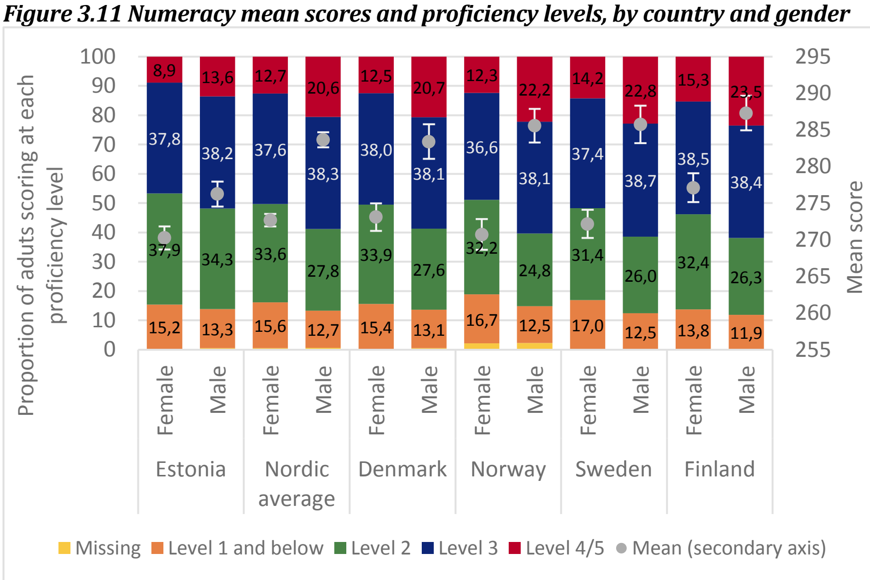
[21] http://www.norden.org/en/nordic-council-of-ministers/council-of-ministers/council-of-ministers-for-gender-equality-mr-jaem/the-nordic-council-of-ministers-for-gender-equality

Figure 3.10 Literacy mean scores and proficiency levels, by country and gender



Note: Countries are ranked in ascending order of the mean score for males and females in average.

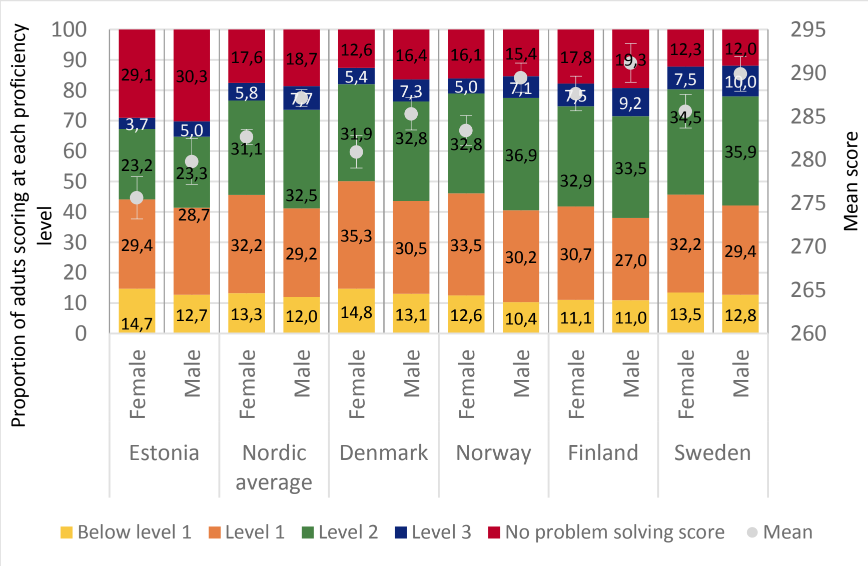
Figure 3.11 Numeracy mean scores and proficiency levels, by country and gender



Note: Countries are ranked in the ascending order of the numeracy mean score for males and females in average.

Regarding top-performers (levels 4 and 5), it can be observed that in the Nordic countries, gender equality prevails in literacy. However, there are significantly more men (8–10 percentage points) performing on the two highest levels in numeracy. Only in Estonia is the difference small (5 percentage points). At the other end of the skill distributions, the proportions of low performers (level 1 and below) do not differ much across genders, neither in numeracy nor in literacy.

Figure 3.12 Mean scores and proficiency levels in problem-solving in technology-rich environments, by country and gender



Note: Countries are ranked in the ascending order of the proportion of adults (both males and female) at levels 2 and 3.

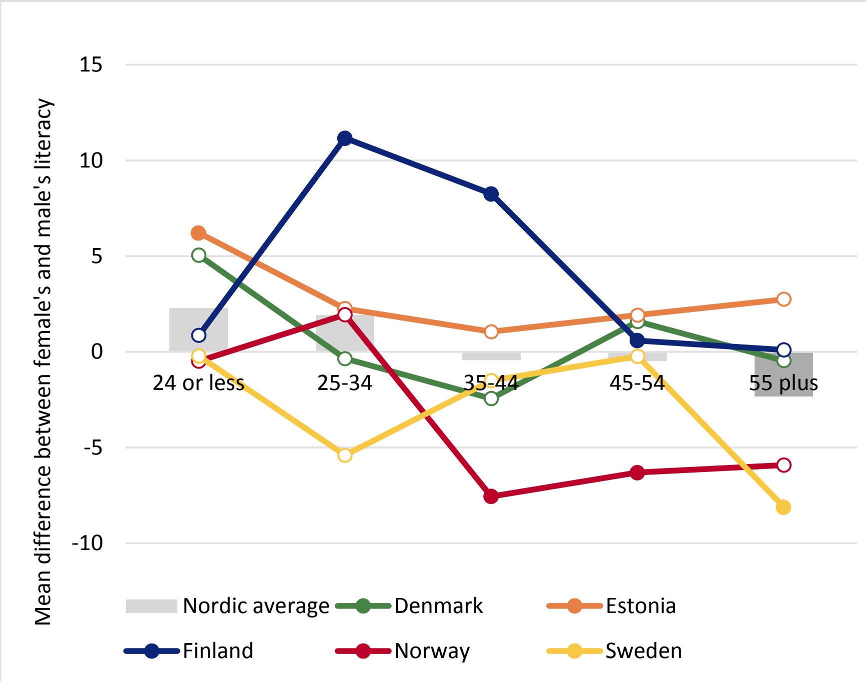
With respect to problem-solving, males outperform females in all countries (cf. Figure 3.12). On average, there are 3.3 percentage points more men than women scoring at levels 2 and 3 in the Nordic countries. This is slightly less than across all PIAAC participating countries (4.7 percentage points). At country level, the differences (both in mean scores and regarding the proportion of adults at levels 2 and 3) are the largest in Norway (Diff(mean)=6.1; Diff(proportion)=6.2 percentage points), whereas the differences in the other countries are approximately 4 in terms of mean scores and 1.5–4 percentage points with respect to the proportion of adults at levels 2 and 3.

3.4 Skills in relation to age and gender

In this subsection, we combine the age and gender dimensions considered in the two previous subsections. By doing so, we are able to shed light on the development of gender differences over time or, more correctly, across cohorts. Are female-male differences smaller in younger cohorts than in older ones? Are the changes across cohorts similar in respect to different skill domains? What is the relative importance of cross-country and within-country differences? These issues are illustrated in Figures 3.13–3.15, which show gender differences in mean scores by skill domain, age category, and country.

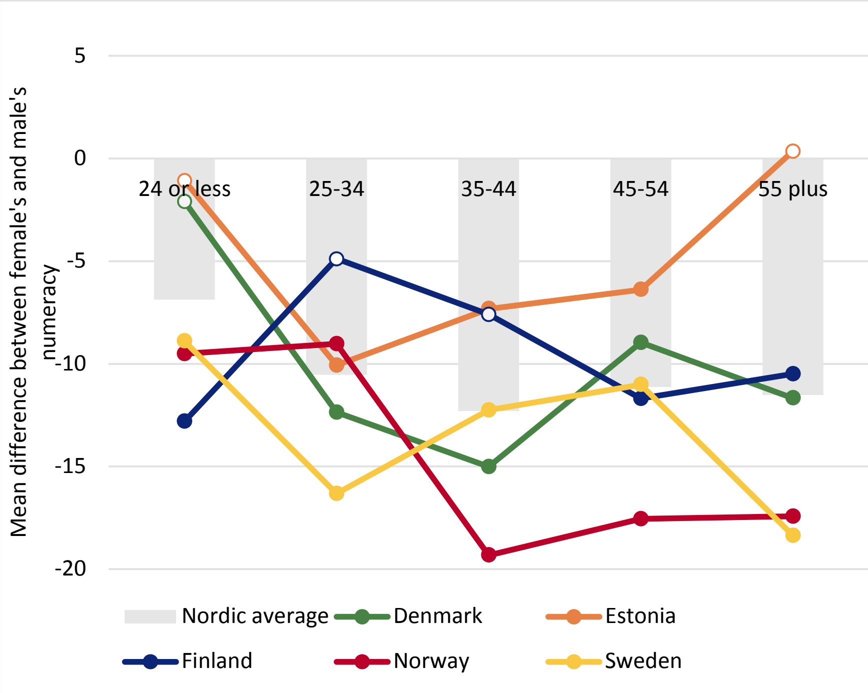
For all three skill domains, gender differences in favour of men seem to be slightly larger among older age groups. This finding can be a sign of positive trends in gender equality. That is to say, the results of younger females are closer to the results of men of the same age than are the results of older females compared to men in the same older cohorts, consistent with male-female differences decreasing over time.

Figure 3.13 Gender differences in mean literacy scores, by age-category and country



Note: The result shows a difference between the female and male mean score (female score minus male score) in the respective age group. Results above zero mean that females performed better. Statistically significant (at a confidence level of 95%) differences between male and female scores are marked with dots in full-colour.

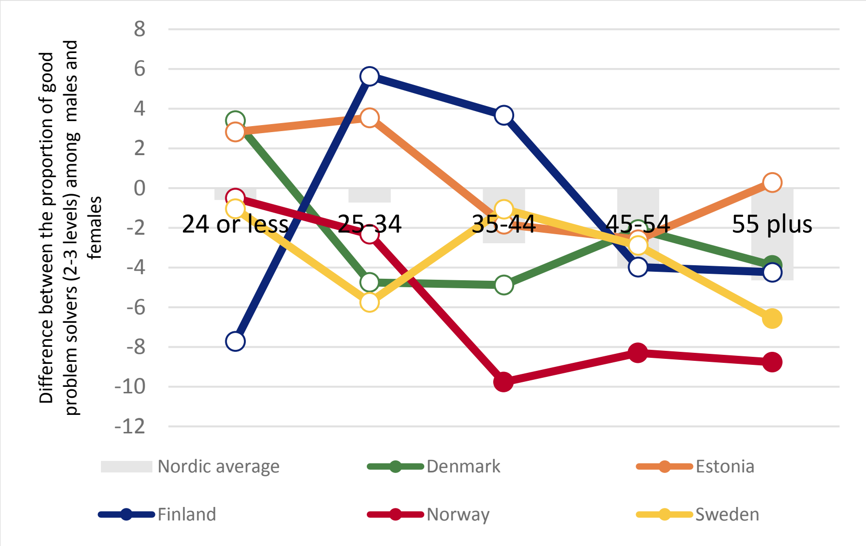
Figure 3.14 Gender differences in mean numeracy scores, by age categories and country



Note: The result shows the difference between female and male mean scores (female score minus male score) in the respective age group. Results above zero mean that females performed better. Statistically significant (at a confidence level of 95%) differences between male and female scores are marked with dots in full-colour.

For literacy, the trend of the Nordic average, illustrated by the bars in Figure 3.13, is almost linear, ranging from +2 points in favour of females among the youngest age group to -2 points among the 55+ individuals. With respect to numeracy, the difference is consistently in favor of men, whereas the female-male difference is -12 points among the 35+ cohorts and is considerably smaller, -7 points, among the youngest cohorts. A linear pattern is also observed for the Nordic average in PS in TRE, where there are almost 5 percentage points more of good problem solvers (adults at levels 2 and 3) among men in the oldest age group compared to a less than 1 percentage point difference in the two youngest age groups.

Figure 3.15 Gender differences in the proportion of adults with good problem-solving skills (levels 2 and 3) in a technology-rich environment, by age categories and country



Note: The result shows the difference between the female and male mean score (female score minus male score) in the respective age group. Results above zero mean that females performed better. Statistically significant (at a confidence level of 95%) differences between male and female scores are marked with dots in full-colour.

Within the Nordic average "trends", there are considerable cross-country differences. It is interesting to notice, however, that the patterns of differences within individual countries are similar for all three skill domains. This finding lends further support to the tentative interpretation of the relative female-male differences among older and younger cohorts as indications of developments in gender equality, because there is no reason to believe that such developments should be very different across skill domains. Moreover, while the within-country differences across cohorts naturally are much larger than the corresponding differences for the Nordic region as a whole, the tendency is the same at the country level as on the regional, Nordic level: the male-female difference is smaller for younger cohorts than for older cohorts, consistent with gender equality increasing over time.[22]

[22] Estonia's cohort structure with respect to the male-female difference in mean numeracy scores seems to deviate from this general pattern by exhibiting a male-female difference that is *smaller* for older cohorts (45+) than for younger cohorts (25-44), cf. Figure 3.13. However, it should be noted that only two of the five male-female Estonian cohort differences in the figure are statistically significant. The same is true with

Regarding specific within-country features, we first note that the Norwegian cohort structure is close to the Nordic average and, hence, can be given the same interpretation (i.e., being in line with gender equality increasing over time). The Danish, Estonian, and Swedish patterns with marked increases in the male-female differences in the 25–44 age group, when adults typically have small children, can be due to women taking parental leave to a (substantially) larger extent than men in these countries.[23] The Finnish trends in male-female differences that are smaller or in favor of females in the same age group (25–44) resemble general trends in skill levels across age groups (see figures 2.4–2.6). This may indicate that females in Finland have won more from the educational reforms referred to above.

3.5 Education and skills

As proved by several earlier analyses (OECD, 2013; OECD, Statistics Canada 2011), education is one of the strongest predictors of information-processing skills. In all countries participating in PIAAC, highly educated people have higher literacy and numeracy skills compared to individuals with lower levels of education. However, there are significant differences across countries in regard to, for example, how much an additional year in education contributes to information-processing skills. Based on PIAAC International data, one year of schooling corresponds to a 4–6 points higher mean skill score in Italy, and 8–10 point higher scores in Sweden and the USA. Also, the typical skill levels of adults at particular levels of education may differ considerably across countries.

Chapter 3 showed that, with regard to educational institutions, the Nordic countries, including Estonia, are rather similar: there is wide access to pre-school education; basic education lasts nine years and is comprehensive; post-compulsory education is, as a rule, free of charge; and more than 1/3 of adults have completed higher education. However, taking a closer look (see table 3.1), there are nevertheless considerable differences across different age groups, both in participation and in outcomes across countries. Specifically, the following observations can be made:

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respect to Swedish cohort structure in the problem-solving domain, Figure 3.15, which, on average seems to correspond to a constant male-female difference across cohorts.

[23] This reasoning implicitly assumes that the loss in work experience incurred during parental leave has a detrimental effect on skills, a hypothesis supported by the analysis in Edin and Gustavsson (2008) on IALS data.

- Finland scores better in PISA than other countries.
- In Estonia and Sweden, there are more adults who have graduated from upper-secondary education than in other countries.
- Regarding higher-education graduates, there are very different trends across countries. In Sweden and Norway the increases in graduation rates over a 30-year period amount to 16–18 percentage points (compare the proportions for higher education among 25–34 year olds with the proportions for 55–64 year olds). In Denmark and Finland, the corresponding increases have been more moderate (8–11 percentage points) and in Estonia, almost stable (a 4 percentage point increase over 30 years).
- In Norway, almost every second young adult (25–34 year olds) graduates with higher education, which is considerably above the corresponding rates in the other Nordic countries. This difference is explained by the fact that in Norway, partially or wholly work-placed higher education is more common and, therefore, there is a higher share of short tertiary professional degrees in Norway compared to other Nordic countries.

Table 3.1 Indicators describing outcomes of lower secondary education, and participation in upper-secondary and higher education

	Average score in PISA reading*		Proportion of adults (25-64) with at least upper secondary educa-tion, 2014**	Proportion of adults with higher education, 2012*				
	2000	2009		25-64	25-34	35-44	45-54	55-64
Denmark	497	495	80	35	40	39	32	29
Estonia		501	91	37	40	36	37	35
Finland	546	536	87	40	40	47	41	31
Norway	505	503	83	39	45	44	35	30
Sweden	516	497	84	36	43	40	30	29
Nordic average	516	506	84	37	42	41	35	31
OECD average	500	494	78	32	39	35	29	24

Source:
* OECD (http://www.oecd.org) .
** Eurostat (http://ec.europa.eu/eurostat/data/database).
Participation for personal interest refers to the proportion of adults participating in only non-job-related, non-formal education and training among all participants.

Besides skills and formal education, it is also of interest to look at participation in adult education across different skill levels. This will be done in more detail in the following section.

3.5.1 *Categorising qualifications for analysis*

Since the educational systems vary between countries and also within each country across different age groups, firstly the best way to categorise the qualifications into a meaningful number of groups were looked for. For the final analyses, the original eight categories were reduced to five, taking into account similarities between the groups in skills as well as group sizes. The final list of educational levels and the corresponding proportions of adults are shown in Figure 3.16, accompanied by basic demographic data in Table 3.2. The levels were merged as follows:

- Because the sample was very small, adults with primary or less education (1%–6%) were merged with basic education graduates despite the fact that the literacy and numeracy scores for these two levels of education differed considerably in all countries.
- Taking into account a rather small proportion (ranging from 2% in Denmark to 10% in Norway) of adults who have graduated with a post-secondary, non-tertiary (ISCED4) degree and the fact that in all countries except Sweden, the literacy scores do not differ from upper secondary (ISCED3) graduates, these two groups were merged as well. However, within the resulting large group, a split was made to differentiate between general and vocational orientation. It should be noted that in Sweden and Denmark, some people were left out of the analysis because it was impossible to classify their qualifications as either general or vocational.
- Another merged group is made up of ISCED 5A (bachelor and master's) and ISCED 6 (PhD) graduates. The sample sizes of PhD graduates were too small (min 37, max 78 individuals) to enable separate analyses. Moreover, except for Estonia, their literacy and numeracy scores did not differ from those of master's graduates. Master's graduates scored about 10 points better than bachelor's graduates in Denmark, Finland, and Norway, vice versa in Estonia,[24] while no difference appeared between these two groups in Sweden.

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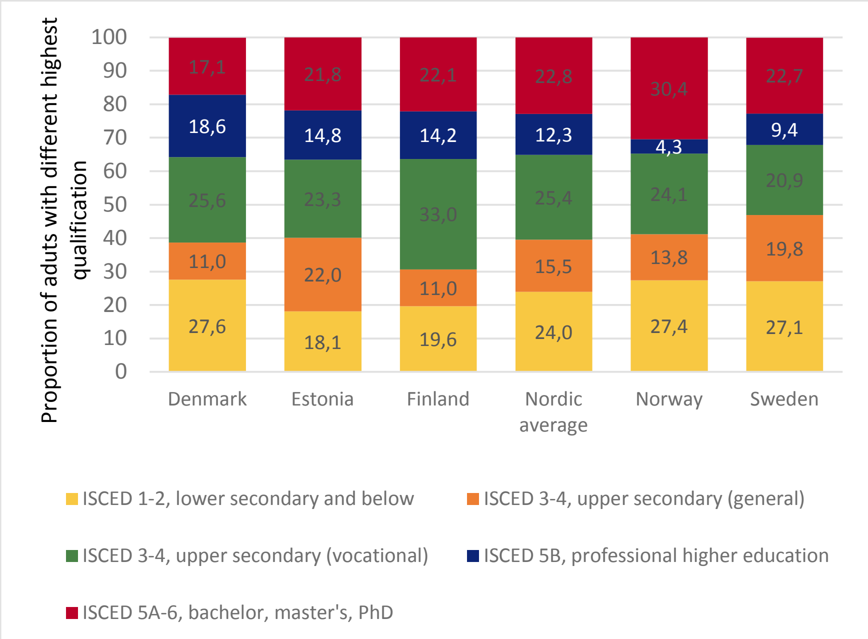
[24] Bachelor graduate's better scores in Estonia are explained by changed curricula and the fact that earlier university (i.e. academic) degrees are recognised in the new system as Master's degrees. Thus, only recent graduates (since 2006) are classified as Bachelor graduates.

Figure 3.16 Proportion of adults at five different levels of education



Note: Countries are presented in alphabetical order.

Table 3.2 Samples across five educational categories, proportion of females and mean age

	ISCED 1–2, lower secondary and below		ISCED 3–4, upper secondary (vocational)		ISCED 3–4, upper secondary (general)		ISCED 5B, professional higher education		ISCED 5A–6, bachelor, master's, PhD	
	% of female	Mean age	% of female	Mean age	% of female	Mean age	% of female	Mean age	% of female	Mean age
Denmark	51.0	37.0	37.7	46.2	53.3	30.4	63.7	45.4	49.0	41.1
Estonia	42.9	33.3	47.5	42.5	48.2	39.1	64.3	42.6	60.7	42.4
Finland	45.4	39.0	41.9	43.8	51.2	30.2	62.1	48.4	56.6	41.1
Norway	49.9	37.0	39.1	42.7	52.8	35.2	50.8	46.7	53.7	42.0
Sweden	48.4	39.3	39.9	41.0	48.5	41.2	53.5	43.5	58.2	42.3
Nordic average	47.5	37.1	41.2	43.2	50.8	35.2	58.9	45.3	55.6	41.8

Table 3.2 shows that, on average, in the Nordic region and also in most countries separately, there are fewer females than males at lower levels (cf. ISCED 1–2 and ISCED 3–4), vocationally oriented. Slightly more than 1/3 (36–39%) of adults whose highest qualification is ISCED 1–2 were continuing their studies during the PIAAC data collection, which means that adults, especially in the younger age group, have often already partly obtained their next level degree.

Especially in Finland, but also in Denmark, there are comparatively fewer adults with upper secondary general education compared to upper secondary vocational education (ISCED 3–4, general and vocational, respectively). In Finland, one to three adults have only general qualifications, while the corresponding relation in Sweden and Estonia is 1 to 1. In Denmark and Finland, the ISCED 3–4 general group is also up to ten years younger than in other countries and is still studying 1.5–3 times more often as in the other countries (60%–62% participated in formal education during the last year preceding the PIAAC data collection compared to 22% in Sweden, 30% in Estonia, and 41% in Norway). Among vocational education graduates, only 9%–17% continued their studies. It should be noted that in cases of Sweden and Denmark, 503 people and 358 people, respectively, at ISCED3–4 levels were left out of the analysis because it was impossible to classify their qualifications as either general or vocational.

Norway stands out with very small number of adults with professional higher education (ISCED 5B) and comparatively more people with ISCED 5A–6. In general, however, the proportion of people with higher education (ISCED 5B + ISCED 5A–6) is very similar in magnitude across countries (34%–37%), except in Sweden, where only 28% of the PIAAC sample have either ISCED 5B, 5A, or 6 qualification.[25] The 5A–6 graduates are also comparatively similar with respect to age, while the gender distribution is slightly more skewed towards females in this group in Sweden and Estonia, compared to Denmark and Norway. Seventeen percent of ISCED 5B graduates (13% in Estonia to 24% in Sweden) and 22% of ISCED 5A–6 graduates (17% in Estonia to 27% in Denmark) were studying in the preceding year.

3.5.2 Skills across five educational categories in five countries

Comparing the skills across five educational levels and three age-groups, some interesting differences appear. First, looking at Figures 3.17a and 3.17c, it should be noted that because a quite large proportion of younger adults, especially at lower secondary and upper secondary-general levels, are still studying, the results of these groups may be misleading – some of the respondents are already closer to the next level. Therefore, the youngest age group with these qualifications seems to perform much

[25] In the Figure 3.16 the proportion of higher education graduates in Sweden is 32.1% that is hgher than in the full sample (28%). The difference is there due to the fact that 503 people were left out from the final analyses.

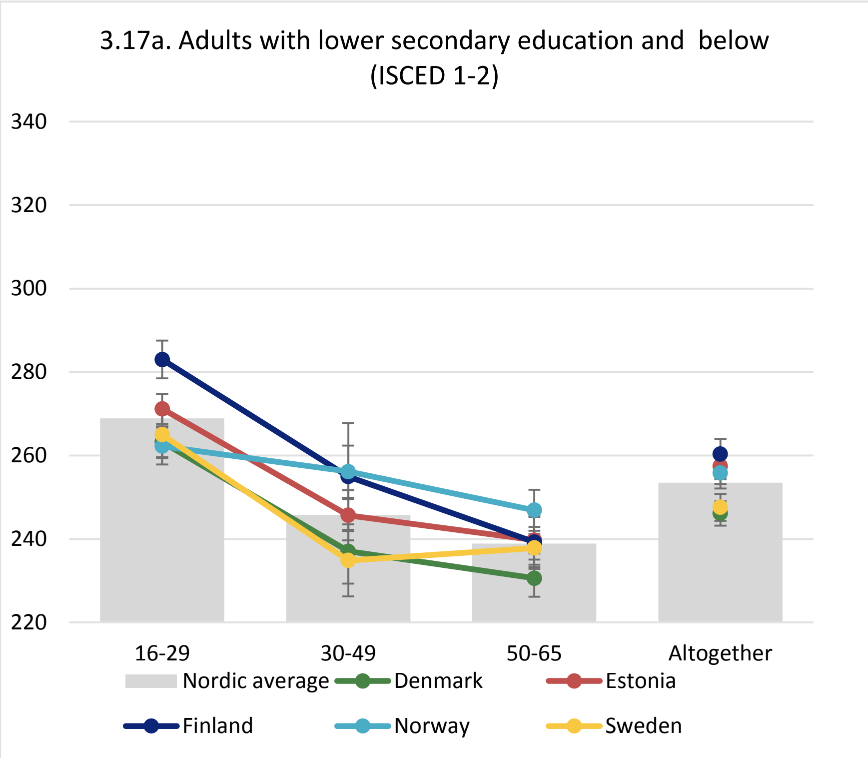
better than the next – the 30–49 age group. For qualifications that are more often the final step in formal education (upper secondary vocational, and different tracks and levels in higher education) the differences between 16–29 and 30–49 age spans are small, while older (50+) adults clearly score lower. To review in more detail:

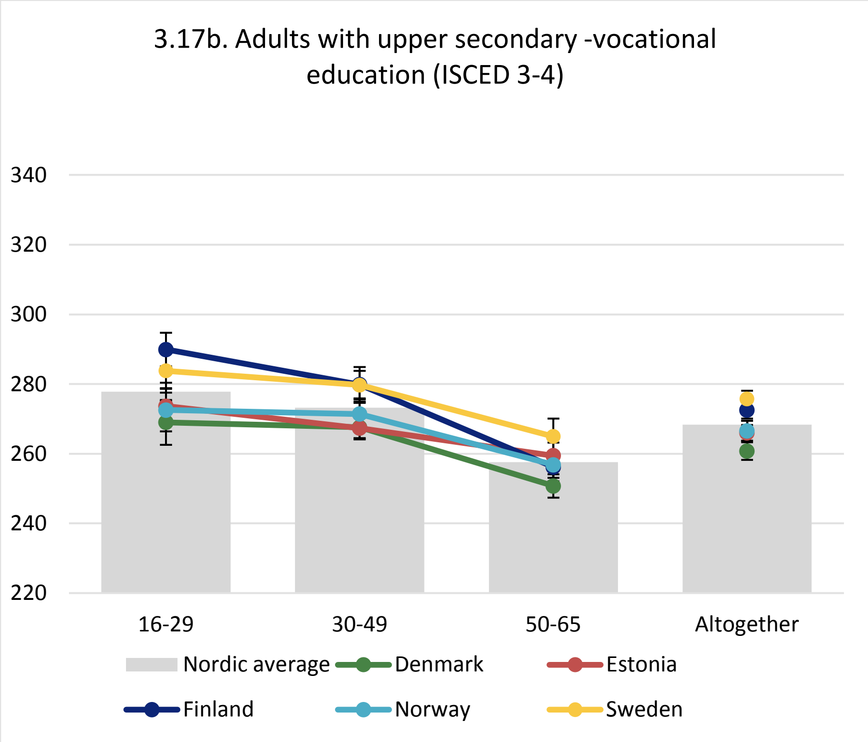
- Young basic education graduates (ISCED 1–2) perform better in Finland and Estonia than in Denmark, Sweden, and Norway, which is in line with PISA results. In the 50+ age group, Norway outperforms all the other countries; see Figure 3.17a.
- Adults with upper-secondary vocational qualification have rather similar literacy proficiency across countries, while Swedish and Finnish adults score 8–20 points higher compared to the other countries among adults below 50 years of age; see Figure 3.17b.
- As shown in Figure 3.17c, upper-secondary general graduates have almost equal results across Denmark, Sweden and Norway in all age groups. Finnish adults score considerably higher in the 16–49 age span and Estonian adults score significantly lower in the two older age groups. The Estonian results could be explained by compulsory upper secondary education in the 1970s and 1980s that affected the majority of people who at the time of the PIAAC study were 40–60 years old. Compulsory education meant that not everyone who obtained a certificate corresponding to ISCED 3–4, in general, had equally good learning outcomes. As shown in Figure 3.16, there are twice as many graduates at this level in Estonia than in Finland and Denmark.
- Something good has happened in ISCED 5B-curricula in Sweden during the last decade; young Swedes with this qualification score better than their peers in the other Nordic countries and also better than their older countrymen, as shown in Figure 3.17d. Estonian's lower results in older age groups at this educational level reflect the fact that this technically oriented and rather narrowly specialised qualification often appeared to be redundant after the collapse of the Soviet Union and the closure of large factories. Many of these people lost their jobs and could not reorientate in the new labour-market. For example, 45% of people at level 5B in Estonia declare that this or a higher level is not needed to obtain their current position. The corresponding numbers are much lower in the other Nordic countries: only 18% of ISCED 5B graduates are overqualified in Denmark and 25%–30% in Finland, Norway, and Sweden.

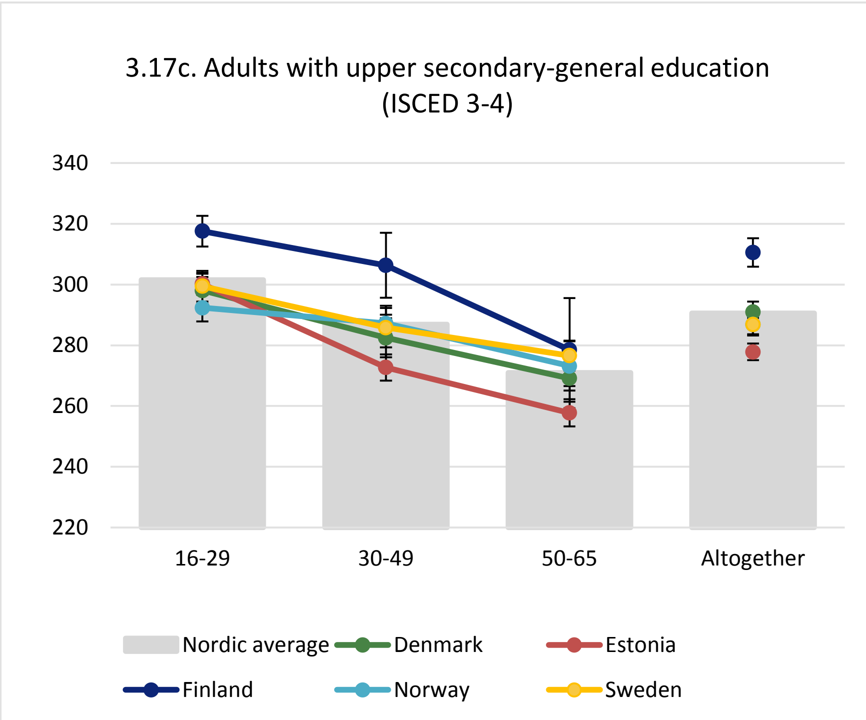
- ISCED 5A–6 graduates have literacy skills higher than the Nordic average in Finland and Sweden and lower than the Nordic average in three other countries; see Figure 3.17e.

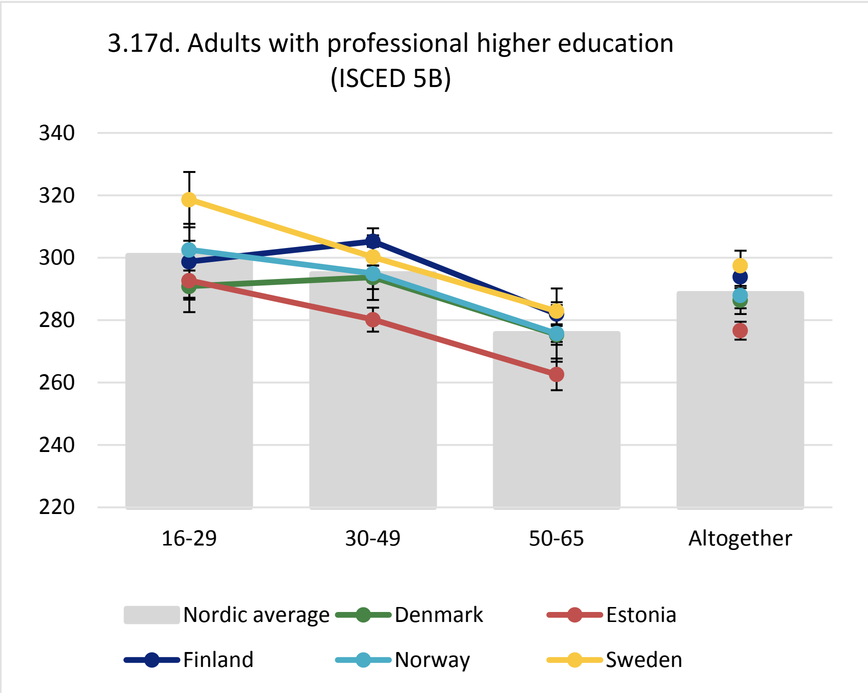
As a general tendency (see Figure 3.17f), it appears that ISCED 3–4 upper secondary general graduates have as good literacy proficiency as adults with ISCED 5B qualification while, in Finland, upper secondary graduates outperform even those with applied higher education. However, one should take into account that since 2000–2005 there are no 5B graduates in Finland and that the share of those with upper secondary general education is also very small in Finland.

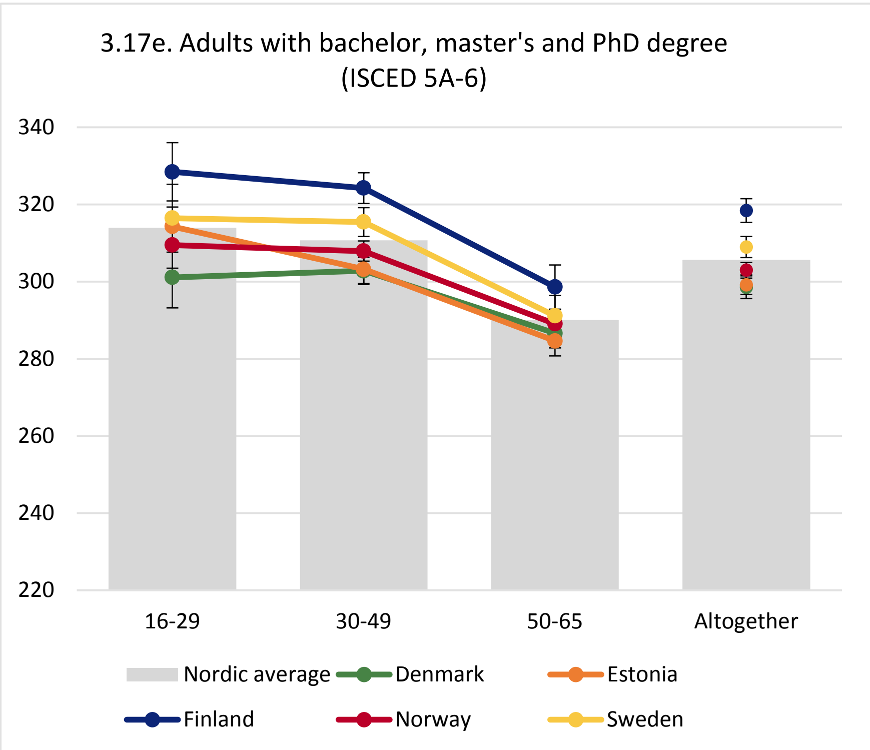
Figure 3.17 a–f Mean literacy scores across educational and age groups




3.17b. Adults with upper secondary -vocational education (ISCED 3-4)
340
320
300
280
260
240
220
16-29
30-49
50-65
Altogether
Nordic average
Denmark
Estonia
Finland
Norway
Sweden


3.17c. Adults with upper secondary-general education (ISCED 3-4)
340
320
300
280
260
240
220
16-29
30-49
50-65
Altogether
Nordic average
Denmark
Estonia
Finland
Norway
Sweden


3.17d. Adults with professional higher education (ISCED 5B)
340
320
300
280
260
240
220
16-29
30-49
50-65
Altogether
Nordic average
Denmark
Estonia
Finland
Norway
Sweden


3.17e. Adults with bachelor, master's and PhD degree (ISCED 5A-6)
340
320
300
280
260
240
220
16-29
30-49
50-65
Altogether
Nordic average
Denmark
Estonia
Finland
Norway
Sweden

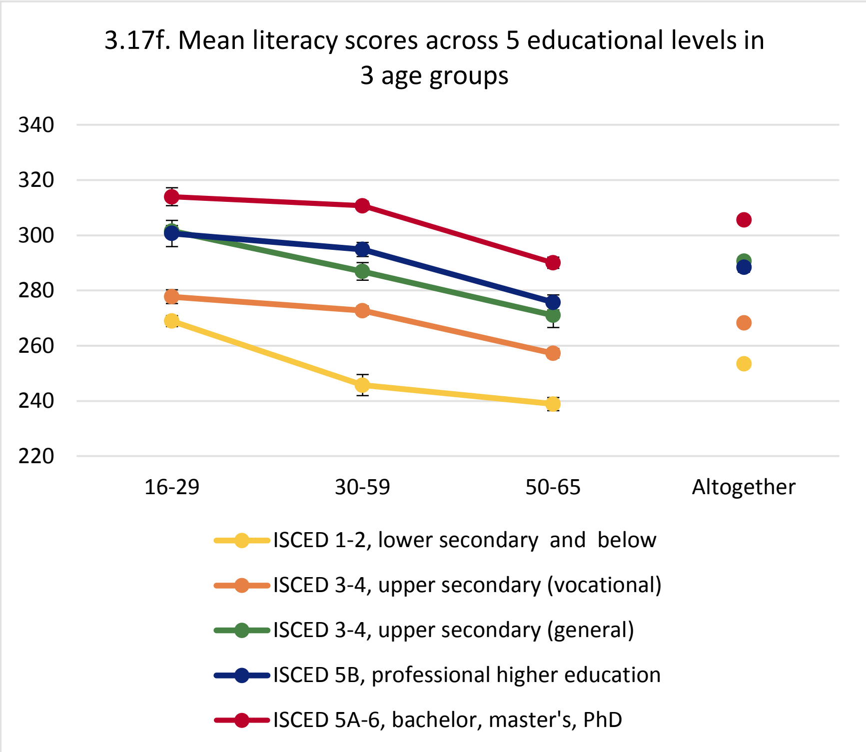


Table 3.3 Comparison of mean literacy scores across countries and levels of education

	Below Nordic average	Above Nordic average
ISCED 1–2, lower secondary and below	Denmark, Sweden	Estonia, Finland
ISCED 3–4, upper secondary (vocational)	Denmark, Estonia	Finland, Sweden
ISCED 3–4, upper secondary (general)	Estonia, Norway, Sweden	Finland
ISCED 5B, professional higher education	Estonia	Finland, Sweden
ISCED 5A–6, bachelor, master's, PhD	Denmark, Estonia, Norway	Finland, Sweden

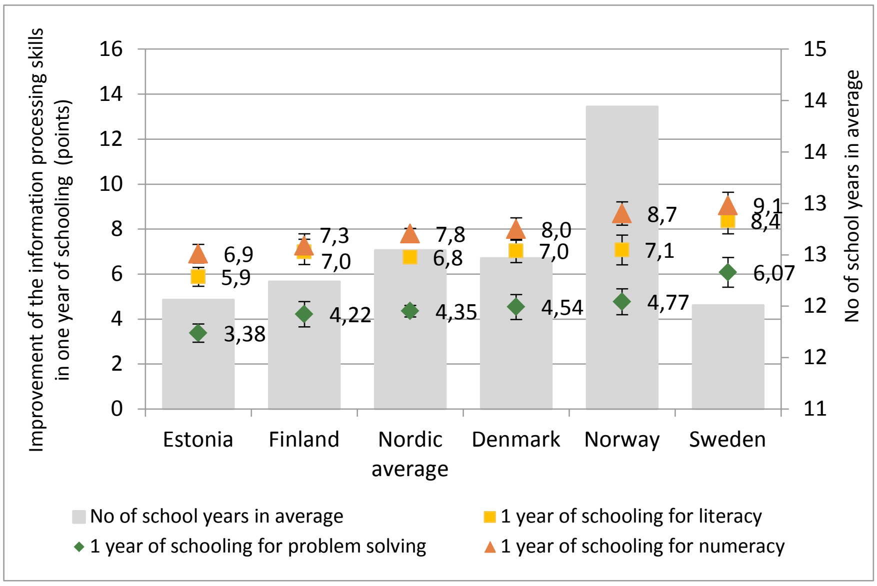
Note: Only differences that are statistically significant at level p<0,05 are presented.

3.5.3 “Improvement” and “loss” of skills in education and after graduation

Finally, regression analysis is performed to see how an additional year of schooling relates to the skills scores in different countries and how one year out of school (since getting the highest qualification) is related to the skills “loss”. The words “improvement” and “loss” or “decrease” are in quotation marks because these are only one of many explanations for the results. Since PIAAC data is cross-sectional, not longitudinal, there are at least two competing theories why in some countries one year of additional schooling relates to more points in some skill domains than in the other countries.

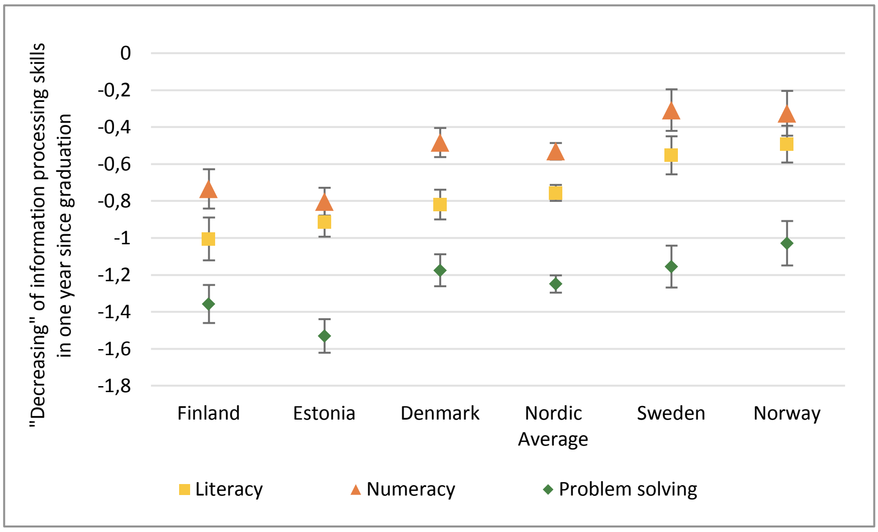
- Because most people (depending on the country, 94%–98%) in Nordic countries have obtained minimal basic education (8–9 years of schooling), the improvement can be interpreted as the quality of post-basic education. However, because the starting point also differs across countries, it could be seen as the quality of basic education as well: what is the minimal level of skills that everyone gets with the basic education. If it is higher (as in Finland, Estonia, and Norway, as shown in Figure 3.17a) then it is logical that the added value of the next years and levels is smaller, as shown in Figure 3.18. The results may also be affected by the different proportions of people with less or more years of schooling in different age groups.
- “Decrease” of skill scores with years since graduation can be interpreted as the process of improvement of the quality of education (i.e. the “cohort” effect). Recent graduates score better than those who graduated 10 or 30 years ago. However, it can be interpreted also as the effect of usage. If people do not use their skills extensively enough, the skills deteriorate.
- Figure 3.18 shows that in all countries (except Finland), numeracy is more strongly and problem-solving in technology-rich environment less strongly related to school years than literacy. In Sweden, for all skill domains, and in Norway, for numeracy, one additional year of schooling relates to more points in proficiency than in the Nordic countries on average. In Estonia, one school-year relates to almost 1 point less “improvement” compared to the Nordic average in all skill domains, while in Denmark and Finland, score improvements are similar to the Nordic average.
- Skills “decrease” with each year after graduation (or the quality of education improves with each year), the most in Estonia and Finland and the least in Sweden and Norway; see figure 3.19. In all countries (except Estonia) numeracy decreases less than literacy, and problem-solving scores decrease more quickly than literacy scores. The decrease in problem-solving scores is in addition to other effects also related to age-differences in ICT usage.

Figure 3.18 Relationship between skills "improvement" and one year of schooling and number of school years in average



Note: Countries are ranked in ascending order of the "improvement" of numeracy score. The results are based on regression model where the skills score is dependent variable and years needed for obtaining the highest level of education is independent variable. Average No of schools years are presented in the secondary axis.

Figure 3.19 Skills "decrease" in one year since obtaining the highest qualification.



Note: Countries are ranked in ascending order of the magnitude of the "decrease" of literacy score. The results are based on regression model where the skills score is the dependent variable and the years passed since obtaining the highest qualification is the independent variable together with education levels.

3.6 Skills and socio-economic background of adults

One of the crucial characteristics of society is how well it supports intergenerational mobility across social class, status or occupation, income, and education. In this section, we will focus on educational mobility, more specifically the relationship between PIAAC participant's skills and their parent's education. Nordic countries have been characterised in this aspect (as in many others) as the best in the world, where a "universalist" welfare state aims at enhancing individual autonomy, promoting social mobility, and ensuring basic human rights (Sachs, 2004).

The review paper of intergenerational mobility by Blanden (2009) summarises the findings of a number of earlier studies as follows: "The Nordic countries tend to have rather high mobility, although Sweden often appears to be less mobile than the other nations." In the measure of educational mobility, the lowest correlation between father's and child's education (measured in years of schooling) among Nordic countries was found in Denmark (.30), followed by Finland (.33), Norway (.35), and Sweden (.40). In Estonia, the correlation is of the same magnitude as in Sweden (Hertz *et al.*, 2007, cited from Blanden, 2009). In another study on educational mobility (Chevalier, Denny, and McMahon, 2007), Finland ranked highest in mobility among 20 countries, followed by Belgium (Flanders), Norway, Denmark, and Sweden.[26]

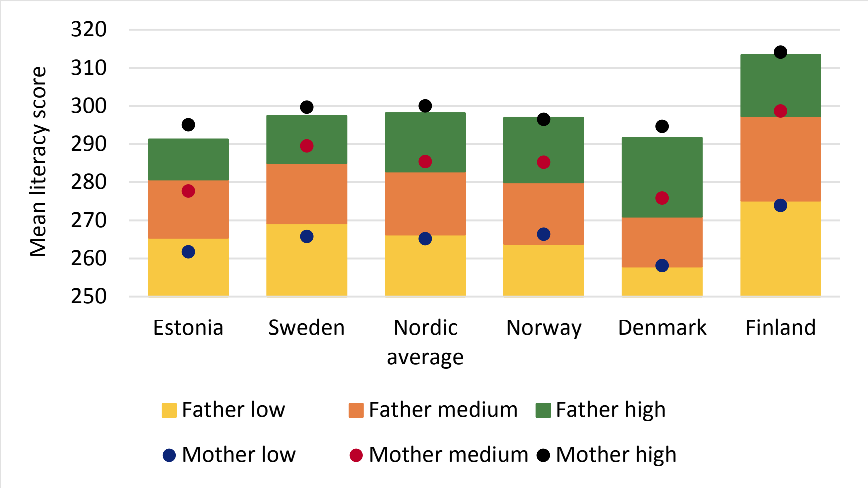
Educational mobility is related both to public investment in education as well as inequality in incomes (i.e., GINI index). Income inequality matters are more strongly associated with intergenerational income mobility, but also with intergenerational educational mobility. In more equal and mobile societies, returns to education tend to be lower (Blanden, 2009). Also two OECD reviews (OECD, 2010a and OECD, 2010b) refer to the Nordic countries being high in intergenerational educational mobility, in particular the effect of parental socio-economic background on students PISA scores. Intergenerational mobility, however, varies between different indicators and levels. Thus, for example, Finland and Denmark are cited among countries where the probability of achieving tertiary education among sons is closely related to their fathers education (the probability is 30% higher for those whose fathers have tertiary education compared to upper-secondary education). In Finland this holds true also for fathers and daughters.

[26] Estonia was not included in the study.

When measured separately, father's and mother's educational backgrounds have rather similar effects on adult's literacy scores in all countries. Adults whose fathers have medium levels of education (ISCED 3AB and C long and ISCED 4) have, on average, 16 points higher literacy scores compared to the adults whose fathers have/had low level education (ISCED 2 and below and ISCED 3c short) in the Nordic countries, see Figure 3.20. For adults with highly educated fathers (ISCED 5–6), this difference is twice as big (i.e., 32 points). When focusing on mother's education, the differences are slightly bigger: 20 and 35 points respectively. The importance of both the father's and the mother's education is the largest in Finland. The literacy score difference between low- and medium-level education is statistically significantly larger than in all the other countries, being respectively 22 points for fathers and 25 points for mothers compared to Denmark (13, 18) and Estonia (15, 16), where the differences are the smallest. Adults with highly educated parents have 38–40 points higher literacy scores in Finland, which is statistically significantly more than in Estonia (26) and Sweden (28) in cases of father's education, and in Estonia (33) and Norway (30) in cases of mother's education.

In the case of numeracy, the effect of parent's education is very similar; on average in the Nordic countries, it is 16 and 31 points, respectively, for medium- and high-level education. As in the case of literacy, the effect is the largest in Finland (19 and 35 points in case of the father's education), but the differences between countries are smaller, so the effect is statistically significantly larger compared to Denmark (in cases of medium-level education) and Sweden (in cases with higher education).

Figure 3.20 Mean literacy scores among adults by the level of education of their parents



Note: Countries are ranked in ascending order of the difference in literacy score between adults with low vs. highly educated fathers. The result are based on regression analyses: for first analyses, adults with low-educated fathers (basic education, short vocational education, or lower) were selected as the reference group (constant) and differences in literacy scores for adults with medium- (upper secondary or post-secondary non-tertiary education) and higher-educated fathers were calculated. In this analysis, mother's education was not taken into account. Secondly, a similar analysis was made with variation in mother's education.

3.7 Skills among natives and immigrants

Besides educational and age-related differences, one of the largest skill gaps can be found in the skills of immigrants vs. native-born people (OECD, 2013). In most cases, these skill gaps are in favour of natives and 2nd generation immigrants, compared to foreign-born individuals.

The differences can be partly explained by immigrant's lower level of education and lower socio-economic status, but this is only part of the story. As discussed in the final IALS report (OECD, Statistics Canada, 2000), immigrants bring different educational experiences, may have learned an official language only as second or third language, or may be less familiar than the native-born population with the dominant literate culture of the country. Schnepf (2004) used data from PISA, TIMSS, and PIRLS studies and demonstrated that immigrant's lower proficiency relates, besides SES-differences, to home language (speaking a foreign language at home decreases pupil's achievements), length of the stay in the country and school segregation. She also relates that selection through immigration control is likely to impact upon their achieved results. Countries differ in many ways, including immigration policies/histories, the background and number of immigrants, and integration practices.

Therefore, the discrepancies between native's and immigrant's proficiencies are not similar across countries, but there are considerable differences. Earlier studies on student's skills based on PISA and TIMMS (Schnepf 2004) show that, for example, in Canada and Australia, immigrants often perform as well as natives, while in Switzerland, Germany, and Sweden, there are large gaps between immigrants and native-born students. In another study by Hvistendahl and Roe (2004) based on PISA 2000 reading literacy data in four countries (Denmark, Germany, Sweden, and Norway), Swedish minority students performed the best compared to majority students. The gap between majority students and minority students born in the country[27] was 95 points in Denmark, 75 points in Germany, 46 points in Norway, and 38 points in Sweden.[28]

The first PIAAC International report (OECD, 2013) indicated that one of the biggest discrepancies between literacy proficiency for native-born and foreign-born adults prevails in Sweden, followed closely by Finland. Also, in Norway and Denmark, the difference between the native- and foreign-born population is above the OECD average. In Estonia, the difference is below the OECD average and the mean proficiency level of a foreign-born adult is one of the highest, together with Australia and Canada. It should be noted that these results are closely related to the skills of the assessment language: Australian and Canadian immigration policies take national language proficiency into account and, hence, it can be assumed that most immigrants are fluent in English (or French in Canada), while in Estonia, Russian immigrants, who form the majority of foreign-born population, could fulfil the PIAAC assessment in Russian.

In a recent study referring to the important and varying role of language proficiency in the assessment of cognitive skills, Kvist (2011) studied the differences in several cognitive tests between native-born people, European immigrants, and non-European immigrants in Sweden. The performance differences were larger on the verbal and visuo-spatial factor and smaller on the problem-solving and speed ability[29] dimensions. Although all-PIAAC skill domains, including numeracy, are text-based (i.e., assume command of the assessment language), it could be

[27] Minority students born in the country are 2nd generation immigrants whose parents are foreign-born.

[28] In PISA scale, 500 points represented the OECD average, and 1 SD=100.

[29] Speed ability is defined as noticing quickly differences between two different sets on numbers or words.

hypothesised that numeracy and problem-solving scores vary less than literacy scores across foreign- and native-born adults.

As shown in the Table 3.4, the Nordic countries exhibit considerable differences, both in the proportion and the background of the immigrant population. Sweden had close to 17% of foreign-born people, Estonia, Norway and Denmark approximately 12%, and Finland 5%. Regarding the proportion of 2nd generation immigrants (native-born people whose mother and father are born abroad), Estonia clearly differs from other countries with a larger proportion of these people: 10% vs. 0–3% in the other countries. The origin of immigrant also varies as shown in table 3.4.

Table 3.4 Immigrant population in the Nordic countries

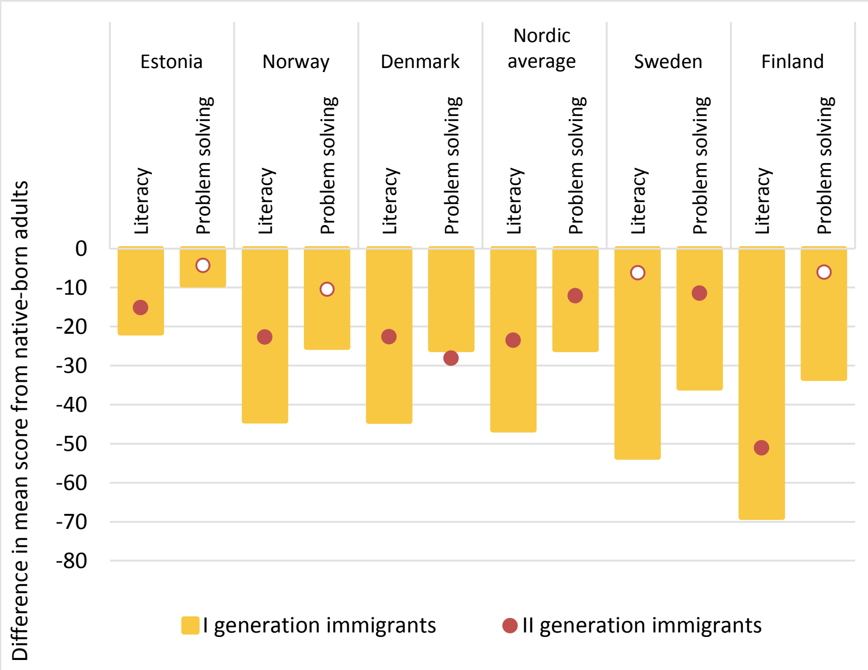
	Proportion (%) of foreign-born population	Proportion (%) of 2nd generation immigrants (2 parents foreign-born)	Main countries of origin
Denmark	10.8	1.4	Sweden, Norway, Germany, Turkey
Estonia	12.3	10.2	Russia, Ukraine
Finland	4.8	0.2	Former Soviet Union, Estonia, Sweden
Norway	12.4	1.1	Poland, Sweden, Germany, Iraq
Sweden	16.8	3.3	Finland, Iraq, Poland, Former Yugoslavia, Iran

Sources: PIAAC for proportions: In PIAAC database there are four categories for classifying people's immigration statuses: natives, generation I immigrants (foreign-born population), generation II immigrants, and non-immigrants, one parent foreign born. In the current table and the following analyses, the latter group was merged with natives. Origin of countries is based on national statistics.

As shown in Figure 3.21, 1st generation immigrants scored significantly lower compared to native-born adults in all countries, both in literacy and in problem-solving in technology-rich environments. The results for numeracy were very similar to those for literacy and are therefore not presented. The hypothesis that numeracy scores may differ less than literacy scores between natives and immigrants was, thus, not supported. However, it appeared that in all countries, the differences in PS in TRE scores across natives and 1st generation immigrants were only about half as large as the differences found with respect to literacy. This can be seen for unstandardised regression coefficients reported in Figure 3.21 as well as standardised ones. On average, 1st generation immigrants in the Nordic countries have 0.29 SD lower literacy scores and 0.16 SD lower PS in TRE scores than native-born adults. It is also interesting to note that in three countries – Estonia, Finland, and Norway–2nd generation immigrant's PS in TRE scores did not differ statistically significantly from native's scores. Thus, while the hypothesis posed above for numeracy was not supported, some support is found for PS in TRE scores differing less across immigrants and native borns than do literacy scores.

