Survey of Adult Skills - Denmark

Summary of Danish PIAAC results

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Summary of Danish PIAAC Results.

1. PIAAC (The Programme for the International Assessment of Adult Competencies), or Survey of Adult Skills, is an OECD study of skills in literacy, numeracy, and problem solving in technology-rich environments among the population aged 16-65 years. The first round comprised 24 countries, including Denmark where PIAAC was initiated and financed by The Ministry of Education, The Ministry of Employment, The Ministry of Science, Innovation and Higher Education, The Ministry of Finance, and The Ministry of Social Affairs, Children and Integration.

The data collection was carried out in 2011-2012. The international results were published by OECD on 8 October 2013 and can be found at: www.oecd.org/site/piaac/surveyofadultskills.htm. The results from Denmark were published at the same time in three Danish reports:

- Anders Rosdahl, Torben Fridberg, Vibeke Jakobsen, Michael Jørgensen: Færdigheder i læsning, regning og problemløsning med IT i Danmark. København: SFI - Det Nationale Forskningscenter for Velfærd. 13:28. 2013.
- Anders Rosdahl, Torben Fridberg, Vibeke Jakobsen, Michael Jørgensen: Færdigheder i læsning, regning og problemløsning med IT i Danmark. Sammenfatning af PIAAC. København: SFI - Det Nationale Forskningscenter for Velfærd. 13:29. 2013.
- Danskernes kompetencer. Danske resultater af OECD's PIAAC-undersøgelse. København: SFI-Det nationale Forskningscenter for Velfærd. Serien Kort og Klart.

The reports can be downloaded from www.sfi.dk. The main results from PIAAC in Denmark are presented in this paper written by Anders Rosdahl, National Project Manager of PIAAC, Denmark. Comments or questions may be communicated to ar@sfi.dk.

2. PIAAC respondents in Denmark. The Danish PIAAC sample was drawn from the population aged 16-65 years in July 2011. This segment of the population comprised 3,629,000 persons. The sample was drawn by random. Persons aged 55-65 years and immigrants were oversampled in order to be able to go into detail with elderly people's expectations concerning retirement and to

distinguish between western and non-western immigrants, respectively. The total number of respondents was 7,328. The response rate was 50 per cent. The results from PIAAC are calculated in a way that makes them representative for the Danish population aged 16-65 years.

PIAAC in Denmark also included interviews with about 1,800 persons who participated in PISA in year 2000. These respondents are not part of the international PIAAC dataset. Results from this part of the Danish PIAAC will be published in 2014.

The data collection was undertaken in the respondents' homes. An interviewer with a PC first conducted an interview (about 40 minutes) with the respondent who was subsequently asked to solve the assessment tasks on the interviewer's PC or - if this was not possible - with paper and pencil. The assessment took about 60 minutes, but the respondent was allowed to use as much time as necessary.

3. Level of Adult Skills in Denmark. The skills measured in PIAAC are Cognitive Foundation Skills (CFS) or "key information-processing skills". For convenience we use the former expression in this summary. PIAAC focuses on skills in three domains:

- *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. This type of skills is for convenience habitually labelled *ICT skills* in this paper.

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 (below 1, 1, 2, 3, 4, and 5). The ICT skills are divided into five levels (no score, below 1, 1, 2, and 3). The "no score" category includes persons with no computer

experience and persons who could not or did not want to do the assessment on the interviewer's computer.

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

As in other countries relatively large proportions of the Danish population aged 16-65 years have poor skills, i.e. are only able to solve extremely simple tasks within the three domains. About 16 per cent or 583,000 persons have literacy skills at level 1 or below. About 15 per cent or 531,000 persons have numeracy skills at the same level. About 14.5 per cent did not solve the computer-based assessments and further 13.9 per cent performed at the lowest level (below 1) on ICT skills. Thus, in total 28 per cent of the population, or 1,032,000 persons, have skills in problem solving in technology-rich environments below level 1.

4. Denmark and other countries. The mean literacy proficiency in Denmark (271 on the scale from 0 to 500) is a little less than the international average (273) of 23 of the 24 countries in the first round of PIAAC, cf. table 1. The mean literacy proficiency in Norway (278), Sweden (279), and Finland (288) is higher than the international average. Finland is number 2 of all countries. Japan is number one with a mean score of 296. Literacy proficiency has decreased substantially in Denmark from 1998 (IALS) to 2011/12 (PIAAC). A similar development has occurred in Norway and Sweden, but not in Finland where there has been no change.