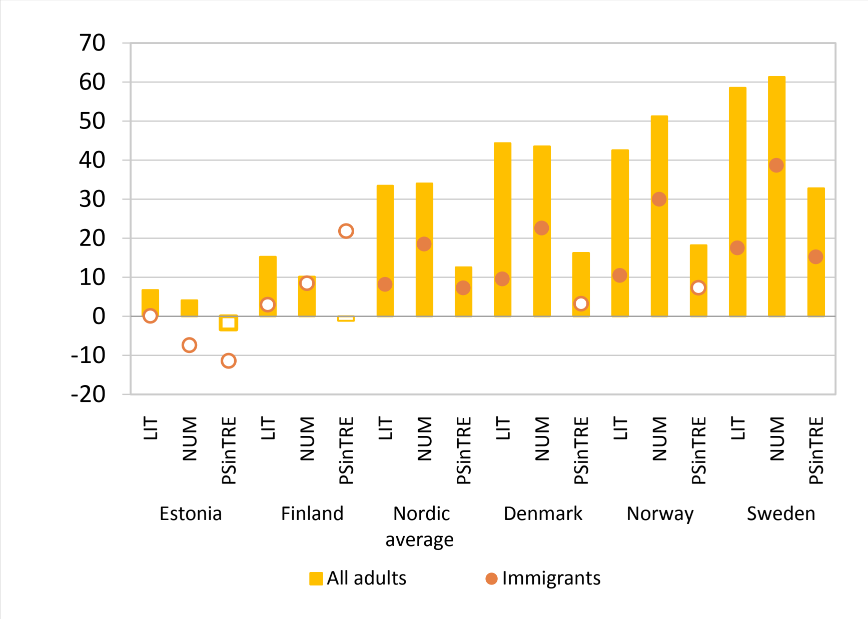
Testing the effect of home language (either the same as test language or different) separately from the fact of immigration, it appears that numeracy may be even more affected by language use than literacy; see Figure 3.22. As shown earlier by Schnepf (2004) for PISA results, it appeared also in the current analysis that those adults whose home language is the same as the language of assessment showed significantly better results. Comparing all adults, this effect was valid for all skill domains in all countries except for PS in TRE in Finland and Estonia.

Figure 3.21 Differences between generation I and II immigrant's scores in literacy and problem-solving in technology-rich environments and the scores of native-borns



Note: Countries are ranked in ascending order of the difference of 1st generation immigrant's and native born adult's scores in literacy. Results are adjusted for age, gender, education and parent's education by means of regression analysis. Statistically significant (at confidence level of 95%) differences from native-born scores are marked with dots in full-colour.

Figure 3.22 Difference between the mean scores across all adults/immigrants whose home language is the same as language of assessment vs whose home language was different



Note: Countries are ranked in ascending order of the difference in numeracy score between adults whose home language was the same as language of assessment vs. not. Statistically significant (at confidence level of 95%) differences are marked in full-colour.

When confining the analysis to immigrants only, the differences between those speaking the language of assessment at home vs. those who were not were smaller but statistically relevant in Denmark, Norway, and Sweden for numeracy and literacy. With respect to PS in TRE, a significant difference was found only in Sweden. Regarding literacy scores in these three countries, across home language (same vs. different as testing language), the differences were only 10–17 points among immigrants while more than times larger among all adults. In cases of numeracy, the differences amongst immigrants were twice as large as the corresponding differences regarding literacy: between 23 to 39 points. The picture for Estonia and Finland is not clear because there were two testing languages and people who, for example, use Russian/Swedish at home but use an Estonian/Finnish language at work may have chosen the latter for assessment.

3.8 Summary

This chapter has provided an overview of the information-processing skills across major groups and categories with an aim to point to both within and cross-country differences. All together, it can be concluded that there is no one country that would stand out as especially different from all others. Neither is there one country having the largest within-country skill discrepancies in all aspects. In sum, the chapter showed the following:

- Regarding the level of information-processing skills in general, Finland and, in some cases, Sweden, tends to score above, and Estonia, and in some cases Denmark, scores below the Nordic average, while Norway best represents the typical Nordic skills pattern.
- When talking about age-related differences, Finland (together with Estonia) stands out with the largest differences in all skill domains, while the smallest differences are found in Norway (for literacy and numeracy) and Denmark (PS in TRE). In all countries, younger people have higher scores than older.
- Gender equality in skills prevails more in Estonia, Denmark, and Finland, while the largest differences across males and females are the Norwegian for all skill domains. Norway is the only country where males outperform females, also in literacy.
- Differences in literacy related to education (analysed across five levels/study orientations and years of schooling) are as follows. Finnish adults score above the Nordic average at all levels of education, while for Estonia this holds true for adults at the lower secondary level and for Swedish adults with respect to vocationally oriented upper secondary and higher education levels (both ISCED 5A and 5B). Norway often performs at or close to the Nordic average. Compared to other countries, Finnish adults seem to do exceptionally well in general-academic education (both at upper secondary and higher education (ISCED 5A) levels, while Sweden stands out with the best literacy results in vocationally oriented education (both at secondary and higher education levels). Comparing literacy skills across age and education, one can notice that young Estonian adults are catching up at all (but especially higher) levels of education: while Estonians often score the lowest in the oldest age group, they perform at the Nordic average in the youngest age group.

- The rather low skills scores of Swedes at the lowest levels of education and rather high scores at higher levels is reflected in the added value of one additional school year. In Sweden, one school year is associated with 1.4–1.7 points higher skills proficiency than on average in Nordic countries. One year out of school is associated with the highest skills loss in Finland and Estonia, a finding that can be related both to improvements in education, but also to loss of skills for different reasons.
- Participation rates both in non-formal and formal adult education are above the OECD average in all of the Nordic countries and only slightly lower in Estonia, compared to the other countries included in the analysis. Participation for personal (non-job related) reasons, another aspect referred to as part of the Nordic pattern in adult education by Tuijnman (2003), is an equally prominent characteristic of all the countries studied. Compared to the other countries, Norway stands out in the sense of having the smallest difference in participation rates between the adults at the lowest and the highest levels of literacy. In Norway, there is also clearly lower interest in participation in education and training, compared to other countries.
- Socio-economic background (i.e. parent's education) matters the most for skills in Finland. On average, adults whose parents have either medium or higher education get respectively 16–20 or 31–35 points higher scores in literacy and numeracy, compared to adults with low educated parents in the Nordic countries. The mother's education matters slightly more than the father's and in Finland this difference amounts to approximately 5 points.
- Considerable variability in immigration rates and skills across the Nordic countries allows us to estimate skills scores across immigrant and native adults. Finland has the smallest proportion of immigrants and the largest differences between native-born adults and 1st generation immigrants. In Estonia, where immigrants make up the largest proportion of the population in the Nordic countries, the differences in results between natives and immigrants are the smallest. It should be noted, however, that the results are not directly comparable across countries, since most of the Estonian immigrants could use their mother tongue (Russian) in the PIAAC assessment. When comparing the skill scores across people who fulfilled the questionnaires in their home language vs. another language, the differences were still the smallest or even in the opposite direction (approximately 5 points in cases of literacy and numeracy) in Estonia for all skill domains, compared to 40–60 point

differences in Norway and Sweden. In Sweden, the largest differences were found among immigrants with home language that matched the language of assessment.

In sum, it could be concluded that while a newcomer in the Nordic family – Estonia – differs in some aspects (lower scores in numeracy and PS in TRE, and less participation in adult education) from the other countries, it is certainly not unique in its skills pattern. Norway stands out with larger gender inequity and higher equity in participation in adult education across adults at different skill levels. Finland has better average scores but also larger differences than other countries across different age groups, socio-economic, and immigration statuses. In Sweden, one year of schooling relates to more points in all skill domains than in other countries and home language matters most for the skills scores. This leaves Denmark to represent the typical Nordic country in respect to skills inequities across different groups, although this is, of course, an over-simplification.

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4. Skills of Employed, Unemployed and Inactive Individuals in the Nordic Region

Vivika Halapuu

The most direct benefits from better skills for individuals come from the labour market, as according to the human capital theory, better skills reflect higher productivity and should, therefore, be rewarded with higher chances of employment and higher salary. Driven by this knowledge, this chapter takes a descriptive look at the distribution of information-processing skills in the Nordic labour market, to understand the similarities and differences of the Nordic workforce in terms of the skills. The skills of the unemployed, among others unemployed with different lengths of unemployment and the unemployed in different age groups, are analysed, such as skills of people out of the labour force. To place the Nordic results into an international perspective, comparison with other country aggregates is presented in the beginning of the chapter. The results confirm the competitive advantage of the Nordic workforce in terms of skills, but demonstrate some moderate differences of the skills inside the Nordic area as well.

4.1 Introduction

Some of the most tangible benefits from better skills come from the labour market: higher employability, better chances for employment in jobs that enable individuals to maintain and develop their skills, and higher salaries. The theoretical foundations for this assertion come from human capital theory (Schultz, 1961; Becker, 1962) and endogenous growth theory (Romer, 1986; Lucas, 1988). Although different, both of them claim that better skills reflect higher productivity and, hence, should be rewarded with higher salary (and higher chances of being employed in the first place). The linkage between skills and any of the aforementioned labour market variables is not necessarily direct, though. Signalling theory claims that under the conditions of asymmetric information, employees send out information about their abilities based on educational credentials (Spence, 1973). Employers, following the theory of screening (Spence, 1973), use the information about people's educational credentials to select the people they assume to have higher ability. They can do so because educational attainment and ability, even though not perfectly overlapping, are thought to be positively correlated.

The fact that the correlation between the two phenomena is not perfect has its own implications on the analyses in the field. Diplomas of MA, MSc, or PhD might not necessarily mean that the people have higher ability or better skills than someone with a lower level of education. In spite of this, most of the empirical analysis about skills and labour market outcomes have used years of schooling or highest level of education as proxies for human capital. This might have led to biased estimates of the associations between the variables. The PIAAC study enables a change in this practice as it adds another dimension to the analysis – direct measures of one's literacy, numeracy, and problem-solving[30] skills.

In this chapter, the current state of skills in the Nordic labour market is analysed. First, literacy, numeracy, and problem-solving skills of Nordic employed, unemployed, and inactive people are compared to the skills of the same groups in other country aggregates to place the knowledge about the Nordic region into the international perspective. Second, skills of the same groups inside the Nordic area are analysed to see whether Nordic countries are a harmonised group in terms of the skills of their people in different labour force categories. Inside the unemployed group, the skills of the unemployed in different age groups and with different lengths of unemployment are analysed.

The importance of improving people's basic skills was stressed in the Nordic context already in the 1990s, when several programmes were implemented based on the findings of earlier adult skills studies. In Sweden, the Adult Education Initiative, which aimed to decrease unemployment by 50% by the year 2000, was implemented during the period of 1997–2002, offering unemployed individuals without education at the upper secondary level the opportunity to get jobs and to continue their studies, as it was said that these people needed educa-

[30] In the figures marked as PSTRE (problem-solving in technology rich environment).

tion to secure a stronger position in the labour market (The National Agency for Education, 1999). In Finland, the NOSTE programme was established based on the results of IALS. The programme took place during the period of 2003–2009 and aimed to improve poorly trained adult's chances in the labour market (Ministry of Education and Culture, 2010). In 2006, initiated by the results of the ALL survey, a Programme for Basic Competence in Working Life was established in Norway. The main purpose of this initiative was to provide low-skilled employed adults with an opportunity to improve the basic skills (reading, writing, numeracy, and digital skills) that are needed in modern working life and civil society (Bergene, n.d; Nasjonalt Fagorgan for Kompetansepolitikk website, 2014). Danes have emphasised the importance of basic skills in the Danish strategy for lifelong learning, claiming that "A coherent education system from pre-school to higher education must provide the opportunity for everyone to acquire excellent basic skills" (Undervisningsministeriet, 2008). Estonia did not participate in the earlier international adult literacy surveys and, hence, did not have the chance to act upon the results. However, shortly after the publication of the results of PIAAC, a new lifelong learning strategy was adopted that, among other purposes, aims to improve the match between the educational system and the labour market.

Most of the aforementioned initiatives were based on information from the early 2000s. The PIAAC survey provides us with updated information. When interpreting the results presented in the chapter, it is important to understand, though, that even adding the measures of key information-processing skills to the indicators of human capital leaves uncovered several facets of human capital that might be valued in the labour market. The European employer survey on skill needs initiated by Cedefop is currently undertaken (see Cedefop 2013 for initial findings of the pilot survey), but the results of several earlier studies (e.g. Anderson, Gantz, 2013; Lepik, 2012; National Association of Colleges and Employers 2013; Bergene, n.d.) have already shown that important employability skills include also cooperative, communication, organisational, and planning skills; learning, analytical, interpretation, and ICT skills; as well as sales experience/influencing skills. This means that if the associations between the information-processing skills measured in PIAAC and some of the labour market outcomes are found to be smaller than expected, this might be due to the fact that there are some other skills that are even more important for the employers, while the information-processing skills might be seen as a basic requirement. However, the importance of the information processing should not be neglected, as these skills are the prerequisites for obtaining all the other skills enhancing employability.

4.2 International perspective on the skills of employed, unemployed, and inactive individuals in the Nordic region

The OECD Skills Outlook 2013 showed that proficiency in literacy, numeracy, and problem-solving in technology-rich environments is positively and independently associated with the probability of participating in the labour market and of being employed and earning higher wages. It also demonstrated that the strength of this relationship is different across countries. Figure 4.1 points to an advantage of the Nordic workforce. Employed individuals in the Nordic countries have on average higher levels of literacy and numeracy skills than their peers in the non-Nordic PIAAC countries – the mean literacy score is 284.1 points in the Nordic region, 273.3 points in the non-Nordic EU countries, and 280.6 points in the countries outside the EU. The advantage is even larger in terms of numeracy, in this case the corresponding numbers are 285.2, 272.6, and 271.7, respectively.

The advantage of the Nordic workforce is affirmed in the case of problem-solving skills in technology-rich environments as well. There are clearly more good problem-solvers in technology-rich environments in the Nordic countries than in the other country aggregates–41.7% in the Nordic region versus 35% in the non-Nordic EU countries and the countries outside the EU. The proportion of people with no earlier computer experience, on the other hand, is the smallest in the Nordic countries (1.9% in Nordic region, 6.8% in the non-Nordic EU countries, and 7.5% in the countries outside the EU; the results are only shown at the aggregated level under the category "No CBA"[31] in Figure 4.1). The difference between the Nordic and the non-Nordic countries would be even more marked if Estonia were not included into the pool of Nordic countries, as the Estonian results on this domain are clearly below those of the other Nordic countries.

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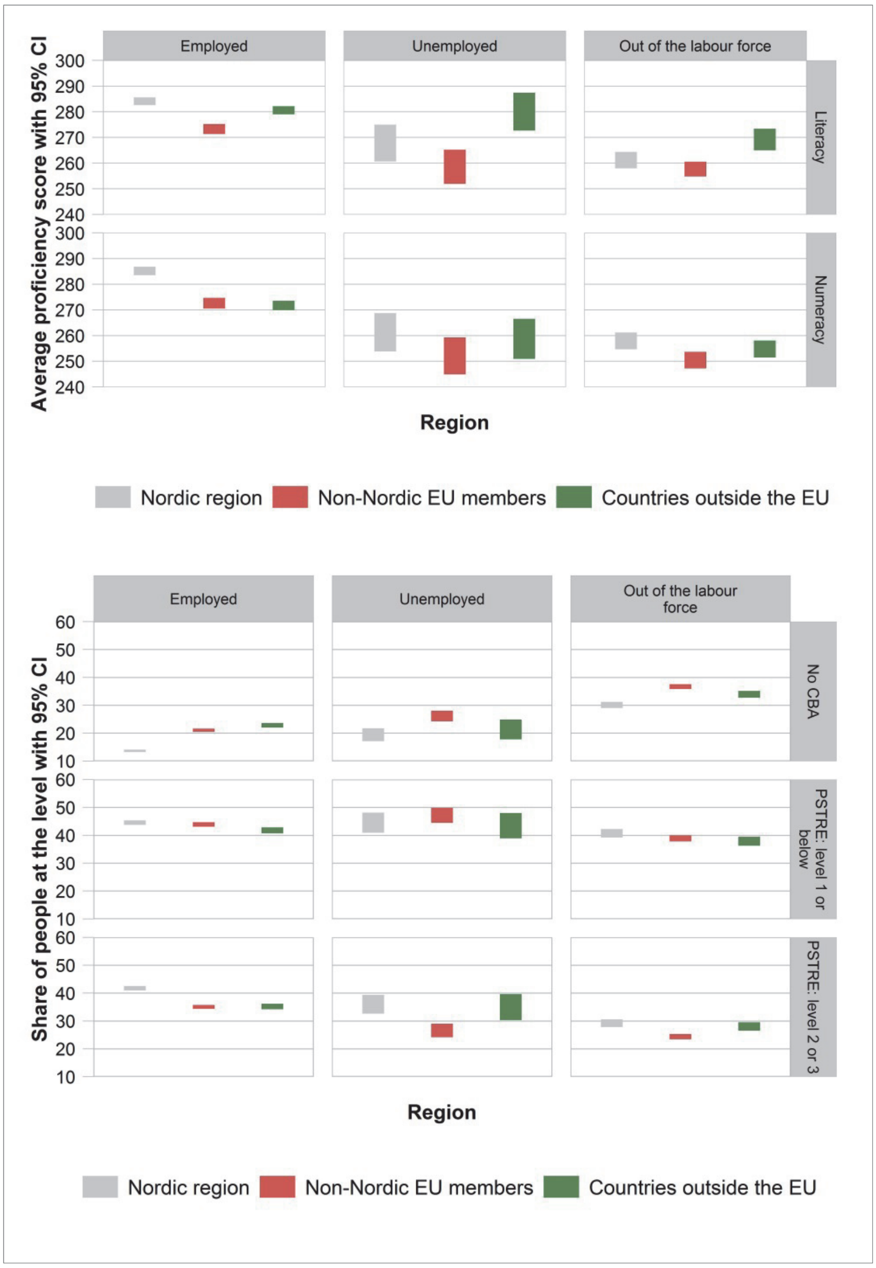
[31] CBA stands for computer-based assessment.

Figure 4.1 Literacy, numeracy, and problem-solving proficiency of employed, unemployed, and inactive people in different pools of countries; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)

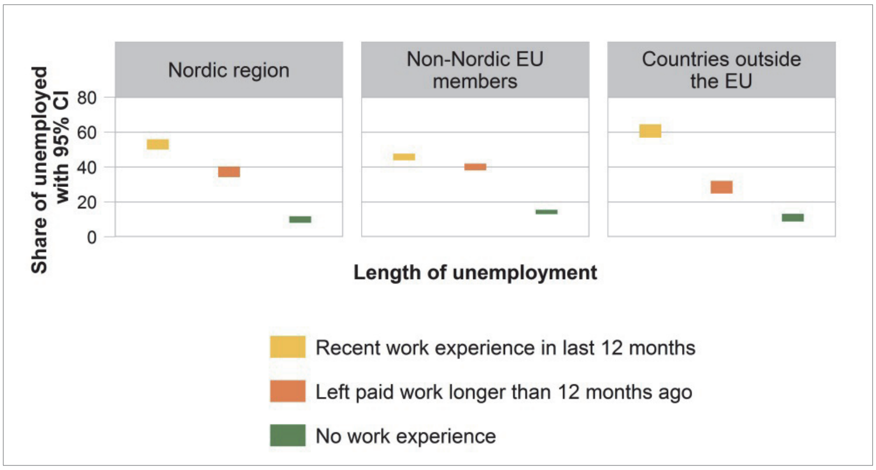


Note: In addition to Australia, Cyprus, and Russia, which are excluded from all of the analyses in the chapter, Italy, Spain, and France are excluded from the pool of non-Nordic EU members in the lower panel because problem-solving skills were not measured in these countries. CI on the vertical axis stands for confidence intervals.

The unemployed in the Nordic region also outperform the unemployed from non-Nordic EU countries in all of the skills measured in PIAAC. The skills of the unemployed in countries outside the EU are at or above the level of the skills in the Nordic region. It also appears that while the average literacy, numeracy, and problem-solving skills of unemployed people are lower than the mean of the skills of employed workforce in the Nordic region and the non-Nordic EU countries, the difference in terms of literacy and problem-solving is statistically insignificant in the countries outside the EU. This is mostly because of Japan and Korea, where the skills of the unemployed are clearly above the average skills of employed people. It should also be noticed here that in these countries, the share of the unemployed is very small (2.0% and 2.9%, respectively). In the Nordic region, the literacy proficiency of unemployed adults is 16.3 points lower than scores among employed people. The differences between employed and unemployed people are even larger in the case of numeracy, ranging from 13 points on average in the countries outside the EU to 24.7 points in the Nordic region. The differences of employed and unemployed people on different levels of problem-solving in technology-rich environments are also noticeable. In the Nordic region, 36% of the unemployed score at levels 2 or 3 on the PS in TRE domain; in the non-Nordic EU countries the share is 26.6%. The share of adults who did not solve tasks on computer is 5.8 percentage points higher among the unemployed in the Nordic region compared to employed people. In the countries outside the EU, the share is in favour of the unemployed, but the difference is statistically insignificant.

In addition to the three main labour force categories, PIAAC enables to distinguish between long-term unemployed (who left paid work more than 12 months before the survey), short-term unemployed (who left paid work within last 12 months), and those with no earlier work experience. The short-term unemployed make up the largest share of the unemployed in all of the country aggregates considered (cf. Figure 4.2).

Figure 4.2 Composition of the group of unemployed by length of unemployment in different pools of countries; average percentages with 95% confidence intervals

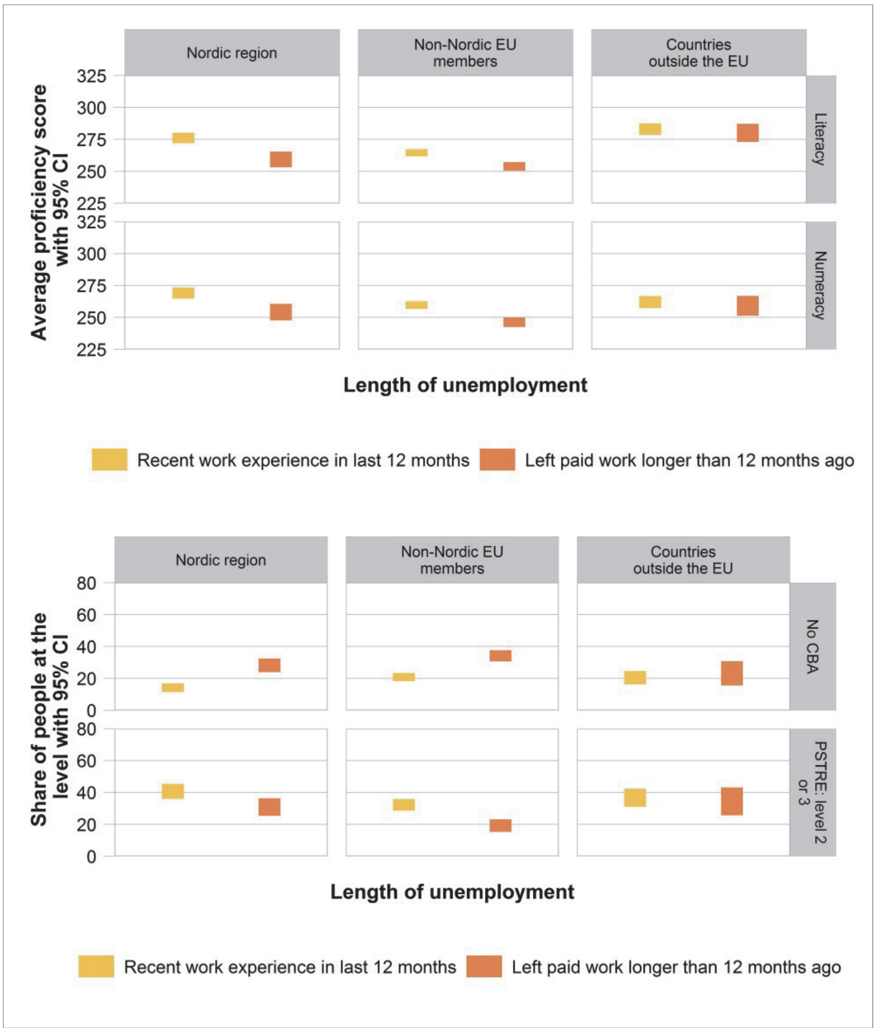


Note: CI on the vertical axis stands for confidence intervals.

It has been claimed that in many countries, the level of skills of long-term unemployed people is lower than the level of skills of short-term unemployed (OECD and Statistics Canada, 2000: 66). In addition, a British study (Bynner and Pearson, 2001) has also shown that poor numeracy skills are a strong predictor of unemployment. A study focusing on youth unemployment reached the same conclusion based on data for Canada, Italy, Norway, and the USA (Lundetræ *et al.*, 2010). Hence, we could also expect larger differences between unemployment categories with respect to numeracy.

After excluding the unemployed with no earlier work experience – the group that is too small to allow reliable inferences – the results show that the countries outside the EU stand out because of the smallest gaps in literacy, numeracy, and problem-solving skills between short- and long-term unemployed. Juxtaposing these findings with the aforementioned statistics, it seems that countries outside the EU are better than other countries in getting people employed and keeping them employed. Moreover, the skills of long-term unemployed in countries outside the EU stay at the level of short-term unemployed. Of course, it is not possible to draw any causal inferences from the PIAAC data that are just a snapshot of skill distribution in several societies at one point of time, but it can be hypothesised that the higher gap of skills between short- and long-term unemployed, for example in the Nordic countries (where the gap is the highest), is due to skill loss caused by lack of active skill use. However, several other hypotheses can also be drawn up: the Nordic labour market might be more selective, excluding individuals with low levels of skills. It can also be that demographic processes play a role: persons who do not speak the country's language might be over-represented among the long-term unemployed in the Nordic region. It is known from the PIAAC International report and from earlier studies that people with non-native background are doing worse in terms of their skills, but also in the labour market.

Figure 4.3 Average literacy and numeracy proficiency among short- and long-term unemployed in different pools of countries; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)



Note: In addition to Australia, Cyprus, and Russia, which are excluded from all of the analyses in the chapter, Italy, Spain, and France are excluded from the pool of non-Nordic EU members in the lower panel because problem-solving skills were not measured in these countries. CI on the vertical axis stands for confidence intervals.

People out of the labour force in the Nordic region outperform inactive people in both of the other country aggregates in terms of problem-solving (shares of people at levels 2 and 3 and those who did not solve tasks on computer) and numeracy. Literacy skills of people out of the labour force in the countries outside the EU exceed those of the Nordic people. The differences between literacy and numeracy skills of people belonging to the groups of employed and out of labour force are similar to the differences described in case of unemployed people, but larger with respect to problem-solving skills in technology-rich environments. As shown in Figure 4.1, the share of those who are inactive with high levels of problem-solving skills is clearly smaller than the same share among employed people. There are also relatively more individuals among the inactive who have never used computers or who just did not feel confident enough to face the challenge of solving tasks on a computer.

All in all, the results show that the employed Nordic labour force outperforms employed people from the other country aggregates, confirming that Nordic economies have what it takes to improve: skilled people. In addition, the unemployed and people out of the labour force also outperform the same groups in the other country aggregates in several cases, especially the non-Nordic EU countries. However, the differences between the skills of employed and unemployed (or inactive) people are rather large, pointing to the clear disadvantage of the latter groups. The next sections will investigate the similarities and differences of all the labour force categories inside the Nordic region.

4.3 Skills of employed individuals in the Nordic region

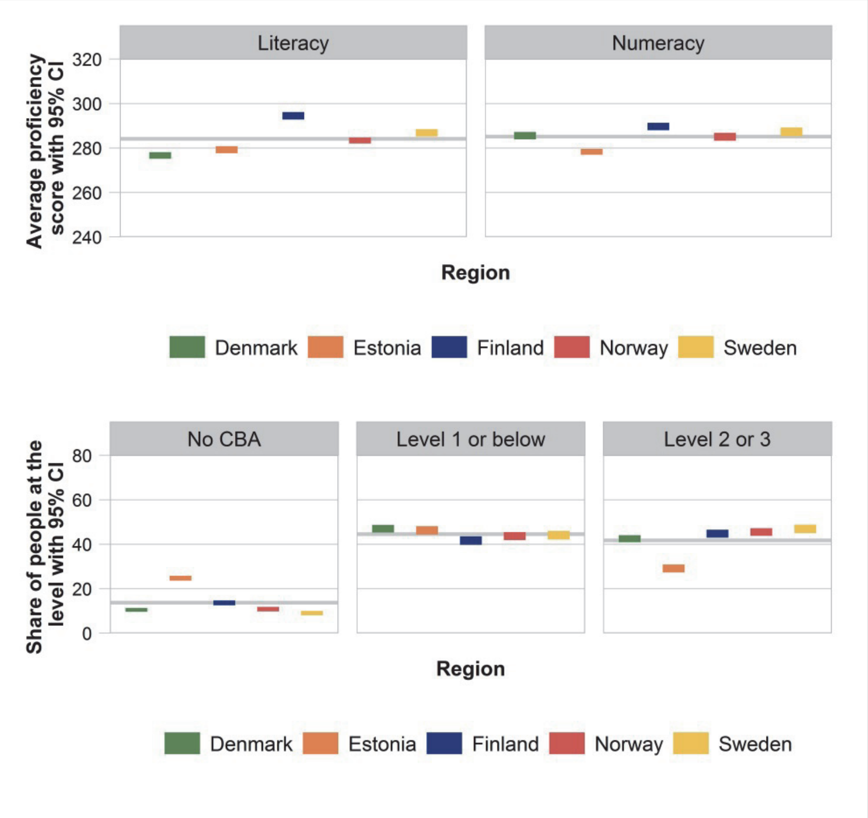
Even though the employed individuals in the Nordic region outperform employed individuals in the other country aggregates on average, there is quite some variation inside the Nordic area. The average literacy proficiency of employed people varies from 294.5 points in Finland to 276.6 points in Denmark. The difference across these extremes – 17.9 points – corresponds to approximately 2.5 years of schooling[32] in the pool of

[32] As shown in chapter 3, one year of schooling is associated with 7 points on the literacy scale and 8 points on the numeracy scale in the Nordic region on average.

countries. In case of numeracy, the difference is smaller – 11.4 points – corresponding to approximately 1.4 years of schooling.

For literacy, the differences across the Nordic countries are heavily influenced from the upper end of the score distribution – excluding Finland's clearly higher result, the maximum difference between the countries decreases to 10.2 points. In the case of numeracy, on the other hand, the difference is driven by the lower end. When excluding Estonia, the difference between the extremes becomes as low as 4.6 points, showing high homogeneity among the other Nordic countries.

Figure 4.4 Literacy, numeracy, and problem-solving proficiency of employed people in the Nordic countries; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)



Note: CI on the vertical axis stands for confidence intervals. Grey lines demonstrate the point estimates of the Nordic averages.

The pattern of distribution of employed people on the problem-solving scale is largely similar in Denmark, Finland, Norway, and Sweden, where on average 44.9% of the employed labour force scores on the highest levels (2 and 3). In Estonia, the same proportion is much lower – 29.1%. There are also more employed people in the Estonian labour market who, for some reason, do not feel confident to use ICT (15.7% of employed people in Estonia abstained from solving tasks on a computer, the same indicator in the other Nordic countries being 5.6% on average) or have no computer experience. Specifically, 5.4% of employed Estonians claimed that they had never used a computer, neither for work nor everyday life. In the other Nordic countries, only 1% of the employed labour force claimed the same.[33] The difference can be attributed to different historical experiences – general access to personal computers became a norm much later in Estonia than in the Scandinavian countries.

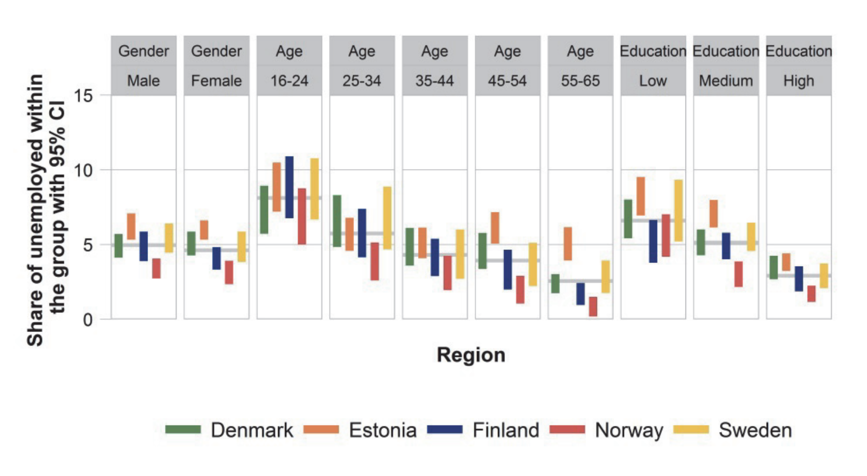
4.4 Skills of unemployed individuals in the Nordic region

The share of unemployed people in the PIAAC survey was small in most countries, ranging from 2% in Japan to 13.8% in Spain, averaging 5.7%. The Nordic average, 4.8%, is lower than the one of the non-Nordic EU members (6.5%), but does not differ much from the mean of countries outside the EU. Inside the Nordic area, the share of unemployed people is rather homogeneous. It is close to 5% in Finland, Denmark, and Sweden (4.5%, 5%, and 5.1%, respectively). Estonia and Norway present the extremes, as the share was the lowest (3.3%) in Norway to highest (6.1%) in Estonia.[34] The incidence of unemployment does not differ by gender in any of the Nordic countries, but is clearly higher among younger people compared to older ones and lower-educated people compared to more highly educated people (cf. Figure 4.5).

[33] In the figure, the numbers for not wanting to use ICT and having no ICT experience are aggregated in the category "No CBA".

[34] The shares of unemployed estimated on the PIAAC data differ somewhat from the Eurostat data. According to the Eurostat, the average rate of unemployment was 7.6% in Denmark (5% in PIAAC), 11.3% in Estonia (6.1%), 7.6% in Finland (4.5%), 3.2% in Norway (3.3%), and 7.7% in Sweden (5.1%) in the 3rd and 4th quarters of 2011 and 1st quarter of 2012 (i.e., the approximate period of the PIAAC data collection).

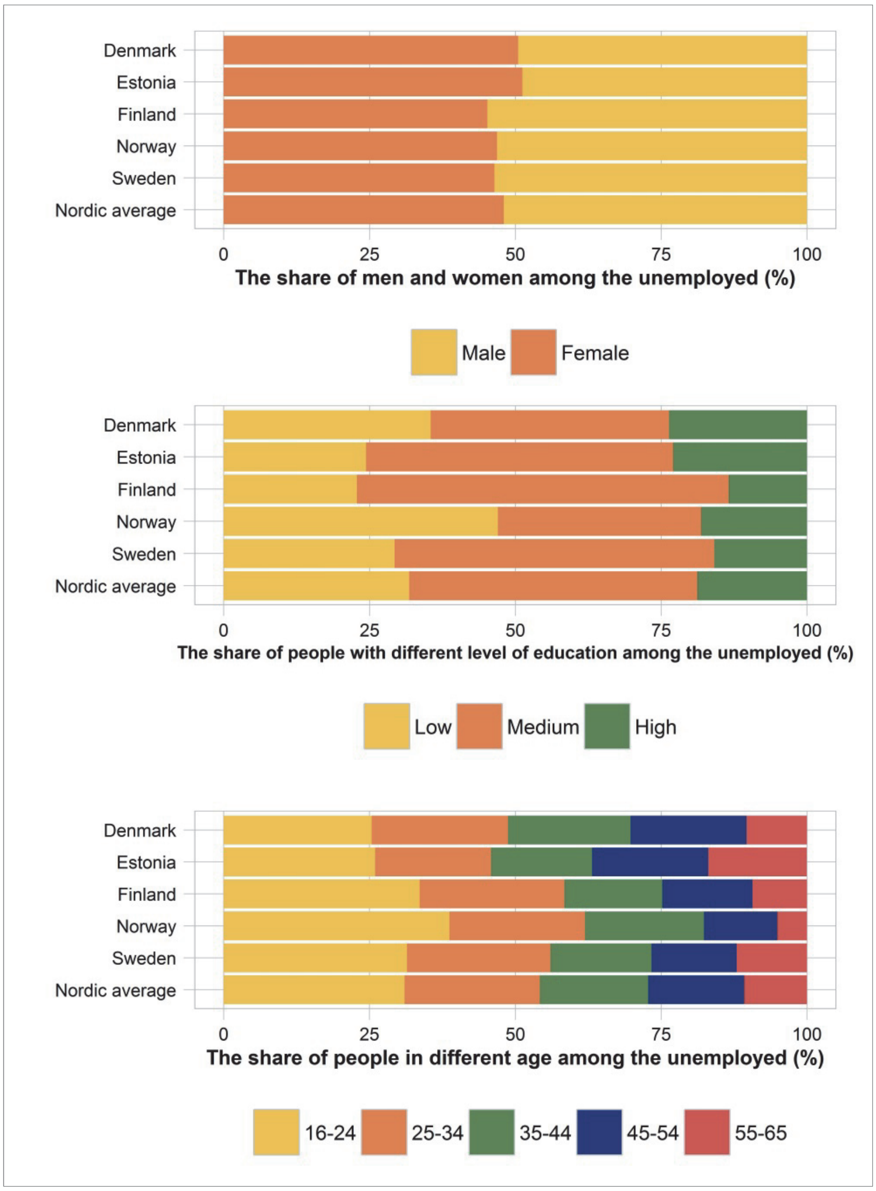
Figure 4.5 Incidence of unemployment, by gender, age, and education; average percentages with 95% confidence intervals



Note: CI on the vertical axis stands for confidence intervals. Education marks the highest level of education one has obtained. Grey lines demonstrate the point estimates of the Nordic averages.

Looking at composition of unemployed by gender, no statistically significant differences are found. Regarding age, the composition of unemployed is biased towards younger individuals. This is especially true for Norway, Finland, and Sweden, where more than 30% of the unemployed are 24 years old or younger (see lower panel in Figure 4.6). In Estonia and Denmark, the corresponding number is approximately 25%. With respect to education, most of the unemployed have medium levels of education – about 50% on average in the Nordic countries. Even though the incidence of unemployment is the highest among people with low levels of education, they do not compose the largest part of the unemployed in most of the countries (cf. Figure 4.6).

Figure 4.6 Composition of unemployed, by gender, age, and education; average percentages with 95% confidence intervals



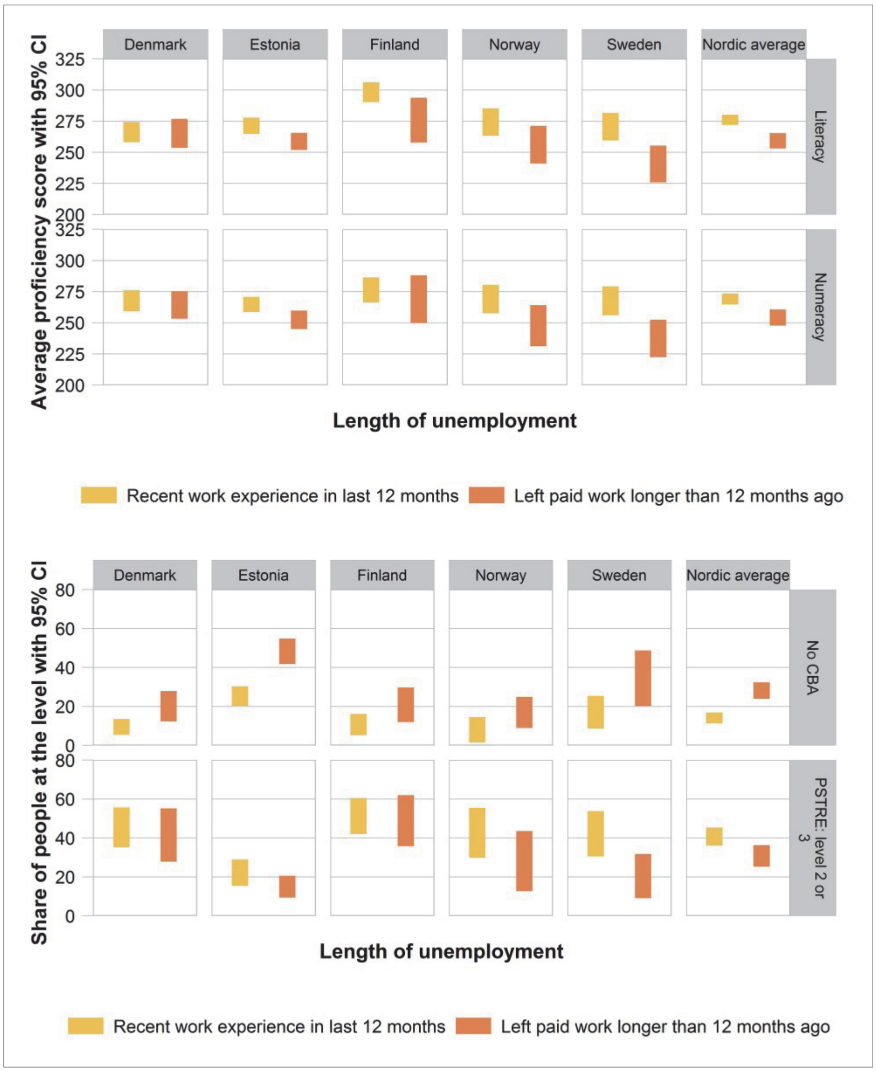
The look at the unemployed in terms of length of unemployment shows that, as in all the other country aggregates, the short-term unemployed make up the largest share of the unemployed in the Nordic countries, with the exception of Estonia, where the shares of short- and long-term unemployed (45.7% and 46.2%) are not significantly different. In Denmark, 60% of the unemployed lost or left their jobs within the last 12 months; in Finland, Sweden, and Norway, the corresponding percentages are 56.1, 52.9, and 47.9, respectively. Denmark stands out because of the small share of unemployed with no earlier work experience – the type of unemployed that includes relatively more young people than the other types. The share of long-term unemployed among all unemployed individuals is the highest in Estonia (46.2%). In the other countries, this is approximately 37% or slightly less.

Figure 4.7 Share of unemployed people and the composition of the group based on length of unemployment in the Nordic area; average percentages with 95% confidence intervals

Note: CI on the vertical axis stands for confidence intervals.

The skills of the short-term unemployed are the highest in Finland, exceeding the skills of the short-term unemployed in the other Nordic countries the most in literacy (see Figure 4.8). Skills of long-term unemployed are below the average of short-term unemployed in most countries. Only Denmark stands out as a country where there is no literacy or numeracy gap between short- and long-term unemployed. Skills of the long-term unemployed are the lowest in Sweden, which is also the country where the skill gap between the groups is the largest. The gap can be at least partly explained by the higher share of people who have been born abroad or who do not speak Swedish among the Swedish long-term unemployed (cf. Figure 4.9). Norway and Estonia perform at the level of the Nordic average in both literacy and numeracy.

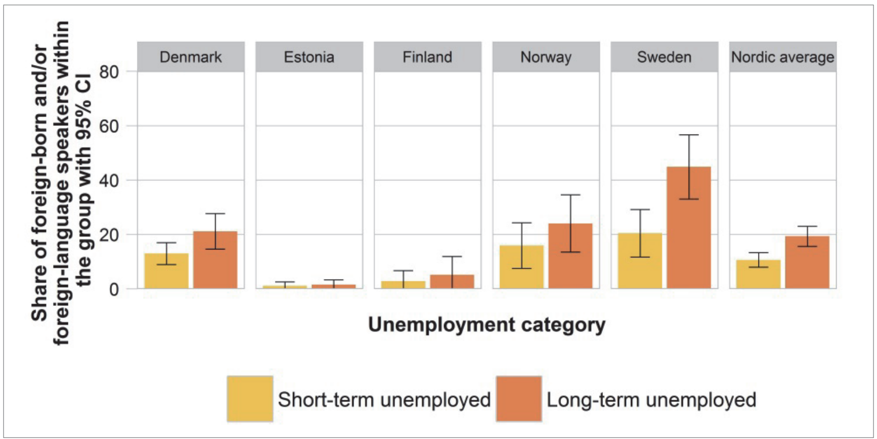
Figure 4.8 Average literacy, numeracy, and problem-solving proficiency among short- and long-term unemployed people in the Nordic countries; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)



Note: CI on the vertical axis stands for confidence intervals.

The analysis shows that ability and willingness to use computers might be related to length of unemployment. In all of the countries, the share of those who did not solve tasks on computer is higher among the long-term unemployed, the difference being the largest in Estonia. The explanation of the association between the ICT skills and the length of unemployment might stem from the fact that ICT can open another channel for finding a job. Having no computer skills or low willingness to use computers instead undermines the chances. The explanation can run in the other direction as well. The opportunities to access ICT might be limited for the long-term unemployed because of lower income, among other reasons, leading to unfamiliarity and distance from the technology-rich world. In addition, there might be some third variable, such as age, mediating the association.

Figure 4.9 Share of foreign-born and/or foreign language speakers among short- and long-term unemployed in the Nordic countries; average percentages with 95% confidence intervals



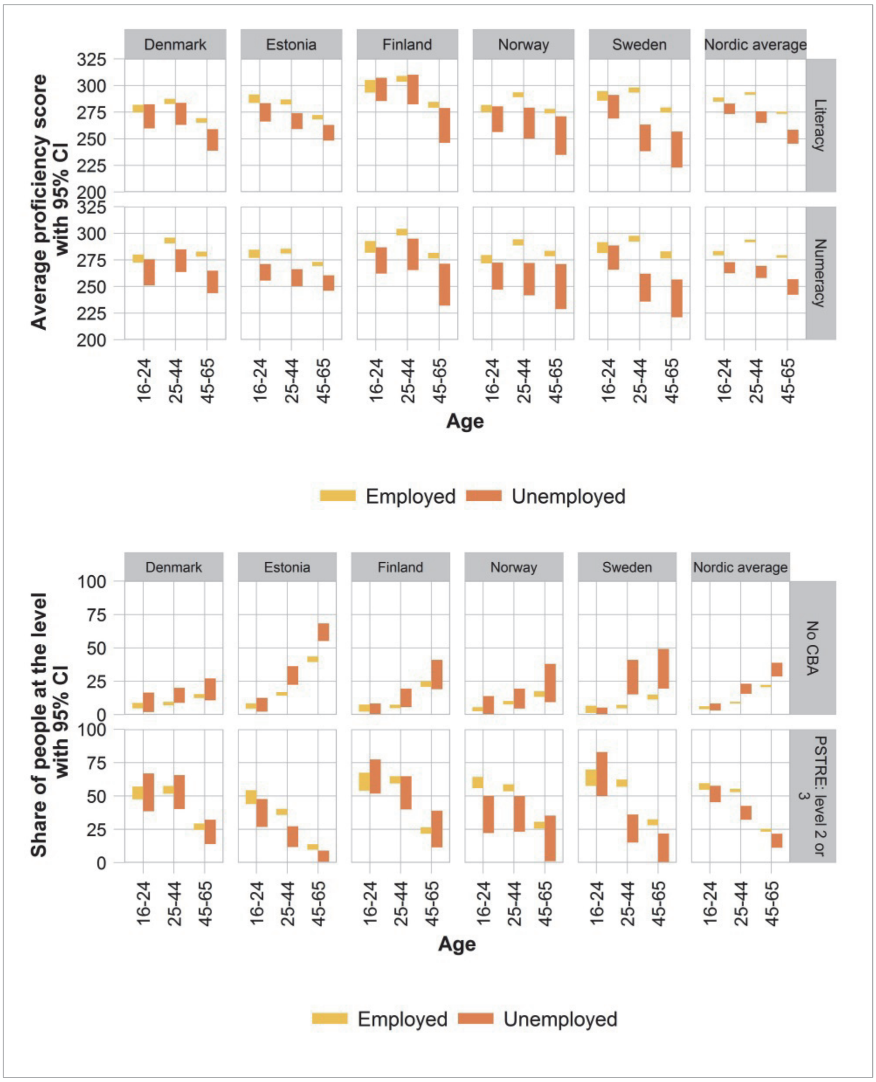
Note: CI on the vertical axis stands for confidence intervals.

When speaking about unemployment, the topic of unemployed youth cannot be overlooked. PIAAC data confirm that the incidence of unemployment is relatively more widespread among youth. The share of unemployed among 16–24-year olds is 8.1% in the Nordic countries on average, corresponding to about one third of the total stock of unemployed in the Nordic area. The share of unemployed among 25–44-year olds is 5% and among 45–65-year olds is 3.2% (results not shown). While many youngsters are out of labour market, we also know that young people on average have higher skills. Does it mean that we waste some of our human capital or have those unemployed youngsters lower skills than employed individuals in the same age bracket? Next, the skills of unemployed in different age groups are analysed.

PIAAC analysis shows that literacy skills of young unemployed are at a higher level than the skills of the oldest age group (unemployed aged 45–65) in all of the countries (see Figure 4.10), the difference being statistically insignificant in Norway. The average proficiency of people aged 16–24 and 25–44 differs significantly only in Sweden (in favour of the 16–24-year olds). The pattern is similar for numeracy.

When comparing the average literacy and numeracy skills of the young unemployed with the skills of the young employed, the disadvantage of the unemployed can be seen. Young unemployed have lower information-processing skills than the employed of the same age (the differences amount to 8.6 points in literacy and 13.7 points in numeracy), though the difference is only significant in Estonia in cases of literacy and in Denmark, Estonia, and Norway in cases of numeracy. These findings show that youth unemployment is not necessarily caused only by insufficient information about young people's skills, work-experience, and work habits, but can also be partly explained by information-processing skills that are inferior to those of young individuals who are employed. At the same time, Figure 4.10 also shows that even though the literacy skills of the young unemployed might be lower than the skills of the young employed, they are not necessarily lower than the skills of employed people aged 45–65. In case of numeracy, they are similar to the skills of older employed people in Finland and Sweden.

Figure 4.10 Average literacy and numeracy proficiency of unemployed and employed people and shares of employed and unemployed people who score on levels 2 or 3 on the problem-solving domain and who did not solve tasks on computer, by age groups; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)



Note: CI on the vertical axis stands for confidence intervals.

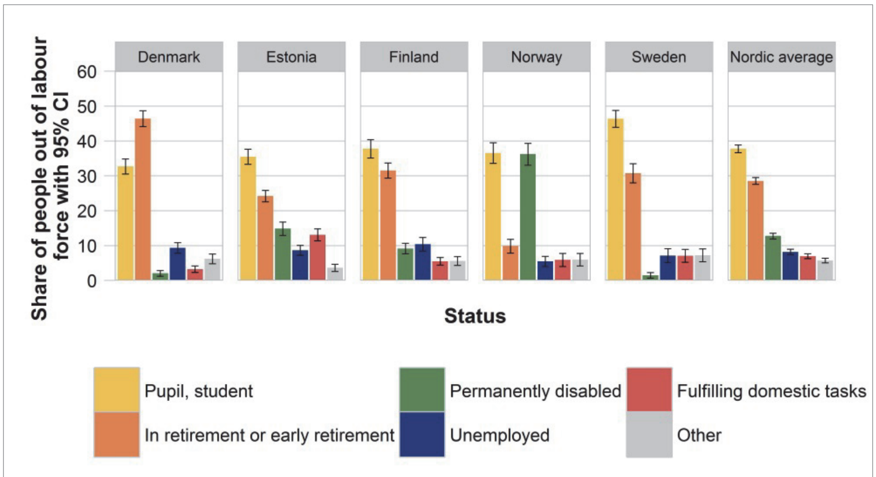
Not surprisingly, the young unemployed are most competitive relative to older individuals, employed and unemployed alike, with respect to the problem-solving in technology-rich environments. In Denmark, the share of good problem-solvers (levels 2 and 3) is 52.8% among young unemployed and 26.9% among older employed people (cf. Figure 4.10, lower panels). A similar difference is found in Sweden and the differences are even bigger in Finland (2.7 times) and Estonia (3.2 times). The difference is surprisingly small in Norway (1.3 times), however, due to the fact that the share of good problem-solvers in technology-rich environments among the young Norwegian unemployed is rather small (36.1%). Unfortunately, the shares of employed and unemployed who did not solve tasks on computers are too small to allow reliable inferences.

4.5 Skills of individuals out of the labour force in the Nordic region

The third labour market category – out of labour force – that amounts to, on average, 21.6% of the working age population in the Nordic area (ranging from 17.9% in Norway to 25.4% in Finland) is probably the most heterogeneous one, consisting of students, retired people, persons on parental leave, disabled people, etc. As the reasons of being out of the labour force vary across sub-groups, differences in skills across sub-groups can also be expected. We analyse the composition of the out of labour force category in each of the Nordic countries to find out where the signs of additional resources to increase the skill supply in the labour market are to be found. The analysis remains descriptive and indicative, without taking any background information into account.

In most Nordic countries, the largest share of inactive people consists of pupils/students (cf. Figure 4.11), most of who are young with low and medium levels of education, as many of them are still in the initial cycle of education. Denmark differs from the other countries in that the share of people in (regular) retirement or early retirement is higher than the share of pupils/students. Norway also stands out by having a share of permanently disabled people that is of the same magnitude as the share of pupils/students, and much higher than in the other countries. Another interesting feature of Norway is that the share of retired people is much smaller than in the other Nordic countries. Taken together, these two observations indicate that Norway may have adopted systems for classifying individuals as retirees and permanently disabled, respectively, that differ from the corresponding system in the other Nordic countries. In addition, there is a small share (less than 10% of the out-of-the-labour-force category across the Nordic countries) of people who do not classify as unemployed according to International Labour Organization's classification, but who claim themselves to be unemployed. These are the unregistered unemployed who are not actively looking for a new job, who could not start working immediately after finding a job, or who have lost the hope of finding a job.

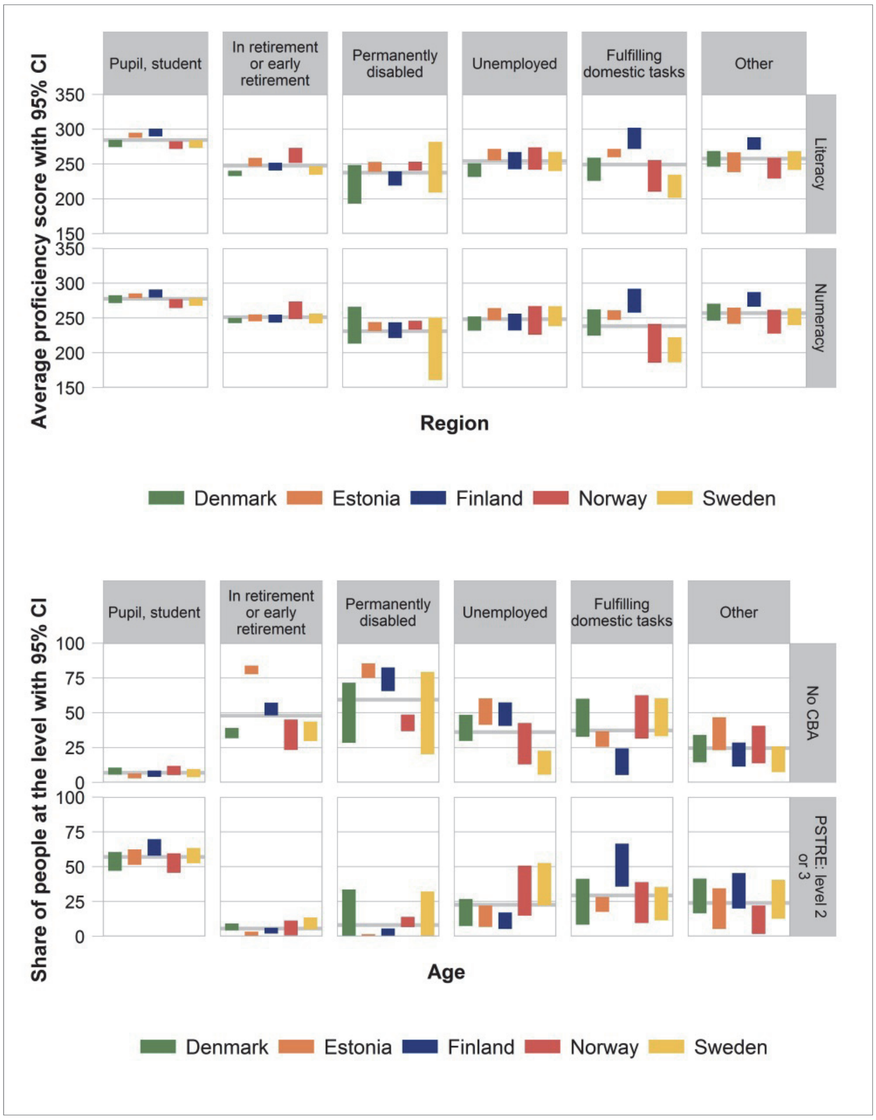
Figure 4.11 The composition of the out-of-the-labour-force category in the Nordic countries; average percentages with 95% confidence intervals



Note: CI on the vertical axis stands for confidence intervals.

The analysis of the skills of the different groups of adults shows that there is a considerable stock of good skills (especially good problem-solving skills) currently not in active use in the labour market. For example, all of the skills measured in PIAAC (literacy, numeracy, and problem-solving skills in technology-rich environments) are higher among pupils and students in Estonia than in the currently employed workforce in the Estonian labour market. The same situation prevails in Finland and Denmark with respect to literacy and in all the countries in the problem-solving domain. It should, however, be noted that even though 57.1% of pupils and students on average have good problem-solving skills in the Nordic area, the stock of good skills could be even higher. Currently, about half of the pupils and students score below level 2 on the problem-solving domain. The average skill proficiencies in the other subcategories of the out of the labour force group are below the scores of people currently employed in the labour markets, but the skills of these people could also be developed and activated in the labour market.

Figure 4.12 Average literacy and numeracy proficiency in the different subcategories of the out-of-the-labour-force category in the Nordic countries; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)



Note: CI on the vertical axis stands for confidence intervals. Grey lines demonstrate the point estimates of the Nordic averages.

While it is clear that it is not possible to put the skills of inactive people immediately into effective use in the labour market (it might not even be desirable because it is important for young people to develop their skills through the initial education), efforts should be made to maintain and possibly develop the skills of the inactive. Otherwise, the human investments made in this group will be in vain.

4.6 Conclusion

The analyses presented in the chapter showed that the Nordic countries have a competitive advantage over other country aggregates in terms of the information-processing skills of their employed workforce. Employed people in the Nordic area outperform employed people in the other country aggregates in all of the skills domains measured in PIAAC. The advantage of unemployed and inactive people over the same groups from the other regions is smaller, but can be noted in the case of problem-solving in technology-rich environment when comparing Nordic regions with the non-Nordic EU countries.

The analyses of the unemployed demonstrated that the countries outside the EU seem to be better than other countries in getting people employed and keeping them in employment. Moreover, the skills of long-term unemployed in countries outside the EU stay at the level of short-term unemployed. It is not possible to draw any causal inferences from the PIAAC cross-sectional data, but it can be hypothesised that the higher gap of skills between short- and long-term unemployed – for example in the Nordic countries (the gap is the highest there) – is because the people lose their skills once these will not be in active use. However, several other hypotheses can also be drawn up: the Nordic labour market might be more selective, excluding people with a low level of skills. Demographic processes can also play a role: persons who do not speak the country's language might be over-represented among the long-term unemployed in the Nordic region. Inside the Nordic area, Denmark stands out as a country where there is no literacy or numeracy gap between the short- and long-term unemployed.

The analysis also showed that one's ability and willingness to use computers might be one factor related to one's length of unemployment. In all of the countries, the share of those who did not solve tasks on computer is higher among the long-term unemployed, whereas the difference is the largest in Estonia. The explanation might stem from the fact that ICT can open another channel for finding a job. Having no computer skills or low willingness to use computers instead undermines the chances. However, there might be some other explanations as well, such as worse access to ICT due to lower incomes or the age composition of the short- and long-term unemployed.

In terms of youth unemployment, the findings show that it is not necessarily caused by insufficient information about young people's skills, work-experience, or work habits, but can also be explained by worse information-processing skills than those possessed by young employed people.

The analysis of the skills of the different groups of inactive individuals shows that there is a rather large stock of good skills (especially good problem-solving skills) currently not in an active use in the labour market. Activating them immediately is at the same time neither possible nor desirable, as young people are still in the middle of the process of developing their skills in the formal education system. It should, however, be noted that approximately half of the pupils and students score below level 2 on the problem-solving domain, demonstrating the need to improve the teaching of this skill. The average skill proficiencies in the other subcategories of the out-of-the-labour-force group are below the scores of people currently employed in the labour markets, but the skills of these people should also be developed and activated in the labour market.

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5. Distributions of Key Information-Processing Skills at Work

Vivika Halapuu

As it has been shown that skills are not only related to higher chances of employment, but also to the intensity and nature of the jobs, this chapter focuses on the questions which are the skills of part-time and full-time workers and people employed in different sectors, industries, and occupations in the Nordic countries. Skills of people working for companies in different size are also analysed, such as the skills of Nordic entrepreneurs. In the analysis of the skills of entrepreneurs, international comparison is also given in some sections. One of the striking results points to large discrepancies in the Nordic area – the cross-industry differences are larger than 40 points when comparing the Nordic averages of skills in information and communication activities and agriculture, forestry, and fishing. Industries for which some countries seem to own a competitive advantage or disadvantage are also reviewed.

5.1 Introduction

Besides higher chances of employment, a higher level of human capital has been shown to be associated with the intensity of the job one does (e.g., OECD, Statistics Canada, 2000, where the association was studied at country level). In addition, the nature of job is found to be related to skills. Constant and Zimmermann (2003) showed that each additional year of schooling increases the odds of becoming a professional as opposed to a menial worker. Schmidt's and Strauss' (1975) findings in the United States were similar. The initial findings of PIAAC (OECD, 2013) demonstrated the relationship between information-processing skills and occupational belonging.

Driven by these findings, first, the association of intensity of employment and skills in the Nordic area will be studied in this chapter, but unlike the earlier OECD study, it will be done at the individual level. The employment intensity will be measured by full-time/part-time employment status and the analysis seeks an answer to the question: which are the skills of part-time workers compared to the skills of full-time workers? Also, is the difference of skills between the groups similar across the Nordic countries? Second, the skills of Nordic people employed in different occupations as well as in different industries will be analysed, but beyond the pursuit to confirm any theories in the field, the analyses aim to reveal industries and occupations for which individual countries own competitive advantages over the others or for which they could learn from the others. Differences in average proficiencies have to be interpreted cautiously, however, because they might also be caused by the structural differences. Third, relationships between information-processing skills and one workplace characteristic – firm size – are studied.

The last part of the chapter focuses on skills of Nordic entrepreneurs. In order to foster employability across Europe, more and more emphasis has been laid on promoting a higher level of self-employment. The European Union has several flagship initiatives tackling the issue, such as the agenda for new skills and jobs (European Commission, 2014). In the Nordic countries, support of entrepreneurship and successful transfer of companies, and of knowledge and skills across generations, has been pointed to as a channel for mitigating the challenges of the current demographic changes (Chiu, 2012). The major concerns related to the development of entrepreneurial activity in the region has changed over the years. While in the past years, inadequate entrepreneurial infrastructure and entrepreneurial culture were considered to be the major problems (Napier *et al*. 2010), the biggest challenge related to entrepreneurship in the Nordic countries nowadays seems to be the lack of ability and skills to accelerate growth in young firms (Napier *et al.*, 2010, Napier *et al.*, 2012). The growth of these firms is important because growth-oriented entrepreneurship is crucial for job creation, and this is especially true for young enterprises (Haltiwanger *et al.*, 2010, Napier *et al.*, 2012).

The question of importance of human capital in entrepreneurial activity and success is somewhat controversial. Le (1999: 386) has said that one of the major theoretical determinants of self-employment is educational attainment, but several empirical studies have questioned this claim (see van der Sluis *et al.*, 2004; Grilo and Thurik, 2008). In addition, it might not be the level of education, but variety of skills obtained, that matter (Lazear, 2004). To shed some light on this topic based on the PIAAC data, we investigate the associations between entrepreneurial activity and human capital, measured by information-processing skills.

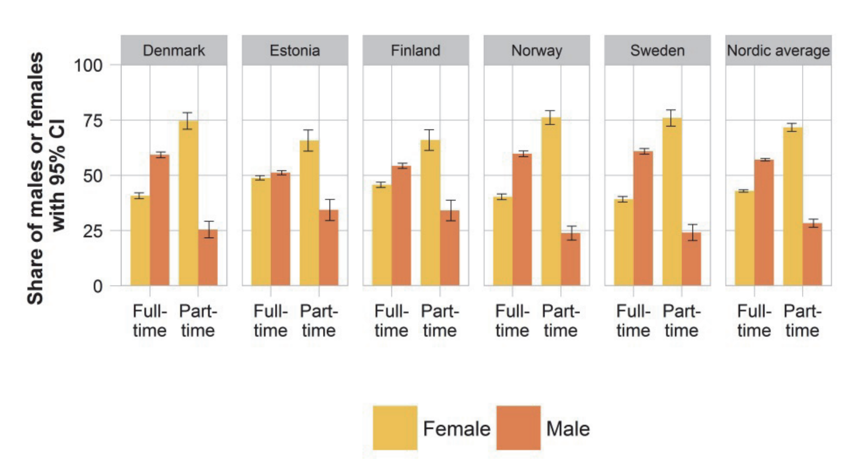
5.2 The relation between skills and employment intensity

In the adult skill survey preceding PIAAC, the IALS survey, an unexpected association was found between the aggregate number of hours worked by a country's labour force and the employee's literacy skills. In countries with high mean (document) literacy skills, aggregate work hours were lower than in countries with lower literacy skills (OECD, Statistics Canada 2000). Here, the association of intensity of employment and skills will be studied again, but at the individual level. In addition, since the correlation between weekly working hours and skills is very weak in all of the Nordic countries according to the PIAAC data – a result most probably driven by collective bargaining, strict labour market regulations, and other factors, which reduce the potential variability in working hours – the employment intensity will be measured by full-time/part-time employment status.

In PIAAC, people were asked about their subjective employment statuses along with questions by means of which their formal employment status was derived. When expressing their subjective employment statuses, they could say whether they worked full-time or part-time (or whether they considered themselves retired, etc.). The analysis of the answers "full-time employed" and "part-time employed"[35] shows that 79.6% of employed people in Sweden and 91.1% of employed individuals in Estonia are full-time workers, while the share of part-time workers is 8.9–20.4% in the Nordic region. The distribution is clearly gender-biased. While the majority of full-time workers are men (the difference in favour of men is not too large, though), women dominate among part-time workers in all the countries (approximately 65% in Estonia and Finland, and more than 75% in Norway and Sweden); see Figure 5.1.

[35] Those formally classified as employed people whose subjective status was anything else but "full-time employed" or "part-time employed" are excluded from the analysis.

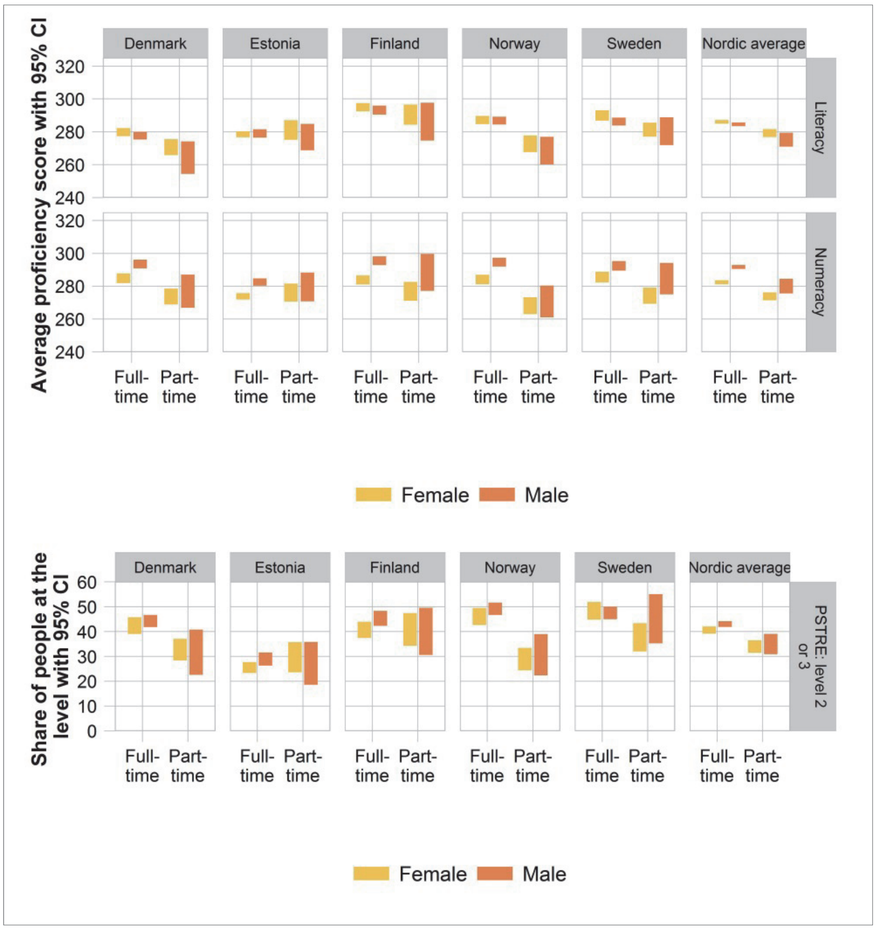
Figure 5.1 Share of full-time and part-time workers by gender; average percentages with 95% confidence intervals



Even though in some cases women might prefer working part-time to better combine work and family life, it is not always the case (see i.e. Bielinski *et al.*, 2002, Kangas, Rostgaard, 2007). Moreover, if women would like to work full-time, but cannot, their risk of poverty might increase (wage penalty on part-time workers has been shown in several papers, i.e. Hirsch 2005, Manning and Petrongolo, 2005).[36] In addition, their human capital might deteriorate. We will next take a look at the skills of full-time and part-time workers to see whether the skills of part-time workers are lower than those of full-time workers or if we can identify higher-skilled people in some of the Nordic countries dominating among part-time workers. The differences of skills between the groups across the Nordic countries are of special interest. When interpreting the results of the descriptive analysis, the fact of neglecting control variables has to be kept in mind.

[36] At the same time, Bardasi and Gornick (2008) have shown that in Sweden there is no part-time wage penalty among women.

Figure 5.2 Skills proficiency among full-time and part-time workers by gender; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)



Note: CI on the vertical axis stands for confidence intervals.

Figure 5.2 demonstrates a versatile picture across countries. In Denmark, Norway, and Sweden (for females) part-time workers (both men and women) have lower skills than people working full-time. The skill difference is the largest in Norway, where the share of part-time workers was also among the largest. However, in Estonia and Finland, the countries with the smallest share of part-time workers, literacy skills of men and women working part-time do not differ from those of the men and women working full-time. It is also true for numeracy, with the only exception that Finnish women working part-time have slightly lower scores than those working full-time.

The differences in the shares of male and female part- and full-time workers with high problem-solving skills in technology-rich environments are similar to the differences in literacy. The shares do not differ among men and women in Estonia and Finland, but in Denmark and Norway (and Sweden in the case of women), part-time workers perform worse than full-time workers.

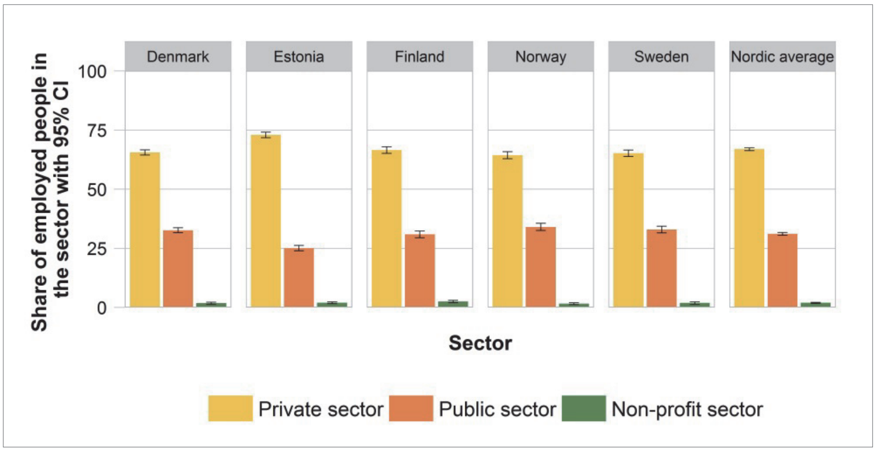
Unfortunately, the PIAAC data do not enable us to detect whether the lower skills of part-time workers are a cause or a consequence of being employed part-time. The explanation can work in both ways because those with lower skills might have a worse position when looking for jobs. At the same time, working part-time does not enable people to use their skills as intensively. It might also limit one's access to work-related training. Finally, potential part-time wage penalties make it more difficult to finance one's further studies.

To summarise, the results of the analysis show that in the Nordic countries with higher shares of part-time workers, the skills of part-time workers are lower than the skills of full-time workers. It might be the case that employers in these countries hire people with lower skills for part-time positions, but it can also be that the skills of part-time workers are lower either because they benefit less from work related training or because they cannot put as many of their skills to practice as individuals working full-time. In Estonia and Finland, the average skills of part-time workers do not differ from those people working full-time.

5.3 Distribution of skills across sectors

In all the Nordic countries, more than 60% of the workers are employed in the private sector – from 64.4% in Norway to 72.9% in Estonia (cf. Figure 5.3). The public sector is the largest in Norway (34.1%) and the smallest in Estonia (25.1%). Among the country aggregates considered – see, for example, Figure 4.1 – the Nordic region has the largest public sector, accounting, on average, for 31.1% of the employed individuals. The share of non-profit organisations is very small in all of the Nordic countries, ranging from 1.7% in Norway to 2.5% in Finland. Because of a very small number of people employed in this sector, it will be excluded from the following analyses.

Figure 5.3 Shares of people employed in different economic sectors in the Nordic area; average percentages with 95% confidence intervals



Note: CI on the vertical axis stands for confidence intervals.

About 60% of all people employed in the private sector are men. Women tend to be overrepresented in the public sector. In fact, the Nordic countries stand out as the most female-biased in this regard: 68% of the individuals employed in the public sector in the Nordic countries are women; for comparison, in the pool of non-Nordic EU members, the corresponding number is 53%. Inside the Nordic region, no big differences regarding gender distribution can be identified. The only minor deviation is the share of women in the Estonian private sector that exceeds slightly the share of women in the other Nordic labour markets.

The private sector is over-represented when it comes to employment of younger people: 14.3% of those employed in the Nordic private sector and 7.4% of those employed in the public sector belong to the age group 16–24. Still, compared to the other country aggregates, the share of youth employed is the highest in the Nordic region with respect to both the private and the public sectors.

Regarding educational composition, the share of highly educated[37] is clearly larger in the public sector. While about every third person employed in the private sector in the Nordic area (29.6%) has a higher edu-

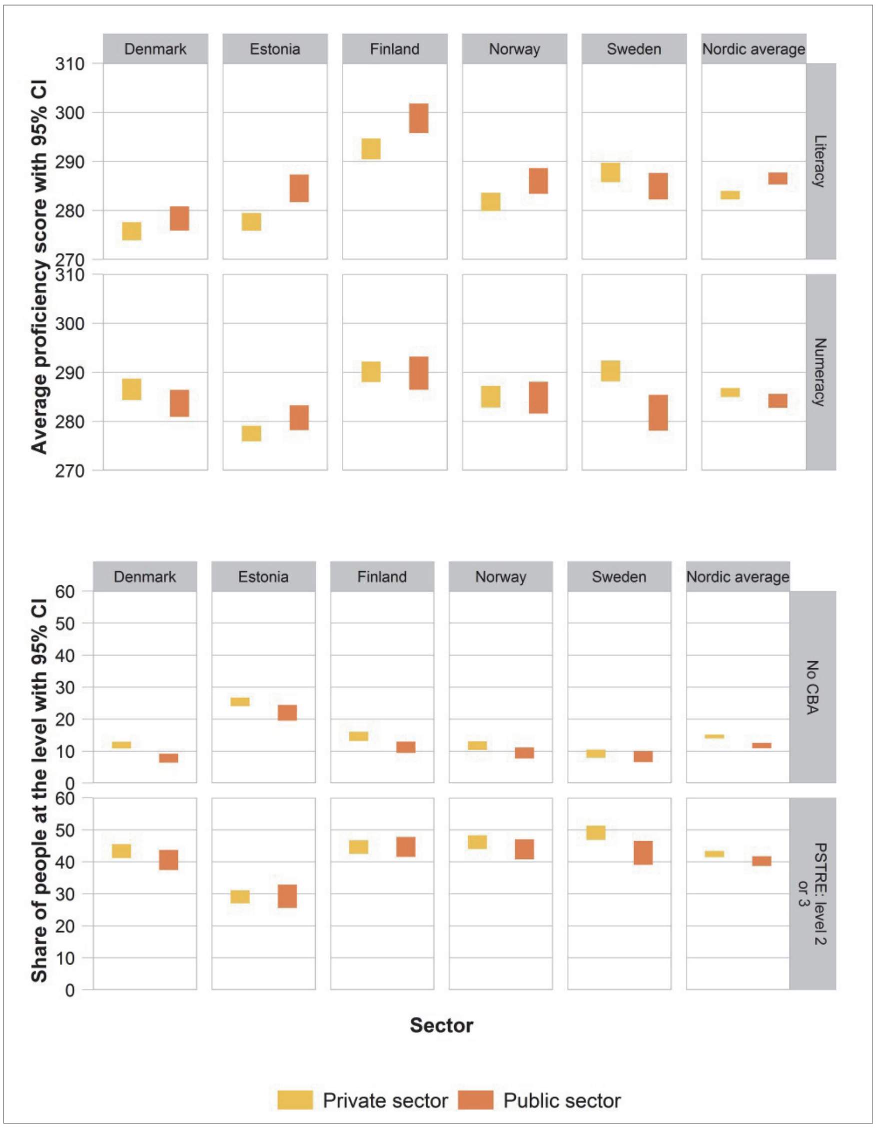
[37] Low-, medium-, and high-level of education are hereby defined as follows: low level of education – No formal qualification or below ISCED1, ISCED 1, ISCED 2, ISCED 3C shorter than 2 years; medium level of education – ISCED 3C 2 years or more, ISCED 3A-B, ISCED 3 (without distinction A-B-C, 2y+), ISCED 4C, ISCED 4A-B, ISCED 4 (without distinction A-B-C; high level of education – ISCED 5B, ISCED 5A, bachelor, ISCED 5A, master, ISCED6).

cation, about every second person employed in the public sector has it (52.7%). Inside the Nordic countries, the largest shares of people with higher education are found in Estonia (36.9% in the private sector and 64.3% in the public sector). At the other end of the educational spectrum, Denmark and Norway stand out. In Norway, 26.6% of those employed in private sector and 11.8% in the public sector have low levels of education. In Denmark, the corresponding shares are 22.8% and 15.5%, respectively.

With respect to skill proficiency, Finns employed in both the private and the public sector clearly outperform people in these sectors in the other Nordic countries in literacy. In Denmark, on the other hand, employees in both sectors score below the Nordic average. In Estonia and Norway, people employed in the private sector score below the Nordic average, while the opposite is true for private sector employees in Sweden. For these three countries, the literacy skills of public sector employees are quite similar.

Differences between public and private sector workers in numeracy skills are largely insignificant, but if anything, they tend to be better among private sector workers (with the exception of Estonia). The cross-country analysis shows that only Finnish people score approximately 5 points above the Nordic average in both the private and the public sector. Estonians, on the other hand, score below the Nordic average (8.7 points lower in the private sector, 3.4 points in the public sector). In Sweden, the numeracy proficiency among private sector workers exceeds that of public sector workers. In Norway, there is no difference between the sectors.

Figure 5.4 Literacy, numeracy, and problem-solving proficiency in private and public sectors, Nordic countries; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)

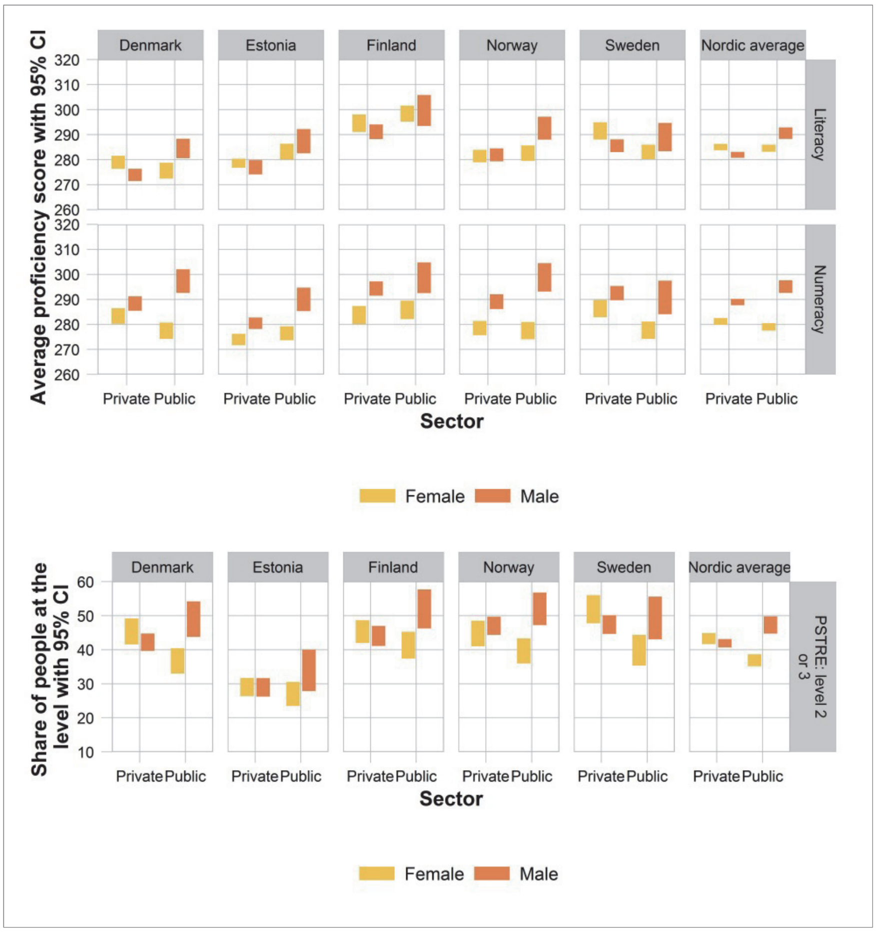


Note: CI on the vertical axis stands for confidence intervals.

Regarding problem-solving skills, the Estonians employed in both the private and the public sectors score below the Nordic average (cf. the bottom panel of Figure 5.4). The Scandinavian countries all score close to the Nordic average with respect to both the private and the public sector. The only exception is Sweden, where there are significantly more people with high problem-solving skills among workers in the private sector (the difference between the private and the public sector is 6.3 percentage points).

When analysing separately the skills of men and women employed in the private and public sectors, it appears that men score higher than females in numeracy in all the countries in both sectors (see Figure 5.5) but the men's advantage is higher in the public sector. The male numeracy skills are on average 7.8 points higher in the private sector and 16.1 points higher in the public sector. The gender differences are less clear-cut in the case of literacy. While, on average, women in the private sector have slightly higher literacy skills than men, the opposite is true for the public sector. Differences across countries occur, too. In particular, in Estonia and Finland, men and women read equally well in both sectors. The female and male shares of high performers in problem-solving do not differ much in the Nordic private sectors. Differences in favour of men appear in the public sectors, however.

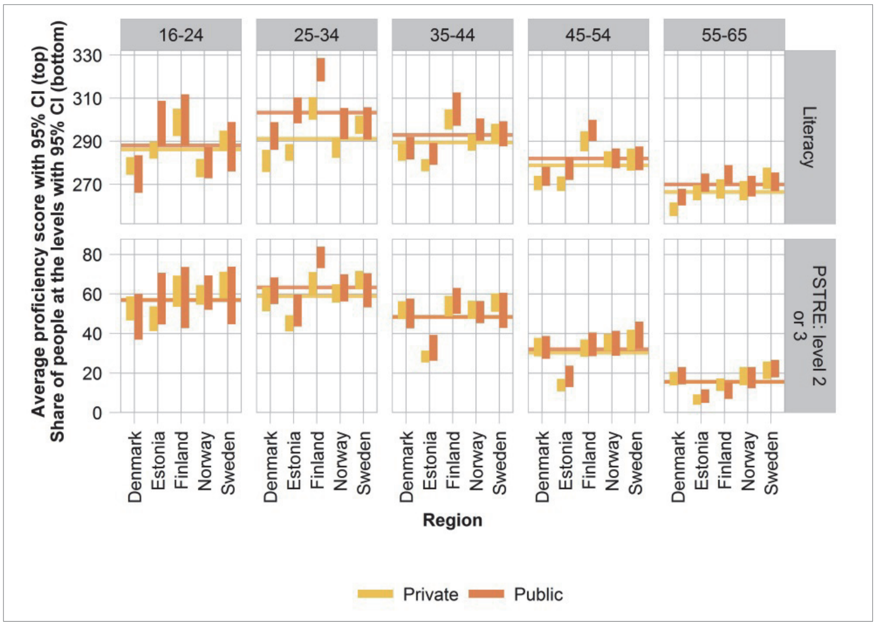
Figure 5.5 Gender differences in literacy, numeracy, and problem-solving skills in private and public sector; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)



Note: CI on the vertical axis stands for confidence intervals.

Turning to sector differences across age groups, Finland's advantage over the other Nordic countries remains (see Figure 5.6). Finnish people aged 16–54 and employed in the private sector perform better in literacy than employed people in this age range in the other Nordic countries. There is no difference from most of the other Nordic countries in the oldest age group, ages 55–65. Results are similar for the public sector. Finnish people aged 25–54 and employed in the public sector outperform their peers in the other countries. In the youngest and oldest age groups, the differences are smaller or statistically insignificant, with the exception of Estonian youths aged 16–24 employed in the public sector, who score as high as Finns.

Figure 5.6 Average literacy proficiency among people in different age groups, private and public sector; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)



Note: CI on the vertical axis stands for confidence intervals. Orange and yellow lines demonstrate the point estimates of the Nordic averages of the skills of public and private sector workers, respectively.

With respect to numeracy (not reported), the biggest deviation from the Nordic average occurs for Estonia. While Estonians aged 16–24 and employed in the public sector score as high as Finns, older Estonians score at or below the Nordic average. The disadvantage of the Estonians is bigger in the private sector.

Regarding problem-solving, an interesting finding indicates that the Estonian society lags approximately ten years behind the other Nordic countries in problem-solving in technology-rich environments. The share of Estonians aged 25–34 at levels 2 or 3 does not differ much from the shares of good problem solvers in the ten-year older age group (35–44) in Scandinavian countries. The finding is similar when comparing Estonians aged 35–44 with the 45–54 age group from the other countries.

5.4 Distribution of skills across industries

An analysis of the distribution of skills across industries might reveal activities for which individual countries own competitive advantages over the others or could learn from the others. Differences in average proficiencies have to be interpreted cautiously, however, because they might also be caused by the structural differences.

On average, the most highly skilled workforce is employed in the information and communication sector, followed by professional, scientific, and technical activities; financial and insurance activities; and public administration and defence and compulsory social security (cf. Figure 5.7).[38] The skills of people employed in the field of education are somewhat lower, and still lower are the skills of people employed in arts, entertainment, and recreation; and wholesale and retail trade. Figure 5.8 shows the skills across countries in industries that can be characterised as low performing in terms of PIAAC scores. Among these industries, those exhibiting the lowest performance are agriculture, forestry, and fishing; construction; and accommodation and food service activities.

The differences of the Nordic averages across industries are as large as 42.6 points (311.5 points in information and communication, and 268.9 points in agriculture, forestry, and fishing) in cases of literacy, and 48.9 points in numeracy. The share of workers who do not have the skills or willingness to use computers ranges from 4.7 points in information and communication to 30.7 points in agriculture, forestry, and fishing. The share of top performers in problem-solving ranges widely as well: from 23.9% in agriculture, forestry, and fishing to 70.6% in information and communication. The picture is more homogeneous inside the industries, but the cross-country differences still vary from 6.9 points in human health and social health activities in cases of numeracy and up to 27.8 points in agriculture, forestry, and fishing in cases of literacy. The differences of top-performers in problem-solving range from 4.4% in information and communication to 24.4% in manufacturing between the Nordic countries. The average share of individuals with very low problem-solving skills in technology-rich environments or low willingness to use ICT ("No CBA" in the figures) ranges from 6.3% in accommodation and food service activities to 29.1% in education.

A cross-country comparison shows that in all the industries included in Figures 5.7 and 5.8, the Danish industries tend to perform worse than the industries in the other countries in literacy, even though the difference from at least some of the other countries is not significant (e.g., in arts, entertainment, and recreation; education; administrative, and sup-

[38] Industries are defined by main categories of ISIC Rev. 4 classification. Categories with a very small number of cases are excluded from the analysis.

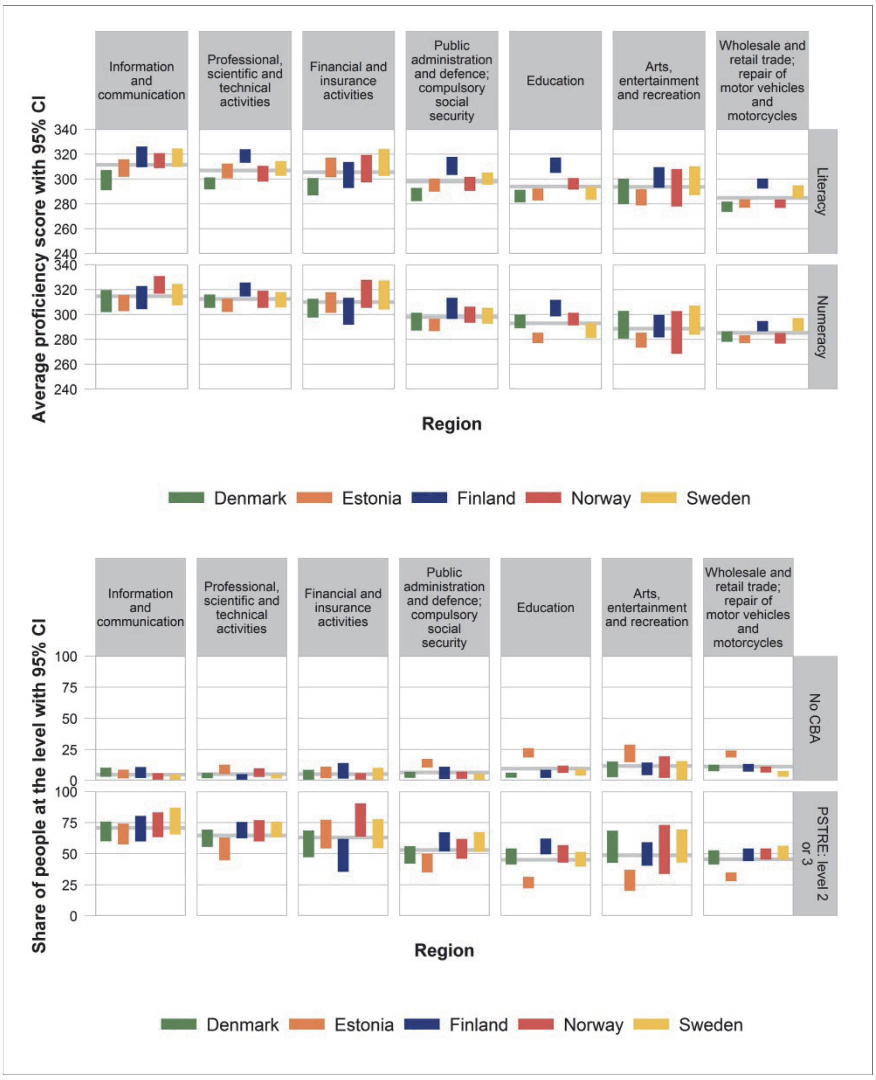
port service activities; transportation and storage; and accommodation and food service activities). Many Finnish industries outperform industries in other Nordic countries in both literacy and numeracy. Some of the most striking differences occur in the case of education, wholesale and retail trade, and manufacturing.

When it comes to the share of people with no computer experience, very low computer skills or very low willingness to use computers (category "No CBA"), it is often the lowest in Danish industries. While the other Scandinavian countries do not differ much in this regard, Estonian industries clearly do worse. Moreover, in public administration and defence; education; arts and entertainment; wholesale and retail trade; human health and social work activities; manufacturing; transportation and storage; as well as agriculture, forestry, and fishing, the Estonian skills in problem-solving in technology-rich environments are distinctly lower than the corresponding skills in the other Nordic countries.

If one wants to identify industries in which one of the countries seems to be doing clearly better or worse, one can mention professional, scientific, and technical activities; field of education; wholesale and retail trade, repair of motor vehicles and motorcycles; and manufacturing in Finland as good examples. However, even in these industries, the differences compared to the other Nordic countries are not overly large. Denmark stands out negatively in construction and Estonia in manufacturing.

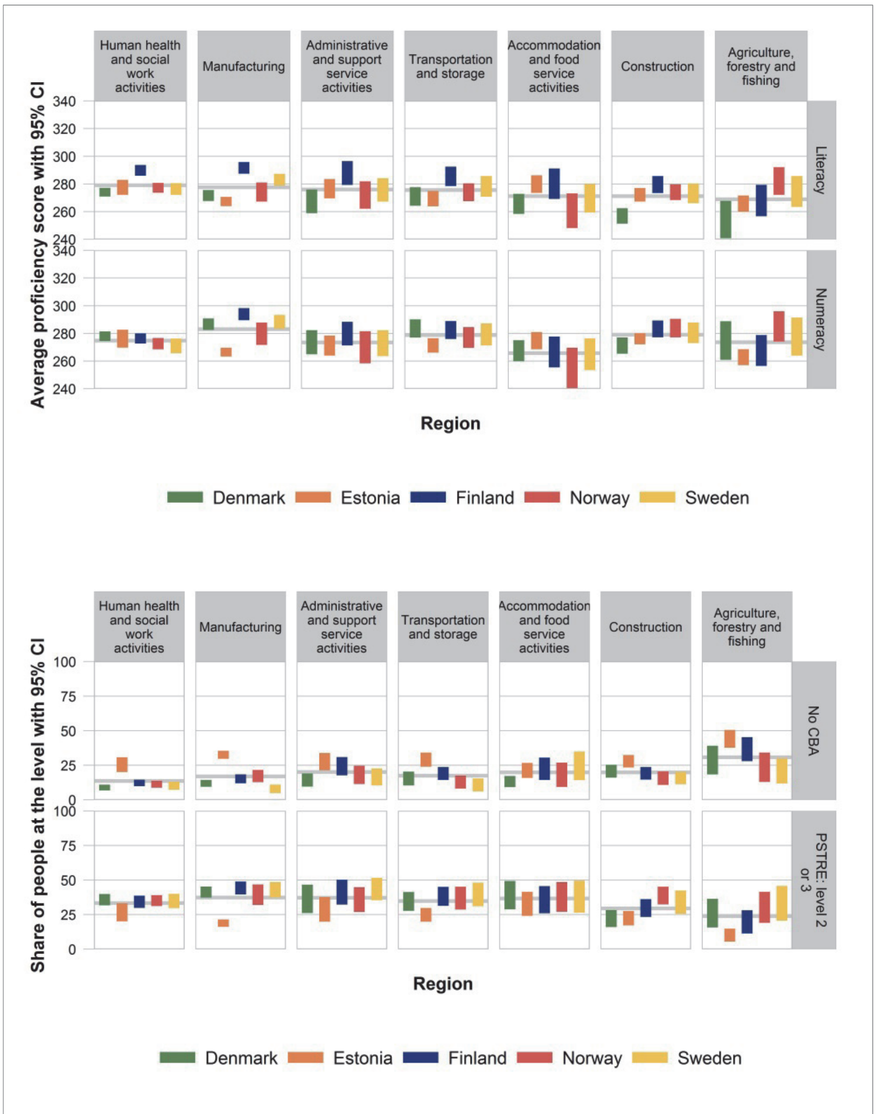
What should make decision makers in all the countries somewhat worried is the fact that in many of the industries, only half or fewer of the people score on the highest levels of problem-solving. The problem-solving (but also literacy and numeracy) skills of people employed in the field of education are not less important. Regarding literacy skills, it can be noted that Estonians employed in education score 23.5 points lower than the corresponding Finns. The difference between Sweden and Finland is also equally large–22.4 points. The Finnish – Estonian and Finnish – Swedish differences on the numeracy scale are 24 and 18 points, respectively. One cannot claim based on these facts only that the skills of Estonian and Swedish teachers are lacking, however. This is so because the major categories of the ISIC Rev. 4 classification include different occupational categories and, for instance, merely an approximate 68% of the people employed in the education industry are employed at professional occupations.

Figure 5.7 Average informational processing skills proficiency in selected (high performing) industries in the Nordic countries; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)



Note: CI on the vertical axis stands for confidence intervals. Grey lines demonstrate the point estimates of the Nordic averages.

Figure 5.8 Average informational processing skills proficiency in selected (low performing) industries in the Nordic countries; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)

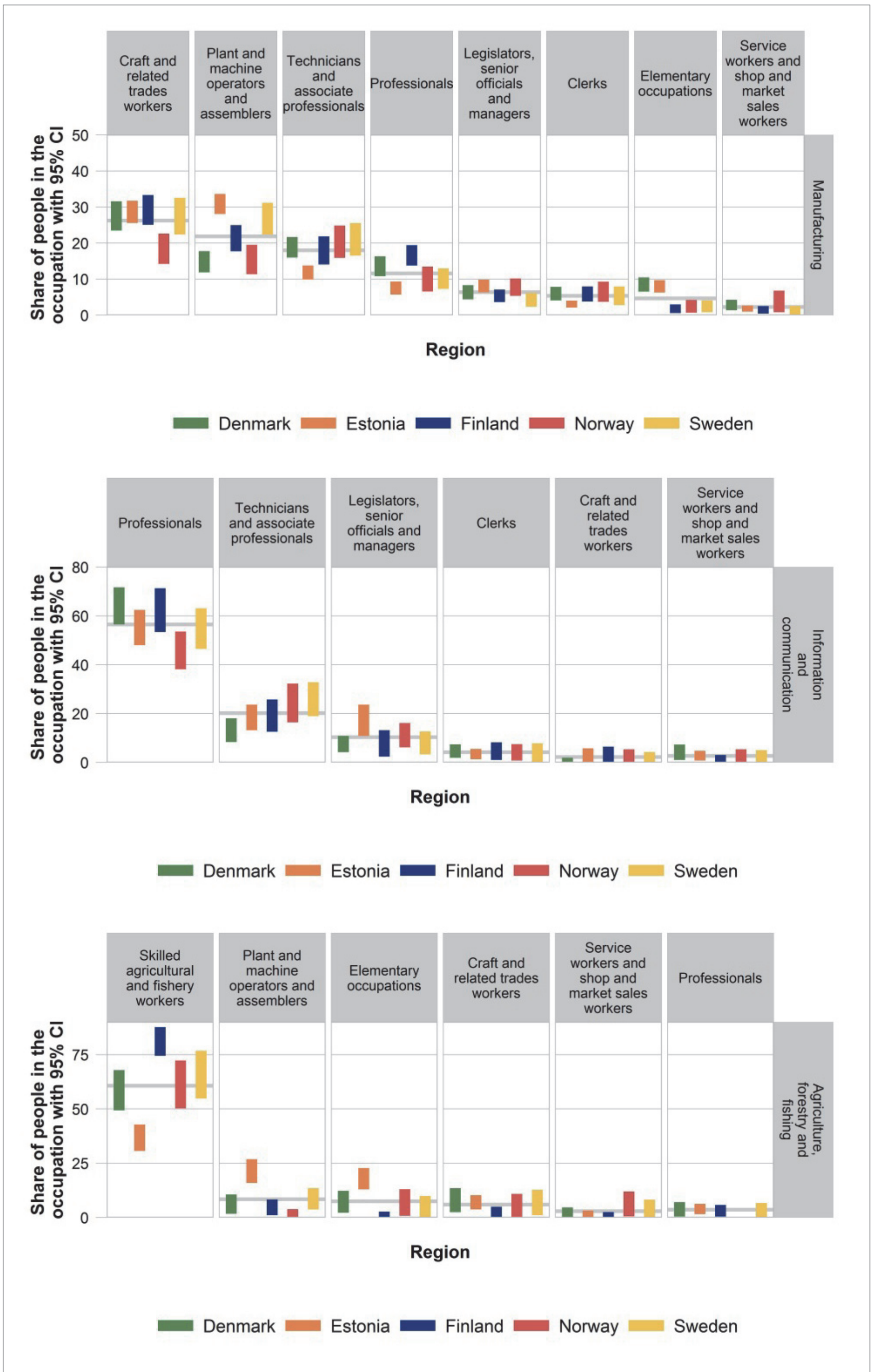


Note: CI on the vertical axis stands for confidence intervals. Grey lines demonstrate the point estimates of the Nordic averages.

5.5 Distribution of skills across occupations

The preceding section showed that skills in the Nordic countries seem to be concentrated in some, but the industry perspective is rather wide. The figures below show that the occupational structure inside an industry can vary quite a bit, country by country. For example, in most of the Nordic countries, about 30% of people working in manufacturing are employed as craft and related trades workers; however, the same category amounts to about 20% in Norway. The shares of plant and machine operators and assemblers inside this industry vary across the Nordic countries as well, ranging from approximately 15% to 30%, see the top panel of Figure 5.9. For illustrative purposes, the corresponding differences in the industries of ICT and agriculture are shown in Figure 5.9 as well (cf. the middle and bottom panels). With the background knowledge provided by Figure 5.9, we proceed to compare the skills associated with different occupations.

Figure 5.9 Occupational composition in different industries; average percentages with 95% confidence intervals



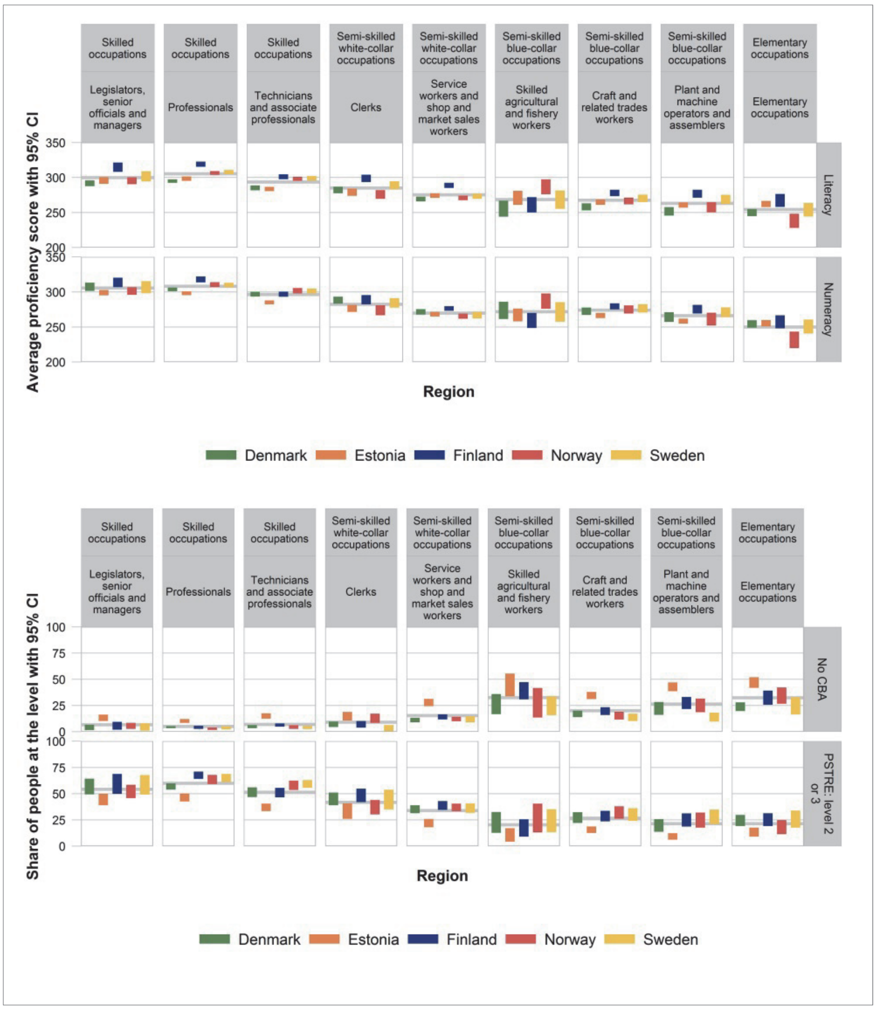
Note: CI on the vertical axis stands for confidence intervals. Grey lines demonstrate the point estimates of the Nordic averages.

The general impression conveyed by Figure 5.10 is that the more skill intensive an occupation is, the higher the average skill proficiency of the people holding the position. While this observation might seem almost tautological, Figure 5.10 shows that for some occupations, in some countries, the spread in skills is quite substantial (e.g., see problem-solving skills among legislators, senior officials, and managers, especially in Finland).

Looking across occupations, we find that the Nordic average for legislators, senior officials, and managers in literacy is 305.7 points, whereas the corresponding average literacy of elementary workers is 254.3 points, leading to a difference of 51.4 points. The corresponding within-country occupational difference is the smallest in Estonia (36.9 points) and the largest in Norway (63.2 points).

Cross-country differences with respect to individual occupations are smaller, but still noticeable. The most homogeneous occupational category seems to be “technicians and associate professionals”. People employed in this occupational category in Estonia have an average literacy proficiency of 283.6 points. The highest average score for this occupational category is found in Finland, 301.1 points, implying a difference of 17.6 points. The most heterogeneous occupational category is “skilled agricultural and fishery workers”, for which the cross-country difference is as high as 31.2 points, literacy skills being the lowest in Denmark (255.5) and the highest in Norway (286.8). As the share of people employed in this occupational category is relatively small, the confidence intervals around the estimates are rather wide; see Figure 5.10. The cross country difference is almost as large in the case of “elementary workers”. This difference equals 29.1 points. With respect to this occupational category, Norway is an outlier; the Norwegians clearly score lower than the other Nordic countries.

Figure 5.10 Average literacy, numeracy, and problem-solving proficiency of Nordic workers employed in different occupations; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)



Note: CI on the vertical axis stands for confidence intervals. Grey lines demonstrate the point estimates of the Nordic average.

In most of the occupational categories, the Finns outperform their colleagues in the other Nordic countries. The Finnish advantage is most marked among service workers and shop and market sales workers (especially in literacy), and for legislators, senior officials and managers, and professionals. The advantage in problem-solving is statistically insignificant.

Regarding professionals, Denmark and Estonia score lower than the other Nordic countries in both literacy and numeracy. Estonian professionals, in addition, are doing worse in problem-solving as well.

Clerks in Estonia and Norway score below the clerks in the other countries in all the domains. When it comes to the plant and machine operators, rather large cross-country differences appear. While Finns score on top in literacy and numeracy, Estonians score below most of the others in numeracy and problem-solving. Swedes stand out because of the low share of people in this occupational category with no or very low computer skills or very low willingness to use computers. However, the share of good and very good problem solvers among Swedish plant and machine operators does not differ from the corresponding shares in Denmark, Finland, and Norway.

Estonia stands out because of low problem-solving skills in all the occupational categories. In particular, the shares of good problem-solvers are the lowest across the Nordic countries with respect to technicians and associate professionals; service workers and shop and market sales workers; craft and related trades workers; professionals; and plant and machine operators and assemblers.

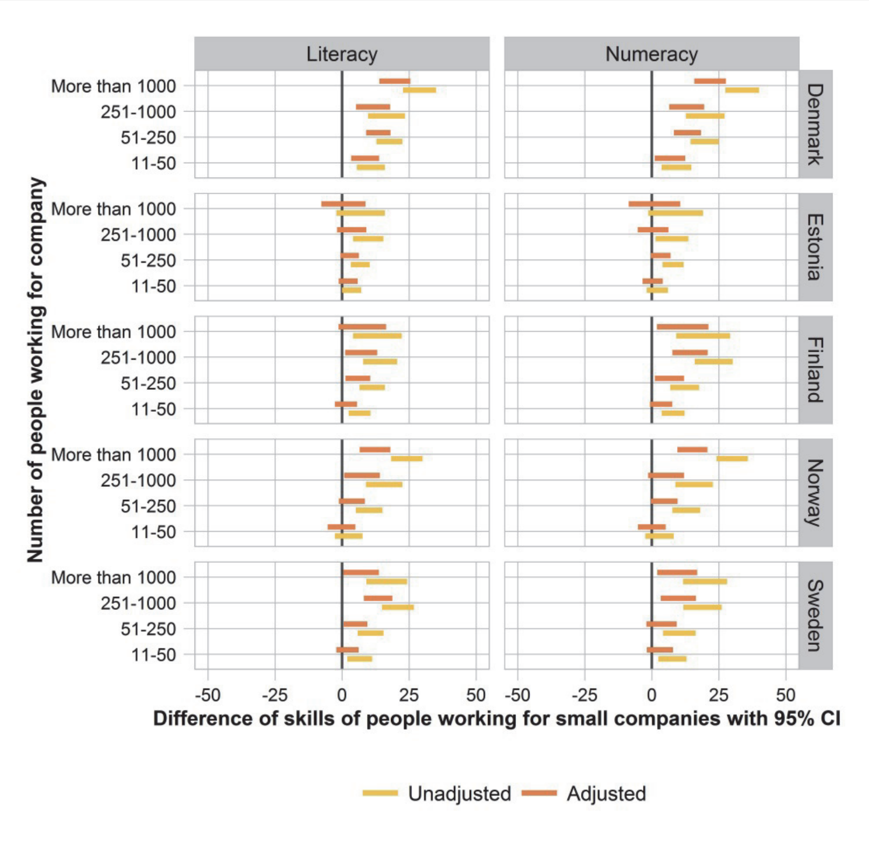
5.6 Skills of people in workplaces that differ with respect to size

Several studies have shown that larger companies contribute more to the training of their employees than smaller firms (e.g., see Bassanini *et al.*, 2007). This is because of the cost advantages of larger organisations. Larger firms might also be more attractive to highly skilled workers. Analyses based on PIAAC data also show that larger companies have more highly skilled workforces, but PIAAC does not enable one to say whether this is because larger companies attract more highly skilled people or because the larger companies contribute more to the development of the skills of their staff. Probably, both mechanisms matter, but identifying the direction of causality is beyond the scope of this chapter.

Regarding the association between literacy proficiency and workplace size, Figure 5.11 shows that the average literacy scores in workplaces with ten people or fewer is lower than the scores in larger workplaces. Compared to workplaces with at most ten employees, the score for workplaces with 11–50 employees is 6 points higher on average; for workplaces with 51–250 employees, the difference is 11.3 points higher; for workplaces with 251–1000 employees, 15.4 points; and for workplaces with more than 1,000 employees, 18 points. These results have been computed without any controls and are shown in Figure 5.11 by means of yellow bars. The differences are significant in most of the comparisons.

Adjusted results (orange bars) are also depicted in Figure 5.11. These confirm again that the literacy and numeracy skills are positively associated with the company's size. Estonia is the only country where, after controlling for age (quadratic), gender, and educational attainment, the differences between the people working in small and large workplaces turn insignificant. In Finland, Norway, and Sweden, the differences are insignificant in some of the comparisons but, overall, the positive relation is still evident.

Figure 5.11 Literacy and numeracy skills of people working in organisations of different sizes; mean of the difference between the selected and the reference category with 95% confidence intervals



Note: Reference category – people working for small companies (1–10 people). Adjusted results are controlled for age, age squared, gender, and educational attainment. CI on the vertical axis stands for confidence intervals. Black line marks the value of 0. Bars that cut the black line are statistically insignificant.

Results are similar (not shown) in the case of problem-solving in technology-rich environments, showing that there are more people performing at the highest levels (2 and 3) in the larger workplaces, compared to those with 1–10 employees. This is especially the case in Denmark, Norway, and Sweden. The share of those who refused to solve tasks using a computer or who did not do it because of lack of computer skills is lower in larger workplaces, in particular in Denmark and Finland.

5.7 Skills of Nordic entrepreneurs

The question of importance of human capital in entrepreneurial activity and success is somewhat controversial. Le (1999: 386) has said that one of the major theoretical determinants of self-employment is educational attainment, but several empirical studies have questioned this claim (see van der Sluis *et al*. 2004; Grilo and Thurik 2008). In addition, it might not be the level of education, but variety of skills obtained, that matters (Lazear 2004). As Lazear put it:

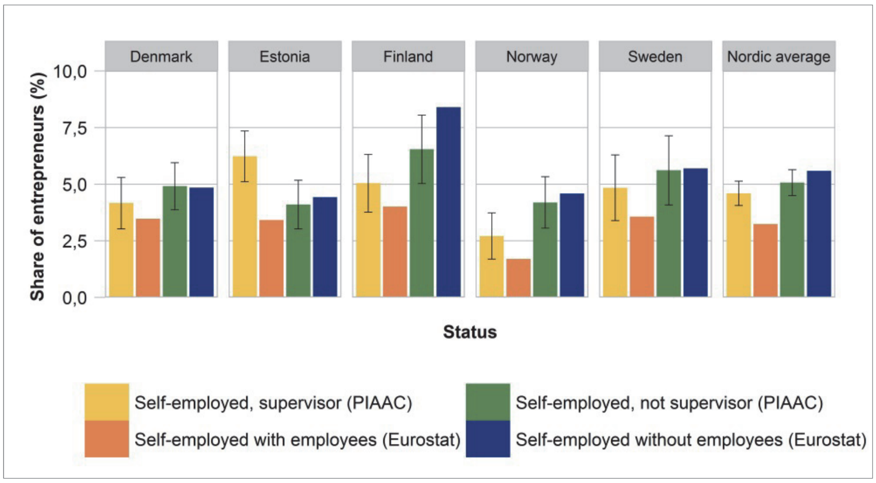
> "Although not necessarily superb at anything, entrepreneurs have to be sufficiently skilled in a variety of areas to put together the many ingredients required to create a successful business".

This subchapter investigates the associations between entrepreneurial activity and human capital, measured by information-processing skills. We examine the level of the key information-processing skills among Nordic entrepreneurs, in comparison with the other PIAAC countries. Even though many of the skills that entrepreneurs need for a successful business were not measured in PIAAC, scoring at least moderately in all the PIAAC skills could reflect one's ability to be able to learn things from very different domains in general.

According to PIAAC, 9.7% of people employed in the Nordic labour market are self-employed, whilst the same indicator in the other groups of countries (pool of non-Nordic EU members and countries outside the EU) is about 15%. The differences are smaller when taking a look at the more narrowly defined self-employed that also have employees–4.6% in the Nordic countries on average, 5.1% in the non-Nordic EU members, and 6.8% in the countries outside the EU.

A look at the representativeness of the PIAAC dataset with respect to the share of entrepreneurs in the Nordic countries shows that the PIAAC estimates seem to point to higher shares than do the corresponding indicators in the labour force surveys in terms of self-employed with employees[39] (see Figure 5.12). This does not necessarily show that the PIAAC sample is not representative. Indeed, it might be consistent with just the opposite – it has been said that labour force surveys might underestimate the actual number of entrepreneurs (OECD, 2011). In addition, Eurostat's data covers the age group 15–64, while the age range is 16–65 in PIAAC.