The mean numeracy proficiency score in Denmark (278) is above the international average (269). The level in Denmark is nearly the same as in Norway (278) and Sweden (279), but somewhat below Finland (282), which again is number 2 among all countries. Japan is number 1 with a mean numeracy score of 288.

The ranking of countries according to ICT skills cannot use the mean proficiency because a significant number of respondents could not or would not do the tests on the interviewer's computer. In Denmark this proportion was 14.5 per cent – that is much lower than the international average of 24 per cent. In table 1 the ranking is based on the proportion of the population with ICT skills at the two highest levels (level 2 and 3).

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 (ICT skills).

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

Note: Columns 1 and 2 include 23 countries (sub-national entities). Due to missing data at the time of reporting Russia is not included. Only 19 countries (sub-national entities) are included in column 3 because Cyprus, France, Italy, and Spain did not measure proficiency in problem solving in technology-rich environments.

The proportion at the two highest levels is 39 per cent in Denmark – that is above the international average (34 per cent). Sweden (44 per cent), Finland (42 per cent), and Norway (41 per cent) are also placed above the international average. Sweden is number one among all countries, Finland number 2, Norway number 4, and Denmark number 5. Thus, the Scandinavian countries are among the very best in terms of ICT skills.

Finland, Norway, and Sweden have an above average ranking in all three domains: literacy, numeracy and ICT skills. Denmark has an above average ranking in two domains (numeracy and ICT skills), but a below average ranking in literacy.

Four countries (Cyprus, France, Italy, and Spain) did not measure ICT 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 mentioned Scandinavian countries have an above average ranking in all three domains. Of the 19 countries 3 countries are placed below the average on all three domains (Ireland, Poland and US).

5. Factors contributing to development and maintenance of skills. The inequality in the distribution of skills within countries is generally more pronounced than variations between countries. This also holds for Denmark where 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 ICT skills. One explanation is, of course, that participation in education and training, in particular intellectual and non-manual, promotes development and maintenance of Cognitive Foundation Skills (CFS). Second, a selection effect may also exist. Presumably, it is the most able and intelligent persons who enrol in education in particular higher education. Third and maybe most important: education means easier access to labour markets and jobs with current and life-long learning opportunities relevant for development and maintenance of CFS.

Age: In the age interval from 16 to about 30 we observe that increasing age means increasing CFS. From the age about 30 to 65 the opposite trend emerges: increasing age means decreasing skills.

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

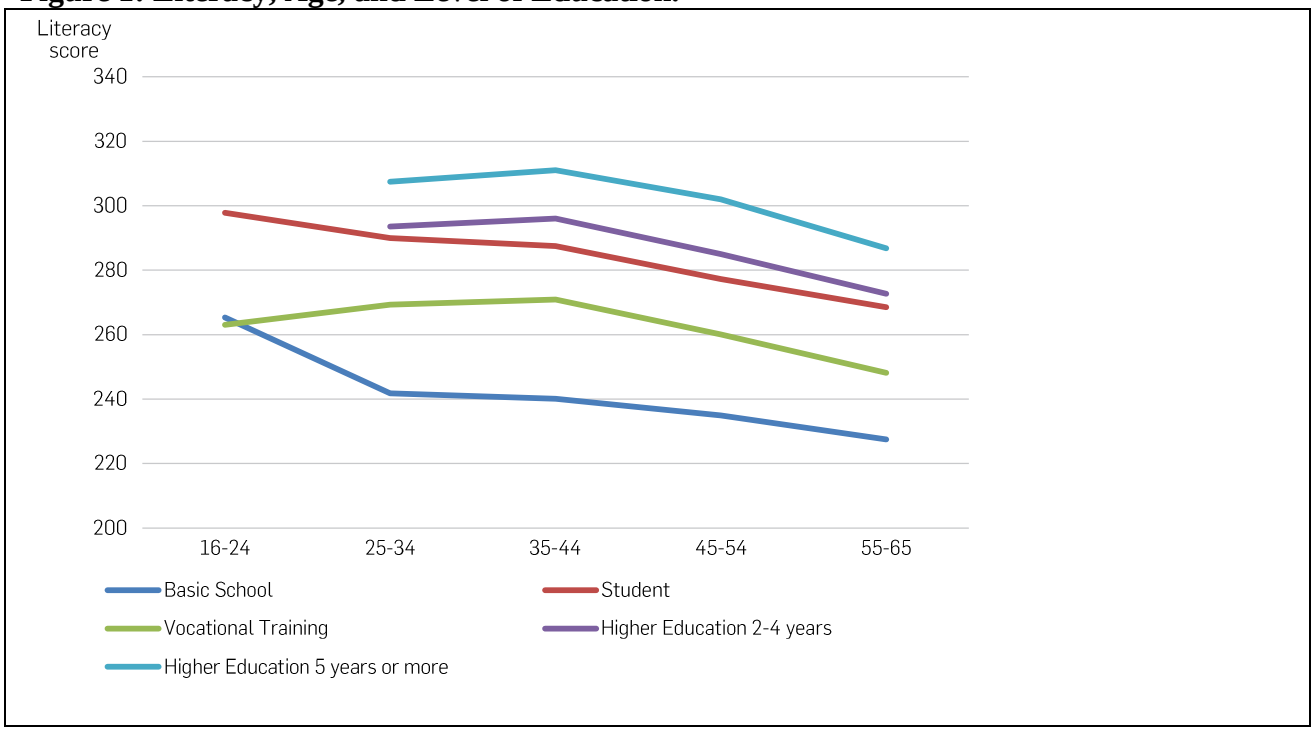
The decrease in skills in the interval 30-65 years may be caused by a *generation effect* implying that differences between age categories are due to variations between generations. Younger generations are generally better educated than older generations, which may contribute to the relatively poor skills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

The skills decrease in the interval 30-65 years may also be caused by an *age-effect* - that is processes that take place in the course of the life of the individual person. *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 society 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.

The association between literacy, age, and highest level of completed education is shown in figure 1. For each age category the skill level increases with higher level of education. And for each level of education one can observe that literacy skills decrease with increasing age - most clearly in the interval 35-65 years. This supports the presumption that an age-effect to some extent may be responsible for the decrease in skills above a certain age. However, nothing can be said neither about the size of such an age-effect nor about the relative weight of biological and social factors.

Immigrant Status. Immigrants - persons not born in Denmark - comprise 10.5 per cent of the population aged 16-65 years. 4.1 per cent are western immigrants, 6.4 per cent are non-western immigrants. The PIAAC response rate among immigrants is much lower than among non-immigrants, which may partly be due to language-related factors. The PIAAC interview and the assessments were undertaken in Danish. Therefore, our results for immigrants are only valid for immigrants with sufficient proficiency in the Danish language.

Figure 1: Literacy, Age, and Level of Education.



Literacy, numeracy, and ICT skills are substantially lower among non-western immigrants than among respondents born in Denmark. The difference is of about the same size as the difference between persons with basic school as their highest level of qualification and persons with an academic education. Western immigrants' proficiency in numeracy and literacy is at a level between non-western immigrants and persons born in Denmark, but closest to the latter group. With respect to ICT skills there is nearly no difference between western immigrants and non-immigrants.

The low educational level of non-western immigrants only partly explains the poor proficiency of this group. Immigrants have lower proficiency in Cognitive Foundation Skills than non-immigrants also when educational level is taken into consideration. This means that other factors than education contribute to explaining variations in CFS 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 CFS 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 CFS than other immigrants.

In addition to educational level, age, and immigrant status a number of other factors contribute to explaining the distribution of skills in Denmark. These are: gender, participation in adult education, employment status and employment experience, health, and parents' education.

Gender: On average men and women have the same level of literacy skills, but men are clearly better at numeracy that women. The latter difference may be related to the gender roles learned in family, school, and other contexts. A slightly larger number of women (87 per cent) than men (84 per cent) have a score for ICT skills, but among those men have a somewhat higher score than women. Thus, the gender difference with respect to ICT skills is not clear.

Participation in training and education. Respondents having participated in training and education within last year have on average better Cognitive Foundation Skills (CFS) within all three domains than non-participants, also when other factors (e.g. age and highest level of education) are taken into consideration. The explanation may be that participation in training promotes CFS. Courses and training opportunities may also attract persons with the best skills at the outset.

Labour market status and employment. Employed persons have on average better literacy, numeracy, and ICT skills than persons without employment (disregarding persons currently participating in formal education). Longer work experience up until about 30 years means, other things being equal, better skills. Thus, employment and substantial employment experience is associated with a higher level of skills. Again, a causal relation may go both ways. Employment implies generally better opportunities to develop and maintain skills. On the other hand, persons with better skills are preferred as employees. Better skilled persons may have better chances of both getting a job and keeping a job.