Figure 5.12 Average share of self-employed with and without employees according to the PIAAC data (with 95% CI) and Eurostat's Labour Force Survey



Note: In PIAAC the difference between self-employed people with and without employees is made based on the information about supervising other people's work. CI on the vertical axis stands for confidence intervals. Constructing the 95% confidence intervals was possible in the case of PIAAC data only. Source: PIAAC database (2013), Eurostat (2015).

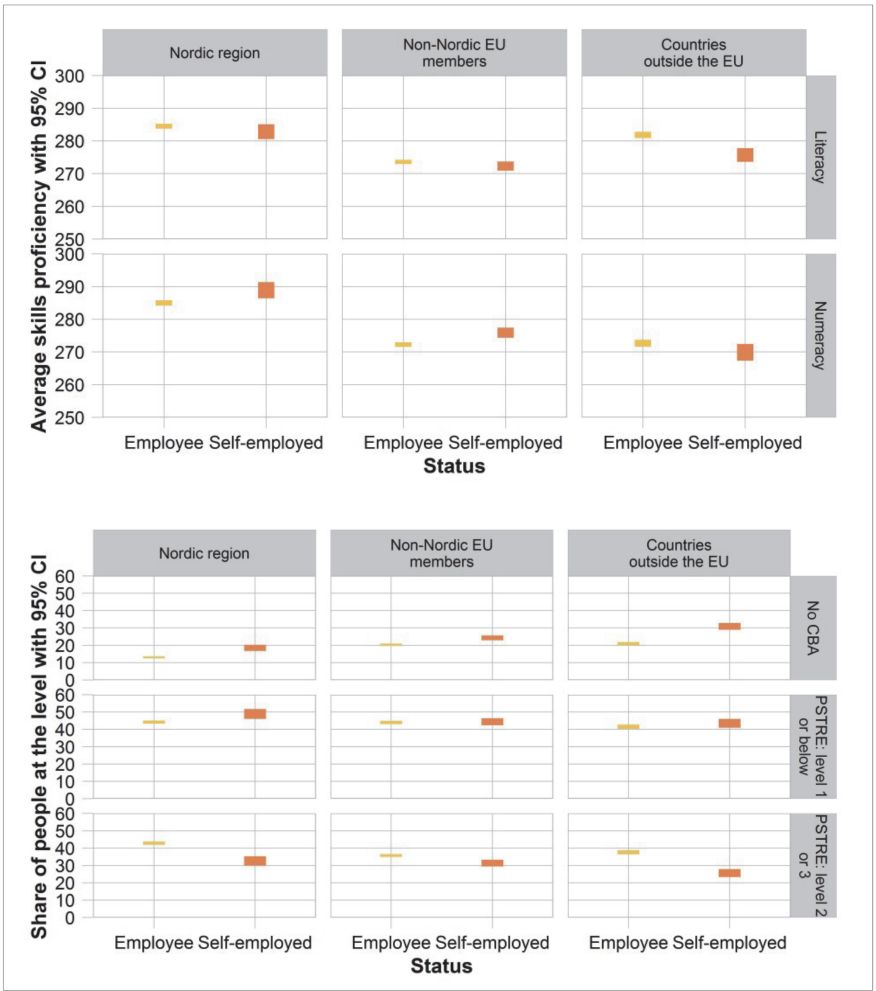
In the analysis of skills of self-employed people, we do not distinguish between self-employed people with and without employees, as the groups would be too small for comprehensive inferences. In addition, the average skills of people in the two groups do not differ much. According to the analysis not shown in the paper, the literacy and numeracy skills of self-employed people without employees are slightly more narrowly distributed in Estonia and Norway. In the rest of the Nordic countries the distribution among this group is somewhat wider than in

[39] Comparing the share of employers among the people aged 16–65 in PIAAC sample with the average share of employers aged 15–64 among all employed people in the same age bracket calculated based on the data from Eurostat. Numbers of employers (both with and without employees) and total number of employed people of the last two quarters of 2011 and the first quarter of 2012 (the approximate period of PIAAC data collection) were used for calculation the estimates based on Eurostat data.

the group of self-employed with employees. The differences in the means of the scores in the two groups are in many cases insignificant.

The international comparison shows that just like employees, entrepreneurs in the pools of Nordic countries outperform the self-employed in the other pools of countries. In the Nordic region entrepreneurs have an average literacy score of 282.8 and an average numeracy score of 288.9 points; see Figure 5.13. The corresponding scores in the pool of non-Nordic EU countries are 10.5 and 13 points lower and in the countries outside the EU 7.1 and 19 points lower, respectively. The Nordic entrepreneurs stand out in terms of their problem-solving skills in technology-rich environments as well. The share of entrepreneurs performing at the highest levels of problem-solving (level 2 or 3) is 32.6% in the Nordic region. Among the entrepreneurs from the non-Nordic countries, 29.6% reached these levels on average. The share of entrepreneurs who did not solve tasks on computer (either because of a lack of experience using computers, insufficient skills using a computer, or for some other reasons, such as fear) was 18.5% in the Nordic area, whereas the same indicator among all non-Nordic countries was 26.3%. The share of entrepreneurs with problem-solving skills at level 1 or below is higher among the Nordic entrepreneurs than the others, balancing out the smaller share of those who did not solve tasks on computers at all.

Figure 5.13 Average literacy and numeracy proficiency of employees and self-employed and the share of people at different problem-solving levels in different pools of countries; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)

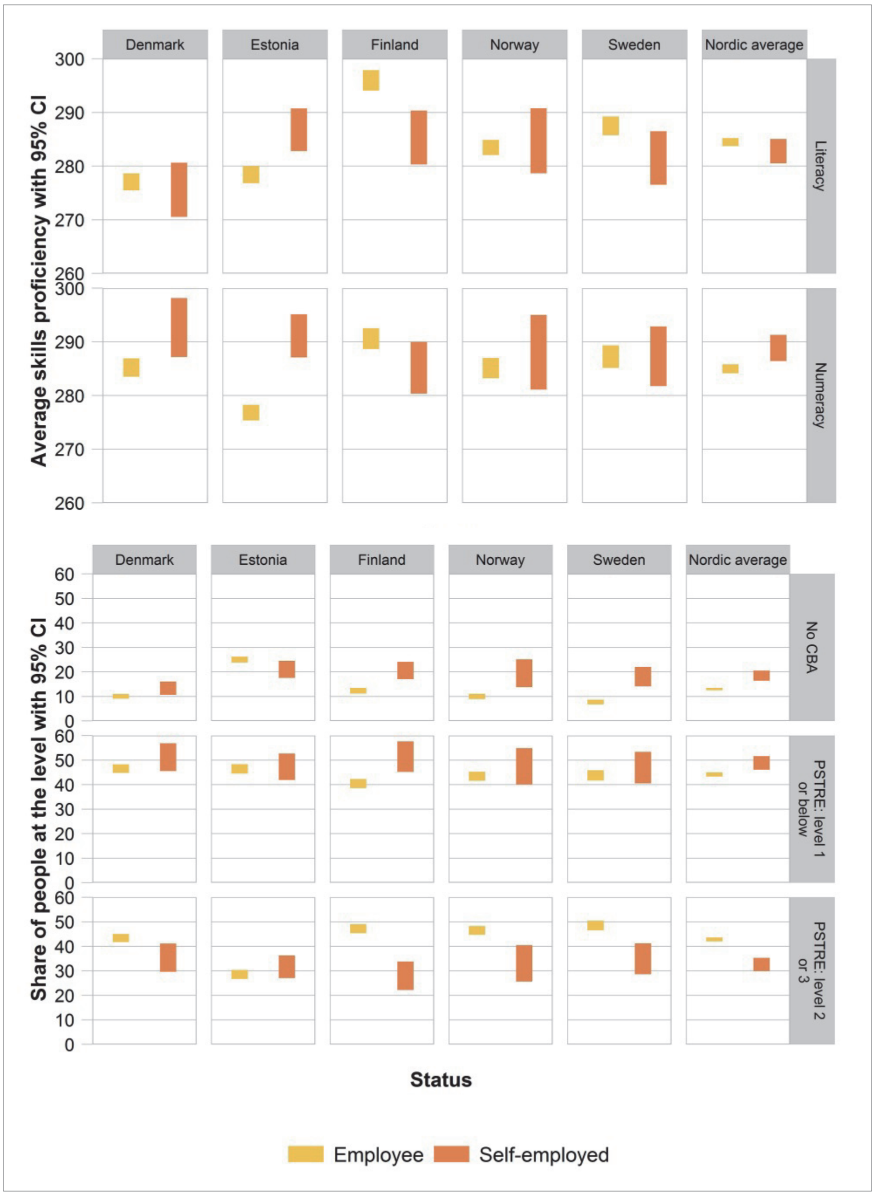


Note: In addition to Australia, Cyprus, and Russia, which are excluded from all of the analyses in the chapter, Italy, Spain, and France are excluded from the pool of non-Nordic EU members in the lower panel because problem-solving skills were not measured in these countries. CI on the vertical axis stands for confidence intervals.

The results indicate that Nordic entrepreneurs have a relatively large advantage over entrepreneurs in other countries when it comes to information-processing skills. Their advantage in literacy can be translated into 1.3 years of schooling and the advantage in numeracy into two years of schooling, on average. In terms of problem-solving in technology-rich environments, the Nordic entrepreneurs demonstrate higher readiness for computer use, but the share of those performing at the top levels is not much higher than in the pool of other countries. However, the fact that the willingness to use computers is higher has a value of its own; one will not improve one's skills unless being open to using the facilities of ICT.

The comparison of skills of employees and the self-employed shows that the average literacy score is higher among employees than among the self-employed in all of the pools of countries, and the same is true for the share of people at high problem-solving levels. Employers outperform employees on average only in numeracy (no other background variables are controlled for in this analysis) with the exceptions of the countries outside the EU where the advantage is in favour of employees.

Figure 5.14 Average literacy and numeracy proficiency of employees and the self-employed, and the share of people at different problem-solving levels in the Nordic countries; means with 95% confidence intervals (top panel) and average percentages with 95% confidence intervals (lower panel)



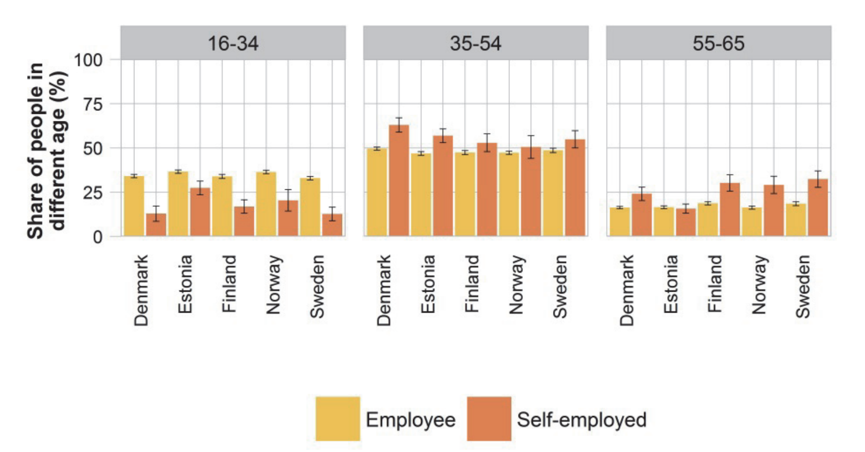
Note: In addition to Australia, Cyprus, and Russia, which are excluded from all of the analyses in the chapter, Italy, Spain, and France are excluded from the pool of non-Nordic EU members in the lower panel because problem-solving skills were not measured in these countries. CI on the vertical axis stands for confidence intervals.

A closer look at the Nordic results shows that the differences in skills across countries are bigger in the case of employees, demonstrating the relatively larger homogeneity of entrepreneurs in the region; see Figure 5.14. Even though the comparison of point estimates would lead to differences in the skills of employers as large as 11.2 points in literacy and 7.5 points in numeracy, the differences are statistically insignificant. Across country comparison shows that while Danish entrepreneurs have slightly lower literacy skills on average than in several other Nordic countries, their readiness of using computers seems to be higher than in the other Nordic countries. Apart from these differences the information-processing skills of the Nordic entrepreneurs are similar across the countries.

The comparison of information-processing skills of employees and the self-employed shows a more versatile pattern across the Nordic countries. Self-employed people tend to have higher numeracy skills on average than employees, but the difference is statistically significant only in Denmark (difference is equal to 7.5 points), Estonia (14.3 points), and the pool of Nordic countries on average (3.9 points). In Norway and Sweden, the difference is statistically insignificant. In Finland and Sweden, employee's literacy proficiency is on average higher than that of self-employed individuals. The advantage of employees is 10.6 and 6 points, respectively. In Estonia, self-employed people have better literacy skills, exceeding the average score of employees by 10.6 points. The differences cannot be identified in Denmark and Norway.

The analysis of problem-solving skills reveals an advantage to employees. In the Scandinavian countries, the share of people at the level of 2 or 3 on problem-solving scale is clearly higher among employees, exceeding the same indicator among self-employed by 19.2 percentage points (pp) in Finland, 13.5 pp in Sweden, 13.4 pp in Norway, and 8 pp in Denmark. In Estonia, there are more people with high problem-solving skills among entrepreneurs (but the difference is not significant). A similar discrepancy between Estonia and the rest of the countries appears when comparing the share of people who for one reason or another did not solve tasks using a computer. This share is higher among employees in Estonia, while in the rest of the countries employees were relatively more willing to take the computer-based assessment than entrepreneurs (see figure 5.14). Such differences can be explained by the age compositions of the two groups of people. As shown on figure 5.15, there are clearly more entrepreneurs in Estonia aged 16–34 than in the rest of the countries, while the share of entrepreneurs aged 55–65 is smaller in Estonia.

Figure 5.15 Age composition of employees and entrepreneurs in the Nordic countries, average percentages with 95% confidence intervals

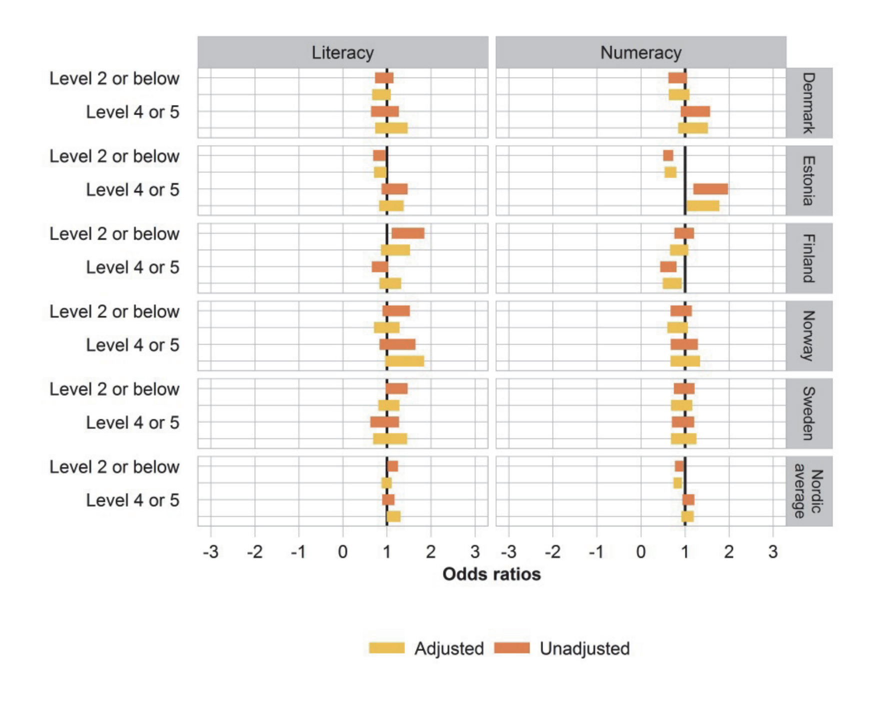


Note: CI on the vertical axis stands for confidence intervals.

All in all, the Nordic entrepreneurs seem to be very similar across the countries, but their skills differ quite a bit from the skills of employees in the respective countries. The entrepreneurs lag behind employees, especially in the case of problem-solving. This disadvantage can be explained with the age distribution of entrepreneurs and employees. Finland seems to be the country where the share of talents in problem-solving is most clearly concentrated to employees.

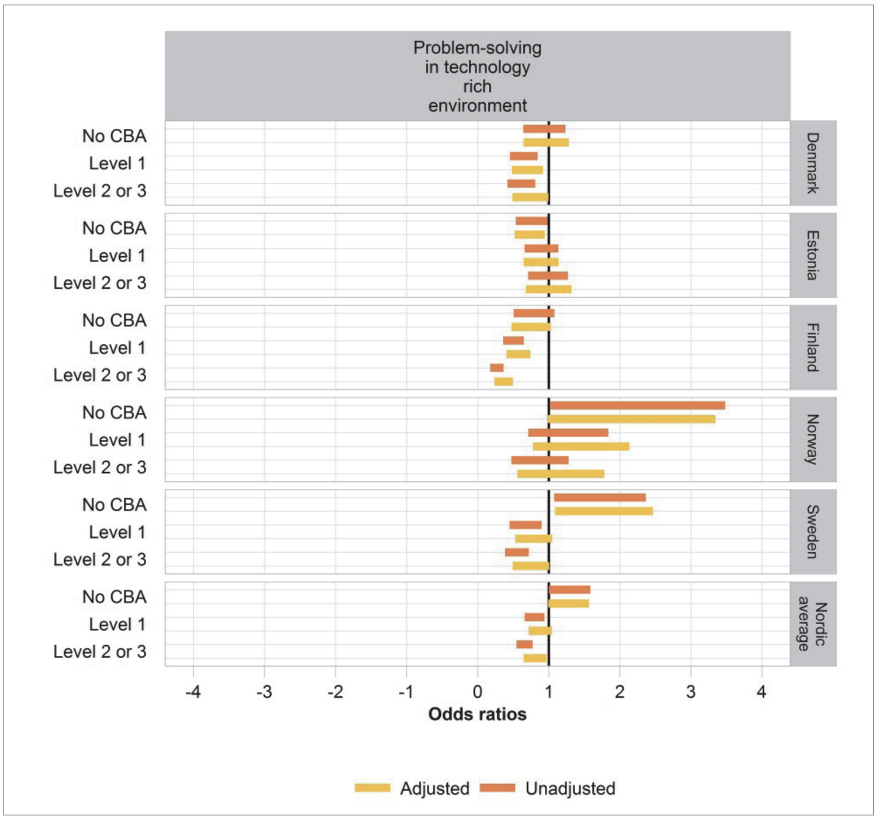
Inspired by the Lazear's hypothesis, a logistic regression analysis was run for testing the association between different levels of skills on one's probability of being an entrepreneur. The unadjusted as well as adjusted analyses controlling for a minor set of background information (age, gender, and educational attainment) were run. The results (Figures 5.16 and 5.17) confirm that the likelihood of being an entrepreneur does not differ much among the people with different skill levels. Figure 5.16 shows that people with low literacy and numeracy skills living in Estonia are less likely to be entrepreneurs when compared to the people with medium levels of the skills. People at high levels of the skills are at the same time slightly more likely to be entrepreneurs. In Finland, people with the highest skills in numeracy seem to be less likely to use their skills for self-employment. These are the only statistically significant associations and the rather small absolute values of the odds ratios, even in these cases, imply that the information-processing skills measured in PIAAC do not seem to be related to the fact, whether one is an entrepreneur or not, in most of the Nordic region. Low levels of literacy and numeracy skills seem to be barriers to becoming an entrepreneur only in Estonia. A high level of skills compared to the medium level at the same times does not contribute much to the likelihood of becoming an entrepreneur.

Figure 5.16 Odds ratios describing the effect of literacy and numeracy proficiency on probability of being an entrepreneur



Note: Reference category – level 3. In both of the cases (literacy and numeracy), the effect of having low level of skills (levels 2 or lower) compared to having a medium level of skills (level 3) and having a high level of skills (levels 4 and 5) compared to having a medium level of skills on the probability of being an entrepreneur is analysed. Adjusted differences are controlled for age, gender, and educational attainment. CI on the vertical axis stands for confidence intervals. Black line marks the value of 1. Bars that cut the black line are statistically insignificant.

Figure 5.17 Odds ratios describing the effect of problem-solving proficiency on probability of being an entrepreneur



Note: Reference category – very basic problem-solving skills (below level 1). The effects of no problem-solving skills ("No CBA") compared to having the very basic problem-solving skills (below level 1), having problem-solving skills at the level 1 compared to having the very basic problem-solving skills, and having very good problem-solving skills (level 2 or 3) compared to having problem-solving skills below level 1 on the probability of being an entrepreneur are analysed. Adjusted differences are controlled for age, gender and educational attainment. CI on the vertical axis stands for confidence intervals. Black line marks the value of 1. Bars that cut the black line are statistically insignificant.

Findings are similar when analysing the probability of being an entrepreneur, depending on one's proficiency in problem-solving in technology-rich environments. The adjusted analysis reveals that in Denmark, the probability of being an entrepreneur is slightly smaller among the people with high levels of problem-solving skills (level 2 or 3) and among those scoring at level 1 than among the people with the very basic problem-solving skills only (below level 1, reference category). The picture is similar, but more magnified, in Finland. In Estonia, the picture is rather the opposite. Whereas those who cannot or are not willing to use computers are less likely employed as entrepreneurs, there are no differences among people with higher levels of problem-solving skills. In Sweden, those with no problem-solving skills are slightly more likely to be entrepreneurs. However, the magnitude of the statistically significant effects is rather small. The most important finding in relation to Lazear's framework is the fact that higher levels of skills do not seem to increase the probability of being an entrepreneur based on the PIAAC data either. Those with very good levels of skills in one domain or another can probably became good specialists in their fields and sell their knowledge to entrepreneurs by working for them. The limitations of the analysis in terms of number of observations and, hence, the small amount of background information included into the analysis have to be considered, though.

5.8 Conclusion

Skills are not only found to be related to higher chances of employment, but also the nature and intensity of jobs. In all of the Nordic countries, most of the people who are employed are employed full-time. The share of part-time workers varies from 8.9%–20.4% and is clearly gender-biased; the share of women among part-time workers is the highest in Norway and Sweden (above 75%). The analysis of the skills of part- and full-time workers shows that in Denmark and Norway the skills of part-time workers are significantly lower than the skills of full-time workers (for both men and women). In Sweden, the difference appears in the case of women only. In Estonia and Finland, where the share of part-time workers is the smallest, there is no statistically significant difference between part-time and full-time workers by gender.

These results might be explained in different ways. One might assume that the skills of part-time workers in Denmark and Norway (and in Sweden in relation to women) are below the skills of full-time workers, because the selection into employment is influenced by skills proficiency, such that the likelihood of obtaining a full-time job is increasing in skills proficiency. On the other hand, taking into account that skills proficiency is strongly related to the skill-use intensity, part-time workers in the aforementioned countries might have lower skill proficiencies because they have had less opportunities to use and develop their skills.

A closer look at the skills proficiency in different sectors revealed that Finns employed in either public or private sectors perform higher with respect to literacy than employed people in the corresponding sectors in the other Nordic countries. The advantage is smaller in numeracy and essentially non-existing in problem-solving. Estonians score below employees in the other Nordic countries with respect to problem solving in both the private and public sectors. Men employed in the public sector outperform their female colleagues in all of the Nordic countries in numeracy and problem-solving. Differences in literacy are smaller. When the results were broken down by age, it was found that while Finns on average outperform individuals from the other Nordic countries in many cases, they do not have an advantage over the others in either the public or private sector in the oldest age group (i.e., 55–65-year olds). In addition, in the youngest age group (16–24), Estonians employed in the public sector score as high as the Finns. In the youngest age group, the Estonian disadvantage with respect to problem-solving in technology-rich environments decreases as well (and disappears entirely in case of public sector employees). It was also shown that the Estonian older age groups seem to lag behind their Nordic peers by about a decade in problem-solving skills.

Analyses of the distributions of skills across industries showed that in the Nordic area the most highly skilled workforce is employed in the information and communication industry; professional, scientific, and technical activities; and financial and insurance activities. The skills are lowest in agriculture, forestry, and fishing; construction; and accommodation and food services. The high equality for which the Nordic countries are renowned does not hold across industries. The cross-industry differences are larger than 40 points when comparing the average skills in information and communication activities and agriculture, forestry, and fishing. Differences were found to be large inside industries as well. A country that others could use as a role model is Finland, with respect to professional, scientific, and technical activities; education; and wholesale and retail trade. Denmark might want to improve the skills of their people employed in the field of construction and Estonians in the field of manufacturing. All of the countries should think about improving the problem-solving skills in many of the industries; the analysis revealed that there are several industries in all of the countries where only half or even less of the employees have good or very good problem-solving skills.

The analysis of skills in different occupational categories showed quite some heterogeneity inside the Nordic region as well, but the main differences are related to Finland's advantage over the others in literacy (and in some cases in numeracy) and Estonia's disadvantage in problem-solving. The most heterogeneous occupational categories are "skilled agricultural and fishery workers" and "elementary workers"; the most homogeneous one "technicians and associate professionals".

The analysis of the skills and sizes of workplaces confirmed earlier studies that have shown both theoretically and empirically that bigger companies contribute more to the development of the skills of their workers. It might be due to their financial opportunities, but also more needs for staff with better skills. The PIAAC results demonstrated that people working for larger companies indeed have better skills (it holds true for literacy, numeracy, and problem-solving skills). The only country where the association turns insignificant when controlling for background factors is Estonia.

Finally, the skills of entrepreneurs were analysed. The results indicate that the Nordic entrepreneurs have a relatively large advantage over entrepreneurs in other country aggregates when it comes to information-processing skills. The advantage in literacy can be translated into 1.3 years of schooling and the advantage in numeracy into two years of schooling on average. In terms of problem-solving in technology-rich environments, the Nordic entrepreneurs demonstrate higher readiness for computer use, but the share of those performing at the top levels is not much larger than in the other country aggregates.

The comparison of skills of employees and entrepreneurs inside the Nordic region shows that the skills of Nordic entrepreneurs are more equally distributed across countries than are the skills of employees. Comparison of the skills among the two groups inside countries shows more varied patterns. In Denmark, Finland, Norway, and Sweden entrepreneurs are doing largely as well as employees or worse; the opposite is true in Estonia, where entrepreneurs are doing better on average. This might be explained by the age composition of the entrepreneurs in Estonia, where there are clearly more entrepreneurs aged 16–34 than in the rest of the countries.

The analyses inspired by the Lazear's (2004) hypothesis that instead of some very high skills, entrepreneurs need a wide scope of different skills, showed that there is no clear association between information-processing skills and the likelihood of being an entrepreneur in the Nordic area. A positive relationship can be identified only in Estonia, where lower numeracy skills were linked to lower and higher numeracy skills and to higher probability of being an entrepreneur. In Finland, the association between numeracy proficiency and the likelihood of being an entrepreneur was negative and weak. Findings are similar with respect to problem-solving.

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6. Adult education and training

Anders Rosdahl

This chapter deals with formal and non-formal education and training among the population aged 30–65 years. The participation is approximately 60% within the last 12 months in all countries except Estonia, where approximately 50% participated. Most adult education and training is job related and very much takes place during working hours and is useful for the job; employers very often cover a substantial part the costs. Different factors explain variations in frequency and duration of training. Non-employed persons and immigrants participate less often, but their training has a longer duration compared to employed persons and non-immigrants, respectively. Between one quarter (Denmark) and half (Estonia) of the employed persons feel that they need more training to cope well with their present duties at their workplace. It is argued that this is an indicator of a real discrepancy between competencies and job requirements. Between one quarter (Norway) and one third (the other countries) of the population aged 30–65 years had within the last 12 months wanted to participate in (further) training but did not. Both employer- and person-related reasons appear to be barriers for training. Age and educational level are among the most important factors explaining variations in behaviour and attitudes related to training. Key information-processing skills (literacy) are of limited importance. Overall, there are more similarities than differences between the five countries with respect to behaviour and attitudes related to adult education and training.

6.1 Introduction

Two types of adult education and training are dealt with in PIAAC. *Formal education* results in a qualification documented in some diploma or certificate approved by educational authorities in a country according to certain standards. Formal education gives authorised vocational/study competence. Formal education comes close to the concept of “education” in everyday language.

Non-formal education includes the following types of activities in PIAAC:

- Open or distance education.
- Organised sessions for on-the-job-training or training by supervisors or co-workers.
- Seminars or workshops.
- Other courses or private lessons.

Respondents in PIAAC were asked about participation in "formal education" and each of these four types of activities. If a respondent had participated in at least one of the four activities, the respondent was coded to have participated in "non-formal" education, which thus includes both job-relevant courses and other types. Non-formal education may therefore also be labelled "courses etc.", whereas formal education can simply be labelled "education".

The terminology in PIAAC was used for international comparative purposes. As systems for adult education and training are very different across countries, the consequence is that the PIAAC terminology does not correspond exactly to the adult education approach or system in any one country, including the Nordic countries.

The PIAAC respondents were asked separately about participation in formal and non-formal education within the last 12 months before the interview. In the analysis in this chapter, the respondents are divided into three categories: 1) Participated in formal education, 2) Participated in non-formal education, 3) No participation. Some of the persons in the first category also participated in one or more of the courses labelled "non-formal education". However, for simplicity, all persons having participated in formal education are placed in one category. A further reason behind this choice is that some of the non-formal activities (e.g., seminars and workshops) may be part of a formal education in which the respondent has been enrolled. Category 2 includes only persons having participated in non-formal education and training.

In this chapter, we will focus on the age group 30–65 years. This is done because the information on formal and non-formal education and training in PIAAC does not by itself tell whether the person participated in education/training within a country's basic youth education system or in the country's adult education and training measures.

6.2 Participation in adult education and training

About 60% of the population aged 30–65 in Denmark, Finland, Norway, and Sweden had participated in formal or non-formal education within the last 12 months. The proportion in Estonia was a little lower (about 50%); cf. table 6.1.

Table 6.1 Participation in formal and non-formal education and training within the last 12 months. Persons aged 30–65 years. Per cent

	Denmark	Estonia	Finland	Norway	Sweden
Formal	10.7	6.3	11.9	12.9	9.7
Non-formal	52.8	43.9	51.8	48.8	53.5
No participation	36.5	49.8	36.3	38.3	36.8
Total	100.0	100.0	100.0	100.0	100.0

6.3–12.9% participated in formal education. The 6.3% stems from Estonia, where 43.9% participated in non-formal education and training within the last 12 months. In the other countries, 48.8–52.8% participated in non-formal activities. Thus, most of the education and training activities among persons aged 30–65 years are what we here label non-formal. Participation in formal education is, of course, much more frequent among younger persons. For example, more than 95% of the 16–19 years olds have participated in formal education within the last 12 months. This proportion decreases clearly with increasing age.

Table 6.2 Participation in formal and non-formal education and training within the last 12 months. Persons aged 30–65 years basic school as their highest level of education. Per cent

	Denmark	Estonia	Finland	Norway	Sweden
Formal	5.0	3.2	3.4	6.3	6.5
Non-formal	36.9	21.8	28.6	32.6	32.9
No participation	58.1	75.0	68.1	61.2	60.7
Total	100.0	100.0	100.1	100.1	100.1

Table 6.2 includes only persons with basic (compulsory) school as their highest level of completed education. It appears that participation in both formal and non-formal education and training is much lower in this group than among the population as a whole; cf. table 6.1.

The participants were asked about their motives for participation: Did they participate for job related reasons? This meant participation aimed at acquiring qualifications relevant for the present or some future job or being better able to find a new job. It appeared that the vast majority participated for job-related reasons. Between 80 and 90% of the participants in formal education in Denmark, Finland, Norway, and Sweden reported that they participated for job-related reasons. The proportion in Estonia was a little lower (below 70%). Between 83% and 90% of the participants in non-formal education and training reported that their motive was job related.

6.2.1 Motives for participation in non-formal education and training

Participants in *non-formal* education and training were questioned in depth about their main job-related motives for participation. The question focused on the latest activity within the last 12 months. The percentage base for the following numbers include all participants, including the minority (10–17%) who did not participate for job-related reasons.

In Estonia, 4.7%; in Sweden, 8.3%; and in Norway, Denmark, and Finland, between 16.2 and 19.9% reported that they were “obliged to participate”. This may be assumed to primarily include persons for whom participation was a requirement from their employer. Seen from the opposite angle, this means that most participation in non-formal training and education is perceived as voluntary by the participants. The same may be assumed to be the case to an even higher extent for participation in formal education.

Only few participated in non-formal training and education, primarily to just “get a certificate”. The proportion was below 5%, except in Norway where 6.5% expressed this main motive.

Each of the following motives were also mentioned by few respondents:

- “To be less likely to lose my job” (less than 2%).
- “To increase my possibilities of getting a job, or changing a job or profession” (less than 4%).
- “To start my own business” (less than 1%).

The motives mentioned by most respondents were:

- “To do my job better and/or improve career prospects”.
- “To increase my knowledge or skills on a subject that interests me”.

One of these two motives were reported by 65.6% of the participants in Estonia, 63.8% in Sweden, 61.5% in Denmark, 61.1% in Norway, and 57.1% in Finland. Thus, these positive and intrinsic motives play a significant role for participation in non-formal adult education and training in the Nordic countries.

6.2.2 Education and training during working hours or outside working hours

For all five countries, it appears that participation during working hours is more frequent for non-formal than for formal training and education; cf. table 6.3, part A.

Denmark is the country where the largest proportion participates in *formal education* only or mostly during working hours (40.7%). It is also the only country in which this proportion is higher than the proportion participating only or mostly outside working hours (36.0%). Of the Norwegian participants, 38.6% in formal education participated only or mostly during working hours. The proportion is 32.0% in Estonia, 25.2 in Finland, and 18.2% in Sweden. Nearly one third of the Swedish participants did not have a job while they were participating. This proportion is lower in the other countries. Thus, there are relatively large differences between the countries in this respect.

The variation between countries is much less for *non-formal education*. About 70% or more of the participants in non-formal education participated only or mostly during their working hours, except in Estonia where the proportion was a little less than 60%. About 10% did not have a job at the time of participation. This proportion is approximately the same in the five countries. In Estonia, 28.9% of the participants participated mostly or only outside their working hours. This proportion is lower in the other four countries (between 14.6% in Denmark and 19.8% in Sweden).

Part B of table 6.3 includes only persons who had a job while they were participating in formal and non-formal education and training, respectively. The respondents should in the interview assess how useful the education/training was for that job.

Table 6.3 Participants in formal and non-formal education and training according to: A) Participation during working hours or outside working hours, B) How useful the training was for the respondent's job at that time. Persons aged 30–65 years. Per cent

	Denmark	Estonia	Finland	Norway	Sweden
A: Participation during working hours or outside working hours?					
Formal education					
Only or mostly during working hours	40.7	32.0	25.2	38.6	18.2
Only or mostly outside working hours	36.0	55.7	56.0	45.6	50.1
Did not have a job	23.3	12.4	18.8	15.9	31.7
Total	100.0	100.1	100.0	100.1	100.0
Non-formal education					
Only or mostly during working hours	74.9	59.2	72.7	76.3	70.5
Only or mostly outside working hours	14.6	28.9	17.9	16.5	19.8
Did not have a job	10.6	11.8	9.3	7.1	9.8
Total	100.1	99.9	99.9	99.9	100.1
B. How useful was the education/training for the respondent's job at that time?					
Formal education					
Not useful at all	8.7	8.5	8.8	8.1	17.6
Somewhat useful	4.9	20.8	10.2	7.8	17.8
Moderately usefull	10.4	30.7	22.9	19.2	23.0
Very useful	76.1	40.0	58.1	64.8	41.6
Total	100.1	100.0	100.0	99.9	100.0
Non-formal education					
Not useful at all	5.4	5.9	6.2	4.7	11.3
Somewhat useful	3.9	23.4	16.6	9.2	18.0
Moderately useful	12.6	41.3	29.8	31.8	37.1
Very useful	78.2	29.5	47.4	54.3	33.6
Total	100.1	100.1	100.0	100.0	100.0

Very few respondents reported that their formal or non-formal training activities were "not useful at all" for the job that they had at the time when they participated in the training. This proportion is below or much below 10% in all countries, except in Sweden where 17.6% (11.3%) assessed that their formal (non-formal) training were not useful at all for the job.

The "degree" of usefulness varies somewhat between countries. The Danish participants in *formal education* seem to have the most favourable view of the relevance of their formal training for their job. Of these participants, 76.1% think their training was "very useful" for their job and 10.4% said "moderately useful". Of the Norwegian participants, 64.8% found their formal training "very useful" and 19.2% "moderately useful". Number three in this ranking seems to be Finland, whereas Sweden and Estonia are at the bottom. In Sweden, 41.6% reported it "very" useful and 23.0% "moderately" useful.

It appears that countries in which large proportions participated during their working hours tend to be the countries where large proportions found their participation useful for the job they had at the time of the training. However, the correspondence is not perfect. A special analysis (not reported in numbers here) shows that there is generally (on average) a positive correlation between participation during working hours and perceived usefulness for the job. This correlation does not, however, exist for Estonia.

With respect to *non-formal education,* we find in all countries an expected strong, but not perfect, correlation between participation in non-formal education during working hours and assessed usefulness for the job.

With the exception of Denmark, participation in formal education is on average assessed to be more useful for the job than participation in non-formal training and education. However, the assessed usefulness for the job is still generally high in all countries for non-formal education as well. The rankings of countries according to assessment of usefulness of formal and non-formal education are similar.

Most participants in Denmark find their participation in non-formal training "very" useful for their jobs; Norwegian participants rate the usefulness somewhat lower, together with the Finnish participants. The Swedish and Estonian participants rank the usefulness of non-formal training least positive when measured in this way.

Thus, one conclusion is that nearly all participation in formal and non-formal training and education is job related. But there are differences between countries with respect to the degree to which this job relevance is from the point of view of the present job (while under training) or for some other possibly yet unknown job.

6.2.3 Do employers pay for training

A crucial theme in relation to adult education and training is the financing of such activity. The costs of training can be direct (e.g., payments to educational institutions or teachers/instructors) or indirect, that is so-called opportunity costs (e.g., the value of the production, which could have been made instead of using working time on training).

The PIAAC participants in training were asked the following question: Did an employer or prospective employer pay for tuition or registration, exam fees, expenses for books, or other costs associated with your participation? There was one question for formal education and one for the latest non-formal training activity. The response categories were in both cases:

- Yes, totally.
- Yes, partly.
- No, not at all.
- There were no such costs.
- No employer or prospective employer at that time.

The response to such a question depends on the knowledge and reflection of the respondent. The response category “There were no such costs” is, in a way, meaningless. There will always be costs associated with training. What the answer means is that the respondent does not experience such costs and this implies probably that at least the respondent himself/herself had not paid for the training.

If the respondent answers “Yes, totally”, we cannot be sure that the employer indeed paid everything. The employer may, for example, get some of the expenses reimbursed (e.g., via public adult education authorities). However, the answer probably means that the respondent himself/ herself made no payments associated with the training.

If the respondent answers “No, not at all”, the implication must be that the costs were paid by somebody else. This could be the respondent himself/herself or it could be public authorities of some kind.

Thus, it is quite difficult to give an unambiguous interpretation of the answers. However, one may say that the sum of “Yes, totally” and “There were no such costs” represents a minimum estimate of the proportion of the respondents who did themselves not make any payments associated with their participation in training (disregarding, for example, extra transportation costs).

The answers are seen in table 6.4. It appears that employers are more often involved in payments associated with non-formal compared to formal education and training, according to the PIAAC respondents. This probably reflects that formal education is more often produced and financed by public authorities than non-formal education.

Denmark is the country where most employers paid totally or partly for formal education (57.5%). The fraction was 48.8% for Norway, 29.3% for Finland, 26.6 for Sweden, and only 20.6 for Estonia. This corresponds to the ranking of countries according to perceived usefulness of the training for the job while under formal training; cf. previous section.

Approximately the same proportions (70% or more) in Denmark, Norway, and Finland report that an employer totally or partly paid the costs of non-formal training. The corresponding proportions are lower for Sweden and Estonia (about 60%). This ranking is similar to the ranking of countries according to perceived usefulness of the training for the job that the respondent had while training.

Table 6.4 Participants in formal and non-formal education and training according to whether an employer or prospective employer paid for the education/training (tuition or registration, exam fees, expenses for books, or other costs associated with the education/training). Persons aged 30–65 years. Percent

	Denmark	Estonia	Finland	Norway	Sweden
Did an employer or prospective employer pay for tuition or registration, exam fees, expenses for books, or other costs associated with your participation?					
Formal education					
Yes, totally	51.8	11.7	19.6	35.0	17.1
Yes, partly	5.7	8.9	9.7	13.8	9.5
No, not at all	27.7	63.0	53.0	44.9	50.8
There were no such costs	2.0	11.1	5.7	1.7	3.6
No employer or prospective employer	12.9	5.3	12.0	4.7	18.9
Total	100.1	100.0	100.0	100.1	99.9
Non-formal education					
Yes, totally	74.5	55.2	69.0	73.3	58.2
Yes, partly	2.4	4.7	1.5	2.8	2.7
No, not at all	10.2	17.6	13.6	12.4	18.1
There were no such costs	5.4	17.0	10.1	8.9	15.5
No employer or prospective employer	7.6	5.5	5.8	2.6	5.6
Total	100.1	100.0	100.0	100.0	100.1

This indicates that there is a positive correlation between an employer's involvement in paying for training and the usefulness of training for the job with this employer.

A special analysis (not documented with numbers here) demonstrates a strong positive association between employer payment and usefulness for the job. The association is strong both for formal and non-formal education and in each of the five countries.

6.3 Non-formal education and training

PIAAC includes relatively detailed information in particular on participation in non-formal education and training; cf. tables 6.5 and 6.6, which show the proportion participating (the first table) and duration of participation (the second table).

There are only small differences between men and women, both with respect to the proportion having participated and the duration of participation.

The participation rate seems to be least in the age-category of 50–65 years in all countries and the duration of participation is also relatively low in some countries in this age-category. The dominating, although not quite consistent, trend is that the volume of participation decreases with increasing age.

In all countries except Norway, it appears that immigrants participate less often in non-formal education and training than non-immigrants. This difference is large in particular in Denmark and Sweden. However, when immigrants participate in non-formal education and training, they do so for a longer time period than non-immigrants. The latter trend is clear in all five countries.

Table 6.5 Participation in non-formal education and training within the last 12 months. Per cent who have participated at least once. Persons aged 30–65 years

	Denmark	Estonia	Finland	Norway	Sweden
All	52.8	43.9	51.8	48.8	53.5
Gender					
Men	51.7	40.2	49.5	49.4	53.8
Women	54.0	47.1	54.0	48.3	53.1
Age					
30–39	54.4	49.8	54.2	54.8	54.1
40–49	56.4	48.7	60.3	53.4	59.7
50–65	49.3	36.6	45.7	41.3	49.0
Immigration status					
Non-immigrants	54.4	45.8	52.0	49.1	56.8
Immigrants	38.6	34.5	48.3	47.2	38.3
Highest level of education					
Compulsory school	36.9	21.8	28.6	32.6	32.9
Youth education	49.6	34.0	47.1	46.8	53.9
Higher education below master	61.9	49.9	60.4	55.6	62.2
Higher education, master or more	68.0	65.8	68.4	59.1	65.6
Employment status					
Employed	61.1	52.4	62.0	55.9	61.2
Unemployed	40.8	29.7	35.1	25.6	27.6
Not in labour force	20.9	10.7	16.7	12.9	18.0

Note: The category "Not in labour force" does not include persons currently enrolled in education.

Table 6.6 Participation in non-formal education and training within the last 12 months. Duration of participation for participants. Hours. Persons aged 30–65 years

	Denmark	Estonia	Finland	Norway	Sweden
All	81	73	63	73	69
Gender					
Men	78	72	60	74	75
Women	84	75	66	73	64
Age					
30–39	93	81	63	88	68
40–49	77	79	62	68	78
50–65	77	68	65	66	64
Immigration status					
Non-immigrants	75	69	56	62	63
Immigrants	161	108	229	160	113
Highest level of education					
Compulsory school	100	76	94	85	82
Youth education	77	74	54	69	69
Higher education below master	78	72	62	76	64
Higher education, master or more	81	75	71	66	73
Employment status					
Employed	71	66	55	64	63
Unemployed	239	167	190	295	261
Not in labour force	113	160	64	210	101

Note: The category "Not in labour force" does not include persons currently enrolled in education.

This type of pattern is also found when employed and non-employed people are compared. Employed people participate in all countries much more often in non-formal education and training than unemployed persons and persons outside the labour force (not including person currently enrolled in education). However, when persons without work participate, they do so for a longer time period. It seems that the duration of participation is high particularly among unemployed people compared to people in employment in all countries except Estonia.

Finally it appears from the tables that the rate of participation is highest among persons with higher education compared to persons with a lower level of education, but the duration tends to be somewhat higher among persons with the lowest level of education. This latter trend is, however, not totally consistent across countries.

An analysis of regression confirms most of the trends in tables 6.5 and 6.6. The independents variables in the analysis include the variables from the tables (gender, age, etc.), plus literacy skills.

Except for Norway and Sweden we find that women participate more often than men; there is no clear, significant gender difference with respect to duration of training.

Both frequency and duration of participation tend to be at the lowest level among elderly persons (above approximately 50 years), but the trend is weak in the statistical analysis and weaker than what appears from the two tables (6.5 and 6.6).

Except for Norway and Finland, immigrants participate less often in training than non-immigrants, but the duration of immigrant's training is in all countries much higher than the duration among non-immigrant participants. Unemployed persons participate less frequently than employed persons, but when they do so, they participate for relatively many hours.

With a higher level of education and a higher literacy score follows a higher probability of participation in non-formal education and training. However, there is no clear correlation between duration of training and educational level; and the correlation between literacy and duration is negative. That is, higher literacy is associated with a lower duration, other things being equal.

6.4 Perceived need for further competencies in current job

The employed PIAAC respondents were asked the following question: *Do you feel that you need further training in order to cope well with your present duties? The respondent could say "yes" or "no"*; cf. table 6.7.

It appears that 48.4% of the employed persons in Estonia feel that they need more qualifications to cope well with their present duties. The fraction is 35.8% in Sweden, 31.2% in Norway, 30.5% in Finland, and only 24.0% in Denmark.

Table 6.7 Per cent of employed persons who feel that they need further training to cope well with the duties in their job. Persons aged 30–65 years.

	Denmark	Estonia	Finland	Norway	Sweden
All	24.0	48.4	30.5	31.2	35.8
Gender					
Men	24.7	45.4	27.5	30.9	35.5
Women	23.3	51.0	33.5	31.7	36.0
Age					
30–39	26.1	50.7	32.4	32.6	39.9
40–49	25.7	51.2	31.0	33.9	37.4
50–65	20.8	43.8	28.7	27.9	31.5
Immigration status					
Non-immigrants	23.8	48.5	30.1	30.4	35.3
Immigrants	26.8	47.6	39.6	37.9	38.4
Highest level of education					
Compulsory school	21.0	34.7	18.7	24.4	30.3
Youth education	21.5	43.0	25.4	30.4	35.5
Higher edu., below master	28.3	52.7	35.7	34.6	38.8
Higher education, master	24.1	55.7	36.8	32.1	40.6
Occupation					
Wage earner	23.7	47.3	30.1	31.1	35.3
Selfemployed	26.7	56.0	33.6	33.5	39.1
Sector					
Private sector	21.5	45.4	28.2	29.5	34.2
Public sector	28.7	56.7	35.3	34.5	38.7

It may be tempting to interpret this by saying that the formal and non-formal adult education and training systems and measures in Estonia are less functional than the systems in the other countries, in particular in Denmark, from the point of view of being able to satisfy the demand for competencies in the labour market. It is interesting that Denmark is also the country where most participants in formal and non-formal education and training reported that the training was useful from the point of view of the job they had while they were under training (cf. above).

Estonia is one of the countries where largest fraction of participants in formal and non-formal education reported that the training was only to a limited extent useful for the job they had while training.

From table 6.7, it appears there are only small differences between men and women and between different age categories with respect to perceived need for further training. When there are differences, the trend is that women more often than men feel that they need further training and that younger persons (30–39 years) more often than elderly ones (50–65 years) feel that they need more training.

In Finland and Norway (but not in the other countries), it seems that immigrants a little more often than non-immigrants feel that they need more training. The variation according to educational level is rather small in Denmark, Norway, and Sweden, but more pronounced in Finland and Estonia. The trend is that the higher the level of education, the higher the proportion feeling that they need more training to cope well with the duties in their present jobs.

In some countries, in particular Estonia, it seems that the self-employed more often than wage earners feel that they need more training and that employees in the public sector somewhat more often have such a need compared to people employed in the private sector.

To understand variations in perceived need for more training in a present job, it may be useful to formulate the hypothesis that the subjective need assessment may be assumed to depend on the discrepancy between the person's qualifications and the job requirements.

To make a preliminary test of this hypothesis, we have conducted an analysis of regression of the perceived need for more training with the following independent variables: gender, age, immigration status, educational level, reading skills (literacy as measured in PIAAC), the amount of reading in the job, required educational level to get the job, and sector (private or public). We have conducted an analysis for which the country is included as an independent variable and separate analyses are included for each of the five countries.

The perceived need for further training is lower in the age categories for 45–65 years compared to the younger age categories. The perceived need is least frequent among persons aged 60–65. The perceived need tends to be lower among non-immigrants (only in Norway) than among immigrants, and among the highly educated and persons with good reading skills. Thus, other things being equal (in particular job-requirements), the probability that a person perceives a need for further training tends to increase in decreasing levels of competencies measured by age (experience), educational level, immigration status, and measured proficiency in literacy.

The analysis also shows that other things being equal (including the person's competencies), increasing mental job requirements in terms of required level of education and required amount of reading activity in the job tend to increase the probability that the person will perceive a need for further training.

These results can be interpreted as a support for the assumption that *the perceived need for further training to perform present job tasks well is an indicator for a real discrepancy between job requirements and the person's competencies,* not just a subjective idiosyncrasy.

The basic trends described above tend to be the same in the statistical analyses for each of the five countries. Seen on this background, it is interesting that a perceived need for further training is somewhat higher in the public sector than in private companies. This is so in all five countries (cf. also table 6.7).

Our statistical analysis also shows that the differences between the countries still exists in the same way as in table 6.7 when all the other variables mentioned above are taken into consideration in the analysis.

6.5 Want to participate in training/education?

After having answered several questions on participation in formal and non-formal education in the last 12 months, the PIAAC respondents were asked: *In the last 12 months, were there learning activities you wanted to participate in but did not?* The respondent was instructed to think of both formal education and other learning activities (non-formal education). The question was answered by both employed and persons without employment at the time of the interview. The result is shown in table 6.8.

Table 6.8 Per cent of the population aged 30–65 years wanting to participate in (further) training/ education

	Denmark	Estonia	Finland	Norway	Sweden
All	33.0	30.4	29.8	24.3	31.5
Gender					
Men	31.0	26.5	23.1	23.6	30.0
Women	35.4	33.8	36.4	25.0	33.1
Age					
30–39	42.2	38.3	38.9	31.7	39.1
40–49	35.8	32.1	33.7	27.7	36.0
50–65	25.4	23.8	22.6	16.6	23.9
Immigration status					
Non-immigrants	32.8	31.7	29.3	23.1	30.9
Immigrants	34.6	23.6	39.1	32.4	34.1
Highest level of education					
Compulsory school	21.4	15.0	13.3	13.0	19.7
Youth education	30.1	25.1	25.0	20.6	28.9
Higher education below master	39.7	35.4	36.8	29.2	37.0
Higher education, master or more	45.3	41.8	43.3	35.1	46.2
Employment status					
Employed	35.2	33.7	33.1	26.1	34.1
Unemployed	40.5	26.3	22.5	28.8	23.9
Not in labour force	20.1	15.5	16.3	12.0	18.7

Note: The category "Not in labour force" does not include persons currently enrolled in education.

About one third of the respondents in four of the countries answered "yes" to the question. The proportions are between 29.8% (Finland) and 33.0 (Denmark). The exception is Norway, where fewer people answered "yes" (24.3%).

In all countries, it appears that the higher the educational level and the lower the person's age, the larger the probability that the person wants (further) training. Persons in the labour force more often want (further) training than persons outside the labour force.

The differences between men and women are not consistent across countries. In Estonia and Finland, women more often want (further) training than men; there is no clear or substantial gender difference in the other countries. Immigrants more often want (further) training than non-immigrants in Finland and Norway. The opposite trend exists in Estonia. The differences between immigrants and non-immigrants are very small in this respect in Denmark and Sweden.

An analysis of regression confirms most of the trends in table 6.8. The independent variables are the variables from the table (gender, age, etc.) plus literacy skills.

Women more often than men want (further) training. However, the difference is not clearly significant in Norway and Sweden.

Lower age, a higher educational level, and better reading proficiency are associated with an increased probability to express an unfulfilled wish for (further) training. This is clear in all countries.

There is no difference between unemployed and employed people in this respect, except in Denmark where unemployed persons more often than employed persons desire (further) training. Persons outside the labour force (excluding persons current enrolled in education) are much less interested in (further) training than employed persons. This is so in all countries. Immigrants more often than non-immigrants desire (further) training, except in Estonia, where the opposite trend appears.

6.5.1 Barriers for training

The respondents who reported that they did not participate in some formal or non-formal training despite their wish to do so were led to the following question: *Which of the following reasons prevented you from participating in education and training? Please indicate the most important reason*. The respondents could choose from a list of eight reasons which are shown in table 6.9.

Table 6.9 Persons aged 30–65 years distributed according to reported main reason for not participating in (further) training/education within the last 12 months. Persons who wanted to participate in (further) education or learning activities but did not

Reason	Denmark	Estonia	Finland	Norway	Sweden
I did not have the prerequisites	1.9	4.0	1.9	2.1	3.1
Education and training was too expensive/ could not afford it	14.2	18.9	6.4	7.8	12.4
Lack of employer's support	15.7	7.5	10.1	12.2	9.2
I was too busy at work	27.3	29.4	30.4	33.5	26.3
The course or programme was offered at an inconvenient time or place	9.3	14.4	19.7	9.3	11.4
I did not have time because of child care or family responsibilities	5.5	9.6	9.6	11.6	13.1
Something unexpected came up that prevented me from taking education or training	4.7	2.7	3.6	6.1	4.3
Other	21.4	13.5	18.3	17.4	20.2
Total	100.0	100.0	100.0	100.0	100.0

The following two reasons can be interpreted as costs of training for the employer (presumably both opportunity costs and direct costs):

- Lack of employer's support.
- I was too busy at work.

Of the Swedish respondents, 35.5% gave answers in one of these two categories; the fraction in Estonia is nearly the same (36.9%); whereas the proportions in the other countries were higher: 40.5% in Finland, 43.0% in Denmark, and 45.7% in Norway. If we make the calculation only for persons employed at the time of the interview, these fractions increase by approximately 10%. This means that between 40 and 50% of the employed persons wanting more education/training in the Nordic countries refer to employer costs as the main reason for not participating.

Few refer to their own direct costs as the reason for not participating. The proportion is 18.9% in Estonia, 14.2% in Denmark, 12.4% in Sweden, 7.8% in Norway, and 6.4% in Finland. The numbers for employed persons are about the same.

The following answers may be interpreted as the respondent's own indirect costs (opportunity costs):

- The course or programme was offered at an inconvenient time or place.
- I had no time because of child care or family responsibilities.
- Something unexpected came up that prevented me from taking education or training.

In Denmark, 19.5% of the respondents chose one of these categories. The proportion in the other countries is between 26.7% (Estonia) and 32.9% (Finland). The numbers are approximately the same if we look only at employed persons.

Because of the relatively large proportions in the "Other" category (cf. table 6.8), it is difficult to draw very precise conclusions about the significance of person-related vs. employer-related reasons for not participating in (further) education/training, despite a wish to do so. On average, employer-related and person-related reasons seem to have a rather equal weight in these countries. Person-related reasons seem to have a somewhat larger significance compared to employer-related reasons in Estonia in particular, but also in Sweden. The two kinds of reasons seem to have about the same weight in Finland. The employer-related reasons seem most important in Denmark and Norway.

6.6 Summary

This chapter deals with formal and non-formal education and training among the population aged 30–65 years. The participation is about 60% within the last 12 months in the five countries, except Estonia, where about 50% participated.

Formal training is "education" in the traditional meaning of this term. Non-formal training includes the following types of learning activities:

- Open or distance education.
- Organised sessions for on-the-job-training or training by supervisors or co-workers
- Seminars or workshops.
- Other courses or private lessons.

Non-formal training is the absolute dominating type in the age interval 30–65 years.

Most adult education and training is job related; very much takes place during working hours and is useful for the job; employers very often cover a substantial part the costs. There is a positive association between the three latter aspects of training. With some simplification, the countries can be ranked in the following order according to these three criteria, which together are an indicator of employer-involvement in the training: Denmark, Norway, Finland, Sweden, and Estonia. Thus, on most dimensions, adult education and training in Denmark tend to be more related to the current job and employer than adult education and training in Estonia. The other countries tend to be placed in-between these two extremes.

About half of the population aged 30–65 years participated in non-formal training, except in Estonia, where 44% participated at least once within the last 12 months. The total duration of non-formal training (for the participants) within the last 12 months is estimated to be 63 hours in Finland, 69 hours in Sweden, 74 hours in Norway and Estonia, and 81 hours in Denmark. If we review frequency and duration together, we find that the average total volume of non-formal training per person per year in the age group 30–65 years is 43 hours in Denmark, 37 hours in Sweden, 36 hours in Norway, 33 hours in Finland, and 32 hours in Estonia.

Different factors explain variations in frequency and duration of non-formal training. Non-employed persons and immigrants participate less often, but their training has a longer duration compared to employed persons and non-immigrants, respectively. Elderly persons tend to participate less often and for fewer hours than younger persons. Women participate slightly more often than men, except in Norway and Sweden, but duration does not vary significantly with gender.

The probability of participation increases with educational level and literacy skills. However, the duration does not vary with educational level and decreases with increasing literacy proficiency.