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 CFS in all three domains. Better self-reported health and better skills 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 and life-style recommendations.

Parents' education. Even if all the factors mentioned are taken into consideration we find a clear association between actual measured Cognitive Foundation Skills and the educational level of the respondents' parents. Respondents where one or both of the parents have a higher education are better skilled than respondents where both parents only have basic school as their highest level of education.

In conclusion, the results show that development and maintenance of Cognitive Foundation Skills are a result of complex processes taking place in different context during the course of life.

6. Target Groups for Efforts to Promote Development of Adult Skills. The results outlined mean that groups with poor skills, compared to the population at large, are overrepresented with persons with only basic school, elderly people, non-western immigrants, persons of poor health, and persons without employment. At the same is it essential to observe that the groups with poor skills are heterogeneous - that is, they do not only include the categories mentioned.

Using literacy as an example we can see that about half of the persons with poor literacy skills (level 1 or below) have only basic school as their highest level of education, while about one third has a vocational education (VET). 60 per cent of the persons poor in literacy are in the age group 45-65 years; the remaining 40 per cent are younger. Unemployed persons and persons outside the labour force (disregarding persons currently participating in education) comprise a little more than one third of the persons with poor literacy skills, but about half of the poor readers are employed. A little less than 30 per cent of the poor readers are immigrants; 70 per cent are of Danish origin. One third of the poor readers describe their health as poor, but 45 per cent report their general health as very good or excellent.

Thus, even if the poor readers are overrepresented in certain groups, the poor readers can be found in large numbers in several or most socio-economic categories in Danish society. The same can be said of persons with poor skills in numeracy and problem solving in technology rich environments.

Box 1 displays the number of persons with low literacy skills in the categories where the low-skilled are especially overrepresented.

Box 1:
Number of persons with poor literacy skills (level 1 or below) in certain socio-economic categories. Per cent of total population 16-65 years in parentheses.

Persons with only basic school:	288,000 (8 per cent)
Persons aged 45-65 years:	335,000 (9 per cent)
No participation in training last year:	306,000 (8 per cent)
Non-western immigrants:	122,000 (3 per cent)
Persons without employment	214,000 (6 per cent)

As the groups overlap the numbers cannot simply be added together. The total number with low literacy skills is 583,000 or 16 per cent of the population aged 16-65 years.

7. Use of Cognitive Foundation Skills. Information about use of skills in PIAAC comes from asking PIAAC respondents how often (daily, weekly, monthly, etc.) they read, write, calculate, or use ICT at work and outside work.

Employed persons in Denmark very often use Cognitive Foundation Skills at work:

- More than 75 per cent read a written text every day either on paper or on some type of screen; 90 per cent must read something at least once a week. That is, almost all employed persons must read at work.
- More than 65 per cent do write some type of text every day either on paper or on some type of screen; less than 10 per cent report that they never write anything at work.
- Every day more than 40 per cent perform some type of numbers handling, e.g. using a calculator or a computer to calculate prices, budgets, or percentages.
- More than 65 per cent of the employed persons use ICT every day in their job, e.g. e-mail, word processing, or spreadsheets. A little more than 20 per cent never use ICT at work.

Employed persons read nearly as often in their leisure time than on the job, but it is not the same texts that are read. In their leisure time it is more often books and articles in newspapers or magazines, whereas reading of instructions and guidelines more often take place at work. Reading of letters, mails, and notes occur with about the same frequency at work and outside work.

The amount and pattern of reading among the unemployed and other persons outside the labour force (disregarding persons currently participating in education) resemble the employed persons' reading outside work. The group reading the most is persons currently under formal education where reading very often takes place as part of their educational activity. Similar results emerge when the groups - employed persons at work, employed persons outside work, unemployed persons, persons currently under education, and other persons outside the labour force - are compared with respect to calculation activities and use of ICT.

If we look at the total use of ICT both at work and outside work PIAAC shows that 71.3 per cent of the population aged 16-65 years use email every day and 51.9 per cent use the internet every day to search for information. ICT of some type is used at least once a week by more than 90 per cent of the population.

Measured Cognitive Foundation Skills and use of such skills are positively associated. For example, people with better literacy skills read more both at work and outside work. The same holds for numeracy and ICT skills and use of these skills.

Using literacy as an illustration the explanation may be that the incentive to read is more pronounced for persons with good literacy skills. For such persons it is easier (less "costly") to read and understand a text. A causal relation between skills and use of skills may also work in the opposite way - that is, from reading to literacy. If it is for some reason necessary that an employee reads given texts at work or outside work, then the person may in a way be forced to develop and maintain his or her literacy skills. A more voluntary wish to maintain or improve reading skills may also contribute to explaining the positive association between actual reading and literacy skills.

Similar considerations are relevant when discussing the relation between calculation/numeracy skills and ICT skills/use of ICT. Based on PIAAC we cannot separate the two explanations or assess their relative weight.

Reading, calculation, and use of ICT occur more often among highly educated persons than among persons with a low level of education – also when actual skills are taken into consideration. This

indicates better learning opportunities at work and outside work for persons with a high level of education. Again, this emphasizes the importance of education.

8. Information processing and physical-manual activities at work. Information processing at work includes reading, writing, calculating, and use of ICT but also activities such as planning of own or other persons' work, communication, influencing, and negotiating.

All questions to PIAAC respondents on job activities started with "how frequent do you …" (daily, weekly, monthly, yearly, never) do this or that activity. This way of asking implies that the measured content of jobs will depend on the working time. If you only work 10 hours a week, for instance, the probability that you do something each day will be less than if you work 40 hours a week. We have in all statistical analyses corrected for this.

As mentioned (paragraph 7) more than 75 per cent of employed persons use literacy and ICT skills every day at work. More than 40 per cent use numeracy skills daily. About 70 per cent report that they perform planning activities related to their own work every day. A little less than 20 per cent indicate that they plan the work of others every day. About 75 per cent of the employed persons report that they carry out one or more communication activities every day at work.

Although information processing is an essential ingredient in most employed persons' work, physical-manual elements also play a significant role. More than two thirds of employed persons in Denmark report that they every day must work physically for long time or work carefully with hands/ fingers, i.e. with a degree of dexterity.

The frequency of all the above-mentioned information processing activities increase with the level of the job's educational requirements, the employee's own level of education, and level of measured Cognitive Foundation Skills. The amount of physical-manual work varies in a way directly opposite to information processing. Higher educational requirements of the job, a higher level of education of the person, and a higher level of Cognitive Foundation Skills are associated with less physical-manual elements in actual work tasks.

Thus, although many or most jobs include a combination of information processing and physical-manual activities, the relative weight of the two elements varies. PIAAC shows that the mix depends BOTH on the employer's job requirements AND the skills of the person performing the job. A job is not just a job objectively speaking – the actual content of a job also depends on the person holding the job and in particular his or her skills. Persons are to some extent able to influence the contents of their jobs. This means that development of skills and life-long learning may be an independent force promoting job enrichment.

Immigrants tend to have a larger amount of physical-manual activities in their jobs than persons with a Danish background. However, our analysis supports the conclusion that it is not immigrant status by itself which primarily explains the large amount of physical-manual elements in their jobs, but rather immigrants' lack of skills - in particular in terms of Danish literacy.

9. Use of English and other foreign languages at work. 24 per cent of employed persons in Denmark use the English language every day at work. From the PIAAC survey we cannot see whether English is used in all written and oral communication every day or only in the context of specific work activities. 45 per cent use English on the job at least once a week. Only 18 per cent never use English at work. Half of the employed persons use *other languages than Danish and English* at work at least once a year. 17 per cent do so at least once a week.

Use of foreign languages occurs much more often in the private (business) sector than in the public sector, where more than one third of the Danish workforce is employed. The larger the size of the workplace, the more it is associated with use of foreign languages. About 45 per cent of employed persons in private companies with more than 250 employees use a foreign language every day. In the public sector it is "only" a little less than 25 per cent in workplaces of the same size. A high level of education and high educational hiring requirements are associated with a more widespread use of foreign languages at work. Thus, measured in this way globalization apparently starts at the highest occupational levels, in the biggest companies, and in the private sector.

Movements across national borders are another indicator of globalization. In general, western immigrants in Denmark use English much more often in their work than persons with a Danish background. The same is the case for non-western immigrants, but the fraction that never uses

English is also larger in this category than among persons with a Danish background. Nearly one fifth of the immigrant group uses another language than Danish and English every day at work; the proportion among non-immigrants is only 5 per cent.