Between one quarter (Denmark) and half (Estonia) of the employed persons feel that they need more training to cope well with their present duties at their workplace. It is argued that this is an indicator of a real discrepancy between competencies and job-requirements. It seems that the discrepancy is somewhat higher in the public sector than in the private sector in all countries.

Between one quarter (Norway) and one third (the other countries) of the population aged 30–65 years wanted to participate in (further) training in the last 12 months, but did not. Both employer- and person-related reasons appear to be barriers for training. Lower age and higher educational level and literacy proficiency increase the probability of expressing a wish to participate (further) in training.

Overall, there are more similarities than differences between the five countries with respect to behaviour, perceptions, and attitudes related to adult education and training.

7. Educational Attainment, Over-Education, and Key Information-Processing Skills in the Nordic Countries

Patrik Lind and Lotta Larsson

In this chapter, we use direct measures of skills and the time dimension available through register data in the Nordic PIAAC database to analyse flows out of over-education and skill-differences between over-educated and well-matched individuals. Because of partially missing data, only Denmark, Finland, and Sweden can be included in the main analyses. Measures of over-education differ in levels (but not in patterns) and we cannot know which measure gives the more accurate incidence. Over-education, as measured by Job Analysis, seems to be a persistent state for many individuals, at least in the short-run. Among those aged 23–32 at the time of PIAAC and who were classified as over-educated in 2008, at best barely half were well-matched in 2011. Among the older over-educated, as many as 70–80% were still classified as over-educated three years later. Neither unadjusted estimates of "initial" (i.e., close to the time of completed education) skill-differences between over-educated and well-matched individuals, nor estimates adjusted for education and gender, are significantly different from zero. That is in terms of key information-processing skills. This suggests that initial differences in key information-processing skills cannot explain over-education. However, potential differences in higher-order skills or non-cognitive skills could still possibly explain over-education.

7.1 Introduction

Over-education (i.e., having a higher attained educational level than one's job requires) has been a topic for debate as well as for research since at least the 1970s when Ivar Berg (1970) published "Education and Jobs: The Great Training Robbery" and Richard B. Freeman (1976) published "The Overeducated American", both analysing an increasing number of college graduates and a decrease in the returns to education.

Educational mismatch is only one aspect of the broad concept of labour market mismatch, which could refer to any type of mismatch between labour demand and labour supply. This could, for example, be a mismatch between the prerequisites of available jobs and the profiles of the unemployed, preventing a jobseeker-job-match to occur. The source of the mismatch could, for example, be the lack of job-specific skills or experience among the unemployed, or could be due to geographical immobility. Labour market mismatch could also refer to situations where individuals who do have jobs are not matched with the jobs for which they would be able to maximise their productivity. The cause of this situation could be similar to the previous example, but instead of preventing a jobseeker-job-match, it might instead induce a bad match. Educational mismatch, and thus over-education, falls within the latter definition.

Although the topic of educational mismatch has attracted its fair amount of research over the years, at least three important issues have not been dealt with satisfactorily: good and precise measures of educational requirements, good measures of skills in the analysis, and individual's transitions across different mismatch states over their careers. We cannot improve the measures of educational requirements, but we can look at the latter two, which will be the focus of this chapter.

The educational level of individuals has, in absence of other measures, often been used as a proxy for ability (or skills). Given this, any match between an individual and a job that does not require that individual's level of education is an inefficient allocation.[40] Even though this, admittedly, i) overlooks the possibility of a (mis)match by choice, ii) only considers efficient use of skills, and iii) ignores, for example, job satisfaction and well-being, the strongest assumption is probably that of homogeneity of skills within educational levels. To not have to rely on

[40] The intuition is that if a certain educational level represents a fixed level of skills, and if a lower educational level (i.e. a lower skill level) would be sufficient to do the job, a share of all the skills available is not being used, which would be an inefficient use of skills.

this strong assumption, a measure of individual's skills is needed. Fortunately, this is the core purpose of the PIAAC, and the 2012 Survey of Adult Skills provides measures of proficiency in literacy, numeracy, and problem-solving in technology-rich environments (PS in TRE).

There are two sides of educational mismatch: under-education and over-education. Under-educated individuals are employed in jobs for which their level of *formal* education is lower than what is usually required for those types of jobs. The over-educated, however, are employed in jobs for which their level of education is too high when considering what is usually required.

The literature on educational mismatch distinguishes between *genuine* and *apparent* over- and under-education. An apparently under-educated individual would have a lower educational level than the job usually requires, but still possess the necessary skills for the job. This would be gained, for example, through *informal* education (e.g., on-the-job training) or through experience. An apparently under-educated individual is not mismatched. This individual would only appear under-educated when comparing the level of formal education with formal educational requirements for the job. The opposite would be true for an apparently over-educated individual. While this individual's educational level would be higher than what is required for the job s/he has, either some job-specific skills or the necessary experience missing to be able to match with a higher-level job. These individuals would not appear as mismatched should the requirements be able to be defined in terms of total human capital and should total human capital be able to be measured.

If the estimated incidence of under-education would represent genuine under-education, this would mean that some companies have difficulties finding job applicants with the required skills. The implications of genuine under-education would be quite different from the implications of genuine over-education. Only in the case of genuine over-education is there a potential waste of available skills. A waste of available skills would be doubly costly because resources would be spent on gaining skills that later would not be used, and by this the actual production level would be lower than the potential production level.

In the context of the Nordic countries, where the share of each cohort attaining tertiary education has risen fast in the last two decades (Estonia exempted, see section 2), it is important to try to determine whether the measured over-education is genuine or apparent. If most of the over-educated individuals would be genuinely over-educated, the implication for society is a waste of the skills that it has spent resources building up. On the other hand, if over-education would, on large, only be apparent, it could mean that a non-negligible share of the post-elementary educated individuals pass through the educational systems without gaining the skills they should have gained. This would be the case if lack of skills can explain a larger share of the measured over-education than lack of experience can. In an attempt to see whether over-education in the Nordic countries is largely genuine or apparent, the focus of this chapter will be on over-education.

Admittedly, we will not be able to measure the total level of human capital, and we have no definitions of job requirements in terms of total human capital. The measures of skills, deemed necessary in today's labour market, that PIAAC provides will however allow us to add the level of skills of individuals to the analysis of over-education. Here it is important to remember that the skills measured in PIAAC are only basic skills in literacy, numeracy, and PS in TRE. Higher-order skills and non-cognitive skills, which are likely to be correlated with educational mismatch, are not measured.

Previous studies (e.g., de Grip *et al.*, 2008) have not had access to direct measures of skills, but with PIAAC and the Nordic PIAAC Database, there is good, direct measures of skills for representative samples of the populations in the Nordic countries. More than that, there is access to additional background information with a time-dimension through register data. This is unique and this chapter will provide a first look at what this additional information can demonstrate about whether over-education is short- or long-lasting for individuals. A constant and high incidence of genuine over-education would be much less costly for society if it is a short stage of individuals' careers, a stage that perhaps gives access to higher-level jobs in the future, than if genuinely over-educated individuals get stuck in jobs for which they are over-educated for a long period of time. The latter case might affect job-satisfaction and well-being, and could be a source of deterioration of skills due to non-use.

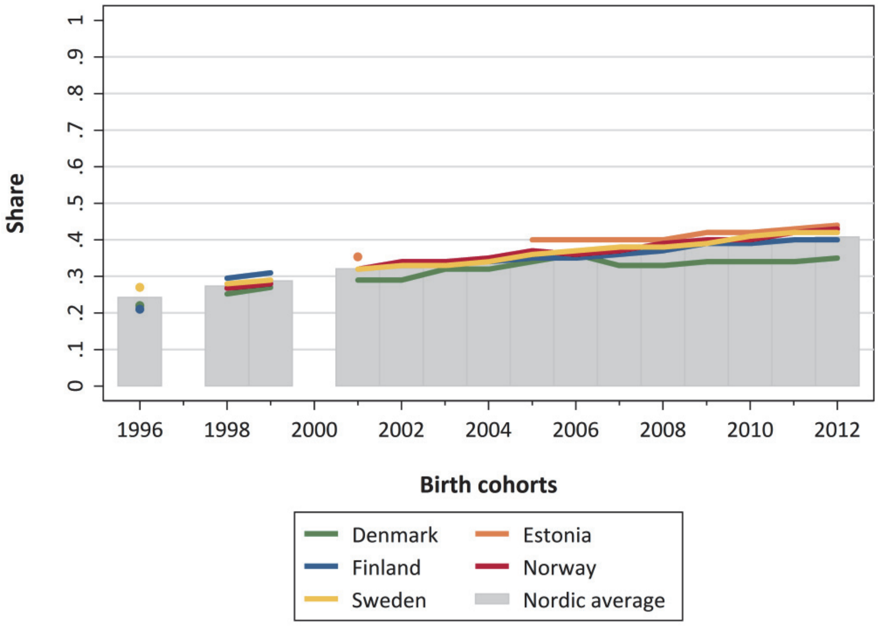
This chapter will describe the development of educational levels in the Nordic region and the development of the educational level in groups of occupations. Commonly used measures of over-education will be described and the incidence of over-education in the Nordic countries according to these measures will be presented. Further, over-education will be analysed at the individual level, looking at common characteristics of the over-educated and whether they are stuck in an over-educated state in the short-run. Finally, the skill differences between over-educated and well-matched will be analysed.

A final caveat that should be mentioned and remembered throughout this chapter is that the available objective definitions of job requirements in terms of educational levels are only available in four broad categories of occupations. The requirements of occupations within these categories might differ, but this will not be captured.

7.2 Development of the level of education in the Nordic region

The Nordic countries have a long tradition of promoting education and life-long learning and the Nordic population's average educational level has increased over time, notably since the end of the 1990s (see Figure 9.1. In 2012, the proportion of adults in the Nordic region aged 25–64 with at least a completed post-secondary, non-tertiary, qualification were on average 40% in the Nordic region. In 1996, the corresponding share was about 25% (see Figure 7.1).

Figure 7.1 Percentage aged 25–64 with at least a post-secondary non-tertiary degree, 1996–2012



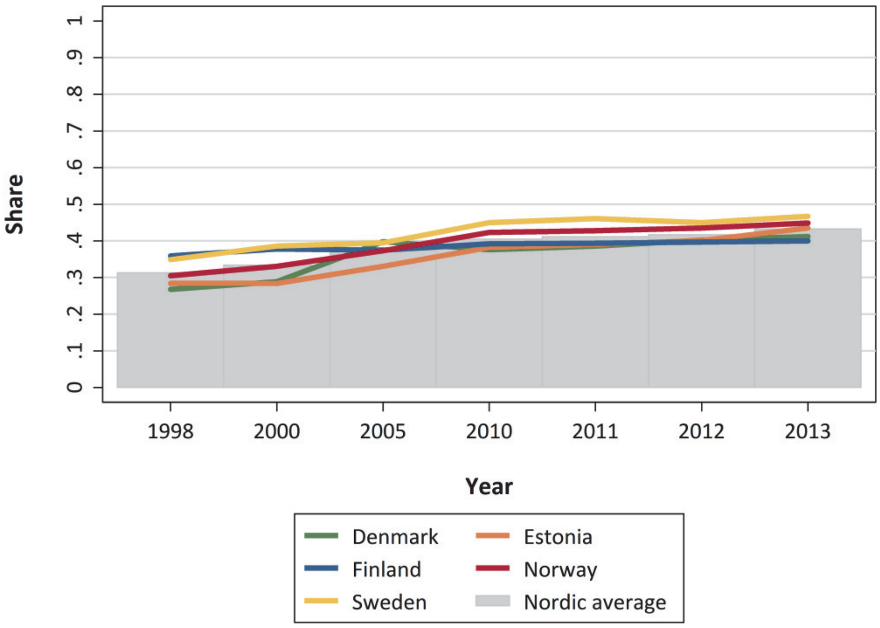
Source: OECD; Education at a Glance.

Note: Educational attainment is classified according to the International Standard Classification and Education (ISCED). The content of a specific level of education according to ISCED may differ between countries and even within countries over time between different age groups.

Looking at the younger generations in the Nordic countries, among those aged 25–34 in 2013, 43% had attained a tertiary qualification, compared to 31% among those aged 25–34 in 1998 (see Figure 7.2). The increase is most significant in Denmark, Estonia, and Norway, followed by Sweden. In Finland, the proportion of young people who have attained a university-level education has been relatively stable at a high level since 1998 and the increase over this time period is therefore more modest in Finland as compared to the other Nordic countries.

The increase in the average educational levels in the Nordic region could probably be explained by a combination of changes in the requirements for jobs, changes in (either or both) employers and individual's expectations and preferences towards educational levels, and extensions of accessibility to higher education. Changes of classifications of educational programs over time can also affect the proportions of people at a specific level of education at different points in time.

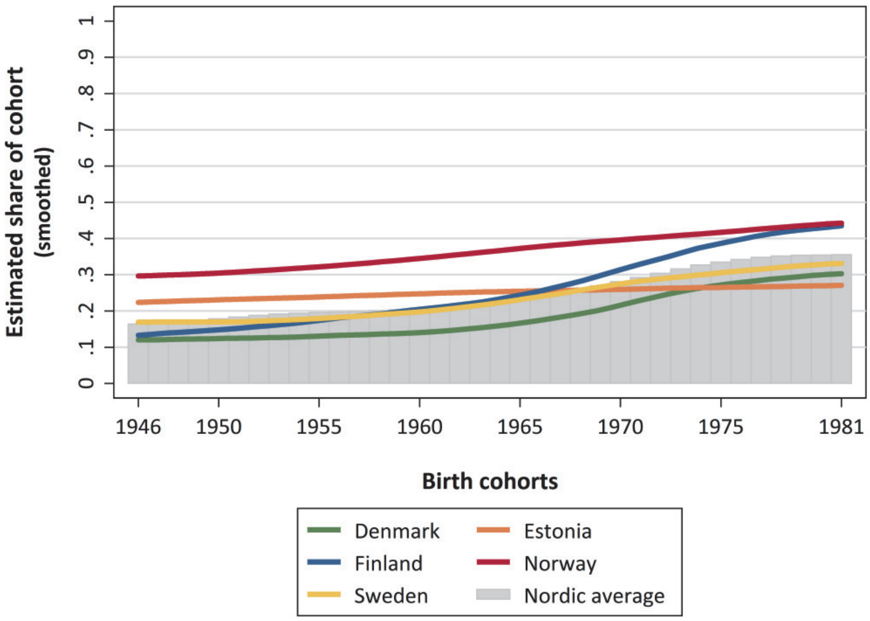
Figure 7.2 Percentage aged 25–34 with an attained tertiary degree, 1998–2013



Source: Eurostat; Labour Force Survey.

To see the development of educational levels in a longer perspective, we use PIAAC to estimate the shares of each cohort, born 1946–1981, who by the time of the PIAAC-survey (then aged 30–65) had attained a tertiary degree. The difference between the youngest cohort and the oldest cohort is most significant in Finland, followed by Denmark. In Norway, the shares of each cohort attaining tertiary degrees were already quite high among the oldest cohorts, while the share has increased substantially over cohorts in Finland from just below 15% among those born in 1946 to approximately 45% among those born in 1981. The shares in Finland and Norway among those born in 1981 are 10 percentage points or more above the shares in Sweden, Denmark, and Estonia (see Figure 7.3).

Figure 7.3 Estimated shares of each cohort attaining tertiary degrees



Note: Estimated population-weighted shares using PIAAC data, smoothed using kernel-weighted local polynomial regression (Stata's *lpoly* plot-type); 95% confidence intervals are not shown because it would make the figure hard to read.

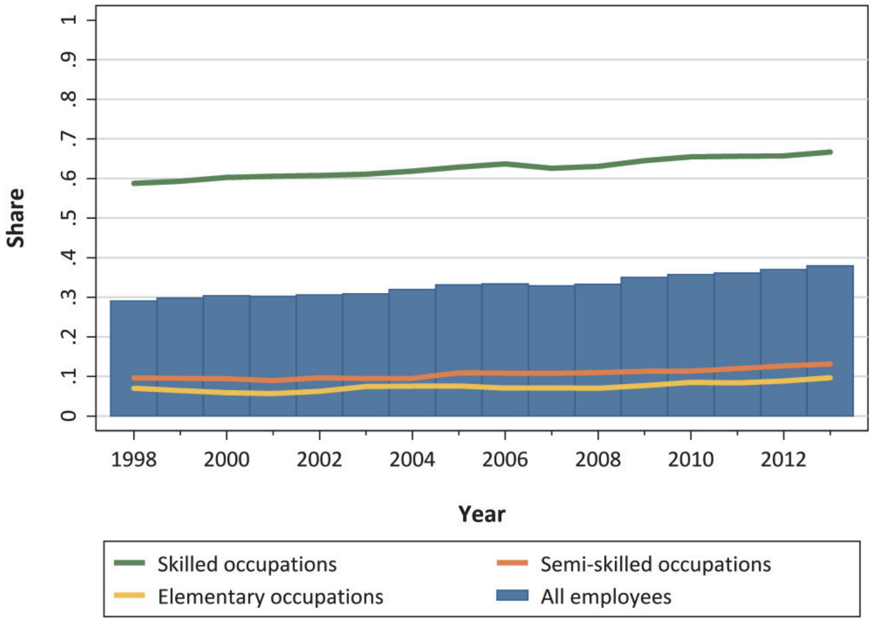
Given that the educational requirements of occupations do not increase at the same rate as, or at a higher rate than, the increase in the population's educational level, it is expected that the share of over-educated, as measured, would increase over time. The development of the educational levels in occupational groups is presented in the following section.

7.3 Development of the educational level in occupational groups in the Nordic region

It is known from the previous section that the level of education has increased over time in all Nordic countries. What would be ideal in this section would be to see how the educational *requirements* in occupations have developed over time (i.e., if the level of education needed to perform in a given occupation has changed over time due to, for example, technological change). Unfortunately, this information is not available. This section will instead describe how the levels of education among individuals employed in skilled, semi-skilled, or elementary occupations have changed over time in the Nordic region.

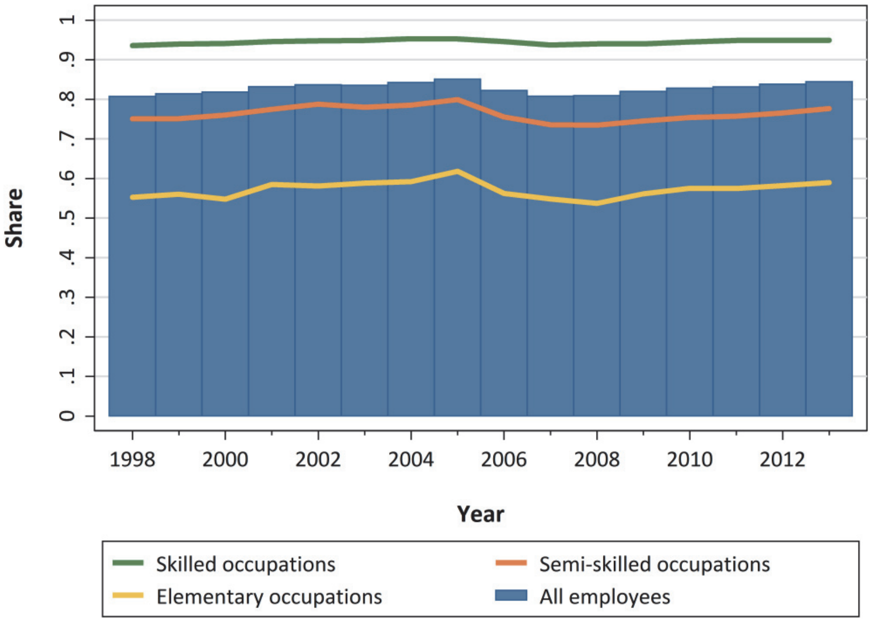
On average, in the Nordic region, the proportion of the employed workforce, aged 16–74, who have attained tertiary degrees, has increased from 29% in 1998 to 38% in 2013 (see Figure 7.4). For skilled occupations, the corresponding proportions were 59% in 1998 and 67% in 2013. The average proportions of individuals in the Nordic region with tertiary degrees are much lower for people working in semi-skilled or elementary occupations and has increased at a lower rate, but has still increased over the last 15 years. The proportions in each occupational group with at least an upper secondary degree have not increased to any higher extent over the same time period and have been stable at approximately 60% among individuals in elementary occupations to above 90% for individuals in skilled occupations (see Figure 7.5).

Figure 7.4 Nordic average; percentage of employed individuals aged 16–74 with tertiary degrees, by occupational groups, 1998–2013



Source: Eurostat; Labour Force Survey.

Figure 7.5. Nordic average; percentage of employed individuals aged 16–74 with at least upper secondary degrees, by occupational groups, 1998–2013

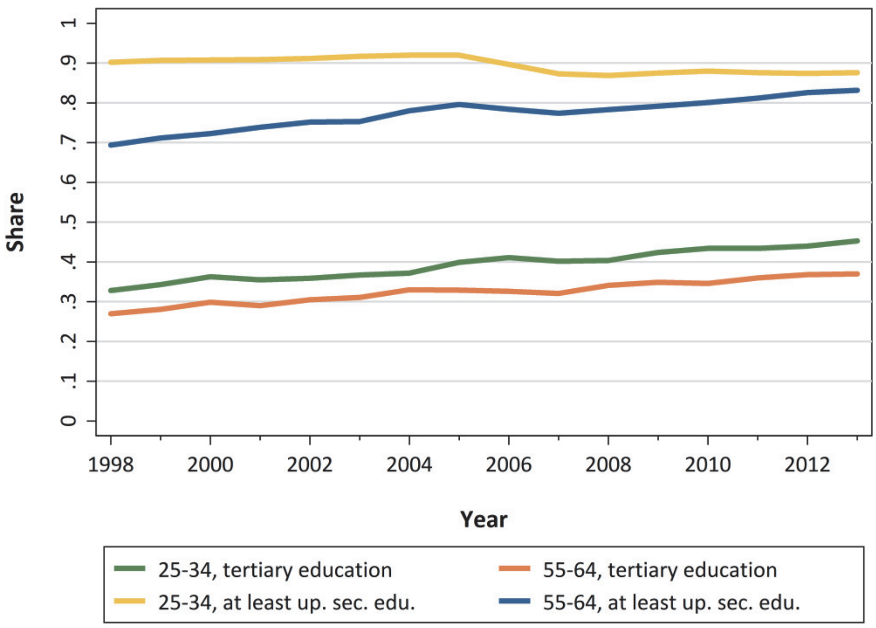


Source: Eurostat; Labour Force Survey.

When comparing educational attainment between employed individuals by age groups (see Figure 7.6), it is clear that those aged 25–34 years in the Nordic region have attained at least upper secondary education to a higher extent compared to those aged 55–64. The differences between the youngest age group and the oldest age group have, however, declined over time. In 1998, the difference was over 20 percentage points compared to less than 5 percentage points in 2013. The reason for this is mainly that the average proportion of the group of individuals aged 55–64 years in the Nordic region with at least upper-secondary education have increased substantially since 1998 as previous generations with lower educational levels flow out of the age group.

When looking at the average proportions of employed individuals in the Nordic region having attained tertiary degrees, the proportions have increased steadily over time for both the youngest and the oldest age groups. The proportions are, however, lower for the oldest age group compared to the youngest, and the differences between age groups have been on the same level since 1998.

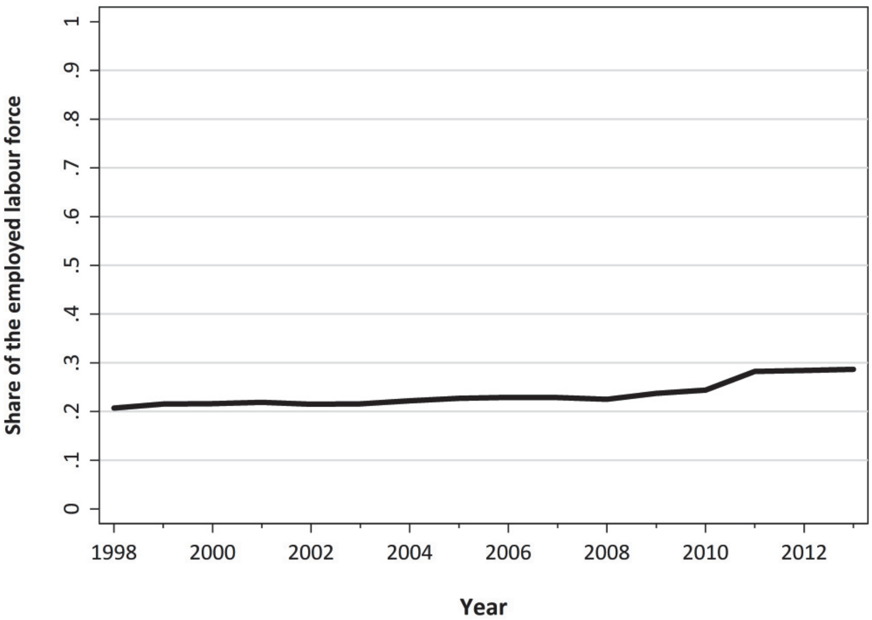
Figure 7.6 Nordic average; percentage of employed individuals by educational attainment and age, 1998–2013



Source: Eurostat; Labour Force Survey.

Even though we were not able to find information on the development of educational requirements in different occupations, we can at least say something related to this based on the information presented in figures 7.4 and 7.5. The level of education among those employed in elementary and semi-skilled jobs has not increased notably over the last decade and a half while it has increased among those employed in skilled occupations. However, this could be due to an increase in the job requirements for skilled occupations or an increase in the number of skilled jobs (or both), leading to a higher demand for labour in those types of occupations at the same time as an increase in the average educational level in the labour force. The relatively stable levels of education among employees in elementary and semi-skilled occupations would then be due to a relatively lower inflow of new employees in these occupations, leading to an average educational level closer to the level of education of the older cohorts of employees. As can be seen in Figure 7.7 there has actually been an increase in the skilled occupations share of the employed populations, on average, in the Nordic region, from 20% in 1998 to close to 30% in 2013.

Figure 7.7 Nordic average; skilled occupation's share of total employment, 1998–2013



Source: Eurostat; Labour Force Survey.

The last two sections have described the development of the educational levels over time and the development of educational levels in different occupational groups over time in the Nordic region. What we should take with us from this to the following sections is that while the educational level in the Nordic region has increased over the last decade and half, so has the skilled occupation's share of the total employment. It is thus not certain that the share of over-educated has increased over time. Whether that is the case or not we cannot answer with the data at hand as we can only categorise individuals into educational mismatch categories at the time of the PIAAC survey and by using register data for Finland, Denmark, and Sweden from 2011 and 2008, which do not allow a follow-up period of similar range as those shown in these two last sections. We will, however, in the remainder of this chapter look at over-education in cross-section and using the short, but important, time-dimension made available through the Nordic PIAAC database.

7.4 Commonly used measures

In this section, we list, describe, and discuss the measures of over-education, or rather the measures of required education, which forms the benchmark for educational mismatch, and, thus, over-education. We will also discuss the concept of skills mismatch and arguments for why we choose not to consider this measure of labour market mismatch.

7.4.1 Educational mismatch – measures of required education

Studies that have used different measures of job requirements in terms of educational levels have found widely differing incidences of educational mismatch. Studies on educational mismatch have reported estimated incidences of over-education varying between slightly more than 10% up to approximately as high as 40% of the workforce, depending on which measure was used (see, e.g., Leuven & Oosterbeek, 2011).

There are three measures of educational mismatch that have commonly been used. These measures are employee self-assessments (SA), job analysis (JA), and realised matches (RM). (ibid.).

When SA has been used to define the required level of education, the respondents have been asked about the level (or years) of education that is required for their jobs. This is then compared to their highest level (years) of completed education. There are two variants of how the question has been phrased: The first asks the respondents which level of education (if any) would be needed to *get* the respondent's job, if applying today. The second asks instead which level of education is needed (if any) to *do* the respondents job well. Both variants were asked in the background questionnaire (BQ) of PIAAC.[41] Unfortunately, the second variant was only a follow-up question. It asked the respondents to state whether the level they answered to the first question (education needed to get the job) was necessary, insufficient, or if a lower level would be enough to do the job satisfactorily. This means that it can only be used to adjust the classification based on the first question and to do so requires subjective interpretations of some combinations of answers. Therefore, only the first variant is considered in this chapter.

JA is based on comparing individual's highest attained educational level to the level of education usually required in the type of jobs that they have. The usually required educational level is based on job classification systems. In PIAAC, the system used is the *International Standard Classification of Occupations 2008* (ISCO–08). Each of the major occupational groups in ISCO has been assigned the level of education that recruitment experts consider to be the level that prospective employees usually would be required to have attained. As some of the major occupational groups share the same requirements, this leads to four categories of educational requirements; the ISCO skill levels.

The third commonly used measure, RM, sets the required level of education equal to the mean or modal educational level of the employees that share the same type of job.

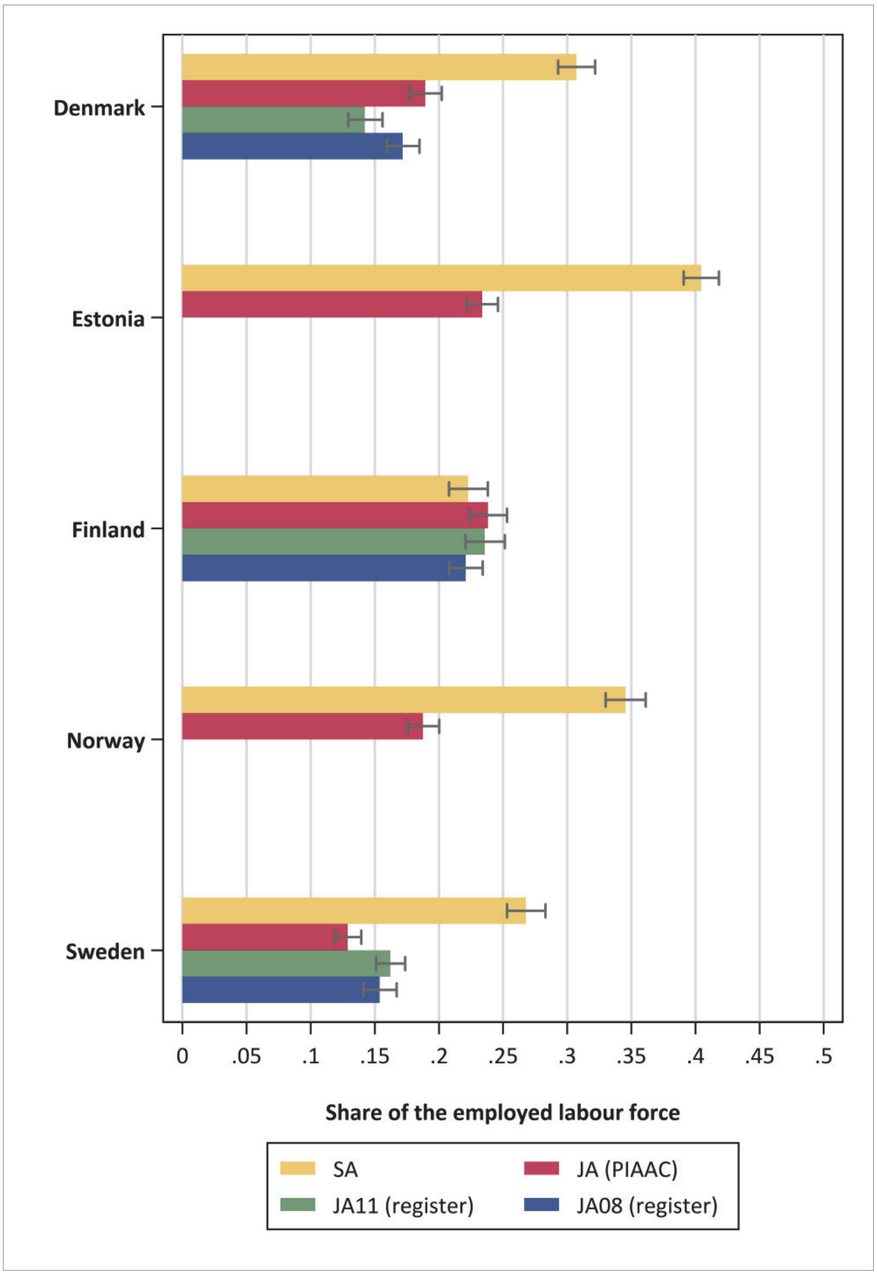
Each measure has its advantages and its disadvantages compared to the others. Whereas SA is based on information that will not show in statistics or is possible to include in a job classification system, it is purely subjective and relies on honest responses from informed respondents who also correctly interpret the question asked. Where JA offers objective views of well-informed recruitment experts, any job classification system will have to rely on categories of jobs, not necessarily homogenous in regard to educational requirements. The classification is also likely to be costly to produce and, thus, possibly not updated on pace with changes in the labour market. Of the three measures, RM is an easily available one, but also the least desired. While a job classification system might actually be perfectly up-to-date, a measure of educational mismatch based on RM

[41] Questions D_Q12a and D_Q12b.

will always, to some extent, pick up the requirements that were standard at the time when the most senior employees were hired. The quality of the measure will also depend on the size and the representativeness of the sample used for the estimation of the mean or mode. The country samples in PIAAC are representative samples of the populations at large; it need not necessarily be representative to the employees in a job category. Most likely it is not. Furthermore, the sample sizes in PIAAC, approximately 5000 respondents per country, would lead to quite broad categories of job types to ensure a sufficient number of observations per category. The measure based on RM will therefore not be considered in this chapter.

Common to all the methods are that they measure the required level of education for a job. These measures of educational requirements will then divide the workforce into the mismatch categories under-educated, adequately educated (or well-matched), and over-educated, depending on each individual's attained educational level and the required educational level of their job, according to each measure. It is clear that these measures will give different incidences of educational mismatch if they do not point to the same educational requirement for the same type of job.

Figure 7.8 Incidence of over-education in the Nordic countries, by measure



Note: Population-weighted shares with .95 confidence intervals. For Norway, 2008 register data is not available and register data on occupations is not available for Norway or Estonia. Self-employed are not included.

In Figure 7.8 the incidences of over-education in the Nordic countries according to SA, JA based on PIAAC data, and JA based on register data for the years 2008 and 2011 (for the same samples) are presented.

Figure 7.8 shows that the share of over-educated workers varies across countries and measures. The highest incidence of over-education is found in Estonia when measuring the educational requirements according to SA. The difference between SA and JA (PIAAC) is similar for Denmark, Norway, and Sweden, with the incidence when using JA being approximately 12–15 percentage points lower than when using the self-reported measure, SA. The same pattern is found in Estonia, but with a larger discrepancy, while the JA-incidence is slightly higher than SA in Finland, about 1.5 percentage points, but not statistically significant. The incidences presented in figure 1 are higher than the incidences presented in OECD (2013, ch. 4). This is because the incidences in this chapter are conditional on being employed and not self-employed, which the incidences presented in OECD (op. cit.) do not seem to be.

Using JA, we can measure over-education at any point in time as long as we have data on individual's educational level and their occupations. In the Nordic PIAAC database we, currently, have access to register data for the years 2008 and 2011 for Denmark, Estonia, Finland, and Sweden. For Norway, register data are available for 2011 only. For Estonia and Norway, however, no occupational information from registers is available and JA based on register data can therefore not be constructed for these two countries. As can be seen in Figure 7.8, the incidence of over-education, according to JA08 and JA11, is very similar. The difference between the incidences, based on these country samples, in 2008 compared to 2011 is less than 1 percentage point in Sweden, about 3 percentage points in Denmark, and between 1 and 3 percentage points in Finland. However, even if these shares, based on the same sample of individuals for each country, do not vary depending on which of the years we look at, this does not necessarily mean that *the same individuals* are classified as over-educated at both points in time. There might have been flows both in and out of the state of over-education at a similar rate, keeping the incidence close to constant over these years. Whether this is likely to be the case or not will be the focus of section 5 of this chapter.

It is known from previous studies (Leuven & Oosterbeek, op. cit.), and it can be seen in figure 7.8, that the incidence of over-education varies considerably depending on the measure used. A comparison of the measures available through PIAAC data only (Lind, 2014) have shown that even though the different measures of educational requirements differ in incidence levels, they tend to follow the same trends. Independent on the measure of required education used, over-education is more common among the younger employees, those who recently finished their highest education, and those who recently started to work for their employer. The slope of these incidences is sometimes quite moderate, but still found to be significantly negative with respect to age, years since graduation, and tenure. There is, therefore, a consistency across the measures, even though they differ in levels.

With this in mind, the rest of this chapter will only consider over-education according to JA. The reason for this is that this is the only measure of over-education that is available to us over time. The time dimension is also a unique feature of the Nordic PIAAC database as well as a very important aspect of the entire concept of over-education and, therefore, for policy.

7.4.2 What about skills mismatch?

In the introduction, we discussed that a potential problem with the concept of educational mismatch is that individuals who share the same educational level also, at least in broad terms, are assumed to possess the same level of skills. It is hard to argue that this would always hold. Instead it is likely that there is, at the very least, a certain degree of heterogeneity of skills within educational levels. Perhaps those who appear to be over-educated for their jobs are less skilled than others who share their educational level, but who also have managed to get jobs where this level is required (i.e., the adequately educated).

Based on SA (the level of education needed to *get* the job) and literacy skills, OECD (op. cit.) finds that in all countries in PIAAC, except for Finland, adequately educated individuals perform better than over-educated, adjusted for years of education, gender, age, and foreign-born status. In Finland, the difference is slightly positive in favour of the over-educated, but not significant (see OECD, op. cit, Figure 4.27(L)). These findings favour the hypothesis that those who appear to be over-educated belong to the lower end of the skill distribution within educational levels.

There have been studies of whether the over-educated also are over-skilled (see, e.g., Allen & van der Velden, 2001; and Chevalier, 2003). The

OECD (see Pellizzari & Fichen, 2013) has, for this purpose, proposed a measure of skills mismatch. In short, this skills-mismatch measure estimates the minimum and the maximum skill proficiency of employees in each job category who responded negatively to both these questions:[42]

> (i) Do you feel that you have the skills to cope with more demanding duties than those you are required to perform in your current job? (ii) Do you feel that you need further training in order to cope well with your present duties?

These individuals are considered well-matched in terms of their skills and the skill requirements of their jobs as they neither feel they underuse their skills nor need extra training.

Those with estimated skill proficiency above the maximum proficiency of the well-matched, in the same occupation, are considered overskilled and those who perform below the minimum proficiency of the well-matched are considered under-skilled for their jobs.

One major drawback of this measure is the few observations that will act as yardsticks to define who are mismatched in terms of skills. Even if the occupation categories are aggregated to the four ISCO skill levels (instead of more disaggregate categories using the ISCO major occupational groups), in some cases the estimates of the minimum and maximum proficiency of the well-matched, in the Nordic countries, will be based on as few as 16 observations. In the Nordic countries, this is mainly a result of as many as 70 to 80% of the employed responding that they have skills to cope with more demanding duties. There is reason to interpret, with caution, whether the responses to these questions actually measure skills mismatch.

Moreover, if we suspect that the job tasks within job categories are heterogeneous and that measurement errors in the skill estimates might exist, it is not clear how reliable the estimates of skill requirements are, especially when those estimates are based on small samples with unclear representativity to the job categories. The risk of ignoring heterogeneity within job categories is, of course, present also in the case of educational mismatch and the way this is measured using JA (and RM). However, when measuring over-education, using JA to define the educational requirements, the objective measurement of educational requirements has been defined by recruitment experts and outside the PIAAC sample. Other than this, the main reason for not considering skills mis-

[42] PIAAC BQ: F_Q07a and F_Q07b.

match in this chapter is that this measure is not available over time. Experience and age are two important parts of human capital and, thus, time should be of importance both when considering educational mismatch and skills mismatch. Only for educational mismatch is this possible with the data at hand.

However, for those interested in analyses on skills mismatch using PIAAC data, a first look at this is available in OECD (2013).

7.5 Over-education at the individual level

If the measured incidences of over-education do represent genuine over-education, and thus potentially constitute a socio-economical problem, it is important, not only to find the one true incidence, but also to know the characteristics of the over-educated and whether individuals, over time, move on to a well-matched job or not. When using the PIAAC BQ to describe the characteristics of the over-educated and the well-matched individuals, the over-educated are usually younger, have less work experience, and have less tenure at their current employer. In Estonia, on the other hand, the over-educated are usually older and more experienced than are the well-matched, all according to JA (PIAAC) and SA. Among the over-educated, the share of non-native speakers[43] is also usually higher. This follows what has previously been found (see, e.g., Leuven & Oosterbeek, op. cit.).

7.5.1 Persistence in the short-run

We will now turn to the main part of this section, namely transitions across mismatch states. The Nordic PIAAC database includes register data for both 2011 and 2008. This will allow us to categorise the respondents according to JA both in 2008 and 2011. Here we present the estimated shares of over-educated 2008, according to JA, who in 2011 moved on to a well-matched job. To reduce the risk of including individuals who worked extra while still in high-school, the sample is restricted to those who were at least 20 years old in 2008 and who, in PIAAC, reported at least three years of work experience (in PIAAC, that

[43] Non-native speakers are, in PIAAC, defined as those whose language most often spoken at home is another than the language of the tests in PIAAC

is years in which six months or more were spent working). As register data for 2008 is missing for Norway, and partly missing for Estonia, they will not be included in the remainder of this chapter, as 2008 data is central to most of the upcoming analyses.

Figure 7.9 shows the incidence of over-education according to JA in 2008, divided into ten-year age-groups. We can see that there is a tendency, somewhat weak in Denmark and Finland, but stronger in Sweden, that the share of over-educated is larger in the younger age-groups. The incidences per age-group resemble that of the aggregate country incidences, ranging between approximately 10% to 25% of each age-group.

Figure 7.9 Incidence of over-education 2008 by ten-year age groups

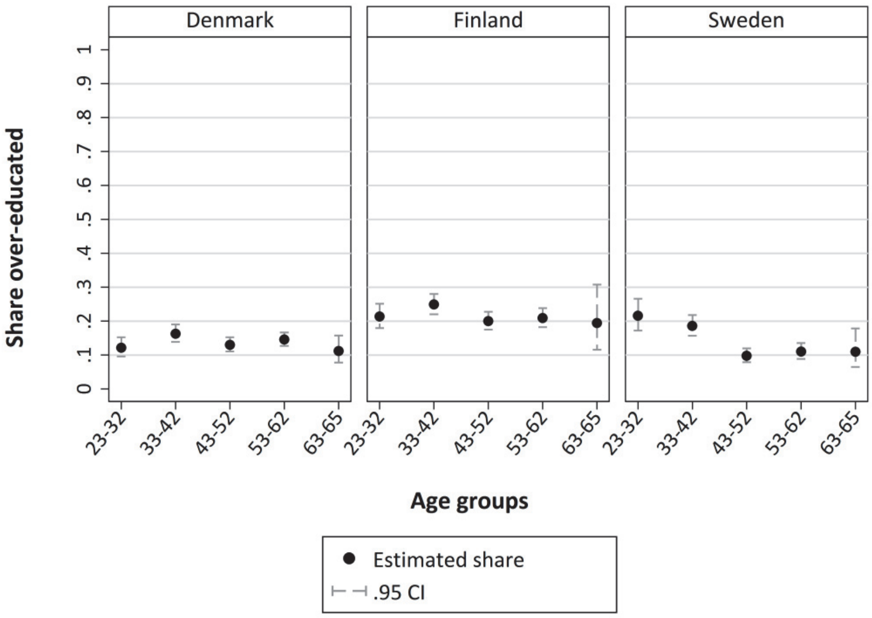
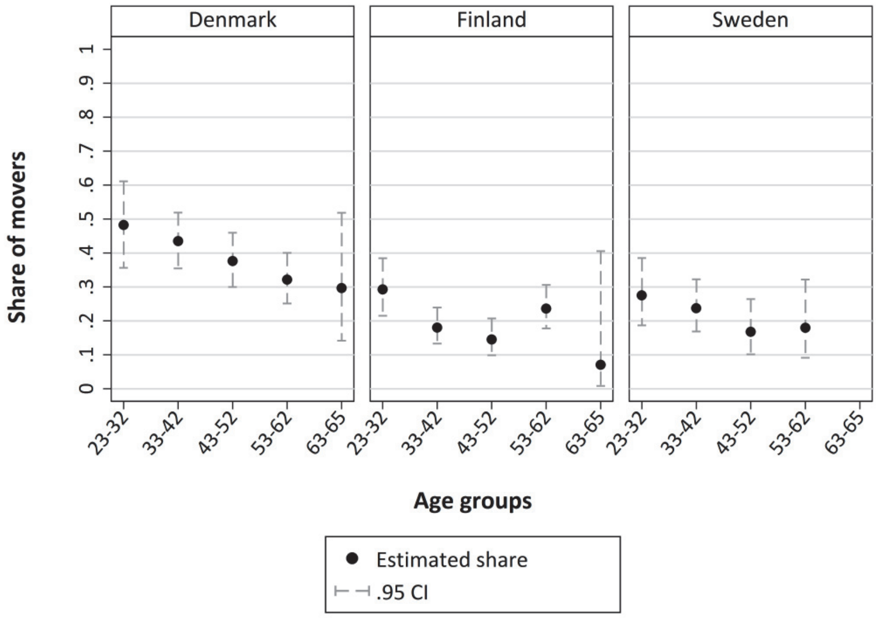


Figure 7.10 shows the shares of over-educated in 2008, per age-group, that by 2011 had managed to find a well-matched job.

Figure 7.10 Share of over-educated 2008 who were well-matched 2011, by ten-year age groups



The analysis sample for figure 7.10 only includes those who were over-educated in 2008 and, as this sample is further divided into groups, there are few observations in each cell. This is the reason for the large confidence intervals (compare the confidence intervals of figure 7.9). Even though we cannot state that the differences across the age groups are statistically significant, the trend in point estimates is that the older you are, the less likely you seem to be to move on from being over-educated to find a well-matched job within three years. It should be mentioned that even if the chances seem to be greater for the younger, only about one third in Finland and Sweden, and about half of the over-educated in Denmark managed to find a well-matched job over a period of three years.

The same pattern as shown in figure 7.10 is found when the respondents instead are grouped by years of work experience and by years of tenure at their employer. The point estimates show greater chances for the less experienced over-educated to, over three years, move on to find well-matched jobs than for the more experienced employees. However, there are not any significant differences across these groups, either.

The issue of the large confidence intervals point to the limits of these types of analysis using the PIAAC data; often there are not enough observations to perform the desired analyses with precision.

7.6 Over-education and skills

As discussed in the introduction, the notion of educational mismatch lays in the assumption that i) skills are being wasted (in the case of over-education), ii) the mismatched individual is not happy with the situation, or iii) the combination of i) and ii). Over-education and its association to job-satisfaction and well-being have been discussed in the literature and are usually found to be negatively related (see, e.g., Allen & van der Velden, 2001; Korpi & Thålin, 2009; Verhaest & Omey, 2009).

Unfortunately, we cannot include all of these analyses in this chapter, and because PIAAC is a survey of skills, that is the analysis that will be included. Moreover, arguably the strongest assumption made in analyses of educational-mismatch and over-education is to assume that the skill levels within educational levels are fairly homogenous.

If this assumption would hold and if we could be relatively sure that what we measure is genuine over-education, a high incidence of over-education could potentially be costly for society. It could be very costly if over-education would be a persistent state for individuals in the long-run as it seems to be in the short-run (see section 7.5 in this chapter).

This reasoning is dependent on there being no *initial* skill differences between the equally educated who managed to find well-matched jobs and those who found (lower level) jobs for which they were (are) over-educated.

The addition of the concept of initial skills when discussing skill differences and potential costs for society is important. It is likely that skills once held will depreciate if they are not put to use (see, e.g., de Grip *et al.*, 2008; Edin & Gustavsson, 2008) and this could then appear as a skill difference between over-educated and well-matched, even though their skills initially, at the time of employment, were equal.

To control for this, we would need to have measures of skills for at least two points in time: both at the time of employment and after some time spent in a matched or mismatched job. We do not have this. Instead we will divide our analysis of skill differences into two separate analyses: i) those that recently finished their highest education and ii) those that finished their highest education long before PIAAC.

In the first group, those who finished their highest education three years or less before PIAAC, the potential depreciation of the skills of the over-educated due to an under-use of skills will not have been going on for too long. Comparing skill differences between this group and the group who finished their education earlier than three years before PI-

AAC will shed some light on the initial and later skill differences between over-educated and adequately educated.

The cut-off for what is considered to be recent is entirely decided to ensure a sufficient number of observations. Setting the cut-off for the first group to three years or less and for the second group to between four and ten years prior to PIAAC gives us two similarly sized groups. As completion of formal education is generally not limited with respect to age, and because skills *to a certain degree* diminish with age irrespective of whether or not they are mismatched, the first group is further limited to those aged 35 and the second group to those aged 45 in PIAAC. The higher age limit in the second group is used to ensure a large enough number of respondents with longer time since graduating. The sizes of these two groups are shown in Table 7.1.

Table 7.1 Number of observations in the groups of recent and less recent graduates

	Graduated 3 years or less prior to PIAAC			Graduated between 4–10 years prior to PIAAC		
	N	N (weighted)	Share	N	N (weighted)	Share
Denmark						
Over-educated	193	117,396	0.20	162	83,279	0.17
Well-matched	445	267,417	0.18	375	223,345	0.15
Finland						
Over-educated	125	78,605	0.15	195	116,759	0.24
Well-matched	330	212,783	0.16	405	251,892	0.19
Sweden						
Over-educated	94	113,842	0.23	99	121,884	0.25
Well-matched	282	369,682	0.15	345	460,173	0.18

Note: The share shown is the share of the total number of over-educated (well-matched), not conditioning on time since graduation and age. The shares of the two groups will not sum to one as those graduated more than ten years prior to PIAAC, those aged 36 (46) and above, the self-employed, and those younger than 23 (following the restrictions made in the analyses in section 7.5 of this chapter) are not included.

With the mentioned restrictions, we are down to approximately 20% of the total number of observations in the sample classified as either over-educated or well-matched. The absolute number of observations is less in Sweden due to Sweden having a smaller share of over-educated according to JA [(PIAAC), see figure 7.8. Sweden also has the largest shares of the non-restricted groups included in the analysis.

We could go further back in time, in terms of years since graduation, and increase the upper age limit in both groups to increase the number of observations, but this would also increase the already present risk of measuring a potential depreciation of skills instead of (close to) initial skills in the first group and depreciation due to ageing in the second group. Instead, we limit the number of control variables to only include gender and educational level. Ideally, we would like to control for age and immigration background as well, but the number of observations in each cell (see table 7.1) does not allow for this. It barely allows for the controls we do add.

To include educational levels as controls might appear strange when it is educational mismatch that we analyze. However, in this section, it is skill differences that are of interest and we know that education and skills are positively related (see e.g., OECD, op. cit.). Furthermore, looking at the assumption of equal skills within educational levels, this is exactly what we would like to try to get an answer to; are two individuals, one over-educated and one well-matched, with the same educational level equally skilled or not? And is there any difference in terms of this if we look at those who recently graduated and those who graduated longer before PIAAC?

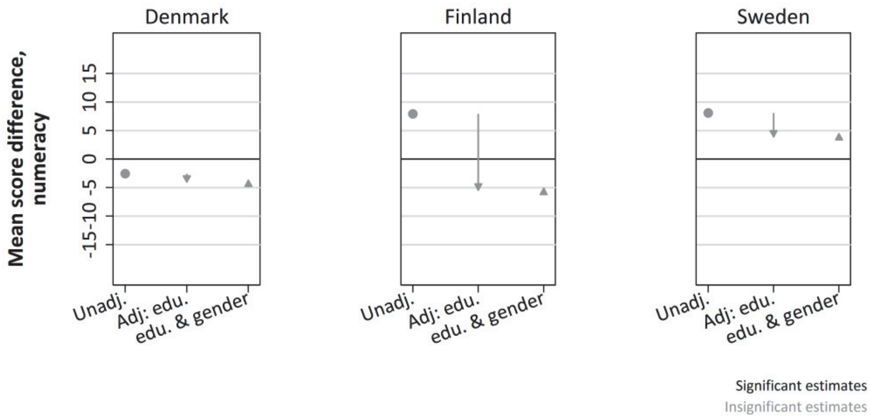
For this comparison, we will use regression analysis, taking the survey design into consideration. The dependent variable in the regression will be proficiency in literacy, numeracy, and PS in TRE, one at a time. The independent, or explanatory, variable of interest will be the dummy variable for over-education, giving information on the skill difference between over-educated and well-matched,[44] given the control variable's educational level and gender.

The educational levels used are i) primary and lower secondary (reference category), ii) upper secondary and non-tertiary post-secondary education, and iii) tertiary education.

Figure 7.12 shows the estimated coefficient on the over-education dummy variable, both unadjusted and adjusted, using basic skills in numeracy as the dependent variable and for the group of recent graduates. The qualitative results using literacy and PS in TRE are the same.

[44] A dummy for under-educated is also included in the model, making the well-matched the reference category.

Figure 7.12 Skill difference in numeracy between over-educated and well-matched, recent graduates

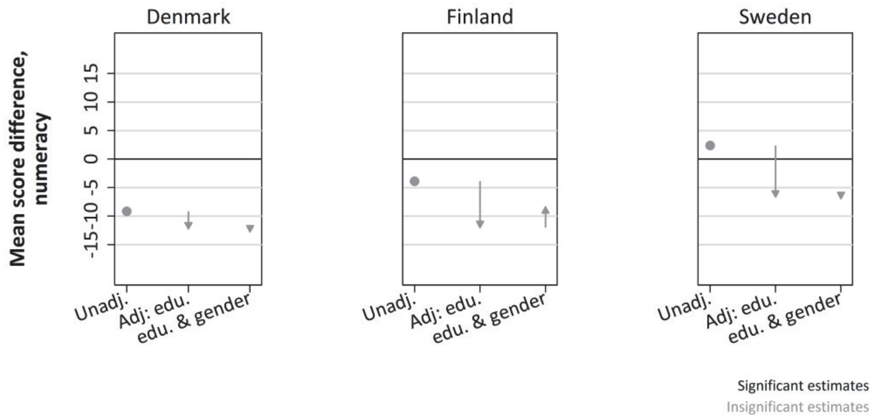


The unadjusted estimates show positive differences in favour of the over-educated in Finland and in Sweden and slightly negative in Denmark. However, none of the estimated, unadjusted differences are significantly different from zero. Controlling for educational level changes the estimated differences to be negative in Finland as well, while still positive but closer to zero in Sweden. Still, no estimated difference is significant. Adding an additional control for gender makes no difference qualitatively, and hardly any difference quantitatively, in any country. The estimated differences are still statistically insignificant. The same pattern is found for literacy and PS in TRE as well.

A likely explanation for the relatively large decrease (Denmark exempted) of the estimates when controlling for educational levels is that we, in the unadjusted case, are likely to compare the skills of over-educated with tertiary-education with the skills of well-matched respondents having lower-secondary education or less. That is because those with the lowest educational level are more likely to be well-matched as they, per definition, cannot be over-educated. Similarly, a larger share of the tertiary educated are expected to be over-educated as they, per definition, can only be over-educated or well-matched.

The estimated skill differences between over-educated and well-matched who finished their education more than three years, but at most ten years before PIAAC, is shown in Figure 7.13.

Figure 7.13 Skill difference in numeracy between over-educated and well-matched, earlier graduates



In all three countries, the estimated differences between over-educated and well-matched are more negative for the over-educated in these groups, compared to the more recent graduates. All estimated differences are statistically insignificant here as well. For Denmark and Sweden, the estimates for both literacy and PS in TRE are close to those shown for numeracy. For Finland, the unadjusted estimates using literacy and PS in TRE are positive in favour of the overeducated, but move towards zero when adding the controls. None of these estimates are significantly different from zero, either.

There is no significant skill difference within educational levels, between over-educated and well-matched. This holds for both the group of recent graduates and for the group of earlier graduates. This does not give support for any initial skill differences between over-educated and well-matched, at least not in terms of key information-processing skills.

The small number of observations that we have discussed should lead to cautious interpretations of these results as this makes it harder to estimate the differences with precision. Given this, if we for a brief moment would take the liberty of discussing insignificant point estimates, we can see a difference between the group of recent graduates and the group of earlier graduates. In all countries, the point estimates of the differences are worse for the over-educated (compared to the well-matched) in the group of earlier graduates than in the group of recent graduates. Where the average skills score difference among recent graduates is approximately -5 score-points (+5 in Sweden) or approximately 0.1 standard deviations of the skills score distribution, it is approximately –10 score-points, or approximately 0.25 standard deviations (-5/0.1 s.d. in Sweden) among the earlier graduates. A difference of -10 score-points, if statistically significant, is equal to about one year of schooling (see OECD, op. cit., p.

175). However, we cannot know whether this is only due to randomness because we cannot say, with certainty, whether the point estimates are different from zero or not.

7.7 Conclusion

Different measures of over-education give widely differing incidences of over-education in the same sample of individuals. Self-assessment measures (SA) usually point to a much larger share of over-educated than Job Analysis (JA) does; on average the difference is approximately 10 percentage points. Even though the measures differ in terms of levels, the characteristics of the over-educated according to each measure are generally the same. Over-educated are usually younger, have less work experience and tenure, and are more likely to be non-native speakers compared to the well-matched.

Over-education is found to be rather persistent at the individual level in the short-run. Of those who were classified as over-educated according to JA in 2008, at best, barely half of these individuals managed to become well-matched by 2011. This is among the youngest; among the older, approximately 70–80% were still classified as over-educated by 2011.

The share of each cohort attaining tertiary education has risen fast in the last two decades and one of the aims of this chapter is to try to determine whether the measured over-education is genuine or apparent. In other words, do we have true over-education leading to a waste of skills? Well-being and job-satisfaction aside, for over-education to constitute a socio-economical problem, it should lead to a waste of skills. If over-education could be explained by skill differences (i.e., that those with a well-matched job got their jobs because they were more skilled than their peers who had to settle for a job for which they were over-educated, it would be hard to argue that skills are being wasted. Looking at the zero (or insignificant) skill differences between the over-educated and the well-matched among recent graduates, it does not support this explanation, at least not in terms of the key information-processing skills measured in PIAAC.

These results differ from those found in Lind (2014), where the over-educated were found to perform significantly worse, on average, compared to the well-matched. However, in that study, the entire groups of over-educated and all well-matched individuals were included in the analysis of differences in skills. If skills diminish due to an underuse, which would be the case with genuine over-education, the time in a mismatched job should matter.

Comparing skill differences between recent and earlier graduates (recent and earlier at the time of the PIAAC survey) and looking at point estimates only, the results point to the direction of diminishing skills over the time spent in a mismatched job. However, in neither of the groups are the differences significantly different from zero and we should thus not draw conclusion based on this pattern in point estimates. Furthermore, these individuals could still differ in their levels of higher order and non-cognitive skills. We should also remember that the relatively small samples in PIAAC do not allow us to control for all important background characteristics.

To conclude, over-educated and well-matched individuals, with the same level of attained education, do not seem to differ with respect to proficiency in key information-processing skills. The insignificant differences in key information-processing skills between over-educated and well-matched individuals point in the direction of the existence of genuine over-education in the Nordic countries included in the analyses in this chapter. However, we cannot say how large the incidence of genuine over-education is. Firstly as the measured incidence of over-education likely consists of both genuinely and apparently over-educated individuals, and secondly as we do not know which of the measures of over-education gives the more accurate estimate.

Future research using larger, but still representative, samples and having more detailed information on the educational requirements of each respondent's job would be needed to draw more precise conclusions regarding the true incidence and the potential socio-economical cost of over-education.

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8. Key Information-Processing Skills and Earnings

Antero Malin and Raija Hämäläinen

PIAAC data provides new prospects for understanding how individual's skills are associated with their earnings. The aim of the study was to generate new knowledge on the association between the key information-processing skills and earnings in the five Nordic countries: Denmark, Estonia, Finland, Norway, and Sweden. The findings illuminated that the Nordic countries have the same trend in terms of their association between skills and earnings in light of PIAAC data. Specifically, individual's proficiency in key information-processing skills, that is literacy, numeracy, and problem-solving in technology-rich environment, are positively associated with labour market earnings, even when labour supply and demand characteristics are controlled. In addition, use of information-processing skills at work is positively associated with earnings.

8.1 Introduction

There is an emerging need for an improved understanding of the association between individual's key information-processing skills and their economic payoff (i.e., later earnings). The question is to what extent are individual's skills associated with their earnings?

The key challenge in investigating this association is determining how to obtain reliable information on individual's skills at the time that earnings are measured. Previously, the problem has been that no accurate international large-scale data has been available for adult's key information-processing skills. Despite this, there have been different research attempts to understand the association between individual's skills and their earnings. In investigating whether individual's skills are associated with labor market earnings, much of the previous work has been done in the United States, using scores from the Armed Forces Qualification Test (AFQT) as a measure of ability or using International

Adult Literacy Survey (IALS) data, focusing on the literacy skills of individuals ages 16–65, or Adult Literacy and Life Skills Survey (ALL), which measured literacy, numeracy, and problem-solving skills of respondents aged 16–65 in 11 countries (OECD, Statistics Canada, 2000; OECD, Statistics Canada, 2011).

The Programme for the International Assessment of Adult Competencies (PIAAC) data comprises the most recent initiative to assess adult skills across 24 countries. PIAAC data is the most comprehensive source of information on adult's skills to date and provides new prospects for understanding how individual's skills are associated with their earnings. The advantages of using the PIAAC data are twofold: first, the PIAAC data enable us to identify features of earnings that are typically only indirectly observed, and second, the data extend previous measures of the AFQT (which is essentially an IQ test adapted for the military) as well as the IALS (which is an OECD survey on literacy skills in 23 countries or regions) and ALL (which is an OECD survey on literacy and life skills in 11 countries). The PIAAC focuses on capturing individual's key information-processing (literacy, numeracy, and problem-solving in technology-rich environments) skills, used for work and everyday life purposes, providing information for both skills and earnings in 24 countries.

There are opposing research findings on the association between individual's key information-processing skills and earnings. In short, while studies based on the AFQT have indicated that the direct contribution of ability to earnings is "quite small" (e.g., Green, 2001; Griliches, 1977), studies grounded in the IALS and ALL data have indicated a positive association between individual's literacy skills and their earnings. For example, Groot & Maassen van den Brink (2006) showed, based on IALS data, that in the Netherlands, relatively many low-literate persons can be found amongst the low-income earners, and high-literate persons can be found relatively more often amongst the highest-income earners. In fact, Green (2001) determined that literacy skills are central determinants of individual's earnings. Also, other research results based on the IALS data support the notion that literacy skills interact with other skills, which are created through experiences when generating earnings but do not interact with other potentially non-cognitive skills (Green & Riddell, 2003). Furthermore, based on ALL data, Desjardins and Rubenson (2011) found that skills are associated with individual's earnings but only if these skills are required by the job. Conversely, Denny, Harmond, and Redmond (2000) claimed that even literacy skills have a role in determining individual's earnings, but the more influential factor is formal education. However, Coulombe and Tremblay (2006) later argued that, when productivity (and more precisely, individual's earnings) are investigated at the country level, literacy skill tests (i.e., scores of IALS surveys) are likely to more accurately capture sources of variance in productivity across countries than would data on schooling.

Further analysis of the PIAAC data has shown that, among prime-aged workers (age 35–54), the increase in numeracy skills is associated with increased hourly wages across 23 participating countries (Hanushek *et al*. 2014). However, there is substantial heterogeneity in returns to skills across countries. Denmark (14%), Finland (14%), Norway (13%), and Sweden (12%) belong to the set of eight countries with returns to skills falling below 15%, while in Estonia the return is the average 18%. It is concluded that the regularity of the relationship between cognitive skills and higher earnings in all countries documents the extent to which modern knowledge-based economies value skills (Hanushek *et al*. 2014, 32).

So far, there have been only very limited attempts to understand the association between individual's key information-processing skills and their earnings in the Nordic area. This study focuses on the association between skills and earning in the Nordic countries Denmark, Estonia, Finland, Norway, and Sweden in light of PIAAC data. In this chapter, the aim is to analyze whether and how individual's key information-processing skills on literacy, numeracy, and problem-solving in technology-rich environments (cf. human capital, chapter 4 and 5 of this report) are associated with labour market earnings. Additionally, we will focus on the role of individual's key information-processing skills when describing Nordic cross-country differences in individual's earnings. Specifically, the study aims to answer the following three research questions:

- What is the association between the proficiency in key information-processing skills and earnings?
- How is the use of key information-processing skills at work associated with earnings?
- What are the associations between labour supply and demand characteristics and earnings, and how do they change the associations between key information-processing skills and earnings?

8.2 Data and variables of interest

The data used in this study is the data from the five Nordic countries participating in PIAAC: Denmark, Finland, Norway, Sweden, and Estonia. The 16–19 year-olds will be excluded from the analyses in this study as the largest share of these individuals, in the Nordic countries, are still in upper-secondary education.

The dependent variable in this study is the hourly earnings, including bonuses for wage and salary earners. The hourly earnings are adjusted using purchasing power parity (PPP) and expressed in U.S. dollars. This variable is derived from the income information which the respondents gave during the PIAAC background interview. The wage distribution was trimmed to eliminate the 1st and 99th percentile (i.e., the top 1% and bottom 1% of earnings were excluded from the analyses to avoid potential bias due to outliers).

In PIAAC, three key information-processing skills were assessed: literacy, numeracy, and problem-solving in technology-rich environments. The cognitive item responses were calibrated, analysed, and scaled. This process resulted in a set of ten plausible values in each skill domain for each individual. Plausible values are random draws from the conditional distribution of scale proficiencies given the item responses (the actual PIAAC literacy, numeracy, and problem-solving test results) and background variables (for more details see OECD, 2013a).

The plausible values between the three skill domains are highly correlated. Inside the Nordic region, the Nordic averages of correlations are 0.84 (literacy and numeracy), 0.80 (literacy and problem-solving) and 0.75 (numeracy and problem-solving). As a consequence, there is a multicollinearity problem if the three skill domains are used as explanatory variables in the same statistical model. To avoid this, we have to either estimate three separate models, one for each skill domain, or to create a new combined measure of the three skill domains, using, for example, principal component analysis.

To avoid omitted variable bias in the models using only one skill,[45] a new combined measure of skill proficiency was created. The combined measure was calculated for each of ten plausible value sets of literacy, numeracy, and problem-solving using principal component analyses.

[45] The coefficient estimate of one skill domain is overestimated if the two other skills are excluded from the model. This is due to the fact that all skill domains are positively correlated as well with each other as with earnings. (See Rockefeller College, University at Albany, 2003).

The purpose of principal component analysis is to transform the original set of correlated variables to a new set of uncorrelated variables called principal components (Chatfield & Collins 1989, 57). Accordingly, there are ten new combined measures (i.e. the component scores of the first principal component), of key information-processing skills, which are used in the statistical models to estimate the associations between the key information-processing skills and earnings. These new measures were calculated separately for each country, and standardised so that their mean is 0 and their standard deviation is 1. The first principal component accounts for approximately 87% in each country for all the variance of literacy, numeracy, and problem-solving in the observations.

However, this solution excludes some respondents out of the statistical analyses. All the participants did not take part in the computer-based assessment and, thus, they have no problem-solving scores. They either had no computer experience, failed ICT core test, or opted out of the computer-based assessment. Altogether, there are 5,517 (18.4%) participants in the Nordic sample who have no problem-solving score. There is a variation between countries in this respect, since in Denmark 15%, in Estonia 30%, in Finland 19%, in Norway 16%, and in Sweden 12% did not take part in the computer-based assessment (OECD, 2013b, p. 87). This also means that the results of the analyses do not represent the associations between skills and earnings in the whole population, but they are restricted to the adults who use all three key information-processing skills at work and who have made the computer-based assessment, therefore having problem-solving scores.

In addition, there are two sets of background variables in the statistical analyses, based on the analyses of Desjardins and Rubenson (2011). They are called the individual, or labour supply, characteristics and the labour demand characteristics.

The labour supply characteristics used in this study are education, work experience, gender, and language background. Education is used in four categories: low education (ISCED 1, 2, 3C short or less), medium vocational education (ISCED 3A–B, C long, 4A–B–C), medium general education (ISCED 3A–B, C long, 4A–B–C) and high education (ISCED 5A–B, 6). The division into medium-vocational and medium-general education was based on the information of whether the respondent’s highest level of education is vocationally or generally oriented. For some of the respondents, this information was not available, excluding 5% of the respondents in Denmark and 13% in Sweden.

Work experience is measured as years of paid work during lifetime. In practice, if at least six months were spent working, it was considered as a year of paid work. It is top-coded at 47 years, centered at 20 years, and divided by ten for statistical analyses. Age was left out of the statistical analyses, since it is highly correlated with the years of work experience in each country; correlations ranging from 0.88 in Norway to 0.92 in Estonia. If they were in the same statistical model, this would again produce multicollinearity problems. However, the years of work experience also act as a good proxy for age.

Language background has two categories: the respondent either is a native speaker of the test language or not. The respondents were asked what language they first learned at home in childhood and still understand. If it was the same as the test language, the respondent was categorised a native speaker. Two test languages were used in Estonia (Estonian and Russian) and in Finland (Finnish and Swedish). To keep the models similar in each country, the test language as such was not included in the independent variables in the model. This may have some effect on the Estonian results, where the Russian speaking population earns less than the Estonian speaking.

The labour demand characteristics in this study are occupation, industry classification, firm size, and the use of key information-processing skills at work. Occupation is divided into four categories, based on the International Standard Classification of Occupations (ISCO). Skilled occupations include ISCO categories 1, 2 and 3, semi-skilled white-collar occupations include categories 4 and 5, semi-skilled blue-collar occupations include categories 6, 7 and 8, and elementary occupations is equal to category 9.

The International Standard Industrial Classification of All Economic Activities (ISIC) is the international reference classification of productive activities. Industry classification is based on ISIC coding and divides the respondent's current job into five categories: manufacturing (ISIC codes A–E), construction (F), production of private goods (J_M), IT intensive industries (G–I, S, T), and production of public goods, or public sector (O–R) (see Mellander 2014).

Firm size is measured by the number of employees working for the employer, and is classified in five categories: 1–10 employees, 11–50 employees, 51–250 employees, 251–1,000 employees, and more than 1,000 employees.

In addition, there are four variables in the PIAAC data describing the use of skills at work for those currently employed or employed in the last 12 months: use of ICT skills at work, use of numeracy skills at work, use of reading skills at work, and use of writing skills at work. They are categorised in six categories, according to the activity of using skills at work: Not at all, the bottom 20 percentile of the skill-use distribution, 20th–39th percentiles, 40th–59th percentiles, 60th–79th percentiles, and the top 20 percentiles. A new combined measure of the use of key information-processing skills was derived for each respondent, based on the four skills use variables. The new variable is simply the mean value of the four variables, ranging from 0–5. The country means of this variable are ranging from 2.8 to 3.1 and the standard deviations from 1.0 to 1.1.

8.3 Methods

The dependent variable in this study is the logarithmic transformation of hourly earnings (i.e., log earnings). The statistical modelling was executed in the following three steps:

Model 1: This includes only one explanatory variable; the combined measure of key information-processing skills proficiency.

Model 2: This includes only one explanatory variable; the use of the combined key information-processing skills at work.

Model 3: In addition to the combined measure of key information-processing skills in Model 1 and the use of the combined key information-processing skills at work in Model 2, the rest of the labour supply and demand characteristics are added into the model.

Models 1, 2, and 3 were estimated for each of the five countries. Additionally, a Nordic aggregate of the estimated country-specific coefficients was calculated. The logarithmic transformation of the hourly earnings was used as the dependent variable in the statistical analyses. As a consequence of the logarithmic transformation, the literal interpretation of the estimated coefficient β is that a one unit increase in the independent variable X will produce an expected increase in log earnings of β units. In terms of log earnings themselves, this means that the expected value of log earnings is multiplied by e^{β}. Each one unit increase in X multiplies the expected value of log earnings by e^{β}. However, for small values of β, e^{β} is approximately equal to $1 + \beta$ (Benoit, 2011).

The statistical analyses were carried out taking the survey design into account using population weights, by calculating mean of regressions over ten combined key information-processing skills measures (i.e., the ten sets of combined literacy, numeracy, and problem-solving skills), and using Jack-knife replication for variance estimation (for more details, see OECD, 2013a; chapters 14 & 15).

8.4 Results

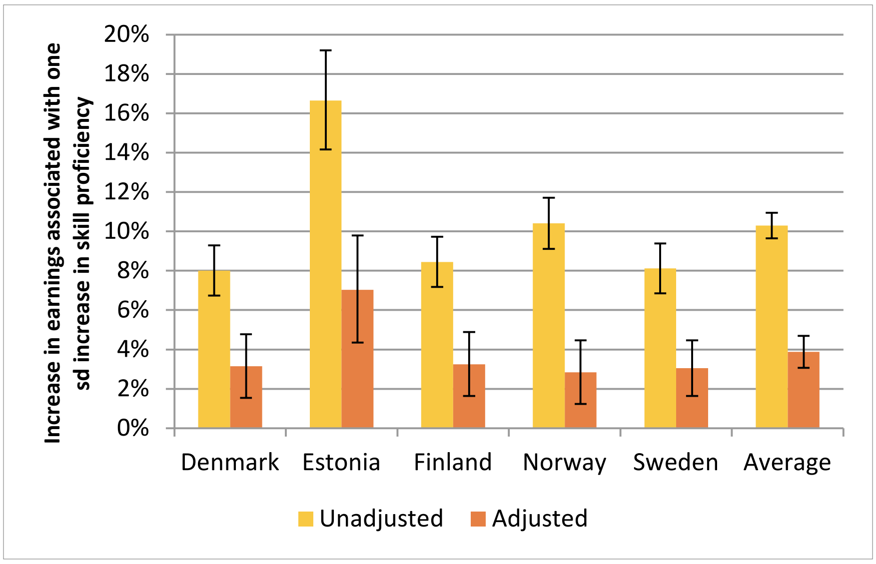
8.4.1 Association between the proficiency in key information-processing skills and earnings

In the following section we will shed light on the association between skills proficiency and earnings in the five Nordic countries: Denmark, Estonia, Finland, Norway, and Sweden, who participated in PIAAC. In all these countries, the combined measure of the key information-processing skills is clearly associated with earnings and these associations are statistically significant. The correlations between skills and log earnings (i.e., the logarithmic transformation of earnings), are varying only slightly between countries. The correlation is 0.22 in Denmark, 0.23 in Finland, 0.26 in Sweden, 0.28 in Estonia, and 0.29 in Norway.

Table 8.1 Model 1: Regression of log earnings on skills proficiency

	Denmark				Estonia			
	b	se(b)	p	exp(b)	b	se(b)	p	exp(b)
Intercept	3.156	0.006			2.175	0.010		
Skill proficiency	0.077	0.006	<0.001	1.080	0.154	0.011	<0.001	1.166
R^2 (adjusted)	0.049				0.076			
Unweighted n	3,719				2,920			
	Finland				**Norway**			
	b	**se(b)**	**p**	**exp(b)**	**b**	**se(b)**	**p**	**exp(b)**
Intercept	2.918	0.005			3.169	0.005		
Skill proficiency	0.081	0.006	<0.001	1.084	0.099	0.006	<0.001	1.104
R^2 (adjusted)	0.052				0.083			
Unweighted n	2,819				3,041			
	Sweden				**Average**			
	b	**se(b)**	**p**	**exp(b)**	**b**	**se(b)**	**p**	**exp(b)**
Intercept	2.893	0.005			2.862	0.003		
Skill proficiency	0.078	0.006	<0.001	1.081	0.098	0.003	<0.001	1.103
R^2 (adjusted)	0.067				0.065			
Unweighted n	2,603				15,102			

Figure 8.1 Unadjusted and adjusted association between skill proficiency and earnings, with 95% confidence intervals*



*Note: Adjusted for education, work experience, gender, language background, occupation, industry classification, firm size and use of skills at work.

The association between the skills proficiency and the log earnings is linear, and better skills are associated with higher earnings on average (Model 1 in Table 8.1, and Figure 8.1). Unadjusted one standard deviation increase in the combined measure of the key information-processing skills is associated with an 8% increase in earnings in Denmark, Finland, and Sweden, and a 10% increase in Norway. In Estonia, the unadjusted association between skills and earnings is stronger than in the other countries, as one standard deviation increase in skills is associated even with a 17% increase in earnings.[46] However, the only statistically significant difference exists between Estonia and the other countries. The skills proficiency alone explains only between 5% (Denmark and Finland) and 8% (Estonia and Norway) of the variation of log earnings between the individuals.

Model 3 aims to understand whether the labour supply characteristics (education, years of work experience, gender, and language back-

[46] The unadjusted associations of between separate skill proficiencies and earnings show very similar country patterns. In literacy (full sample), the difference between Estonia (14%) and Denmark (9%), Finland (9%) and Sweden ((9%) is statistically significant, but not with Norway (11%). In numeracy (full sample), the difference between Estonia (20%) and Denmark (11%), Finland (13%), Norway (14%) and Sweden (10%) is statistically significant. In problem-solving, the difference between Estonia (15%) and Denmark (5%), Finland (5%), Norway (7%) and Sweden (6%) is statistically significant.

ground) and the labour demand characteristics (occupation, industry classification, firm size, and use of skills at work) are also associated with earnings, and in addition, how these associations change the relation between skills proficiency and earnings. Therefore, in Model 3 (Table 8.3, and Figure 8.1), these characteristics are included in the model, and the association between skills and earnings is adjusted accordingly. The adjusted association between skills and earnings is substantially reduced in each country, compared to Model 1, but it is still statistically significant in each country. After controlling the associations between earnings, labour supply, and demand characteristics, one standard deviation increase in skills proficiency is associated with a 3% increase in income in Denmark, Finland, Norway, and Sweden, and still as much as a 7% increase in Estonia. The reduction in the association is smallest in Sweden and Finland and largest in Estonia and Norway. Unlike the unadjusted difference, the adjusted difference between Estonia and the other countries is not statistically significant.

8.4.2 Association between the use of key information-processing skills and earnings

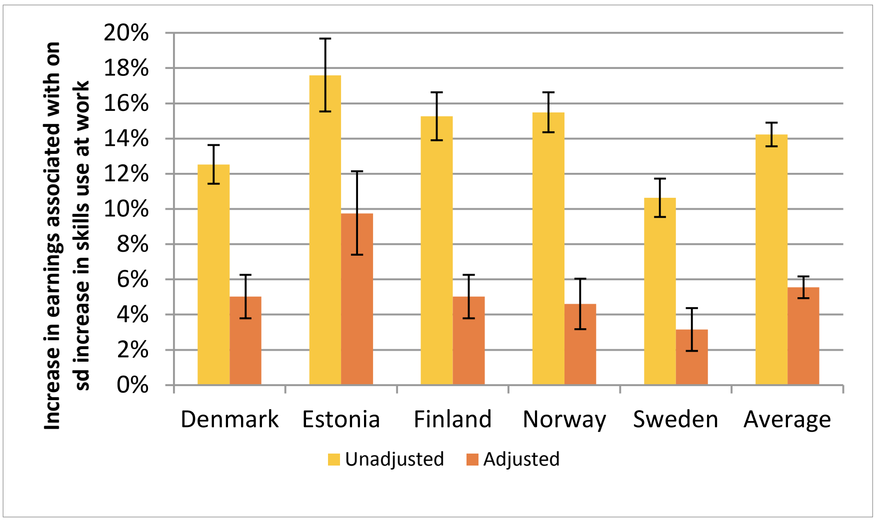
We will illustrate that, in general, the use of key information-processing skills at work is also associated with earnings. Our results indicate that the actual use of key information-processing skills at work is clearly and statistically significantly associated with earnings. The correlations between the combined skills use at work and the log earnings are stronger than the correlations between the skills proficiency and the log earnings. The correlations are ranging from 0.38 in Sweden to 0.44 in Norway. In Denmark, this is 0.39, in Estonia 0.40, and in Finland 0.43. As expected, the skills proficiency and the use of skills at work are also correlated, but the correlations are not very high. The correlation in Finland is the lowest, 0.24, and the highest it is in Sweden 0.33, while in Estonia it is 0.27, in Denmark 0.30, and in Norway 0.31.

In Model 2 (Table 8.2 and Figure 8.2) the unadjusted association between the use of key information-processing skills at work and earnings is presented. In generally, the more skills are used at work, the higher are the earnings. One unit increase in the use of skills is associated with an 11% increase in earnings in Sweden, 13% in Denmark, 15% in Finland and Norway, and even 18% in Estonia. The difference between Sweden and Denmark is not statistically significant, as well as the differences between Finland, Norway, and Estonia, but the difference between these two country groups is. The use of the key information-processing skills at work alone explains 12% in Estonia, 14% in Sweden, 15% in Denmark, 18% in Finland, and 19% in Norway of the variation in the log earnings between the individuals. This is clearly more than the proficiency in the information-processing skills alone explains.

Table 8.2 Model 2: Regression of log earnings on use of skills at work

	Denmark				Estonia			
	b	se(b)	p	exp(b)	b	se(b)	p	exp(b)
Intercept	2.830	0.017			1.725	0.030		
Use of skills at work	0.118	0.005	<0.001	1.125	0.162	0.009	<0.001	1.176
R^2 (adjusted)	0.152				0.121			
Unweighted n	3,529				2,529			
	Finland				**Norway**			
	b	**se(b)**	**p**	**exp(b)**	**b**	**se(b)**	**p**	**exp(b)**
Intercept	2.503	0.019			2.750	0.014		
Use of skills at work	0.142	0.006	<0.001	1.153	0.144	0.005	<0.001	1.155
R^2 (adjusted)	0.183				0.194			
Unweighted n	2,708				2,930			
	Sweden				**Average**			
	b	**se(b)**	**p**	**exp(b)**	**b**	**se(b)**	**p**	**exp(b)**
Intercept	2.628	0.015			2.487	0.009		
Use of skills at work	0.101	0.005	<0.001	1.106	0.133	0.003	<0.001	1.142
R^2 (adjusted)	0.143				0.159			
Unweighted n	2,469				14,165			

Figure 8.2 Unadjusted and adjusted* association between skills use at work and earnings, with 95% confidence intervals



*Note: Adjusted for education, work experience, gender, language background, occupation, industry classification, firm size and skill proficiency.

Furthermore, the more skills are needed and used at work, the higher are the earnings when the association is adjusted for labour supply and demand characteristics (Model 3 in Table 8.3, and Figure 8.2). This association is the strongest in Estonia. There the increase of one unit in the use of skills at work is equal to 10% higher earnings. In Sweden, the increase is only 3%, and in three other countries 5%. Only the difference between Estonia and the other countries is statistically significant.

The use of skills at work seems to have somewhat stronger association with earnings than skills proficiency in each country except Sweden, even after adjusting the association for labour supply and demand characteristics. Since the standard deviation of the combined key information-processing skill measure is 1.0, and of the combined use of key information-processing skills at work it is 1.1 (only in Norway it is 1.0), the coefficient estimates of these two variables can be easily compared. However, if we look at the standard errors of the coefficient estimates, there is no clear evidence for the conclusion that the associations are unequal, since the two coefficient estimates do not differ statistically significantly within any country.

Table 8.3. Model 3: Regression of log earnings on all labour supply and labour demand characteristics

	Denmark				Estonia				Finland			
	b	se(b)	p	exp(b)	b	se(b)	p	exp(b)	b	se(b)	p	exp(b)
Intercept	2.725	0.038	<0.001		1.375	0.173	<0.001		2.393	0.053	<0.001	
Skill proficiency	0.031	0.008	<0.001	1.031	0.068	0.013	<0.001	1.070	0.032	0.008	<0.001	1.033
Low education (ref.)												
Medium vocational	0.026	0.019	0.173	1.026	0.013	0.051	0.799	1.013	0.038	0.024	0.116	1.038
Medium general	-0.035	0.030	0.252	0.966	0.089	0.043	0.040	1.093	0.048	0.029	0.100	1.049
High	0.139	0.019	<0.001	1.149	0.157	0.046	0.001	1.171	0.110	0.026	<0.001	1.116
Work years linear	0.093	0.006	<0.001	1.098	0.009	0.009	0.329	1.009	0.070	0.005	<0.001	1.072
Work years quadratic	-0.030	0.003	<0.001	0.971	-0.036	0.007	<0.001	0.964	-0.030	0.004	<0.001	0.971
Female (ref.)												
Male	0.051	0.010	<0.001	1.052	0.286	0.024	<0.001	1.332	0.095	0.011	<0.001	1.100
Non-native speaker (ref.)												
Native speaker	0.022	0.019	0.243	1.022	-0.037	0.161	0.819	0.964	0.000	0.039	0.995	1.000
Skilled occupations	0.128	0.026	<0.001	1.136	0.284	0.093	0.002	1.328	0.272	0.034	<0.001	1.313
Semi-skilled white-collar occupations	0.029	0.025	0.257	1.029	0.048	0.092	0.598	1.049	0.042	0.031	0.174	1.043
Semi-skilled blue-collar occupations	0.019	0.029	0.525	1.019	0.305	0.098	0.002	1.357	0.113	0.037	0.002	1.120
Elementary occupations (ref.)												
Manufacturing	0.127	0.014	<0.001	1.136	0.080	0.026	0.002	1.084	0.065	0.016	<0.001	1.067
Construction	0.131	0.022	<0.001	1.139	0.241	0.064	<0.001	1.272	0.160	0.031	<0.001	1.173
Production of private goods	0.131	0.016	<0.001	1.140	0.174	0.032	<0.001	1.190	0.079	0.016	<0.001	1.082
IT intensive industries	0.035	0.014	0.013	1.036	0.071	0.023	0.002	1.074	0.075	0.017	<0.001	1.077
Production of public goods (ref.)												
1 to 10 people (ref)												
11 to 50 people	0.065	0.016	<0.001	1.068	0.122	0.026	<0.001	1.030	0.093	0.013	<0.001	1.097
51 to 250 people	0.059	0.016	<0.001	1.061	0.163	0.028	<0.001	1.178	0.142	0.015	<0.001	1.153
251 to 1000 people	0.128	0.019	<0.001	1.137	0.225	0.037	<0.001	1.253	0.202	0.019	<0.001	1.224
More than 1000 people	0.141	0.021	<0.001	1.151	0.195	0.053	<0.001	1.215	0.210	0.024	<0.001	1.233
Use of skills at work	0.049	0.006	<0.001	1.050	0.093	0.011	<0.001	1.098	0.049	0.006	<0.001	1.051
R^2 (adjusted)	0.389				0.345				0.467			
Unweighted n	3,104				2,153				2,490			

	Norway				Sweden				Average			
	b	se(b)	p	exp(b)	b	se(b)	p	exp(b)	b	se(b)	p	exp(b)
Intercept	2.671	0.054	<0.001		2.532	0.046	<0.001		2.339	0.040	<0.001	
Skill proficiency	0.028	0.008	0.001	1.028	0.030	0.007	<0.001	1.030	0.038	0.004	<0.001	1.038
Low education (ref.)												
Medium vocational	0.063	0.020	0.001	1.065	-0.003	0.017	0.874	0.997	0.027	0.013	0.035	1.028
Medium general	0.033	0.021	0.108	1.034	-0.001	0.021	0.944	0.999	0.027	0.013	0.046	1.027
High	0.168	0.020	<0.001	1.182	0.066	0.020	0.001	1.068	0.128	0.012	<0.001	1.137
Work years linear	0.081	0.006	<0.001	1.085	0.073	0.004	<0.001	1.076	0.065	0.003	<0.001	1.067
Work years quadratic	-0.033	0.004	<0.001	0.968	-0.022	0.004	<0.001	0.978	-0.030	0.002	<0.001	0.970
Female (ref.)												
Male	0.084	0.013	<0.001	1.088	0.062	0.012	<0.001	1.064	0.116	0.007	<0.001	1.123
Non-native speaker (ref.)												
Native speaker	0.038	0.017	0.023	1.039	0.027	0.017	0.116	1.027	0.010	0.034	0.764	1.010
Skilled occupations	0.169	0.050	0.001	1.184	0.196	0.039	<0.001	1.217	0.210	0.024	<0.001	1.233
Semi-skilled white-collar occupations	0.059	0.048	0.224	1.060	0.052	0.038	0.164	1.054	0.046	0.023	0.050	1.047
Semi-skilled blue-collar occupations	0.080	0.050	0.110	1.083	0.052	0.038	0.172	1.053	0.114	0.025	<0.001	1.120
Elementary occupations (ref.)												
Manufacturing	0.192	0.019	<0.001	1.212	0.078	0.015	<0.001	1.081	0.108	0.008	<0.001	1.115
Construction	0.165	0.026	<0.001	1.179	0.135	0.031	<0.001	1.144	0.166	0.017	<0.001	1.181
Production of private goods	0.142	0.017	<0.001	1.153	0.114	0.016	<0.001	1.121	0.128	0.009	<0.001	1.137
IT intensive industries	0.061	0.016	<0.001	1.063	0.093	0.016	<0.001	1.098	0.067	0.008	<0.001	1.070
Production of public goods (ref.)												
1 to 10 people (ref)												
11 to 50 people	0.036	0.018	0.043	1.036	0.029	0.012	0.019	1.030	0.069	0.008	<0.001	1.071
51 to 250 people	0.057	0.019	0.002	1.059	0.063	0.014	<0.001	1.065	0.097	0.008	<0.001	1.102
251 to 1000 people	0.113	0.024	<0.001	1.119	0.128	0.019	<0.001	1.137	0.159	0.011	<0.001	1.173
More than 1000 people	0.144	0.021	<0.001	1.155	0.140	0.021	<0.001	1.150	0.166	0.014	<0.001	1.180
Use of skills at work	0.045	0.007	<0.001	1.046	0.031	0.006	<0.001	1.031	0.054	0.003	<0.001	1.055
R^2 (adjusted)	0.450				0.389				0.408			
Unweighted n	2,316				2,081				12,144			

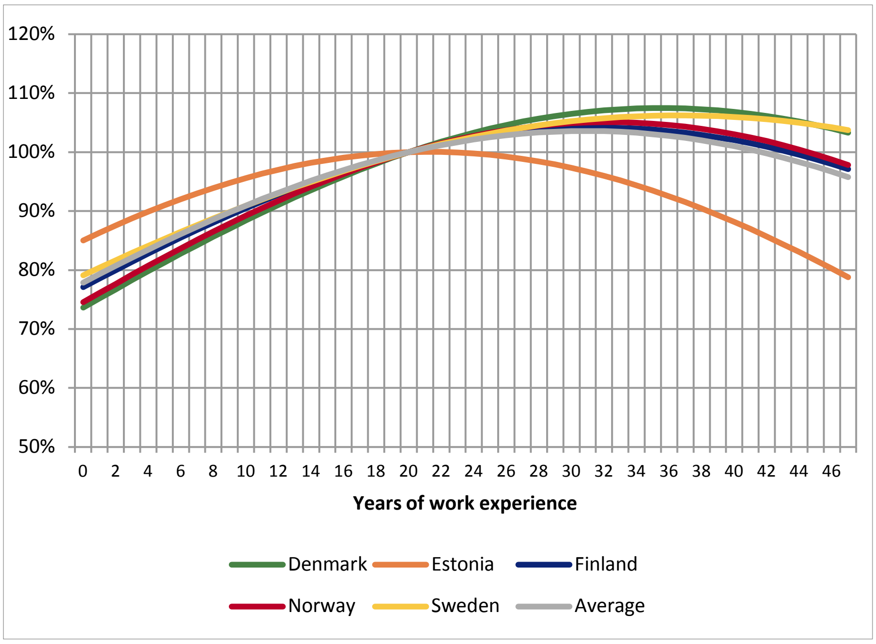
8.4.3 Association between labor supply characteristics and earnings

Even though the main purpose of including the labour supply and demand characteristics into the model is to adjust the association between skills and earnings, these results are briefly commented. The associations between the labour supply characteristics and earnings are described next. These associations are adjusted for labour demand characteristics and skills proficiency (Model 3 in Table 8.3).

First, high education, compared to low education, is clearly associated with higher earnings in all countries, all other characteristics being equal. Employees with high education earn 15–18% more in Denmark, Estonia and Norway, 12% more in Finland, and 7% more in Sweden on average than employees with low education. Compared to skill proficiency, the increase in earnings associated with high education is roughly equal to a two standard deviation increase in skill proficiency in Estonia and Sweden, a three standard deviation increase in Finland and even more in Denmark and Norway. Only in Norway, employees with medium vocational education earn more than low educated (7%) and only in Estonia medium-general education is associated with increased earnings (9%), all other factors being equal.

Second, the association between work experience as years of paid work and earnings is statistically significant in each country. However, the association is not linear (Table 8.3 and Figure 8.3). For statistical analyses, years of paid work is centered at 20 years and divided by 10, which has to be remembered when interpreting the results. Despite this, in all Nordic countries, the association between work experience and earnings is statistically significant; there are some differences between countries. Figure 8.3 illustrates that the association is clearly different in Estonia compared to other countries. The individuals with the highest earnings in Estonia have approximately 18–25 years of work experience. In other countries, the adults with the highest earnings have longer work experience: In Denmark and Sweden, approximately 30–40 years, and in Finland and Norway, 30–35 years. In Estonia, those who have clearly less than 20 years of work experience earn less than the top income earners, as do the employees with longer work histories as well. In the other countries, the difference between the top income earners and those with shorter work experience is larger than in Estonia. The difference between the top income earners and those with longer work experience is larger in Estonia than in the other countries. This difference is not as big in the other countries, and even the most experienced workers in these countries earn about as much as the reference group, which has 20 years of work experience.

Figure 8.3 Adjusted* association between years of work experience and earnings



*Note: Adjusted for skill proficiency, education, gender, language background, occupation, industry classification, firm size and use of key information-processing skills at work.

Third, men have higher earnings than women in each country. Estonia is clearly different from the other countries. Men in Estonia earn 33% more than women, all other factors being equal. The second largest male-female difference is in Finland, 10%, and almost the same in Norway (9%). In Denmark and Sweden, the gender difference in earnings is the smallest, only 5%–6%.

Finally, there is a statistically significant difference between native and non-native speakers of a test language, all other factors being equal, only in Norway (4%). We have to keep in mind that in Estonia, both Estonian and Russian speaking are native speakers, as well as both Swedish and Finnish in Finland.

8.4.4 *Association between labour demand characteristics and earnings*

The associations between the labour demand characteristics and earnings are described next. These associations are now adjusted for labour supply characteristics and skills proficiency (Model 3 in Table 8.3).

All the labour demand characteristics are statistically significantly associated with earnings in each country. Employees working in skilled occupations earn more than individuals working in elementary occupations. In Denmark, the difference is smallest, only 14%. The biggest difference is in Estonia, 33%, and in Finland (31%), while in Sweden, it is 22% and in Norway 18%. In semi-skilled white-collar occupations, the difference to elementary occupations is not statistically significant in any country. Conversely, in the semi-skilled blue-collar occupations, the difference to elementary occupations is statistically significant only in Estonia (36%) and in Finland (12%).

In industry classification, only five categories are used. In Denmark, employees working in manufacturing, construction, and production of private goods earn 14% more than employees in the public sector on average. In Estonia, employees working in construction earn even 27% more than in the public sector. In production of private goods, the difference is 19%, and in manufacturing and IT-intensive industries, 7–8%. In Finland, the best-earning employees are also working in construction, and they have 17% higher earnings compared to employees in the public sector. In the other industry categories, the difference is only 7–8%. In Norway, the best-earning employees work in manufacturing (21%). In construction and production of private goods, the difference is somewhat smaller (15–18%), and in IT-intensive industries, even smaller (6%). Finally, in Sweden, employees working in construction earn 14% more than in public sector, while the differences in other sectors are 8–12%.

The model also illustrates that the size of the company is clearly associated with earnings. The general trend is that working in bigger companies means higher income on average. This trend is strongest in Finland and in Estonia, where people working in companies with more than 250 employees earn 22% and in companies with 251–1,000 employees, 25% more than people working in a workplace with ten or fewer employees, all other characteristics being equal. In other countries, the earnings increase along with the size of the company, and in companies with more than 250 employees, the earnings are 15% higher than in the smallest companies.

Model 3 explains almost half (47%) of the variation of log earnings between the individuals in Finland, and almost as much in Norway

(45%). The model explains more than one third of the variation (35–39%) for the other countries.

8.5 Conclusion

The aim of the study was to generate new knowledge on the association between the key information-processing skills and earnings in the Nordic countries Denmark, Estonia, Finland, Norway, and Sweden in light of PIAAC data. In practice, PIAAC data provided new prospects for understanding how individual's skills are associated with their earnings. Furthermore, the investigation into the Nordic countries provided the opportunity for comparative research in understanding the similarities and differences within this rather homogeneous area. The findings illuminated that countries have the same trend in terms of their association between skills and earnings. Specifically, in the Nordic area, individual's proficiency in key information-processing skills, that is literacy, numeracy and problem-solving in technology-rich environments, are positively associated with labour market earnings, even when labour supply and demand characteristics are controlled. In general, the Nordic countries seemed to be characterised by a rather similar association between skills and earnings (also see de Baldini Rocha & Ponczek 2011; Størset & Malin 2014, Chapter 10 in this publication).

This study was limited to the adults using all three key information-processing skills at work and who have made the computer-based assessment, and accordingly, the results cannot be generalised to the whole populations. However, previous analyses of the PIAAC data have illuminated similar findings related to the association between skills and earnings. For example, earnings are strongly associated with reading proficiency in PIAAC. Namely, an increase of one standard deviation in literacy proficiency is also associated with an 8% increase in hourly wages, on average across countries (OECD, 2013b, p. 224). Furthermore, Malin, Sulkunen, and Laine (2013) found that in Finland, literacy and numeracy skills are associated with earnings. Top performers (level 4/5) are more often in the highest-earning three deciles and low performers are more often in the lowest-earning three deciles than on average. As the three skill domains are highly correlated with each other, it is natural that the findings of a combined measure of the key information-processing skills (variable of the three domains) used in this study result in similar findings as the previous analysis of reading proficiency only.

Although cognitive skills are the most important factor associated with an individual's earnings, there are other influential factors in addition to cognitive skills. For example, Green (2001) has argued that one can typically explain less than half the variation in earnings with measured covariate points captured in literacy tests. Green's notion points towards the existence and importance of non-cognitive skills. Cawley, Heckman, and Vytlacil (2001) found that personality and social skills are also important in determining wages. Therefore, we were interested in determining how the use of key information-processing skills, labour supply characteristics, and labour demand characteristics are associated with earnings.

Our findings revealed that use of information-processing skills at work is positively associated with earnings, even when skills proficiency, labour supply, and other demand characteristics are controlled. In addition, high education is clearly associated with higher earnings. Furthermore, work experience (in years) seems to be strongly and positively associated with individual's earnings. In Estonia, however, this association differs from the other countries. There, the top income earners have shorter work histories than in the other countries. In addition, employees with long work histories, compared to the top earners, have clearly lower earnings, while in the other four countries this difference is not as big. Finally, the most important demand characteristics in relation to earnings are occupation and industry classification. In sum, although cognitive skills are important, our findings are in line with the notion that other (non-cognitive) factors need to be considered as well.

In sum, based on the findings of the OECD PIAAC data, individual's skills seem to be associated with their earnings. However, it has to be acknowledged that investigating OECD countries in itself is not sufficient to fully understand the association between skills and earning; globally, the starting points for analyzing this association significantly vary from country to country. For example, approximately 16% of the world's population over 15 years of age (759 million people) can neither read nor write (UNESCO, 2010). Related to that, Green (2001) has argued that literacy skills have been becoming more important as a determinant of earnings over the last three decades. The challenge for the future is to develop a better understanding of how skills affect earnings in similar societies (e.g., Nordic countries) as well as in different societies (e.g., Nordic countries vs. developing countries). Therefore, it is essential to gain more knowledge on how individual's skills are associated with their earnings worldwide and how the investment in human capital (see OECD, 2007; Kokkinen, 2012) is reflected in individual earnings.

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9. Social outcomes

Torben Fridberg

This chapter demonstrates that that there seem to be strong associations between proficiency in literacy, numerac,y and problem-solving in a technology-rich environment and four indicators of social outcomes as they are drawn up in the survey of adult skills. That is social trust or trust in others, political efficacy or the sense of influence on the poltical process, voluntary work in associative, religious, political, or charity activities, and self assessed health status.

General social trust or trust in other persons is strongly associated with proficiency in all three domains of skills. Volunteering or participation within the latest 12 months in voluntary work, including unpaid work for a charity, political party, trade union, or other non-profit organisations also is strongly correlated with profiency in literacy, numeracy, and problem-solving in a technology-rich environment. Political efficacy is measured by a question regarding whether the respondents find that they have a say about what the government does. This sense of influence on the political process is strongly correlated with proficiency in all three skills domains. Finally it is demonstrated that there is high correlation between skills proficiency and self-assessed health. Also, this relation remains at a statistically significant level even when level of education, age, and other factors are taken into consideration.

The overriding impression from the analyses of the relations between skills and the different indicators of social outcomes is that the relations are very similar in all five countries.

9.1 Introduction

The Survey of Adult Skills (PIAAC) collected information on four dimensions of what the OECD Skills Outlook 2013 report calls “well being” (OECD, 2013a, p. 234). The dimensions are level of trust in others, political efficacy or the sense of influence on the poltical process; participation in associative, religious, political, or charity activities (volunteering), and self-assessed health status. The background for this is a growing interest in the competencies needed to achieve social and personal well-being, understood in a broad way, in addition to those believed to be essential for economic success. It is well known that skills affect people's lives and the level of well-being in countries in ways that go beyond what can be measured by labour market earnings of the individuals and economic growth of the countris. Less is known about how skills, such as literacy, numeracy and problem-solving in a technology-rich environment, may affect social and personal wellbeing.

Table 9.1 Trust, political efficacy, volunteering and health in the Nordic countries

			Denmark	Estonia	Finland	Norway	Sweden
Trust in others:							
a. There are only a few people you can trust completely	01 Strongly agree – 05 Strongly disagree	Mean	3.02	1.99	2.61	2.68	2.65
b. If you are not careful, other people will take advantage of you	01 Strongly agree – 05 Strongly disagree	Mean	2.94	2.09	2.94	2.65	3.02
Trust Index (a+b)/2	01 Strongly agree – 05 Strongly disagree	Mean	2.98	2.04	2.77	2.67	2.84
Political efficacy:							
People like me don't have any say about what the government does	01 Strongly agree – 05 Strongly disagree	Mean	3.18	2.54	3.13	3.20	3.12
Voluntary work (%):							
In the last 12 months, how often, if at all, did you do voluntary work, including unpaid work for a charity, political party, trade union or other non-profit organisation?	Never		55.9	72.3	56.3	42.7	63.8
	Less than once a month		20.0	17.7	23.1	29.3	17.6
	Less than once a week but at least once a month		11.3	5.6	11.6	14.4	8.8
	At least once a week but not every day		10.9	3.5	7.5	11.9	8.2
	Every day		1.8	0.9	1.5	1.8	1.7
All			100.0	100.0	100.0	100.0	100.0
Health (%):							
In general, would you say your health is excellent, very good, good, fair, or poor?	Excellent		22.2	7.6	15.2	17.6	23.6
	Very good		39.6	19.6	28.3	34.7	31.7
	Good		21.1	38.0	38.4	30.7	28.7
	Fair		13.0	29.1	15.3	12.9	12.5
	Poor		4.1	5.7	2.7	4.1	3.5
	ALL		99.99	100,01	100	100	99.99

For lack of a better concept, we are here, as in the OECD report, talking about social outcomes of the skills, although we are well aware, that it is not possible to say anything about causality based on the PIAAC cross-sectional data. We do not know the direction in any correlations between the specific skills and the dimensions of social and personal well-being. Skills may have an influence on the level of volunteering, but volunteering, as well, may have an influence on the level of skills in each country.

Table 9.1 presents an overview of how the four social outcome dimensions (trust in others, political efficacy, volunteering, and self-assessed health) are distributed in the five countries.

The measure for trust in other people usually is constructed on the basis of two or three specific questions. In the Survey of Adult Skills two questions are included. The respondents were asked:

> To what extent do you agree or disagree with the following statements?
> – There are only a few people you can trust completely.
> – If you are not careful, other people will take advantage of you.

Answers are in five categoires from “01-Strongly agree” to “05-Strongly disagree”. The two questions finally are combined into the “social trust” measure.From other studies, it is well known that the Nordic countries of Denmark, Finland, Norway, and Sweden are characterised by very high levels of social trust, and that the mean of trust in others is somewhat lower in Estonia than in the other four countries. This appears in table 9.1. Where the mean on the 5-point scale is 2.04 in Estonia, it is between 2.77 and 2.98 in the other four countries.

Estonia also separates out when it comes to political efficacy or the sense of influence on the poltical process. Here the question to the respondents was:

> To what extent do you agree or disagree with the following statements?
> – People like me don't have any say about what the government does.

Again, the possible answering was the five categories from: “01-Strongly agree” to “05-Strongly disagree”. Mean score on this 5-point scale was 2.52 in Estonia and between 3.12 and 3.20 in the four Nordic countries. On average, the sense of influence on the political process is at a lower level in Estonia than in the other four countries.

In studies on social capital, it is usually the two dimensions of social trust and volunteering that are applied as indicators on social capital. In the Survey of Adult Skills, it is a question on participation in associative, religious, political, or charity activities (volunteering):

In the last 12 months, how often, if at all, did you do voluntary work, including unpaid work for a charity, political party, trade union, or other non-profit organisation?

The five answering categories ranged from "Never" to "Every day" (see table 9.1).

Table 9.1 demonstrates that 24% of the population in Denmark aged 16–65 years had carried out voluntary work at least once a month in the latest 12 months. In Estonia, the corresponding share was 10%, in Finland 21%, in Norway 28%, and in Sweden 19%. In international comparisons, the level of volunteering in the Nordic countries, and especially in the three Scandinavian countries, is rather high. It seems that the level of volunteering in Sweden is a little underestimated in this survey (See Fridberg & Henriksen, 2014). However, in accordance with other studies, the level of volunteering is a little lower in Estonia than in the other Nordic countries.

Self assessed health is measured by the question:

In general, would you say your health is excellent, very good, good, fair, or poor?

From table 9.1, it appears that the Danes are most positive in characterising their health. In all, 62% of the Danes find their health "Excellent" or "Very good". Most negative are the Estonians. In all, 27% of the Estonians find their health "Excellent" or "Very good", and 35% find their health "Fair" or "Poor" in contrast to 16–18% in the other four countries.

9.2 Skills and general social trust in others

The figures 9.1–9.3 demonstrate the relation between the basic skills profiency average score and general social trust in the five countries.

It appears from the tables that, in general, by increasing social trust, we find higher average skills scores for all the three skills: literacy, numeracy, and problem-solving in a technology-rich environement. Low social trust is associated with low-average skill scores and a high level of social trust in others is associated with high-average skill scores. However, it looks like respondents with extremely high scores in social trust (score 4.5 or 5.0) on average have a slightly lower proficency in literacy, numeracy, and problem-solving than respondents with a slightly less high score in social trust (score 4.0). This is most marked in Estonia, where we find average skills profiency to be considerably lower among those with extremely high social trust than among the respondents with a slightly lower score in social trust. Also in Finland, we find the highest proficiency scores in the group of respondents having scored 3.0 on the social trust scale.

Figure 9.1 Literacy average score by general social trust

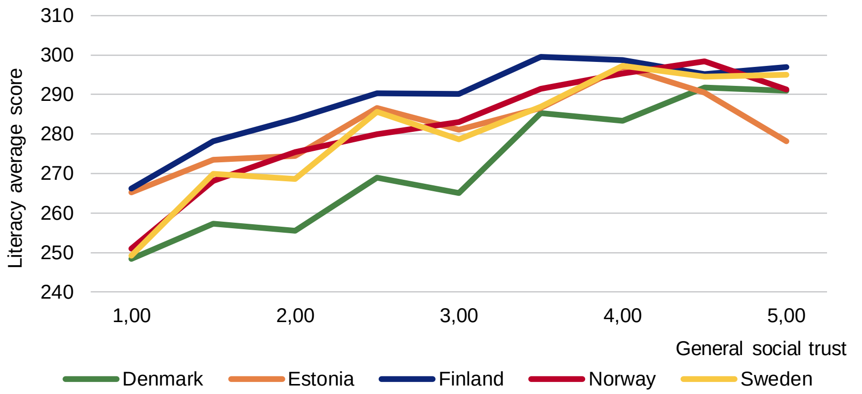

Figure 9.2 Numeracy average score by general social trust

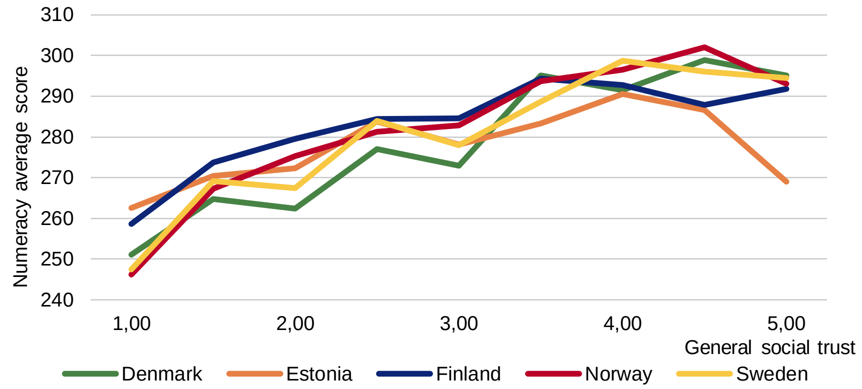

Figure 9.3 Problem-solving average score by general social trust

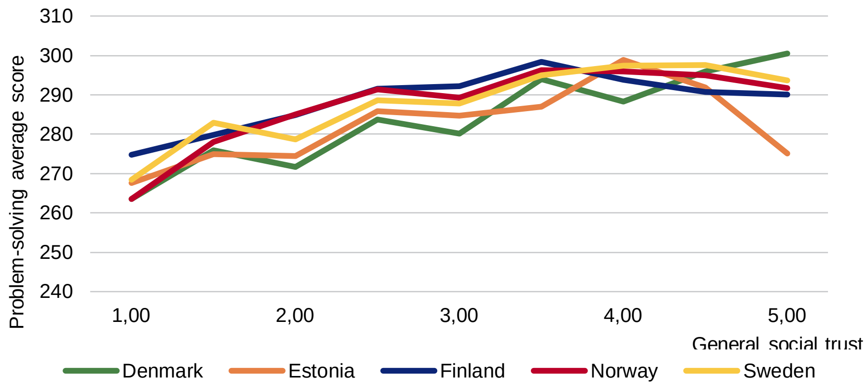

Table 9.2 Regression: General social trust. Model with Literacy proficiency

	Denmark		Estonia		Finland		Norway		Sweden	
	Coef.	p	Coef.	p	Coef.	p	Coef.	p	Coef.	p
Gender: Woman	0.26	0.00	0.04	0.05	0.03	0.32	0.16	0.00	0.15	0.00
Age: number of years	0.01	0.10	0.01	0.00	-0.02	0.01	0.02	0.02	-0.01	0.17
Age: number of years*number of years	0.00	0.75	0.00	0.00	0.00	0.02	0.00	0.37	0.00	0.02
Highest completed education										
Compulsory school										
Youth education	0.18	0.00	0.01	0.77	0.24	0.00	0.08	0.11	0.07	0.21
Higher education – below master	0.55	0.00	0.10	0.00	0.44	0.00	0.31	0.00	0.26	0.00
Higher education – master or above	0.75	0.00	0.36	0.00	0.75	0.00	0.59	0.00	0.46	0.00
Immigrant	-0.21	0.00	-0.06	0.04	-0.26	0.00	-0.09	0.09	-0.12	0.04
Main occupation										
In work – full time										
In work – part time	0.02	0.67	0.05	0.26	-0.08	0.15	-0.12	0.04	-0.05	0.37
Unemployed	-0.32	0.00	-0.09	0.00	-0.27	0.00	-0.25	0.01	-0.32	0.00
Under education	-0.17	0.01	0.16	0.00	-0.13	0.01	0.07	0.28	-0.19	0.00
Retired	-0.30	0.00	-0.03	0.43	-0.31	0.00	-0.47	0.00	-0.37	0.00
Other	-0.19	0.01	-0.06	0.06	-0.08	0.14	-0.06	0.53	-0.18	0.04
Literacy proficiency	0.004	0.00	0.002	0.00	0.001	0.14	0.005	0.00	0.004	0.00
Constant	1.18	0.00	1.28	0.00	2.69	0.00	0.47	0.01	1.79	0.00
Number of respondents	7,245		7,562		5,419		4,921		4,423	
R2	0.18		0.06		0.08		0.14		0.11	

Usually social trust is closely related with level of education. Table 9.2 shows the result of a regression analysis for which a number of factors are brought in, which might be associated to the trust in others at the individual level. In addition to highest education completed is the labour market connection. This connection is expected to be related to social trust. Furthermore, immigrant status is included from the information regarding whether the respondent is born in the country. In addition, gender and age are included. Finally, literacy skills are included in this analysis to see if the relation between skills in literacy and social trust remain in force even when the relation between education and social trust is taken into consideration.

As demonstrated in the table, almost all of the variables included in the analyses are independtly related to social trust at a statistically significant level, even when the other variables in the analysis are taken into consideration. The strong relation between education and trust in others remains part of the results. There is a significant independent connection between literacy and social trust in all five countries. Furthermore, it appears from table 9.2 that in all five countries, immigrants have less trust in others than persons born in the country. The connection between labour market connection and social trust remains in this analysis, at least in the four Nordic countries. The unemployed especially have much less trust in others than persons working full time. In the table, Estonia separates out from the four Nordic countries in a number of ways. According to this analysis, the connection between social trust and the factors of highest completed education, immigrant status, and labour market connection are weaker in Estonia than in the other countries. As it appears above in table 9.1 also the average level of social trust is at a lower level in Estonia than in the other four countries. The differences in level of social trust between different groups of the population are smaller in Estonia than in the other countries.

9.3 Skills and volunteering

Figures 9.4–9.6 demonstrate the relation between the three basic skills and participation within the latest 12 months in voluntary work, including unpaid work for a charity, political party, trade union, or other non-profit organisations.

The major impression from the figures is that persons who never do voluntary work, on average, have lower profiency scores in all three skills compared to persons who have performed voluntary work within the latest 12 months. However, it is not a linear relation between skills and the frequency of volunteering in most of the countries. Only in Norway do the groups doing voluntary work every day or at least once a week have higher scores on average in literacy and in problem-solving than persons who are doing voluntary work less frequently. In Denmark and Sweden, the groups doing voluntary work less than once a week, but at least once a month, on average, are scoring highest in literacy and numeracy. In Estonia, the groups volunteering less than once a month have the highest levels of average skill scores.

Participation in voluntary work is usually related to the kind of ressources which the volunteers possess. The frequency of volunteering, however, is related to time available for voluntary work after salaried working hours and family obligations. Persons using excessive time volunteering are mostly found among the very young age-groups or among the groups who have retired from salaried work, but still are able to carry out voluntary work.