10. Economic and social outcomes of Cognitive Foundation Skills. The basic reason for the relevance of skills is that these are assumed to have a number of positive outcomes both in terms of a person's quality of life (individual level) and for countries' competitive power, economic growth, and the viability of their democratic and other institutions (national level).

The Danish PIAAC analysis clearly supports the assumption that there are positive economic outcomes of Cognitive Foundation Skills.

The *probability of being employed* rather than unemployed is associated with a number of factors, such as level of education. The probability of being employed also increases with previous employment experience, whereas it decreases with e.g. increasing age, all other things being equal. The Danish PIAAC analysis shows that Cognitive Foundation Skills seem to have an independent positive association with the probability of being employed, even if a number of other factors known to influence employment prospects are taken into consideration.

The *hourly wage* of wage earners also seems to depend on Cognitive Foundation Skills. If these skills increase by 1 point on the 0-500 scale, the hourly wage is estimated to increase by about 0.07 per cent. This result is based on an analysis where a large number of factors also influencing wage level are taken into consideration. With respect to these other factors similar results are found in other analyses of variation in wages. This supports the validity of the analysis where hourly wage is calculated from PIAAC respondents' reported paid wage per time unit (e.g. month or week) and weekly working hours.

Social outcomes of Cognitive Foundation Skills include the following psychological dimensions measured by letting PIAAC respondents indicate on a 5-point scale to which extent they agreed or disagreed with certain statements:

- Perceived *social trust*. Statement: "There are only a few people you can trust completely".

- Perceived *political influence*. Statement: "People like me don't have any say about what the Government does".
- Perceived *political understanding*. Statement: "I feel that I have a pretty good understanding of the important political issues facing our country"

PIAAC shows that better Cognitive Foundation Skills are associated with more trust in other people (perceived social trust), more perceived political influence, and better self-reported understanding of current political issues. This holds true even when a number of other factors also associated with these indicators are included in the analysis. Among those other factors education is of particular importance: a higher level of education is associated with more social trust and higher perceived political influence and understanding.

Volunteering is also positively related to Cognitive Foundation Skills. Volunteering is a behavioural indicator (not a psychological dimension) and was measured by letting respondents indicate how often they did voluntary work, including unpaid work for a charity, political party, trade union, or other non-profit organization. Education is also of importance here. Participation in voluntary work is more frequent among people with education beyond basic schooling than among those with only basic schooling.

It may be discussed to what extent voluntary work and the other dimensions are in fact "outcomes" of Cognitive Foundation Skills. For voluntary work the cause-effect relation may also go the opposite way from volunteering to development and maintenance of Cognitive Foundation Skills.
The "social outcomes" are indicators of social cohesion, which is influenced by several other factors apart from skills. PIAAC shows, for example, that immigrants score lower than respondents with Danish background on all social cohesion dimensions, even when the lower immigrant skills are corrected for.

11. Formal and non-formal adult education. Development and maintenance of skills, including Cognitive Foundation Skills, take place in the course of life both in education, at work, and outside work.

About 40 per cent of the employed PIAAC respondents report that they learn new work-related things on their job every day. The learning may stem from interaction and communication with co-

workers and supervisors, from learning by doing specific tasks, or from activities involving keeping up to date with new products and services. More than 70 per cent learn new work-related things at least once a week. Only 1 per cent says that they never learn anything at work. Thus, learning on the job is a normal activity occurring very frequently.

The Danish concept "adult education/supplementary training" (abbreviated "VEU" in Denmark) and the OECD concept "adult education" are not identical although rather similar, at least on the face of it and at a high level of abstraction. Both concepts refer to organized learning where a teacher or leader instructs one or more adults. On-the-job learning integrated in current job activity or production, cf. above, does not fall under these concepts, although it is not easy to draw sharp distinctions.

Even if OECD and Danish concepts have similarities, national Danish terminology on "adult education/supplementary training" is different from the OECD approach used in PIAAC. The difference is, among other things, related to the fact that a special "adult education" system exists apart from "basic education" in Denmark.

PIAAC makes a distinction between formal and non-formal education, which together may be labelled organized learning in contrast to spontaneous learning. Both kinds can be undertaken to improve labour market relevant skills or other types of skills. *Formal education* results in an exam paper (certificate) sanctioned by authorities according to regulations of some kind. The levels of formal education are ordered in the ISCED system, from basic school to PhD. In the PIAAC questionnaire respondents were first asked about participation in formal education and then about engaging in non-formal education – for both types within the last 12 months. *Non-formal education* includes work-related or non-work-related activities of the following four types, which the respondent must report separately:

1. Courses conducted through open or distance education.
2. Any organized sessions for on-the-job training or training by supervisors or co-workers.
3. Seminars or workshops.
4. Courses or private lessons, not already reported.