Figure 9.4 Literacy average score by voluntary work

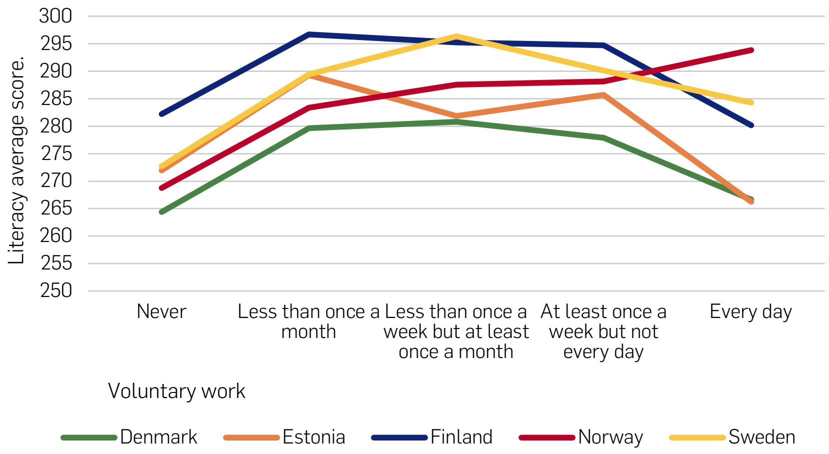

Figure 9.5 Numeracy average score by voluntary work

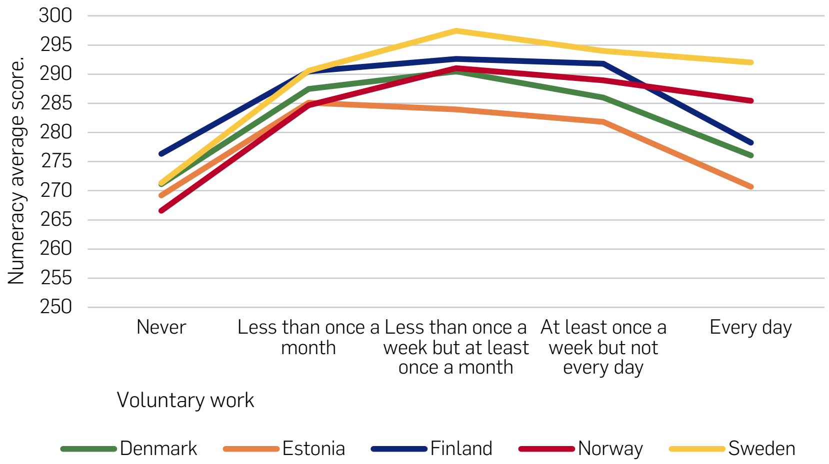

Figure 9.6 Problem-solving average score by voluntary work

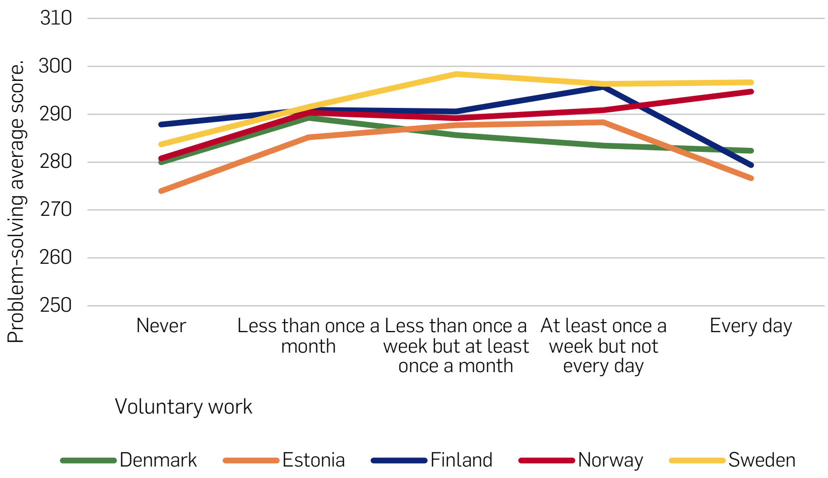

Table 9.3 Regression: Voluntary work. Model with Literacy proficiency

	Denmark		Estonia		Finland		Norway		Sweden	
	Coef.	**p**	**Coef.**	**p**	**Coef.**	**p**	**Coef.**	**p**	**Coef.**	**p**
Gender: Woman	-0.10	0.00	-0.07	0.00	-0.10	0.00	-0.12	0.91	-0.13	0.00
Age: number of years	0.02	0.02	0.01	0.16	0.03	0.00	0.07	0.94	0.03	0.00
Age: number of years*number of years	0.00	0.10	0.00	0.10	0.00	0.01	0.00	1.00	0.00	0.02
Highest completed education										
Compulsary school										
Youth education	0.13	0.00	0.11	0.00	0.08	0.10	0.10	0.92	0.13	0.02
Higher education – below master	0.13	0.00	0.18	0.00	0.20	0.00	0.15	0.88	0.16	0.01
Higher education – master or above	0.14	0.02	0.32	0.00	0.19	0.01	0.06	0.95	0.21	0.00
Immigrant	-0.13	0.00	0.03	0.39	-0.08	0.24	-0.28	0.78	-0.12	0.01
Main occupation										
In work – full time										
In work – part time	0.00	0.99	0.10	0.03	0.15	0.01	0.05	0,96	0.13	0.02
Unemployed	-0.09	0.12	0.03	0.34	-0.03	0.61	-0.04	0,97	-0.06	0.37
Under education	0.06	0.39	0.24	0.00	0.06	0.24	0.28	0,78	0.06	0.39
Retired	-0.01	0.87	-0.08	0.00	0.06	0.29	-0.15	0,88	0.01	0.91
Other	-0.23	0.00	-0.05	0.24	0.02	0.72	0.18	0,86	-0.02	0.77
Literacy proficiency	0.002	0.00	0.001	0.00	0.002	0.00	0.003	1,00	0.002	0.00
Constant	0.65	0.01	0.92	0.00	0.54	0.00	-0.22	0,83	0.28	0.24
Number of respond-ents	7,281		7,573		5,449		4,940		4,458	
R2	0.03		0.03		0.03		0.06		0.04	

Table 9.3 shows the results of a regression analysis for which gender, age, highest level of education, immigrant status, and labour market connection are brought into the analysis in addition to the proficiency in literacy. As with social trust, it appears from the table that skills in literacy have a siginificant connection with participation in voluntary work, even when the other factors are taken into consideration.

The relation between voluntary work and education or labour market connection is weaker than the relation between social trust and education or labour market affiliation. This might be because the variable on voluntary work actually embraces both the question regarding whether or not the person performs voluntary work and the question regarding how frequently the voluntary work is performed. For Estonia, however, the table shows a rather strong relation between education and volunteering and between labour market affiliation and volunteering.

Finally, the table shows that persons not born in the country less frequently volunteer than persons born in the country. This is true in all countries except in Estonia, where the opposite is the case.

9.4 Skills and political efficacy

The sense of influence on the political process is measured by the question *people like me don't have any say about what the government does.* Respondents who strongly agree with this statement have a sense of having very little influence on the political process. As shown in tables 9.7–9.9, they score low on average on all the three skills: literacy, numeracy, and problem-solving.

The overriding impression from the tables is that average skill scores are increasing with the sense of having influence on the political process, but the groups that most strongly disagree with the statement are scoring slightly lower than the groups who disagree slightly less strongly. Only in Estonia is it the group of persons with the highest sense of political influence that also is the group with the highest skill score, on average, in all three skill domains.

A regression analysis, for which gender, age, highest level of education, immigrant status, and labour market connection are considered along with proficiency in literacy, shows a significant relation in all five countries between skills in literacy and the sense of political influence, even when all other factors are taken into consideration (see table 9.4).

Highest completed education is the variable most strongly associated with sense of political influence. In all the countries, the most educated have the highest sense of influence on the political process. However, immigrant status is also strongly associated with political efficacy in all the countries. Persons not born in the country have a lower sense of influence on the political process.

In Estonia and Finland, unemployed persons have a lower sense of influence on the political process than persons in full-time work, but in Denmark, Norway, and Sweden, there is no significant difference between the unemployed and the group of the population in work full-time.

Figure 9.7 Literacy average score by political efficacy

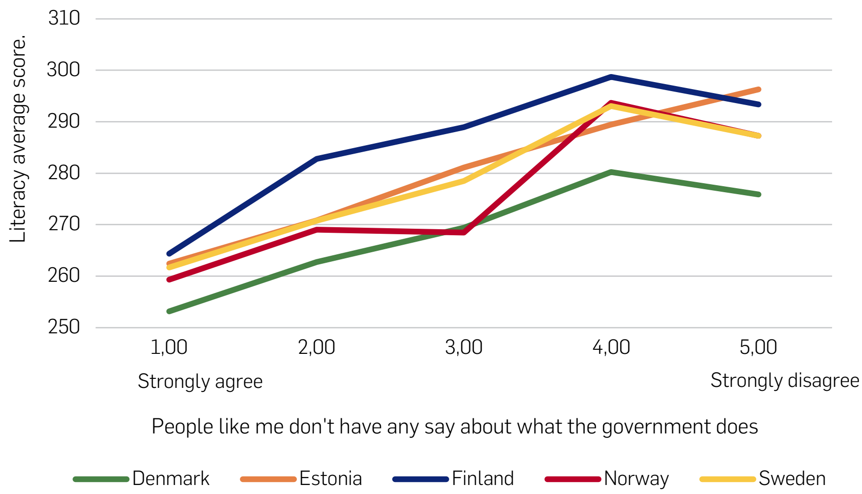

Figure 9.8 Numeracy average score by political efficacy

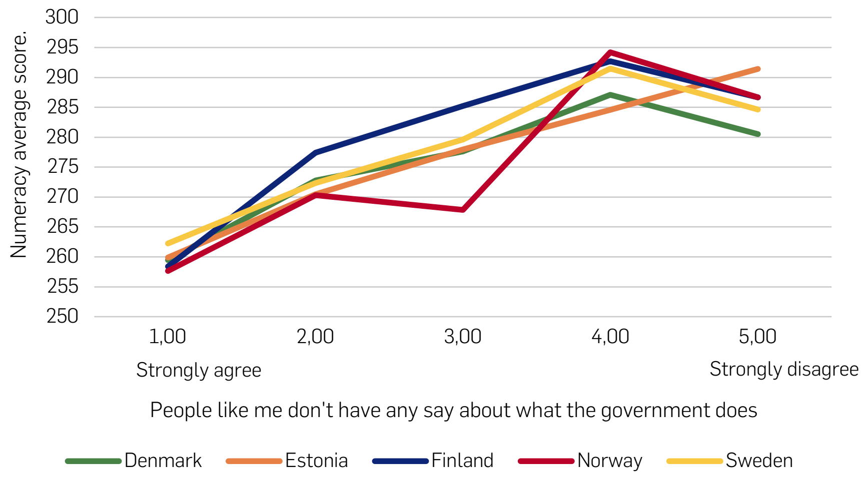

Figure 9.9 Problem-solving average score by political efficacy

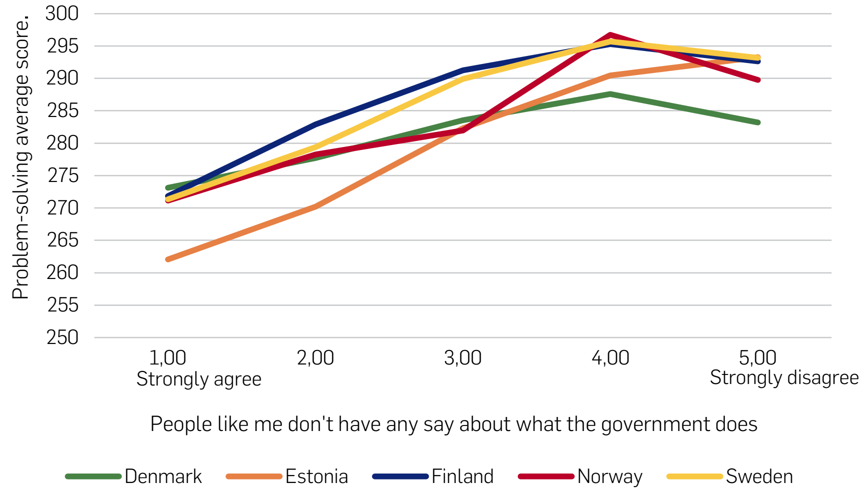

Table 9.4 Regression: Political efficacy. Model with Literacy proficiency

	Denmark		Estonia		Finland		Norway		Sweden	
	Coef.	**p**	**Coef.**	**p**	**Coef.**	**p**	**Coef.**	**p**	**Coef.**	**p**
Gender: Woman	0.15	0.00	-0.05	0.11	0.02	0.53	0.16	0.00	0.21	0.00
Age: number of years	0.00	0.61	-0.02	0.00	-0.01	0.27	-0.01	0.20	0.00	0.96
Age: number of years*number og years	0.00	0.47	0.00	0.15	0.00	0.22	0.00	0.17	0.00	0.70
Highest comple-ted education										
Compulsory school										
Youth education	0.20	0.00	0.16	0.00	0.27	0.00	0.16	0.00	0.10	0.17
Higher education – below master	0.37	0.00	0.25	0.00	0.55	0.00	0.39	0.00	0.29	0.00
Higher education – master or above	0.39	0.00	0.54	0.00	0.87	0.00	0.68	0.00	0.32	0.00
Immigrant	-0.38	0.00	-0.32	0.00	-0.44	0.00	-0.20	0.00	-0.10	0.11
Main occupation										
In work – full time										
In work – part time	-0.01	0.91	0.14	0.06	0.05	0.39	-0.10	0.10	-0.06	0.32
Unemployed	-0.14	0.09	-0.22	0.00	-0.22	0.00	-0.13	0.27	-0.07	0.45
Under education	-0.06	0.34	0.27	0.00	0.02	0.72	0.01	0.88	0.07	0.35
Retired	-0.04	0.48	-0.09	0.19	-0.11	0.14	-0.28	0.00	-0.09	0.36
Other	0.14	0.07	0.06	0.35	-0.01	0.90	-0.09	0.43	-0.04	0.73
Literacy profici-ency	0.003	0.00	0.004	0.00	0.002	0.00	0.004	0.00	0.003	0.00
Constant	2.22	0.00	1.95	0.00	2.36	0.00	1.97	0.00	2.02	0.00
Number of respondents	7,235		7,554		5,397		4,917		4,391	
R2	0.06		0.12		0.09		0.09		0.07	

9.5 Skills and self-assessed health

Figures 9.10–9.12 show the relation between the three basic skills and self reported health. As expected, the figures show a strong relation between health and skills in all the five countries and for all three basic skills, literacy, numeracy, and problem-solving in a technology rich environment. Groups reporting poor health are on average scoring much lower on the skills scales than the groups with better health. On the upper end of the health assessment scale, it appears that the group assessing its health as excellent is not scoring any higher in skills proficiency than the group assessing its health as very good. Except for problem-solving in Denmark, average scores in all the countries and for all three skills are slightly lower among the group with excellent health than among those who have reported their health to be very good.

Table 9.5 shows the result of a regression analysis in parallel to the analyses above for social trust, voluntary work, and political efficacy. The variables on gender, age, highest level of completed education, immigrant status, and labour market affiliation are included in the analysis in addition to the proficiency in literacy. Also, it appears that even when the other factors are taken into consideration, the table shows a separate significant correlation between literacy skills and self-reported health. The poorer the health assessment the lower the scores on the literacy scale.

Furthermore, the table reveals a strong correlation between self assessed health and education. Higher education is associated with better self-assessed health in all the countries. Also, persons born in the country assess their health to be better than the immigrants do. Finally, unemployed persons have poorer health in average than part-time employees, and part-time employees have poorer health than full-time workers in all the countries. However, age is not significantly related to self assessed health when the other factors are taken into consideration.

Figure 9.10 Literacy average score by self assessed health

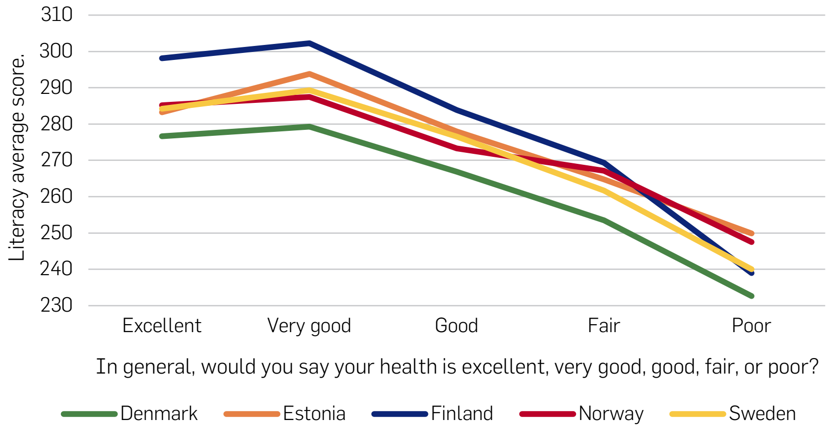

Figure 9.11 Numeracy average score by self assessed health

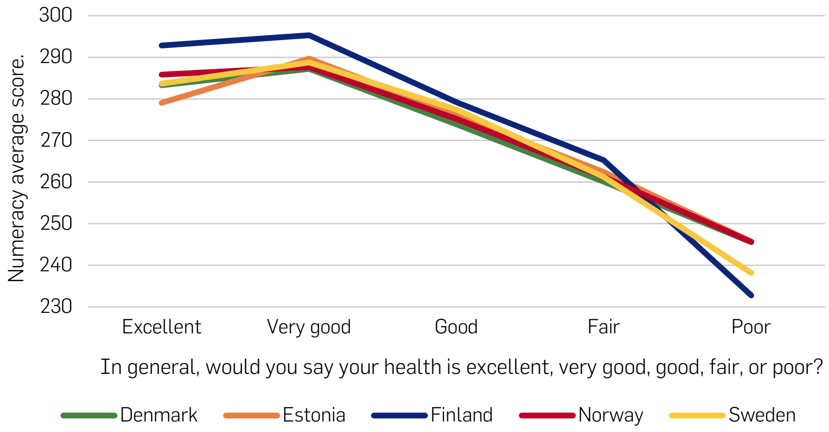

Figure 9.12 Problem-solving average score by self assessed health

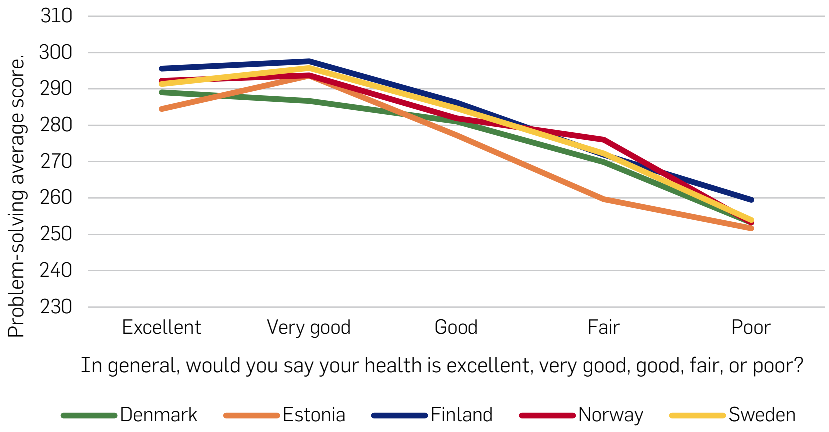

Table 9.5 Regression: Self assessed health. Model with Literacy proficiency

	Denmark		Estonia		Finland		Norway		Sweden	
	Coef.	**p**	**Coef.**	**p**	**Coef.**	**p**	**Coef.**	**p**	**Coef.**	**p**
Gender: Woman	-0.03	0.24	0.05	0.04	-0.06	0.01	0.00	0.89	0.03	0.35
Age: number of years	0.09	0.00	0.06	0.00	0.05	0.00	0.05	0.00	0.04	0.00
Age: number of years*number of years	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Highest completed education										
Compulsory school										
Youth education	-0.28	0.00	-0.19	0.00	-0.08	0.10	-0.14	0.00	-0.24	0.00
Higher education – below master	-0.41	0.00	-0.33	0.00	-0.34	0.00	-0.27	0.00	-0.35	0.00
Higher education – master or above	-0.49	0.00	-0.52	0.00	-0.53	0.00	-0.45	0.00	-0.35	0.00
Immigrant	0.02	0.51	0.08	0.01	0.03	0.68	0.03	0.50	0.02	0.71
Main occupation										
In work – full time										
In work – part time	0.17	0.00	0.16	0.00	0.18	0.00	0.23	0.00	0.20	0.00
Unemployed	0.49	0.00	0.25	0.00	0.44	0.00	0.48	0.00	0.25	0.02
Under education	0.41	0.00	0.09	0.07	0.28	0.00	0.18	0.00	0.24	0.00
Retired	1.07	0.00	0.62	0.00	0.71	0.00	1.22	0.00	0.88	0.00
Other	0.64	0.00	0.10	0.01	0.25	0.00	0.33	0.00	0.73	0.00
Literacy proficiency	-0.002	0.00	-0.002	0.00	-0.001	0.00	-0.001	0.00	-0.002	0.00
Constant	1.04	0.00	1.82	0.00	1.73	0.00	1.91	0.00	2.03	0.00
Number of respondents	7,281		7,566		5,453		4,941		4,459	
R2	0.17		0.29		0.19		0.18		0.11	

9.6 Summary

This chapter demonstrates that there seems to be strong associations between proficiency in literacy, numeracy, and problem-solving in a technology-rich environment and the indicators of social outcomes as they are drawn up in the Survey of Adult Skills.

General social trust or trust in other persons is strongly associated with proficiency in all three domains of skills. Usually, education is found to be higly correlated with social trust, but even when level of education is taken into consideration, there is a significant separate relation between skills (here in literacy) and trust in other persons.

Volunteering or participation within the latest 12 months in voluntary work, including unpaid work for a charity, political party, trade union, or other non-profit organisation also is strongly correlated with profiency in literacy, numeracy, and problem-solving in a technology-rich environment. However, the frequency of volunteering among those doing voluntary work does not have a simple relation to skills. The explanation might be that many highly educated persons in full-time work who are also scoring high on the skills scales belong to groups of the population that are not able to spend time every day on voluntary work. The highest average skills scores are found among the groups carrying out voluntary work at least once a month.

Political efficacy is measured by a question about whether the respondents find that they have a say about what the government does. This sense of influence on the political process is strongly correlated with proficiency in all three skills domains. Also, the level of highest completed education is strongly related to a sense of political influence, but even when education is taken into consideration, there appears to be a significant separate relation between skills in literacy and sense of political influence.

Finally, it is demonstrated that there is a high correlation between skills proficiency and self-assessed health. This relation remains at a statistically significant level even when level of education, age, and the other factors are taken into consideration.

The overriding impression from the analyses of the relations between skills and the different indicators of social outcomes is that the relations are very similar in all the Nordic countries. Also, the Nordic countries are very similar when looking at the distribution of the populations on the four dimensions. Only Estonia separates somewhat from the four other countries. The level of social trust, the level of volunteering, and the sense of political influence are all at a lower level in Estonia than in the other countries. This is the case as well for the level of self-asessed health among the 16–65-years old populations that are participating in the study. However, the relations between skills and the four social outcome indicators are very similar in all of the five countries.

9.7 References

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10. Weak and Strong Performers in Literacy and Numeracy

Hanne Størset and Antero Malin

The PIAAC data were used to study weak and strong performers in literacy and numeracy and the associations between these groups and socio-demographic background factors. The Nordic region countries Denmark, Finland, Estonia, Norway, and Sweden were compared to two other aggregates of the PIAAC-participating countries. There are small differences in the weak-performing groups between the Nordic region countries. The variation is larger for the strong-performing groups. In most PIAAC countries, the amount of weak in both literacy and numeracy is larger than the sum of the weak either in literacy or numeracy. There is more variation across the countries when it comes to which strong group is the largest. The same association patterns were found across the country aggregates between age, gender, education, employment status, and income, and performance groups in literacy and numeracy. The most disadvantaged group are adults who are weak performers both in literacy and numeracy, and the most advantaged group are adults who are strong performers in both skill domains. Numeracy, not literacy to the same extent, is associated with employment status and income. Being weak in numeracy is associated with unemployment and low income, and being strong is associated with employment and high income. The results support the conclusions that more attention in research and policy could be given to numeracy and to numeracy in relation to literacy.

10.1 Introduction

As the international surveys on adult skills have been developed and improved, the scope of skills that get assessed has broadened. Skills are seen as drivers in individual lives and in economies (OECD, 2013a, 2013b). The ALL survey concluded that 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. The findings showed that disadvantage is more pervasive when adults had weak performance in all four skill domains assessed (OECD/Statistics Canada, 2011).

An earlier British study concluded that, for men, there is no real difference between the effect of poor literacy and poor numeracy together, and poor numeracy alone. For women, the impact of weak literacy and weak numeracy skills is substantial, but weak performance in numeracy has the greater effect, even when it is combined with competent literacy (Bynner & Parsons, 2005).

We will use the PIAAC data to look at performance across skills. We delimit the chapter to looking at literacy and numeracy. We will study the association between the two skills in both ends of the performance scale and investigate how the associations vary across countries.

10.2 Research questions and methods

We know that a large share of the weak performers in literacy are also weak performers in numeracy. Similarly, strong performers in literacy are usually also strong performers in numeracy. In this chapter we will take a closer look at the strength of these associations.

The weak and strong performing groups in literacy and numeracy are defined by using the conventional proficiency levels used in the PIAAC study (OECD, 2013a). The description of what adults can do at different levels of proficiency is presented in the introduction. The weak performing groups are defined as:

- LN-weak: Adults who are at level 1 or below both in literacy and in numeracy.
- L-weak: Adults who are at level 1 or below in literacy, but above level 1 in numeracy.
- N-weak: Adults who are at level 1 or below in numeracy, but above level 1 in literacy.

The strong performing groups are defined as:

- LN-strong: Adults who are at level 4 or 5 both in literacy and in numeracy.
- L-strong: Adults who are at level 4 or 5 in literacy, but below level 4 in numeracy.
- N-strong: Adults who are at level 4 or 5 in numeracy, but below level 4 in literacy.

The groups are created using the ten plausible values in literacy and numeracy and producing ten groups for each weak and strong performing group. The country estimates are thus the average of ten values.

After we have established the size of these three different weak and strong performing groups, we will analyse these groups in terms of socio-demographic background factors. We aggregate the countries to maximise the use of the data. However, unlike earlier in this book, we do not describe distributions of proficiency levels within socio-demographic background groups, but we describe the weak and strong performing groups in terms of background factors.

In grouping the countries, we use the following country aggregates (as described in chapter 2):

- Nordic region: Denmark, Estonia, Finland, Norway, and Sweden.
- Non-Nordic EU member countries: Austria, Belgium (Flanders), Czech Republic, France, Germany, Ireland, Italy, Netherlands, Poland, Slovak Republic, Spain, and United Kingdom (England and Northern Ireland).
- Countries outside the EU: Canada, Japan, Korea, and United States.

As in the OECD report (OECD, 2013), the estimates of the country aggregates in weak and strong performing groups are the averages of the respective country estimates. In addition, the overall estimate of the studied background characteristics in each aggregate is given, describing the background characteristics in the whole aggregate instead of the weak and strong performing groups. This is again calculated as the average of the respective country estimates of each aggregate. More specifically, in this chapter we focus on the following questions:

- Q1: What size do the weak and strong performing groups have in the Nordic and other PIAAC-participating countries, as well as in country aggregates? Do these groups differ across countries and aggregates?
- Q2: Do we find association between the weak and strong performing groups in the Nordic region and key socio-demographic factors? Do we see similarities or differences in such associations across country aggregates?

10.3 Weak and strong performers in the Nordic region

Chapter 3 looked at one skill at a time, and showed that there is some variation among the Nordic countries in the distribution of weak and strong performers. Finland stands out as having the lowest percentage of weak performers and the highest percentage of strong performers, both in literacy and numeracy. Denmark, on the contrary, has the highest percentage of weak performers and the lowest percentage of strong performers in literacy.

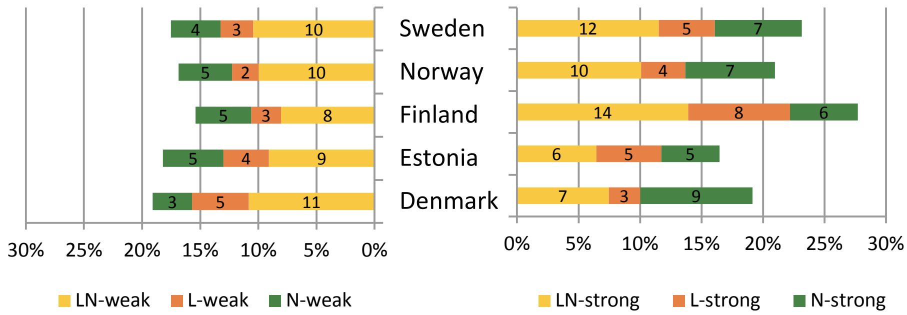
When we look at proficiency in literacy and numeracy combined (Figure 10.1a, Table 10.1), the weak performing groups (LN-weak, N-weak and L-weak) show small differences between the Nordic countries. Overall, the total share of weak performers varies between 16% in Finland and 19% in Denmark. The share of LN-weak is larger than the joint share of L-weak and N-weak in all the countries except in Estonia, where the size is equal. This means that the largest shares of the weak performers are weak in both literacy and numeracy. In total, there are about 3 million adults in the Nordic region who suffer from skill shortage in numeracy, in literacy, or in both. About 1.7 million adults in the Nordic region are weak in both literacy and numeracy, 550,000 are weak in literacy only and 750,000 are weak in numeracy only (Table 10.1).

The variation across the countries is larger for the strong-performing groups than for the weak-performing groups. Overall, the total share of strong performers is the largest in Finland (28%) and the smallest in Estonia (16%). The N-strong group is the biggest in Denmark (9%). The share of LN-strong is equal to the joint share of L-strong and N-strong groups in Sweden, Norway, and Finland, and smaller in Estonia and Denmark. In total, there are 1.8 million adults in the Nordic region who are strong performers both in literacy and numeracy, 800,000 who are strong performers only in literacy, and 1.2 million who are strong in numeracy only (Table 10.1).

Table 10.1 Distribution of adults in weak and strong performing groups in the Nordic countries

	Denmark		Estonia		Finland		Norway		Sweden		Total		Average
	N	%	N	%	N	%	N	%	N	%	N	%	%
Combined literacy and numeracy													
LN-Weak	393,353	10.8	81,505	9.1	281,539	8.1	327,381	10.0	625,192	10.4	1,708,970	9.9	9.7
LN-Strong	270,810	7.5	57,811	6.5	486,618	13.9	330,922	10,1	690,269	11.5	1,836,430	10.6	9.9
Literacy alone													
L-weak	176,427	4.9	35,141	3.9	89,495	2.6	75,044	2.3	168,980	2.8	545,086	3.2	3.3
L-strong	92,364	2.5	47,326	5.3	289,290	8.3	118,540	3.6	272,389	4,6	819,910	4.7	4.9
Numeracy alone													
N-weak	123,272	3.4	46,597	5.2	167,197	4.8	150,995	4.6	254,946	4.3	743,007	4.3	4.4
N-strong	331,866	9.1	42,310	4.7	193,052	5.5	239,222	7.3	422,733	7.1	1,229,184	7.1	6.7

Figure 10.1a Weak and strong performing groups in the Nordic region



10.4 Weak and strong performers in the native-speaking population in the Nordic region

The respondent's language background is reflected in the proficiency of literacy and numeracy. The respondents were asked about the language they first learned at home in childhood and still understand. If it was the same as the test language, the respondent was categorised as a native speaker. The proficiency level in PIAAC by a non-native speaker of the test language does not indicate the proficiency in the person's native language (OECD, 2013b).

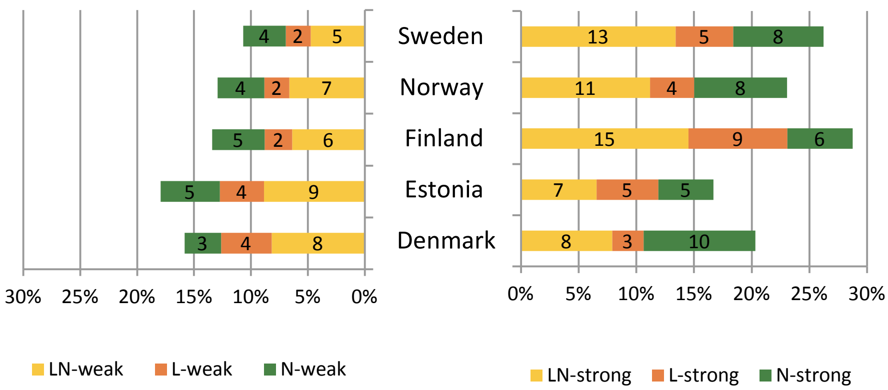
In PIAAC, the Nordic region stands out as having relatively large shares of non-native speakers of the test language in PIAAC (Sweden 19%, Norway 14%, and Denmark 12%).The shares of non-native speakers are small in both countries with two test languages, Estonian and Russian in Estonia (2%), and Finnish and Swedish in Finland (5%). By looking at native speakers only, we get a notion of the proficiency without the language background interfering with the results.

When looking at native speakers only, in general, the share of weak performers is smaller and there is a small increase in the share of strong performers, compared to the whole sample (Figure 10.1b). Sweden shows the largest change. The share of people who perform weak in both literacy and numeracy is half the size, down to 5%. The weak groups in Estonia do not change. When we look at the native speakers only, the differences between the countries increase. Sweden has the smallest share of weak performers, and Estonia has the largest.

The changes are smaller for the strong-performing groups, when we look at native speakers only. In each country the share of strong performers in both literacy and numeracy increases by one percentage point. Sweden, Denmark, and Norway show the same increase in the share of N-strong, and in Finland this happens to the share of L-strong.

Although the shares of weak performers decreased when we removed the non-native speakers from the sample, the shares are still substantial. The pattern of strong groups remains the same, while there is a slight change for the weak groups. In Sweden and Finland the LN-weak groups are one percentage point smaller than the sum of the two other weak groups, while it's the other way around for Norway and Denmark.

Figure 10.1b Weak and strong performing groups in the Nordic region, native speakers of test language only



10.5 Weak and strong performers in all PIAAC participating countries

The variation across the Nordic countries is smaller than the variation among all countries participating in PIAAC (Figure 10.2). In all the countries (except Japan) the largest share of weak performers is in the group, which is weak in both literacy and numeracy, indicating that the proficiency in these domains is related. In most countries the LN-weak group is larger than the two groups L-weak and N-weak together. The largest share of the LN-weak group is in Spain (22%) and the smallest in Japan (4%). The variation across the countries is smaller when we look at the N-weak and L-weak groups. The variation for N-weak is from 4% in Japan to 13% in the United States. The L-weak groups are rather small for all countries, from 1% in Japan to 6% in Italy.

The shares of LN-weak and N-weak are smaller in all the Nordic region countries than the average of all PIAAC participating countries. The average of the L-weak group for all PIAAC countries is only 3% and the share is smaller only in Norway.

In total, about 88 million adults in OECD countries participating in PIAAC are weak in both literacy and numeracy, 16 million are weak in literacy alone, and 55 million are weak in numeracy alone.

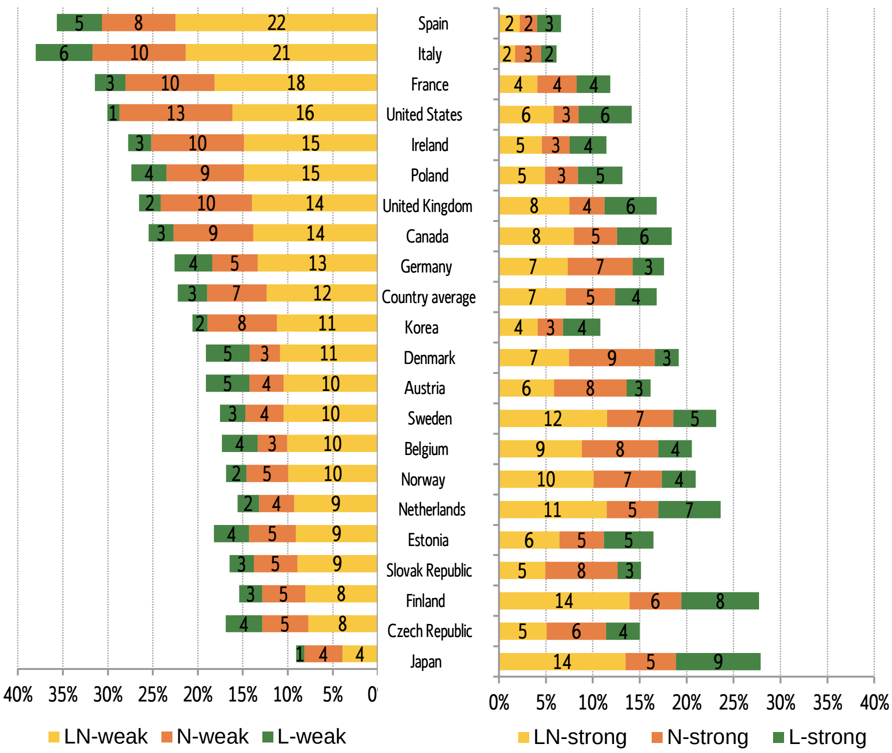
The shares of strong performers are smaller than the shares of weak performers. This means that the variation in shares across countries is somewhat smaller for the strong performer's groups. However, there is more variation across the countries when it comes to which strong group is the largest. The group of individuals who are strong in both literacy and numeracy is the largest in most countries, although the LN-strong group is smaller than the L-strong and the N-strong groups put together. Among the strong performers, Japan and Finland have the largest LN-strong group (14%) and Italy and Spain the smallest (2%). Japan also shows the largest share of performers who are strong in literacy alone (9%), while Italy shows the smallest (2%). Denmark shows the largest shares of N-strong performers (9%) and Spain the smallest (2%).

In the Nordic region, Estonia and Denmark have shares of LN-strong in line with the average share of all participating countries while the other three countrie's shares lie clearly above the average. Finland's L-strong share is clearly above the average for all countries (8%), while in the other Nordic countries it is roughly the size of the average. The shares of N-strong groups are equal to or above the average (5%) in all the Nordic region countries.

In total, about 42 million adults in OECD countries participating in PIAAC are strong in both literacy and numeracy, 32 million are strong in literacy alone, and 25 million are strong in numeracy alone.

There is a pattern showing that if the share of weak performers is low, the share of strong performers tends to be larger. If we compare the ranking of the LN-weak and the LN-strong groups only, exceptions from this pattern are the United States, the United Kingdom, Canada, and Germany. These countries have relatively larger LN-strong shares, while Korea has a relatively smaller LN-strong share, than what would be expected based on the share of LN-weak performers. The Czech Republic, Slovak Republic, and Estonia are doing well if we look at weak performers only. The countries have rather small shares of weak performers, but the shares of strong performers are small as well.

Figure 10.2 Weak and strong performing groups in the PIAAC participating countries*



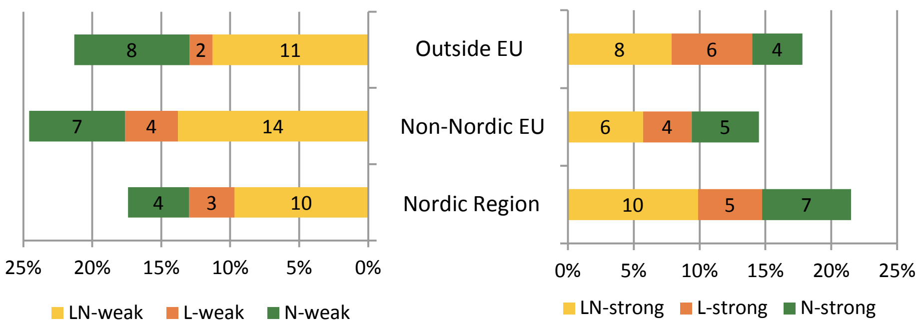
*Data from Australia, Cyprus and Russian Federation is missing. From United Kingdom only England and Northern Ireland participated.

10.6 Weak and strong performers by country aggregates

When we look at the variation between the country aggregates (Figure 10.3), the Nordic aggregate shows the best results of the aggregates. The strong groups together are larger than the weak groups together, but the LN-strong and LN-weak are the same size. The non-Nordic EU aggregate has the opposite result, with weak groups that are larger than the strong groups. The LN-weak is more than double the size of the LN-strong. The Outside EU aggregate has a result in between the two other aggregates, but the N-weak and the LN-weak groups are larger than the respective strong groups.

When looking at the aggregates, it is good to keep in mind that the countries in the Nordic region are quite homogenous and that there is little variation between the countries' weak and strong groups. The other aggregates gather countries where the differences are apparent. The non-Nordic EU aggregate contains twelve countries. The range of results is from countries showing good results in both weak and strong groups, to countries with small shares in weak groups and in strong groups, and, finally, the countries with the poorest results. The aggregate Outside EU contains four countries, two in Asia and two in North America. Of the four, Japan stands out with top performance. Korea has small shares in strong groups, while the United States and Canada have large shares of weak performers.

Figure 10.3 Weak and strong performing groups by country aggregates

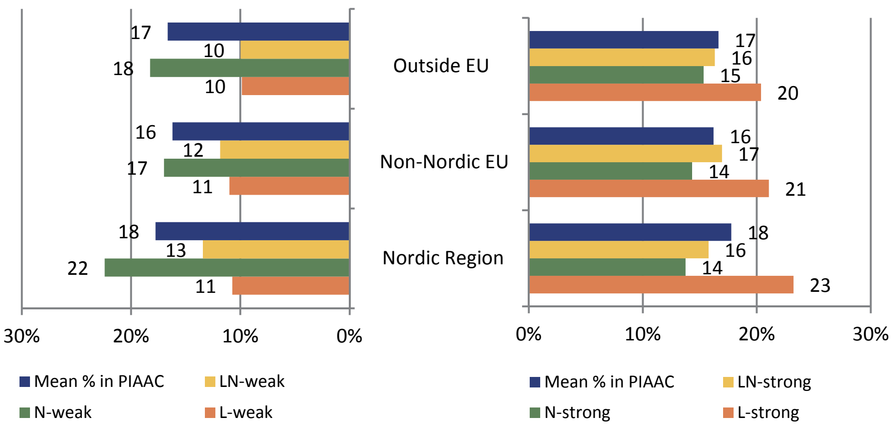


10.7 Age and the distribution of weak and strong groups

The age groups we used are 16–24, 25–34, 35–44, 45–54, and 55–65 years olds. The average share of each age group in the PIAAC sample of the respective country aggregates is about the same. In the Nordic region, the youngest age group makes up 18% of the sample. The age group's total samples increase by one percentage point until the oldest makes up a 22% share. When we look at the shares of weak and strong groups, we compare them with the proportion of the age group. The results show that for each age group the pattern of the weak and strong groups is quite the same across all the country aggregates (Figure 10.4a–e).

The youngest are performing relatively well, with an exception for the N-weak and N-strong groups (Figure 10.4a). In all aggregates, the shares of both groups with weak performers in literacy are clearly smaller than the proportion of this age group. Particularly in the Nordic region, the group with weak performance in numeracy only is larger than the age group size. When looking at the strong performing groups, the L-strong groups are large for all aggregates. The two other strong groups are smaller, and in the Nordic region both are less than the age group proportion.

Figure 10.4a Percentage of adults aged 16–24 in weak and strong performing groups



The next two age groups (25–34 and 35–44) show good proficiencies, and almost the same results (Figure 10.4b and 10.4c). For all aggregates, both age groups show smaller percentages in weak groups than the age group proportions, and larger in the strong groups. The younger group has somewhat better results. The Nordic region has the smaller L-weak. The Outside EU aggregate has a smaller LN-weak. The 25–34 year olds have larger L- and LN-strong groups than the N-strong group in all aggregates. Amongst the 35–44 year olds, the LN-strong is larger than the other strong groups.

Figure 10.4b Percentage of adults aged 25–34 in weak and strong performing groups

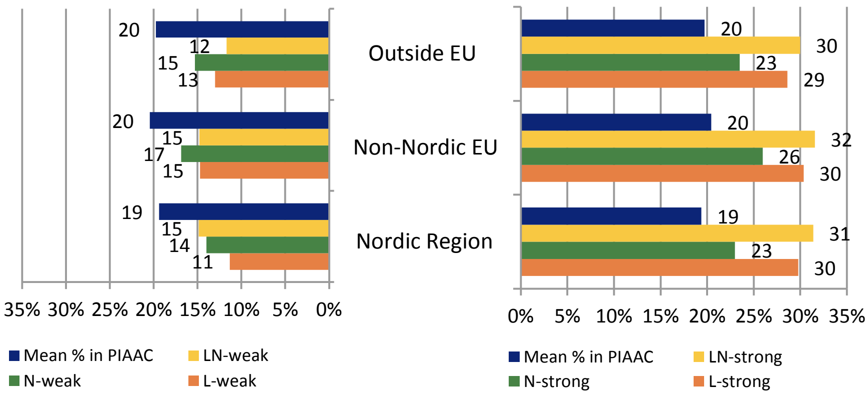
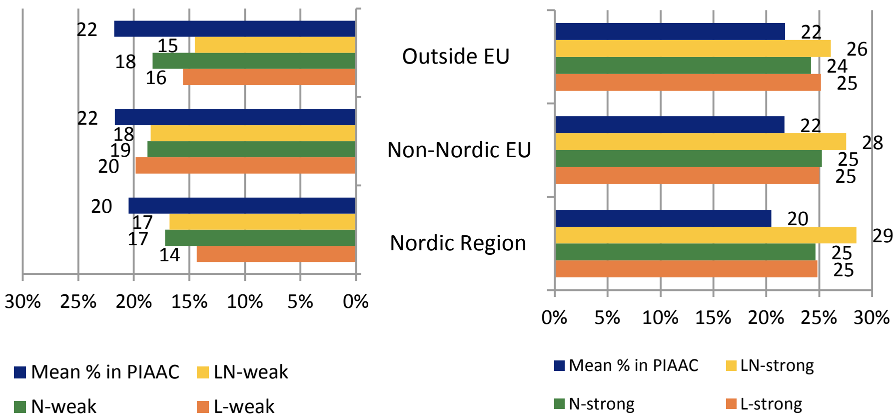


Figure 10.4c Percentage of adults aged 35–44 in weak and strong performing groups



The 45–54 year olds show weak groups close to the size of the age group proportion, but the shares of LN-and L-weak are somewhat larger (Figure 10.4d). This also goes for the strong groups, but the LN- and L-strong groups are smaller. The oldest age group (55–65) has the weakest proficiencies (Figure 10.4e). Particularly, the two groups with weak literacy are larger than the age group proportion, and the groups with strong performance in literacy are small. The Nordic region has a particularly large L-weak group compared to the other country aggregates. Otherwise, the aggregates have the same patterns for weak and strong group shares, respectively.

Figure 10.4d Percentage of adults aged 45–54 in weak and strong performing groups

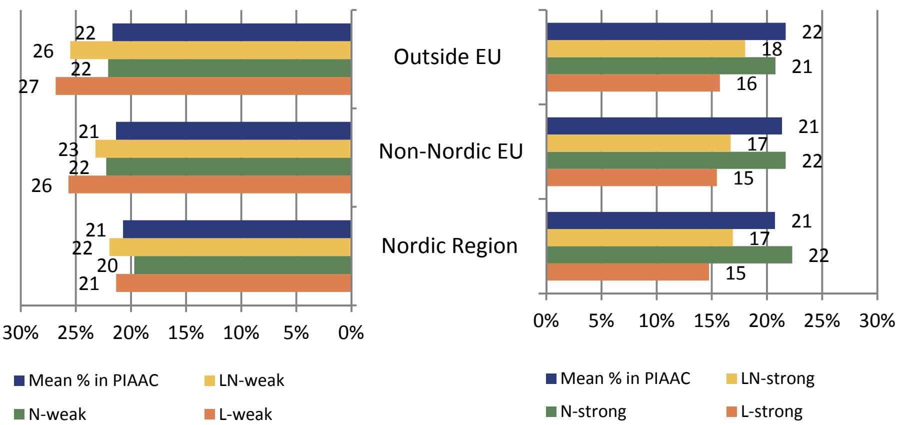
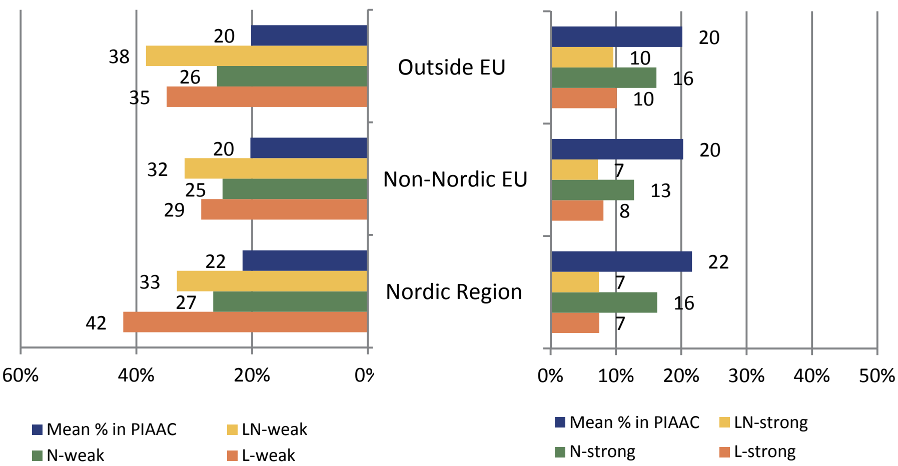


Figure 10.4e Percentage of adults aged 55–65 in weak and strong performing groups



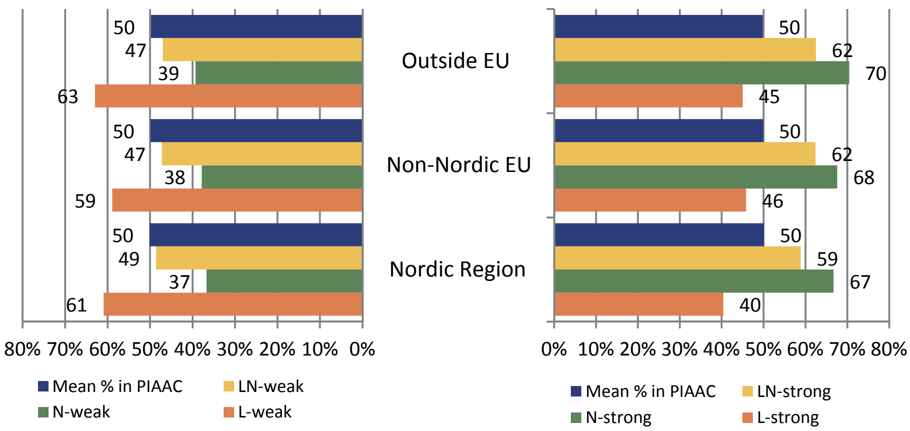
10.8 Gender and the distribution of weak and strong groups

If there are no gender differences in terms of weak and strong performers, we would find that approximately half of the weak and strong performers are men and approximately half are women. Interestingly, regardless of the aggregate, those who perform weakly in both literacy and numeracy (LN-weak) are evenly distributed between women and men (Figure 10.5). The Nordic region is particularly close to equal distribution. When we look at the people who are weak in only one of the skills the gender gap appears. The majority of the L-weak group consists of men in all of the aggregates. On the other hand, women tend to dominate the N-weak groups. Since the L-weak and N-weak together are smaller in size than the LN-weak, this indicates that amongst the weak performers there are fewer women who need to improve literacy proficiency only and fewer men who need to improve numeracy only.

Among the strong performer's groups, the gender variation is more apparent (Figure 10.5). More men than women are represented amongst the strong performers. The two largest groups, both with strong performers in numeracy, have a clear overweight of men. The somewhat larger presence of women in the L-strong group weights up some of this. The Nordic region is the closest to equal shares for the LN-strong and N-strong groups and furthest away in the L-strong group.

Although the aggregates are quite different and the sizes of weak and strong groups differ, the distribution of men's and women's performances follows the same pattern for all aggregates.

Figure 10.5 Percentage of men in weak and strong performing groups



10.9 Education and the distribution of weak and strong groups

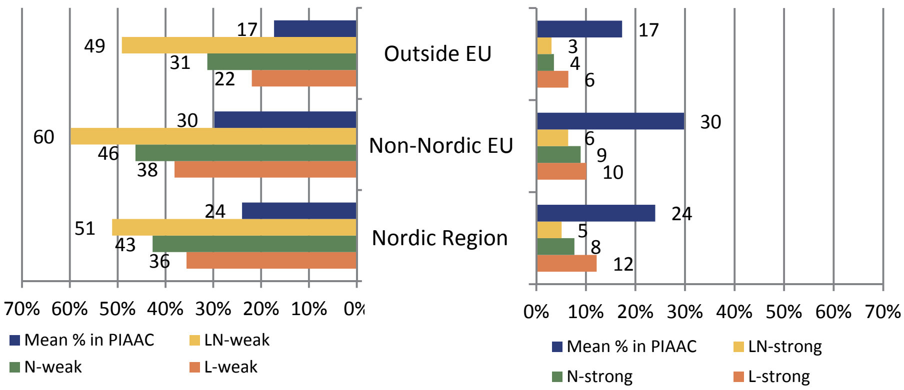
It is well known that the educational level is strongly associated with skill proficiency (OECD, 2013). This is clearly reflected in the educational level of the weak and strong performer's groups (Figures 10.6a–d). The educational levels used here are a low level of education that corresponds to lower secondary education or less (ISCED 1, 2, 3C short or less), a medium level of education that corresponds to upper secondary education and post-secondary, non-tertiary education (ISCED 3A–B, C long and ISCED 4A–B–C), and a high level of education that corresponds to tertiary education (ISCED 5B, 5A, 6). In addition, the medium level of education is divided into a vocational or general track depending on if the respondent's highest level of education obtained is vocationally oriented or not (derived, ISCED3 and 4 only). For some of the respondents, this information was not available, and in the Nordic Region this excluded 5% of the respondents in Denmark and 13% in Sweden from the analysis.

When it comes to the average share of each education group in the PIAAC sample of the respective country aggregates, there are differences (Figures 10.6a–d). The proportion of low educated is 17% outside the EU, 24% in the Nordic region, and 30% in the Non-Nordic EU. The countries outside the EU have the highest proportion of medium general educated (29%). The other aggregates have proportions of half this size. The groups of medium vocational education show almost the opposite proportions, 13%, 25%, and 29%, respectively. The average shares of high educated are 41% in countries outside the EU, 35% in the Nordic region, and 28% in the non-Nordic EU. Although there are differences in these proportions, when looking at the weak and strong groups, we found the same pattern across the aggregates. In general, low and high education is most closely associated to the weak respectively strong performance in literacy and numeracy.

Amongst adults with low levels of education, we find a clear pattern. In the weak performing groups, the shares of low educated are larger and in the strong performing groups, smaller than the proportions of low educated (Figure 10.6a). In the Nordic region, the share of low educated performing weak in both literacy and numeracy is 51%. The share of the N-weak group is 43%, while the L-weak group is 36%. An estimated 5% of the adult population, aged 16–65, in the Nordic region have low education and weak performance in both literacy and numeracy. The share of low educated with weak performance in numeracy only is about 2%, and low educated with weak performance in literacy only is about 1%. The same pattern is found for all of the country aggregates. The share of low educated in the LN-weak is at least twice the size of the share of low educated in the population, and close to three times the size outside the EU.

There are small shares of low educated adults in strong performer's groups. The LN-strong groups are the smallest (3–6%). The average share of low educated in each aggregate is approximately five times the share of the LN-strong group. In all aggregates, the share is the largest in the L-strong group (6–12%). In the Nordic region, the share of low educated in the L-strong group is approximately half the size of the average share of low educated. It is approximately one third in the two other aggregates.

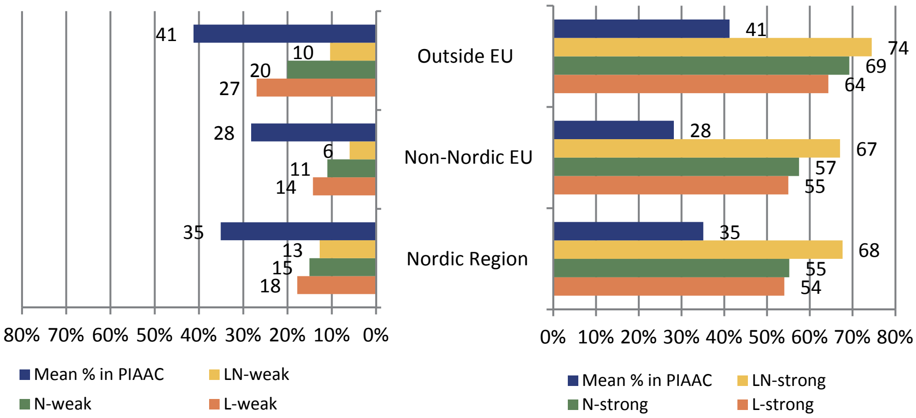
Figure 10.6a Percentage of adults with low education in weak and strong performing groups



When we look at the adults with a high level of education (Figure 10.6b), the pattern is the opposite from that of low educated. The association between high level of education and strong performance is particularly apparent. All shares of strong performing groups are above 54%. The groups of strong performers in both literacy and numeracy are the largest, and in the non-Nordic EU countries, the share exceeds twice the size of the proportion of high educated. In the Nordic region, this is approximately twice the size, while outside the EU it gets close to this size. The N-strong and the L-strong group have about the same size in each of the aggregates.

In the weak-performing groups, the adults with high levels of education are clearly underrepresented (Figure 10.6b). The LN-weak group share is the smallest and the L-weak group is the largest in all aggregates. The largest share of LN-weak is found in the Nordic region (13%), and it is a bit more than a third of the share of the high educated in the region. In the other aggregates, the share does not make up more than one fourth the share of the high educated. The countries outside the EU have the largest shares of highly educated who are weak in either literacy or numeracy.

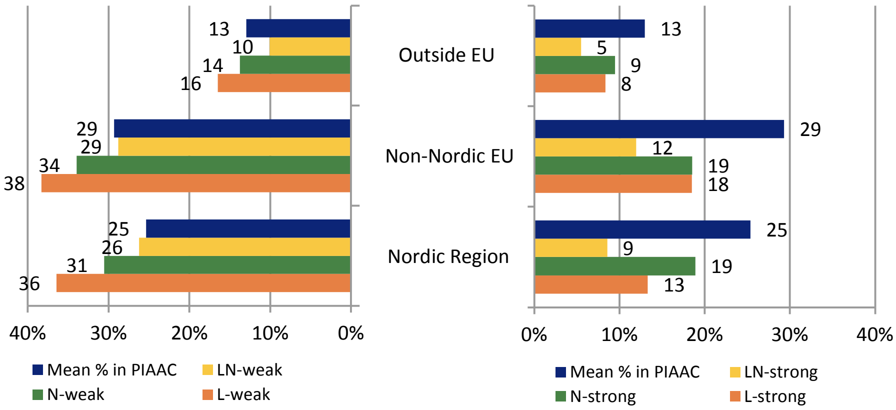
Figure 10.6b Percentage of adults with high education in weak and strong performing groups



When it comes to adults with medium-level vocational education, the shares of the weak performing groups are quite similar to the shares of the education group across all aggregates (Figure 10.6c). The differences are quite small and the pattern is the same across the country aggregates, with the LN-weak groups being the smallest and the L-weak groups the largest. In other words, the weak in literacy only are somewhat overrepresented amongst the medium vocational educated.

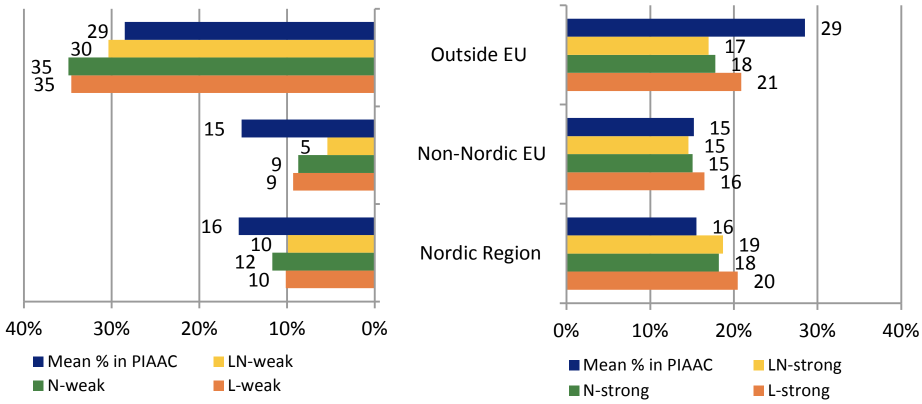
The strong performing groups are clearly smaller than the shares of medium-level vocational educated in each country aggregate. This is most visible in the LN-strong group, and in the Nordic region the share is about one third of what the medium-level vocational educated make up. In other aggregates, the difference is slightly smaller. There are more adults in the two other strong-performing groups. In the Nordic region, there is a clear difference with 19% N-strong group share and the L-strong group being 13%.

Figure 10.6c Percentage of adults with medium vocational education in weak and strong performing groups



When looking at the medium-level general educated we see a similar pattern for both the European aggregates, while countries outside the EU differ. Across all aggregates, the shares of strong performing and weak performing groups respectively, have about the same size (Figure 10.6d). The Nordic region and the non-Nordic EU countries have weak group shares that are smaller than the proportion of the medium-level general educated, while for the outside the EU aggregate the shares are somewhat larger than the proportion of the education group. When we look at the strong groups, the Nordic region has shares that are a bit larger than the education group proportion. For the non-Nordic EU aggregate, the shares are about the same size, but outside the EU, the shares are smaller than the education group size.

Figure 10.6d Percentage of adults with medium general education in weak and strong performing groups*



*Belgium and Italy do not have this educational category in the data and they are not included in the calculation.

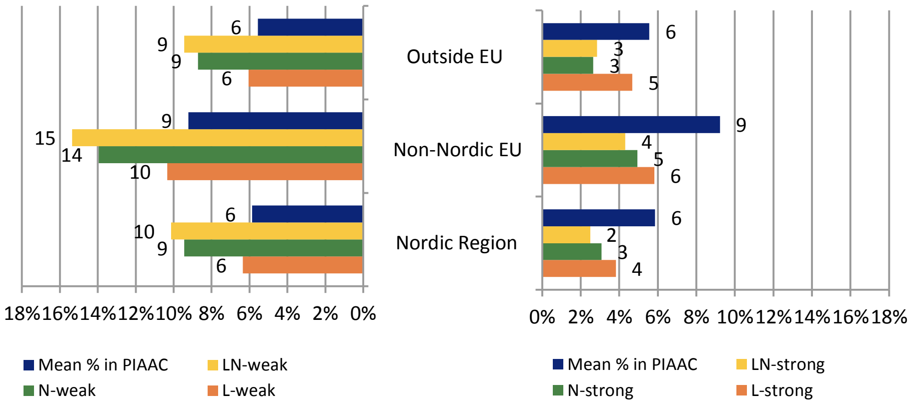
10.10 Employment and the distribution of weak and strong groups

Employment status is based on the information given by the respondents about their current situation. Employed are people who responded that they are full-time or part-time employees or self-employed, and unemployed are those who themselves reported so.

There is a clear pattern when we look at unemployed and the shares of weak or strong performing groups (Figure 10.7a). In the Nordic region, the share of unemployed among adults performing weak in both literacy and numeracy is almost twice as large as the share of unemployed. The share of weak in numeracy alone is almost as high. On the contrary, the share of unemployed in the L-weak group is close to the average share of unemployed. There seems to be an overrepresentation of unemployed among weak performers in numeracy, regardless of the performance in literacy. Interestingly, the same type of result is apparent in all aggregates.

When we look at the unemployed amongst the strong performers, differences between the strong groups are small and the mean share of unemployed is about double the size of the LN-strong group. The exception from this pattern is the countries outside the EU, where the share of unemployed in the L-strong is close to the average share of unemployed and the shares in the N-strong and the LN-strong are equal.

Figure 10.7a Percentage of unemployed in weak and strong performing groups*



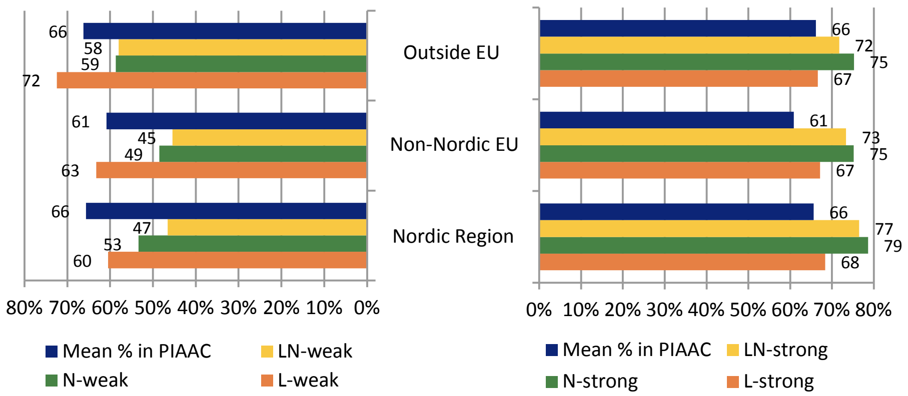
*Austria does not have this information in the data and it is not included in the calculation.

When we look at shares of employed people in the weak and strong performing groups, there is a corresponding pattern compared to the results of unemployed weak performers, although it is less clear in the Nordic region than in the other aggregates (Figure 10.7b). Surprisingly, the L-weak groups have larger shares than the average employment rate in both the non-Nordic EU and the countries outside the EU. It's not clear that performing weakly in literacy is a disadvantage, while weak performance in numeracy undermines one's chances in the labour market.

When looking at the employed and the groups of strong performers, there is the same pattern across the aggregates. In the groups of strong performers in literacy only the shares are the same size as the shares of employed. Slightly larger shares of the people who perform strongly in numeracy only are employed, compared to those who perform strongly in both literacy and numeracy.

In summary, numeracy performance seems to be of general importance, strong performance for being employed, and weak for being unemployed. There are indications that numeracy could be important also regardless of the performance in literacy. The indication is that strong and weak performance in literacy is less important, or even can be of little importance, for employment or unemployment. Interestingly the patterns are the same, or similar, across the aggregates, even though the aggregates are quite different and have different unemployment rates.

Figure 10.7b Percentage of employed in weak and strong performing groups*

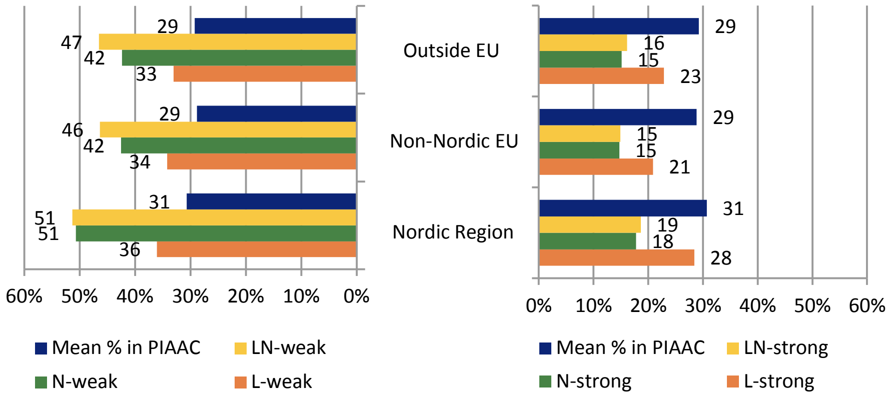


10.11 Income and the distribution of weak and strong groups

We find an association between income and weak or strong proficiency. On average, about half of adults with weak performance in both literacy and numeracy belong to the three lowest earning deciles (Figure 10.8a). This share is the largest in the Nordic region. The shares of low-earning people in the N-weak groups are slightly smaller than in the LN-groups, but in the Nordic Region it is the same high share as the LN-weak group. Approximately one third in the L-weak groups belong to this income category in all country aggregates, and almost the same size as the income group.

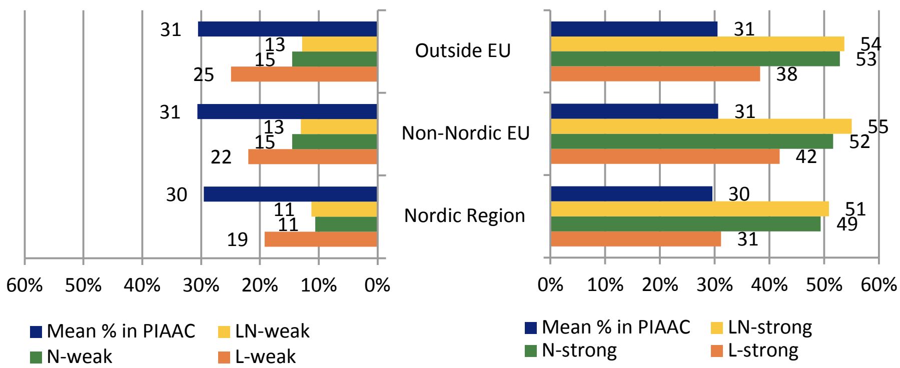
Between 15% and 19% of the LN-strong and N-strong adults belong to the three lowest earning deciles in all aggregates. The largest share of adults belonging to this income category in the L-strong group is found in the Nordic region (28%), but the shares of L-strong groups are rather closer to the size of the income group across aggregates.

Figure 10.8a Percentage of adults in three lowest earning deciles in weak and strong performing groups



When we look at the three highest earning deciles (Figure 10.8b), the overall picture is the opposite compared to the three lowest earning deciles. In the Nordic region, only every tenth of adults in the LN-weak and N-weak group belong to the three highest earning deciles, while in other country aggregates, these shares are slightly larger. Also, when looking at the L-weak group, the share in the Nordic region is lower than in the other aggregates. Conversely, the shares of adults in the LN-strong and N-strong groups belonging to the three highest earning deciles are smaller in the Nordic Region compared to the other aggregates. The L-strong group shares are much smaller and equal or closer to the average shares.

Figure 10.8b Percentage of adults in three highest earning deciles in weak and strong performing groups



The overall patterns for high/low income in association with weak/strong performance are clearly similar across the aggregates. It seems that in the Nordic region, the association between skills and earnings is somewhat stronger when it comes to weak performance than in the other country aggregates. The Nordic region has the largest shares for low income and the smallest shares for high income among the weak performers. We see the opposite for strong performers in the Nordic region. The shares are somewhat closer to the share of the low or high income group than is the case for other aggregates. Particularly in the Nordic region, the L-strong group share does not differ from the share of the high or low earning group. In the Nordic region, numeracy performance clearly is important for the high and low earnings, and the general picture indicates it is regardless of performance in literacy. The results indicate that literacy performance is more important in the other aggregates, but less important than performance in numeracy.

10.12 Conclusion

Shortage of information-processing skills may implicate a variety of problems in adult life. To make good policies and take effective measures concerning the adults scoring at the lower levels of proficiency, it is important to obtain more knowledge about this particular group. Where most research takes one skill into account, our approach has been to investigate an association between literacy and numeracy. We derived three weak-performing groups: those who are weak in both literacy and numeracy (LN-weak) and those who are weak either in literacy (L-weak) or numeracy (N-weak). Alike, we derived three strong performing groups: those who are strong in both literacy and numeracy (LN-strong) and those who are strong either in literacy (L-strong) or numeracy (N-strong). In this study, we have described the weak and strong performing groups in terms of socio-demographic background factors.

First of all, the PIAAC data shows that in both ends of the proficiency scale, the performance of literacy and numeracy is associated. Although there are large differences in the proportion of weak performers in each country, the LN-weak group in almost all countries is as large as, or larger, than the L-weak and N-weak group together.

There are small differences in the weak-performing groups between the Nordic region countries Denmark, Finland, Norway, Sweden, and Estonia. The shares of people who are weak in both literacy and numeracy are between 8% and 11%. The variation is larger for the strong-performing groups. The shares of people who are strong in both literacy and numeracy are between 6% and 14%. The total share of strong performers is larger than the share of weak performers in each country, except in Denmark where the two shares are equal. When looking at native speakers only in the Nordic region, in general, the share of weak performers is smaller and there is a small increase in the share of strong performers, compared to the whole sample. Non-native language status is related to low performance, but it might also be the intermediate effect of some third variables. As an aggregate, the Nordic region has smaller share of weak performers and larger share of strong performers than the non-Nordic EU and the outside EU country aggregates.

We compared the Nordic region aggregate to the two other aggregates of the PIAAC-participating countries when looking at the background factors of age, gender, education, employment status, and income. The youngest age group (16–24) performs on average. The general pattern across the aggregates, though, is that the N-weak groups are larger and the L-strong groups are larger than the average shares. The 25–34 year olds are strong performers, and particularly large shares of LN-strong and L-strong. The oldest age group in the sample (55–65) shows a weaker performance across the aggregates. The LN- and L-strong are particularly small and the LN-weak and L-weak are large. A general observation for all aggregates is that the N-weak and N-strong groups are closer to the average and, hence, have less difference across the age groups.

Gender differences are also interesting, showing the same pattern across the aggregates. The LN-weak consists of about the same proportion of men and women. Men are overrepresented in the L-weak groups and the women are overrepresented in the N-weak groups. There are clearly more men than women represented amongst the strong performers in LN-strong and N-strong.

Education is closely linked with performance. The low educated show particularly large shares of LN-weak groups. The highly educated show large shares in all strong groups.

Looking at employment, we found that the groups for weak or strong in literacy only are the same as, or close to, the average in every aggregate. The results indicate that weak or strong performance in literacy is less important, for employment or unemployment, while there seems to be an association between employment/unemployment and strong respectively weak performance in numeracy. Interestingly the patterns are the same, or similar, across the aggregates, even though the aggregates are quite different in several respects.

A corresponding pattern for weak and strong groups is apparent for the lowest and highest earning groups as for the employed and unemployed. Numeracy seems of importance for the earnings. Both the groups including strong performance in numeracy are about the same size and clearly are different from the average. This is also the case for the two groups with weak performers in numeracy, while the L-strong and L-weak groups are close to the average.

To summarise, at both ends of the proficiency scale, the same associations with the background factors can be found across the three country aggregates. The most disadvantaged group consists of adults who are weak performers both in literacy and numeracy. Conversely, the most advantaged group consists of adults who are strong performers in both skill domains. It looks like numeracy is developed a bit later than literacy, and that the performance in numeracy somehow is held at a certain level for higher age, than is literacy. Women are somewhat less represented in the groups with strong numeracy. When it comes to education, about half of the LN-weak group has low education. The highly educated show particularly high shares of LN-strong groups, but all strong group shares are above 50%.

Our main findings are the results concerning employment and income. Performance in numeracy is of general importance for being employed/unemployed or having high/low income. We do not find the same result for literacy. The finding that numeracy, not literacy to the same extent, is associated with employment and income is in line with results from earlier research (Bratsberg, Hægeland, & Raaum, 2006; Bynner & Parsons, 2005).

The point of our findings, as supported by previous research, is that literacy is of importance for adult's lives. However, our results indicate that more attention, in research and policy, should be given to numeracy and to numeracy in relation to literacy. As literacy and numeracy so clearly are associated in both ends of the proficiency scale, effects of proficiency in numeracy can, to a certain extent, be explained by looking at proficiency in literacy. We see some interesting questions that can be raised based on our finding, across aggregates. Is weak performance in numeracy of special importance to adults ending as unemployed? Why does proficiency in literacy seem to be of less importance than proficiency in numeracy when it comes to employment and income?

10.13 References

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Sammenfatning

Anders Rosdahl

Indledning

Denne rapport præsenterer resultater fra PIAAC i Danmark, Estland, Finland, Norge og Sverige i et komparativt persepktiv. De fem lande kaldes under ét for ”nordiske lande” i rapporten. PIAAC (The Programme for the International Assessment of Adult competences) er en OECD-undersøgelse af grundlæggende færdigheder i læsning, matematik (regning) og problemløsning med IT i befolkningen i alderen 16–65 år i 24 lande. I 2011–2012 blev repræsentative udsnit af befolkningerne i disse lande testet og interviewet. I de fleste tilfælde foregik testningen i personernes hjem og på en interviewers computer (PC). De nævnte færdigheder er grundlæggende i den forstand, at et vist færdighedsniveau er en forudsætning for at kunne fungere tilfredsstillende i et moderne samfund, hvad enten det drejer sig om at gennemføre uddannelse, deltage i arbejdslivet, indgå i sociale sammenhænge og fungere som borger i forhold til demokratiske institutioner og velfærdssamfundets tilbud inden for fx sundhed, indkomstoverførsler og pleje.

OECD udgav de samlede internationale resultater fra PIAAC i 2013 (OECD, 2013a; OECD, 2013b). Adskillige lande udgav også nationale rapporter, herunder Danmark (Rosdahl, Fridberg, Jacobsen & Jørgensen, 2013), Estland (Halapuu & Valk, 2013), Finland (Malin, Sulkunen & Laine, 2013), Norge (Bjørkeng, 2013) og Sverige (Statistics Sweden, 2013). Samlet indgik svar fra 30.000 respondenter i PIAAC i disse fem lande. Perspektivet i den foreliggende rapport er således bredere end i de nationale rapporter, men mere fokuseret end i den nævnte publikation fra OECD. Island indgår ikke i den foreliggende rapport, fordi Island ikke deltog i PIAAC.

Færdighederne i PIAAC definers på følgende måde (OECD, 2013a):

- Læsefærdigheder (”literacy”): Evnen til at forstå, vurdere og benytte skrevne tekster med henblik på at deltage i samfundslivet, opnå personlige mål og udvikle viden og forståelse.
- Regnefærdigheder (”numeracy”): Evnen til at finde, bruge, fortolke og formidle matematikholdige informationer og pointer med henblik på at kunne give sig i kast med og mestre matematikholdige krav i en række situationer i voksenlivet.
- Færdigheder i problemløsning med IT (”Problem-solving in technology-rich environments”): Evnen til at bruge digitale teknologier, kommunikationsredskaber og netværk med henblik på at finde og vurdere information, kommunikere med andre mennesker og udføre konkrete opgaver. Det drejer sig bl.a. om at kunne udføre søgning på internettet, finde rundt på hjemmesider, vurdere elektronisk information, bruge regneark og sende e-mails. For nemheds skyld bruges i denne sammenfatning oftest udtrykket ”færdigheder i problemløsning med IT” som betegnelse for denne type færdigheder.

Færdigheder på disse områder måles i PIAAC på en skala fra 0 til 500. Mange befinder sig i det midterste område. Færre har meget gode eller meget ringe færdigheder. OECD har inddelt skalaen for læsefærdigheder og skalaen for regnefærdigheder i seks niveauer (0, 1, 2, 3, 4 og 5). Færdigheder i problemløsning med IT er inddelt i fem niveauer (ingen score, 0, 1, 2 og 3). Kategorien ”ingen score” omfatter personer uden erfaring med at bruge en computer samt personer, der ikke var i stand til, eller som ikke ønskede at gennemføre testen på interviewerens computer.

Der er en stærk positiv sammenhæng mellem de tre typer færdigheder. Hvis man har gode færdigehedr på ét område, har man typisk også gode færdigheder på de to andre områder.

De tre typer færdigheder kaldes i denne sammenfatning under ét for ”grundlæggende færdigheder”. OECD bruger bl.a. udtrykket ”key information-processing skills”, dvs. nøglekompetencer i informationsbehandling.

Grundlæggende færdigheder på tværs af PIAAC lande

Tabel 1 giver en oversigt over grundlæggende færdigheder i PIAAC landene. Gennemsnittet for *læsefærdigheder* i Finland (288), Sverige (279), Norge (278) og Estland (276) er højere end det internationale gennemsnit for samtlige PIAAC lande (273). Finland er nummer to af samtlige lande. Japan er nummer ét med en gennemsnitlig score på 296. Danmark (271) ligger en smule under gennemsnittet for alle PIAAC lande. Med score-værdier på omkring 250 er Spanien og Italien placeret helt i bunden med hensyn til læsefærdigheder.

Den gennemsnitlige score for *regnefærdigheder* er næsten den samme i Sverige (279), Norge (278) og Danmark (278), lidt mindre i Estland (273) og højere i Finland (282). Alle fem lande er placeret over det internationale gennemsnit (269). Igen er Japan nummer ét med en gennemsnitlig score på 288, og Spanien og Italien ligger også her i bunden med en score på under 250.

Det estimeres, at 6–9 point på skalaerne for læsefærdigheder og regnefærdigheder svarer til omkring ét uddannelsesår (OECD, 2013a). Variationen mellem PIAAC landene med hensyn til niveauet for disse to typer grundlæggende færdigheder er således betydelig.

Tabel 1 Lande rangordnet efter 1) gennemsnitlig score i læsefærdigheder, 2) gennemsnitlig score i regnefærdigheder, 3) den procentvise andel af befolkningen med færdigheder i problemløsning med IT på de to højeste niveauer (2+3). PIAAC 2011–2012

Niveau	Læsefærdigheder: Gennemsnitlig score	Regnefærdigheder: Gennemsnitlig score	Problemløsning med IT: Procent på niveau 2+3
Over	296: Japan	288: Japan	44: Sverige
gennemsnit	288: Finland	282: Finland	42: Finland
af alle lande	284: Holland	280: Flanderen (Belgien)	42: Holland
	280: Australien	280: Holland	41: Norge
	279: Sverige	279: Sverige	39: Danmark
	278: Norge	278: Norge	38: Australien
	276: Estland	278: Denmark	37: Canada
	275: Flanderen (Belgien)	276: Slovakiet	
	274: Tjekkiet	276: Tjekkiet	
	274: Slovakiet	275: Østrig	
	273: Canada	273: Estland	
		272: Tyskland	
Gennemsnit	273: Gennemsnit	269: Gennemsnit	36: Tyskland
af alle lande	273: Korea	268: Australien	35: Japan
	272: England/ Nordirland		35: Flanderen (Belgien)
			35: England/ Nordirland
			34: Gennemsnit
			33: Tjekkiet
			32: Østrig
Under	271: Danmark	265: Canada	31: USA
gennemsnit	270: Tyskland	265: Cypern	30: Korea
af alle lande	270: USA	263: Korea	28: Estland
	269: Østrig	262: England/ Nordirland	26: Slovakiet
	269: Cypern	260: Polen	25: Irland
	267: Polen	256: Irland	19: Polen
	267: Irland	254: Frankrig	
	262: Frankrig	253: USA	
	252: Spanien	247: Italien	
	250: Italien	246: Spanien	

Note: Kolonne 1 og 2 omfatter 23 lande. Rusland indgår ikke på grund af manglende data ved udarbejdelse af tallene. Kun 19 lande indgå i kolonne 3, fordi færdigheder i problemløsning med IT ikke blev målt i Cypern, Frankrig, Italien og Spanien (OECD, 2013a).

Rangordningen af landene med hensyn til *færdigheder i problemløsning med IT* kan ikke ske på grundlag af den gennemsnitlige score, fordi en betydelig andel af PIAAC respondenterne ikke var i stand til eller ikke ønskede at gennemføre testen på interviewerens computer. Denne andel er et skøn over, hvor stor en andel af befolkningen i alderen 16–65 år, som ikke har tilstrækkelige tekniske IT-færdigheder til at gennemføre testen på interviewerens computer. Andelene er 12, 14, 14 og 18 % i henholdsvis Sverige, Norge, Danmark og Finland, hviket er noget under det internationale gennemsnit (24 %). I Estland var det 29 %, som ikke havde tilstrækkelige tekniske IT-færdigheder. Rangordningen af landene efter færdigheder i problemløsning med IT er i tabel 1 baseret på den procentvise andel af befolkningen, der har færdigheder i problemløsning med IT på de to højeste niveauer (2+3). Personer uden tilstrækkelige tekniske IT-færdigheder indgår i procentgrundlaget i de tal, der er præsenteret i tabel 1 og i det følgende.

Andelen på de to højeste niveauer i problemløsning med IT er et godt stykke over det internationale gennemsnit (34 %) i Sverige (44 %), Finland (42 %), Norge (41 %) og Danmark (39 %). Sverige er nummer ét af alle lande, Finland nummer to, Norge nummer fire og Danmark nummer fem.

Befolkningerne i de fire nordiske lande – Sverige, Finland, Norge og Danmark – er således blandt de allerbedste, når det drejer sig om færdigheder i problemløsning med IT. Andelen med færdigheder på de to højeste niveauer på dette område er 28 % i Estland.

Alt i alt er Finland, Norge og Sverige placeret over gennemsnittet på alle tre områder: læsefærdigheder, regnefærdigheder og færdigheder i problemløsning med IT. Danmark ligger over gennemsnittet på to områder (regnefærdigheder og færdigheder i problemløsning med IT), men en anelse under gennemsnittet med hensyn til læsefærdigheder. Estland ligger også over gennemsnittet på to områder (læsefærdigheder og regnefærdigheder), men en del under gennemsnittet med hensyn til færdigheder i problemløsning med IT.

I fire lande (Cypern, Frankrig, Italien og Spanien) blev færdigheder i problemløsning med IT ikke målt. Disse fire lande ligger under gennemsnittet på de to andre færdigheder. Af de resterende 19 lande i tabel 1 er det kun Holland og de tre tidligere nævnte nordiske lande (Finland, Norge og Sverige), som er placeret over gennemsnittet på alle tre områder. Tre af de 19 lande er ligger under gennensnittet på alle tre områder (Irland, Polen og USA).

Landenes rangorden efter grundlæggende færdigheder tenderer til at være som beskrevet også, når man betragter undergrupper opdelt efter fx køn, uddannelse og arbejdsmarkedsstatus.

Udvikling og vedligeholdelse af grundlæggende færdigheder

Uligheden i fordelingen af færdigheder inden for lande er generelt mindst lige så udtalt som variationen mellem lande. Det er også tilfældet for de fem nordiske lande, hvor de vigtigste faktorer, der opdeler befolkningen i grupper med gode og mindre gode færdigheder er uddannelse, alder og indvandrerstatus.

Uddannelse: Hovedtendensen er, at jo højere uddannelsesniveau, des bedre læsefærdigheder, regnefærdigheder og færdigheder i problemløsning med IT. Denne sammenhæng skyldes for det første, at uddannelse, især hvis der indgår boglige elementer, kan bidrage til udvikling og vedligeholdelse af de tre grundlæggende færdigheder. Forskelle i uddannelse kan derfor være en del af årsagen til, at nogle har bedre grundlæggende færdigheder end andre. Samtidig kan uddannelse formodes at tiltrække de mest lærenemme og uddannelsesmotiverede samt dem, der i forvejen har de bedste færdigheder. Uddannelse kan således tillige formodes at have en såkaldt selektionseffekt. For det tredje betyder et højere uddannelsesniveau, at man får nemmere adgang til arbejdsmarkeder og job, hvor færdigheder i særlig grad bruges, vedligeholdes og udvikles, hvilket kan være en tredje forklaring på den sammenhæng, der på et givet tidspunkt kan konstateres mellem uddannelse og henholdsvis læsefærdigheder, regnefærdigheder og færdigheder i problemløsning med IT.

Alder: I intervallet fra 16 år til omkring 30 år (afhængigt af type af færdighed og det land, der betragtes) ses det, at stigende alder betyder stigende niveau for grundlæggende færdigheder. Fra omkring 30-års alderen til 65 år ser vi den modsatte tendens: Stigende alder betyder svagere færdigheder. Personer i aldersgruppen 55–65 år har i gennemsnit ringere færdigheder end aldersgruppen 16–24 år.

Stigningen i de yngre aldersgrupper fra 16 år til cirka 30 år hidrører uden tvivl primært fra en *alderseffekt*: Efterhånden som unge mennesker bliver ældre, gennemfører flere og flere en ungdomsuddannelse, enten erhvervrettet eller studieorienteret, og en videregående uddannelse.

Faldet i de grundlæggende færdigheder i intervallet fra cirka 30 år til 65 år kan stamme fra en *generationseffekt*, dvs. at forskellen mellem aldersgrupperne skyldes variationer i uddannelsesniveau mellem generationer. Gennemgående har de yngre generationer opnået mere uddannelse end de ældre grnerationer. De unge har i forhold til deres alder også mere erfaring med IT og computere, som først er blevet taget bredt i anvendelse inden for de seneste årtier.

Faldet i færdigheder i intervallet fra circa 30 år til 65 år kan også, i hvert fald delvis, tænkes at hidrøre fra en alderseffekt, dvs. processer som finder sted i løbet de enkelte menneskers tilværelsen. Biologiske faktorer kan eventuelt spille en rolle her. Demens kan nævnes som et ekstremt eksempel. Alderseffekten kan også have en social komponent. Økonomisk teori argumenterer fx for, at incitamentet til at tage uddannelse, herunder voksen- og efteruddannelse, mindskes med lønmodtagernes stigende alder – både lønmodtagerens eget incitament og arbejdsgiverens. Vores samfund og arbejdsmarked fungerer måske på en sådan måde, at mulighederne og motivationen for at lære og vedligeholde færdigheder i mange tilfælde mindskes, efterhånden som man bliver ældre.

Hvis man korrigerer for uddannelsesniveau, finder man også, at niveauet for de grundlæggende færdigheder mindskes, jo ældre aldersgruppe, man betragter. Det peger i retning af, at det lavere færdighedsniveau i de ældre aldersgrupper næppe alene kan skyldes en generationseffekt. En alderseffekt i form af faldende færdigheder, efterhånden som den enkelte bliver ældre, må i et eller andet omfang antages også at eksistere, men vi kan intet præcist sige om effektens størrelse eller om den relative vægt af en evt. biologisk henholdsvis social forklaring.

Indvandrerstatus: I følge PIAAC udgør indvandrerne – her defineret som personer der er født i udlandet – 4,8 % af den 16–65-årige befolkning i Finland; 10,8 % i Danmark; 12,3 % i Estland; 12,4 % i Norge og 16,8 % i Sverige. I disse lande udførte indvandrerne de kognitive test på værtslandets sprog undtagen i Estland, hvor de russiske immigranter og efterkommere havde mulighed for at gennemføre testen på russisk. I følge PIAAC har ikke-indvandrere i alle lande bedre målte grundlæggende færdigheder end indvandrere. Forskellen i læsefærdigheder er omkring 40–50 score-point i Danmark, Finland, Norge og Sverige, men kun det halve i Estland. Sidstnævnte resultat peger i retning af, at sprogforskelle kan være en vigtig medvirkende faktor til forklaring af de ringere målte færdigheder hos indvandrere.

Det lave uddannelsesniveau blandt mange ikke-vestlige indvandrere specielt i de skandinaviske lande forklarer kun delvis indvandrernes lave færdighedsniveau. Indvandrere har også lavere færdigheder end ikke-indvandrere, når der er korrigeret for forskelle i uddannelse. Det betyder, at andre faktorer medvirker til at forklare variationen i færdigheder blandt indvandrere.

PIAAC i Danmark viser, at indvandere, der kom til Danmark i førskolealderen eller i skolealderen, har bedre grundlæggende færdigheder end andre indvandrere. Færdighedsniveauet stiger med længden af opholdstiden i Danmark, og indvandrere, der bruger dansk som vigtigste sprog i hjemmet, har bedre målte færdigheder end andre indvandrere.

Ud over uddannelse, alder og indvandrerstatus bidrager en række andre forhold til at forklare variationen i grundlæggende færdigheder inden for de nordiske lande. Disse faktorer er køn, beskæftigelse, erhvervserfaring, helbred og forældrenes uddannelse.

Køn: Kvinder og mænd har omtrent samme gennemsnitlige læsefærdigheder i henholdsvis Danmark, Estland og Finland. I Sverige og Norge har mænd i gennemsnit noget bedre læsefærdigheder end kvinder. Kønsforskellen er mere udpræget for så vidt angår regnefærdigheder og færdigheder i problemløsning med IT: I alle fem lande klarer mænd sig bedre end kvinder på disse to områder. Kønsforskellen til mændenes fordel er mindre i de yngre end i de ældre aldersgrupper – hvilket er konsistent med en formodning om, at ligheden mellem kønnene er forøget på dette felt inden for de seneste årtier.

I følge PISA er piger klart bedre til at læse end drenge i 15-års alderen (OECD, 2013a). Denne betydelige kønsforskel er imidlertid langt mindre eller findes slet ikke blandt unge i PIAAC i alderen 16–24 år.

Arbejdsmarkedstilknytning, stilling, sektor, branche, arbejdstid og arbejdspladsens størrelse. I gennemsnit har beskæftigede bedre læsefærdigheder, regnefærdigheder og færdigheder i problemløsning med IT end ledige og andre uden arbejde, idet der i sidstnævnte gruppe ikke medregnes personer, der er under uddannelse. Længere tids erhvervserfaring hænger gennemgående sammen med bedre færdigheder. Det vil sige, at beskæftigelse og lang tids beskæftigelse tenderer til at gå hånd i hånd med gode færdigheder. En årsagssammenhæng kan gå begge veje. At være beskæftiget indebærer i almindelighed bedre læringsmuligheder end at være uden arbejde. Omvendt kan det tænkes, at personer med gode færdigheder foretrækkes af arbejdsgivere. Personer med gode færdigheder kan således formodes at have bedre chancer både for at få et job og for at beholde et job.

Forskellige job og stillinger kræver forskellige uddannelsesmæssige og andre kvalifikationer. Derfor er det ikke overraskende, at grundlæggende færdigheder varierer betydeligt mellem forskellige stillingsgrupper. Personer med ufaglært eller manuelt arbejde har således i gennemsnit ringere grundlæggende færdigheder end personer med komplekse job, der kræver længere uddannelse eller kompetencer inden for ledelse.

I Danmark, Finland, Norge og Sverige tenderer lønmodtagere til at have samme eller bedre grundlæggende færdigheder end selvstændige erhvervsdrivende. I Estland har de selvstændige erhvervsdrivende bedre grundlæggende færdigheder end lønmodtagere, hvilke kan hænge sammen med, at de selvstændige erhvervsdrivende er relativt unge i Estland.

Forskellige brancher og sektorer har forskellige typer af job og medarbejdere, hvilket formentlig er hovedforklaringen på, at grundlæggende færdigheder også varierer mellem brancher og sektorer. Eksempelvis er de gennemsnitlige læsefærdigheder lavere i den primære sektor end i den tertiære sektor (servicesektoren). Færdighedsniveauet er generelt lavere i den private sektor end inden for det offentlige, hvor uddannelsesniveauet gennemgående er højest.

I de fleste nordiske lande har deltidsbeskæftigede lavere grundlæggende færdigheder end heltidsbeskæftigede, hvilket kan hænge sammen med, at deltidsbeskæftigede og heltidsbeskæftigede omfatter personer, der er forskellige bl.a. med hensyn til uddannelse og stilling.

Endelig er der en tendens til, at jo større arbejdsplads (målt ved antal beskæftigede), des højere er det gennemsnitlige niveau for de ansattes grundlæggende færdigheder. Som for andre arbejdsmarkedsrelaterede forhold kan forklaringen være, at større arbejdspladser tiltrækker de bedst kvalificerede, og/eller at læringsmulighederne er bedst på de større arbejdspladser.

Helbred: PIAAC respondenterne blev bedt om at vurdere deres helbred på en 5-trins skala fra "fremragende" til "dårligt". Der er en klar sammenhæng mellem det selvvurderede helbred og grundlæggende færdigheder på alle tre områder. Et godt helbred og gode færdigheder har en tendes til at følges ad. Et dårligt helbred kan nedsætte evnen til at klare sig godt i de kognitive test, og ringe grundlæggende færdigheder kan omvendt betyde, at evnen til at blive opmærksom på og forstå anbefalinger vedrørende sundhed, livsstil og arbejdsmiljø svækkes.

Forældrenes uddannelse: Selv når alle de nævnte forhold tages i betragtning, finder man, at grundlæggende færdigheder hænger sammen med forældrenes uddannelse. Respondenter, hvor den ene eller begge forældre har en videregående uddannelse, har i gennemsnit bedre færdigheder end respondenter, hvor begge forældre alene har grundskole som deres højeste fuldførte uddannelse. Forklaringen herpå skal formentlig søges i et komplekst samspil mellem arv og miljø.

Sammenfattende viser resultaterne, at udvikling og vedligeholdelse af grundlæggende færdigheder er et resultat af komplekse processer, der finder sted i forskellige sammenhænge i løbet af menneskers liv. Vore analyser tyder på, at de generelle mønstre i fordelingen af grundlæggende færdigheder i befolkningen tenderer til at være de samme eller ligne hinanden betydeligt i de fem nordiske lande, som denne rapport sætter fokus på.

Gode (ringe) grundlæggende færdigheder hænger sammen med at være i en relativt gunstig (ugunstig) situation med hensyn til uddannelse, arbejdsmarkedstilknytning og andre faktorer, som har betydning for menneskers livskvalitet.

Færdigheder og løn

Baggrunden for at interessere sig for grundlæggende færdigheder er, at sådanne færdigheder har en række positive virkninger både på det samfundsmæssige og på det personlige plan. I denne rapport har vi belyst den økonomiske og sociale betydning af grundlæggende færdigheder på de invididuelle niveau.

Det økonomiske udbytte er i vores analyse målt ved timelønnen for beskæftigede lønmodtagere. Analysen viser, at timelønnen stiger med bedre grundlæggende færdigheder. Det er også tilfældet, hvis der samtidigt tages hensyn til en række andre forhold, som erfaringsmæssigt hænger sammen med aflønning. Det skønnes, at en stigning i grundlæggende færdigheder på 40–50 score point på skalaen fra 0–500 hænger sammen med en stigning i timelønnen på circa 3 % i de fem nordiske lande – undtagen i Estland hvor den estimerede stigning er 7 %. Forskellen mellem de 7 % og de 3 % er dog ikke statistisk signifikant. Samtidig har respondenternes oplyste brug af deres grundlæggende færdigheder på arbejdet også en selvstændig og en anelse større positiv betydning for timelønnen. Det bedste udbytte af grundlæggende færdigheder fås således i kraft af den kombinerede effekt af både at have og at bruge færdighederne i det aktuelle job.

Ligesom i andre økonomiske analyser konsteteres også i denne rapport, at timelønnen varierer med en række andre forhold, herunder uddannelsesniveau, erhvervserfaring, køn, indvandrerstatus, stilling, sektor og arbejdspladsens størrelse.

Lønmodtagere med videregående uddannelse tjener betydeligt mere, alt andet lige, end lønmodtagere, der alene har grundskole eller mindre end to års erhvervsrettet uddannelse efter skolen. I Danmark, Estland og Norge tjener den førstnævnte kategori 15–18 % mere end den sidstnævnte. I Finland drejer det sig om 12 %, i Sverige 7 % mere.

Stigende erhvervserfaring op til en vis grænse betyder bedre timeløn. Grænsen er cirka 20 års erhvervserfaring i Estland, 30–35 år i Finland og Norge samt 30–40 år i Sverige og Danmark. Mænd tjener mere end kvinder i alle fem lande. Kønsforskellen er på 5–10 %, undtagen i Estland hvor den er langt højere (33 %).

Lønmodtagere i faglærte og professionelle job tjener mere end ansatte i ikke-faglærte stillinger, og ansatte i den private sektor tjener i gennemsnit mere end ansatte i den offentlige sector, alt andet lige. Endelig viser vores analyse i lighed med andre undersøgelser, at jo større arbejdsplads, man arbejder på, des mere tjener man i gennemsnit, alt andet lige.

Indikatorer på socialt udbytte

Rapporten viser, at der er en stærk sammenhæng mellem læsefærdigheder, regnefærdigheder og færdigheder i problemløsning med IT på den ene side og indikatorer på socialt udbytte, således som dette opfattes i PIAAC, på den anden side.

Oplevet social tillid eller tillid til andre mennesker hænger positivt sammen med gode grundlæggende færdigheder på de tre områder. Andre undersøgelser viser, at uddannelse er positivt korreleret med social tillid, men også når der tages hensyn til uddannelsesniveau, kan vi konstatere, at der er en klar sammenhæng mellem gode læsefærdigheder og tillid til andre mennesker.

Udførelse af frivilligt arbejde inden for de sidste 12 måneder hænger også sammen med de grundlæggende færdigheder. Frivilligt arbejde omfatter her ulønnet arbejde for en velgørende organisation, et politisk parti, en faglig organization eller anden såkaldt non-profit organization. Sammenhængen mellem frivilligt arbejde og grundlæggende færdigheder er imidlertid kompleks. Forklaringen kan være, at de højtuddannede og mest travle mennesker med arbejde på fuld tid, som scorer højest på de grundlæggende færdigheder, ikke har tid til at udføre frivilligt arbejde fx hver eneste dag. Det højeste færdighedsniveau findes hos den gruppe, der udfører frivilligt arbejde mindst en gang om måneden, men ikke hver uge eller hver dag.

Oplevet politisk indflydelse blev målt ved at lade PIAAC respondenterne tage stilling til, i hvor høj grad de oplever at have ”indflydelse på, hvad regeringen gør”. Denne oplevede indflydelse er kraftigt relateret til grundlæggende færdigheder på alle tre områder: Jo bedre færdigheder, des større oplevet indflydelse. Uddannelse er også af betydning her, men selv når der tages hensyn til højeste fuldførte uddannelse, er sammenhængen mellem grunlæggende læsefærdigheder og oplevet politisk indflydelse klar.

En stærk positiv sammenhæng findes som tidligere nævnt også mellem grundlæggende færdigheder og selvrapporteret helbred. Bedre færdigheder, bedre helbred – også når der tages højde for andre forhold (som fx alder og uddannelse), som også hænger sammen med helbredet.

Hovedindtrykket fra de gennemførte analyser er, at sammenhængene mellem grundlæggende færdigheder og de nævnte indikatorer på socialt udbytte er de samme eller ligner hinanden betydeligt i de nordiske lande. Landene er også ret ens med hensyn til, hvorledes befolkningen i alderen 16–65 år fordeler sig på de nævnte fire dimensioner for socialt udbytte. Kun Estland skiller sig noget ud fra de øvrige lande. Niveauet for oplevet social tillid, udførelse af frivilligt arbejde og oplevet politisk indflydelse er således lavere i Estland end i de andre lande. Det er også tilfældet for niveauet for selvrapporteret helbred. Men sammenhængene mellem færdigheder og de nævnte indikatorer på socialt udbytte er stort set de samme i alle fem lande.

Personer med ringe grundlæggende færdigheder

Fra et uddannelses- og arbejdsmarkedspolitisk synspunkt er det af særlig interesse at sætte fokus på personer med ringe målte grundlæggende færdigheder, fordi man kan argumentere for, at netop disse personer især mangler disse færdigheder. Både ud fra et velfærdssynspunkt og en retfærdighedsbetragtning kan man hævde, at en forstærket indsats for at forbedre grundlæggende færdigheder især burde rette sig imod disse grupper. Derfor har det interesse at forsøge at sætte tal på størrelsen og sammensætningen af disse kategorier i befolkningen.

Personer med ringe færdigheder i læsning henholdsvis regning defineres i denne rapport som personer, der befinder sig på niveau 0 og 1 set under ét. Disse personer scorer mindre end 226 på skalaerne på læsefærdigheder, henholdsvis regnefærdigheder, der går fra 0 til 500. Personer på niveau 1 og 0 i læsning er kun i stand til at læse og forstå meget simple tekster med ukomplicerede budskaber, som fordrer en begrænset evne til informationsbehandling. Personer på niveau 0 og 1 i regning er i kun i stand til at udføre simple matematiske operationer som fx at tælle, lægge små tal sammen eller sortere. Disse personers evne til at forstå og håndtere matematisk information i forskellige sammenhænge er begrænset.

Personer med ringe færdigheder i problemløsning med IT defineres som respondenter på niveau 0 (under 1) på skalaen fra 0 til 500 plus respondenter med utilstrækkelige tekniske IT-færdigheder, dvs. at de ikke var i stand til eller ønskede at udføre testen på interviewerens computer.

Samlet finder vi, at *andelen med ringe færdigheder* i aldersgruppen 16–65 år tenderer til at være *lavere i de nordiske lande*, som denne rapport sætter fokus på, end i de fleste andre lande, som deltog i PIAAC. Dette er konsistent med den generelle rangordning af landene, som blev præsenteret i begyndelsen af dette kapitel.

Andelen med ringe læsefærdigheder udgør 16 % af befolkningen i aldersgruppen 16–65 år i Danmark, 11 % i Finland og 13 % in Estland, Norge og Sverige. Variationen er endnu mindre med hensyn til regnefærdigheder. Andelen med ringe færdigheder på dette område udgør 13 % in Finland og 14–15 % i de andre fire nordiske lande. Der er et betydeligt overlap mellem disse to grupper af personer med ringe færdigheder. Det er baggrunden for, at kun cirka 10 % af befolkningen i alderen 16–65 år har ringe færdigheder *både* inden for læsning *og* inden for regning. Denne andel varierer mellem 11 % in Denmark og 8 % in Finland. Andelen med ringe færdigheder i *enten* læsning *eller* regning varierer mellem 19 % (Danmark) and 15 % (Finland).

Andelen med ringe færdigheder i problemløsning med IT udgør 43 % af den 16–65-årige befolkning i Estland. Andelen er meget lavere i Finland (29 %), Danmark (28 %), Norge (25 %) og Sverige (25 %). Der er et betydeligt overlap mellem ringe færdigheder på dette og de to andre områder, men det har ikke været muligt at sætte præcise tal på dette overlap.

Tabel 2 giver et overblik over det estimerede absolute antal personer med ringe færdigheder i de fem lande.

Tabel 2 Estimeret antal personer i alderen 16–65 år med ringe grundlæggende færdigheder (1.000 personer)

Land	Læse-færdigheder	Regne-færdigheder	Læse- eller regne-færdigheder	Læse- og regne-færdigheder	Problem-løsning med IT
Danmark	576	517	693	393	1.018
Finland	371	449	538	282	1028
Estland	117	128	163	82	384
Norge	402	478	553	327	836
Sverige	794	880	1.049	625	1.502

Sammensætningen af grupperne med ringe grundlæggende færdigheder adskiller sig fra befolkningen som helhed. Grupperne med ringe færdigheder er overrepræsenteret med de kategorier i befolkningen, som i gennemsnit ligger lavt, når det drejer sig om grundlæggende færdigheder (jf. ovenfor). Det betyder, at følgende grupper er overrepræsenteret blandt dem med ringe færdigheder: Personer med et lavt uddannelsesniveau, ældre aldersgrupper, indvandrere, personer med ringe selvrapporteret helbred, personer uden arbejde og personer i ufaglærte jobs.

Dette er dog ikke ensbetydende med, at personer med ringe grundlæggende færdigheder *kun* findes i disse kategorier. Sammenhængen mellem ringe færdigheder og sociodemografiske karakteristika er langt fra fuldstændig og uden undtagelser. Der er mange med ringe grundlæggende færdigheder også blandt unge, ikke-indvandrere, personer med erhvervsrettet uddannelse, personer med et udmærket helbred og personer med stabil beskæftigelse og i relativt krævende job. Man fristes til at sige, at *personer med ringe grundlæggende færdigheder findes overalt i vores nordiske samfund* til trods for, at de nordiske lande er blandt dem, som klarer sig bedst internationalt, når det drejer sig om niveauet for læsefærdigheder, regnefærdigheder og færdigheder i problemløsning med IT i landenes befolkninger (jf. ovenfor).

Overuddannelse

En beskæftiget person kan definers som ”overuddannet”, hvis den pågældende har en uddannelse på et højere niveau end det niveau, der kræves for at blive ansat i jobbet eller for at kunne udføre jobbet. Overuddannelse kan have negative konsekvenser samfundsøkonomisk og/eller på det individuelle niveau. I denne rapport har vi forsøgt at belyse, hvor udbredt overuddannelse er, og om de overuddannede har nogle særlige karakteristika. Grundlaget er PIAAC data kombineret med nationale registerdata om de enkelte PIAAC respondenter.

Forskellige målemetoder synes at give forskellige skøn over omfanget af overuddannelse. Selvvurdering (SV), dvs. overuddannelse bedømt af PIAAC respondenterne selv resulterer generelt i en meget højere andel af overuddannede end jobanalyse (JA); i gennemsnit er forskellen omkring ti procentpoint. JA baseres på klassifikationer af stillingstyper efter det uddannelsesniveau, som stillingerne kræver. Mindste-skønnet over andelen af overuddannede er 15–20 % i Danmark, Norge og Sverige – lidt højere i Finland og Estland. Disse skøn er temmelig usikre.

Selv om forskellige målemetoder resulterer i forskellige skøn over omfanget af overuddannelse, giver de nogenlunde samme billede af, hvem de overuddannede er. Sammenlignet med dem, der ikke er overuddannede, er de overuddannede gennemgående yngre, har mindre erhvervserfaring og anciennitet, og har en større sandsynlighed for at være personer, der ikke taler landets sprog.

Det ser ud til, at overuddannelse gennemgående er en temmelig vedvarende tilstand på det individuelle niveau. Af dem, der blev klassificeret som overuddannede (målt ved JA) i 2008, var det knapt halvdelen, der havde formået at blive godt matchet med et job i 2011. Jo højere alder, des mere vedvarende synes en tilstand af overuddannelse at være.

Andelen af en fødselsårgang, som gennemfører en videregående uddannelse, er steget kraftigt inden for de seneste to artier. Derfor er det relevant at spørge, om den her målte overuddannelse kun er tilsynelandende, eller om den er reel. Med andre ord: Er der tale om egentlig overuddannelse med deraf følgende spild af kompetencer, dvs. økonomiske tab?

Reel eller egentlig overuddannelse betyder, at de overuddannedes færdigheder erhvervet gennem uddannelse svækkes som følge af manglende brug. Nogle af vore resultater peger i denne retning, men mere forskning er nødvendig for at kunne formulere mere præcise konklusioner om omfanget af egentlig overuddannelse og de mulige samfundsøkonomiske omkostninger som følge heraf.

Voksen- og efteruddannelse (VEU)

I PIAAC opereres med to typer voksen- og efteruddannelse (VEU), nemlig formel uddannelse og ikke-formel uddannelse. *Formel uddannelse* omfatter uddannelse, der er godkendt af de relevante myndigheder i et land, og som giver en anerkendt erhvervs- og/eller studiekompetence, der er dokumenteret ved et uddannelsesbevis. Betydningen af udtrykket "formel uddannelse" kommer tæt på det, som i daglig tale ofte blot omtales som "uddannelse".

Ikke-formel uddannelse omfatter følgende læringsaktiviteter i PIAAC:

- Kurser afholdt som fjernundervisning eller kurser over internettet.
- Organiseret undervisning på arbejdet eller organiseret instruktion fra overordnede eller kollegaer.
- Seminarer eller workshops.
- Kurser eller individuel undervisning, som ikke indgår i ovennævnte kategorier.

Hvis en respondent har deltaget i mindst én af disse fire aktiviteter, kodes respondenten som deltager i "ikke-formel uddannelse". Terminologien og spørgsmålene i PIAAC blev anvendt for at kunne foretage sammenligninger mellem lande. Eftersom voksen- og efteruddannelse er organiseret meget forskelligt i forskellige lande, betyder det, at PIAAC terminologien ikke præcist svarer til den nationale sprogbrug i noget enkelt land.

Analyser af VEU i denne rapport er afgrænset til aldersgruppen 30–65 år. Det sker, fordi PIAAC spørgeskemaet ikke i sig selv præcist fortæller, om den uddannelses- eller læringsaktivitet, som en respondent har deltaget i, falder under voksen- og efteruddannelse i det pågældende land eller indgår som en del af det ordinære uddannelsessystem for unge mennesker i landet.

Omkring 60 % af PIAAC respondenterne i alderen 30–65 år havde inden for de sidste 12 måneder før interviewet deltaget i enten formel eller ikke-formel uddannelse. I Estland var andelen dog kun cirka 50 %. Ikke-formel uddannelse er den absolut dominerende form for VEU i aldersintervallet 30–65 år.

Det meste voksen- og efteruddannelse er ifølge PIAAC jobrelateret; meget finder sted i arbejdstiden, og meget ofte bidrager arbejdsgiveren i betydeligt omfang til at dække omkostningerne ved VEU. Der er en positiv sammenhæng mellem disse tre aspekter af VEU. Med en vis forenkling kan de nordiske lande rangordnes på følgende måde efter, hvor dominerende disse tre katakteristika er i landet: Danmark, Norge, Finland, Sverige og Estland. På disse dimensioner tenderer VEU i Danmark til i højere grad at være relateret til det nuværende job sammenlignet med VEU i Estland. De andre lande befinder sig mellem disse yderpunkter.

Omkring halvdelen af befolkningen i alderen 30–65 år havde inden for de seneste 12 måneder deltaget i ikke-formel uddannelse, undtagen i Estland, hvor andelen var 44 %. Den samlede varighed af deltagelse inden for de sidste 12 måneder (for deltagerne) estimeres til 63 timer i Finland, 69 timer i Sverige, 74 timer i Norge og Estland samt 81 timer i Danmark. Hvis man kombinerer oplysningerne om frekvens og varighed, estimeres det, at det samlede omfang af deltagelse i ikke-formel uddannelse pr. person pr. år i aldersgruppen 30–65 år er 43 timer i Danmark, 37 timer i Sverige, 36 timer i Norge, 33 timer i Finland og 32 timer i Estland.

Forskellige faktorer forklarer variationer i frekvens og varighed. Personer uden beskæftigelse og indvandrere deltager sjældnere i ikke-formel uddannelse end henholdsvis beskæftigede og ikke-indvandrere, men når de deltager, gør de det i betydeligt flere timer. Ældre tenderer til at deltage både sjældere og i kortere tid end yngre personer. Kvinder deltager lidt oftere end mænd undtagen i Norge og Sverige, men varigheden af de to køns deltagelse adskiller sig ikke meget fra hinanden.

Sandsynligheden for at deltage i ikke-formel uddannelse stiger med uddannelsesniveau og stigende læsefærdigheder, men varigheden af deltagelse varierer ikke med uddannelsesniveau og synes endda at falde med bedre læsefærdigheder.

Mellem en fjerdedel (Danmark) og halvdelen (Estland) af de beskæftigede oplever, at de har brug for mere uddannelse/oplæring for at kunne udføre deres nuværende arbejdsopgaver godt. I rapporten argumenteres for, at respondenternes svar er indikator for, at der i en række tilfælde er et misforhold mellem jobkrav og de beskæftigedes kompetencer. Det ser ud til, at det oplevede behov for mere uddannelse eller oplæring er mere udbredt i den offentlige end i den private sektor i alle nordiske lande.

Mellem en fjerdedel (Norge) og en tredjedel (de andre lande) af befolkningen i alderen 30–65 år oplyste, at de inden for de sidste 12 måneder havde haft et ønske om at deltage i (yderligere) uddannelse, uden at dette ønske var blevet opfyldt. Både forhold relateret til arbejdsgiveren/arbejdspladsen og personlige omstændigheder synes at være barrierer for (yderligere) uddannelse. Lavere alder, højere uddannelsesniveau og bedre læsefærdigheder synes at øge sandsynligheden for at udtrykke et ønske om yderligere uddannelse.

Alt i alt synes der at være flere ligheder end forskelle mellem de fem nordiske lande, når det drejer sig om adfærd og holdninger i relation til voksen- og efteruddannelse.

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Adult Skills in the Nordic Region

Denmark, Estonia, Finland, Norway, and Sweden participated in the first round of the International Survey of Adult Skills. The survey is a product of the Programme for the International Assessment of Adult Competencies (PIAAC) led by the Organisation for Economic Co-operation and Development (OECD). The survey assessed the proficiency in literacy, numeracy, and problem-solving in technology-rich environments of adults aged 16–65.

This publication is the product of the Nordic PIAAC Network, consisting of members from all five countries. It concentrates on the comparative results from four Nordic countries and Estonia, forming a Nordic region with many common features. It supplements the series of national and international PIAAC reports by comparing the results from five countries, as well as comparing an aggregate of these countries to other country aggregates.

The results published in this book draw on a unique Nordic database, which the Nordic PIAAC Network has produced. The database consists of PIAAC assessment data and background information, supplemented by social, educational, and labour market register data from the five countries.

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