It was emphasized in the instruction that activities already reported in the questions on formal education should not be reported again. Category no. 4 functions as a "rest" group which may also, due to the design of the questionnaire, include some formal courses.

Based on these indicators PIAAC shows that more than 70 per cent of the Danish population aged 16-65 years had participated in *formal and/or non-formal education* at some point within the last 12 months. The proportion is 99 per cent in the age group 16-19 years, about 85 per cent in the age group 20-29, more than 70 per cent in the category 30-44 years, more than 60 per cent in the category 45-59 years, and 40 per cent among persons aged 60-65 years.

For the age group 30-65 years the proportion is more than 60 per cent. Measured in this way participation in adult education/supplementary training in Denmark is very high compared to most other PIAAC countries.

The mix between formal and non-formal education changes with increasing age: formal education becomes less frequent compared to non-formal education. A striking result is that most training and educational activity is somehow related to or aimed at the labour market, according to PIAAC. Only a relatively minor fraction of the total volume of organized learning among adults in the age group 16-65 years is not work-related.

About 60 per cent of the population aged 16-65 years have participated in *non-formal adult education* within the last 12 months, that is, courses of the four types mentioned above. On average, the length of participation was 86 hours per person - not including transport and homework. For most, the course took primarily place within their working time, and the course was deemed relevant for their present job. Presumably, most participants did not have any significant economic expenses as a consequence of their participation.

Both the probability and duration of participation decrease with increasing age and decreasing level of education. Unemployed participate less often than employed individuals, but the unemployed participate in courses of a longer duration. Individuals outside the labour force participate less often than employed people. Immigrants participate less than non-immigrants, but their participation is of a longer duration, on average.

12. Perceived labour market outcomes of courses and further education. 83 per cent of PIAAC respondents have participated in "courses and further education" one or more times in their life.

About 80 per cent of this majority report that they have experienced positive labour market impacts of this participation at some point. The most frequently reported impacts are the ability to handle new tasks on a job, more responsibility at work, better chances of keeping a job, and better chances of getting a new job. More than 60 per cent of participants have experienced each of these four types of benefits as a consequence of participation in courses and supplementary training. Higher income is mentioned less frequently, but nearly 40 per cent assess that courses and further education at some point in their lives have meant increased personal income.

All impacts are reported more often by persons having the highest level of education. That is, positive impacts are especially experienced by categories of people participating the most in courses and supplementary training.

13. Skills and retirement from the labour market. The Danish PIAAC included an oversample of persons aged 55-65 years and special Danish questions on retirement to PIAAC respondents aged 50 or more. In the analysis of retirement we have combined PIAAC survey data with information from statistical registers.

Very few in Denmark retire before the age of 60. The probability of retirement is in particular high at the following ages: 60, 62, and 65, which is due to economic incentives built into current pension regulations and rules. In general women retire earlier than men. Individuals with poor health and a relative weak attachment to the labour market have a higher probability of retiring early than persons with excellent health and individuals with stable and permanent employment. On average, high income, a high level of education, and better Cognitive Foundation Skills mean later retirement. The association can be due to economic incentives – persons with high incomes generally lose the most when retiring. Persons with high incomes and a high level of skills generally have the most interesting and satisfying work. Therefore, such persons also lose the most in terms of immaterial benefits when they withdraw from work. Finally, persons with high level of skills are more valuable to employers.

Investigations generally show a high correlation between expected (intended) and actual retirement age unless legislation changing the economic incentives is introduced in the meantime. The expectations concerning age of retirement among PIAAC respondents aged 50-65 seem quite realistic on the background of recent reforms in Denmark. PIAAC results on expected retirement indicate that the trend in recent years toward later retirement seems to continue at least for several years ahead - unless severe external economic crises of some kind emerge.

PIAAC indicates that better Cognitive Foundation Skill may push retirement age upwards, but the complex causal mechanisms in this field are difficult to single out. Generally, however, it can be concluded that it is the most skilled persons in terms of education, Cognitive Foundation Skills, and labour market experience who remain the longest on the labour market.