

PIAAC BQ JRA V5.0 – Conceptual Framework

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BACKGROUND QUESTIONNAIRE V5.0 – CONCEPTUAL FRAMEWORK

0. SUMMARY

0.1. Criteria for inclusion of items

We adopted the following criteria for the inclusion of concepts and items in the BQ:

1. Clearly established relation to skills and other relevant outcomes.
2. Good measurement properties in terms of reliability and validity.
3. Comparability across groups and across countries.
4. National adaptations of questions to be kept to a minimum.
5. Comparability with other international surveys.
6. Developing items for small subgroups should be minimised.

0.2. The Policy Questions

The PIAAC project seeks to answer the following policy questions:

1. *How are skills distributed?* A comparison of skill levels, skill requirements, mismatches and investments in education and training across countries, and within countries across demographic categories, regions, sectors of industry, levels and fields of schooling.
2. *Why are skills important?* The relation of skills to relevant labour market outcomes like employment opportunities, earnings, job security, and skill utilisation, as well as to other outcomes such as health, civic and political engagement.
3. *What factors are related to skill acquisition and decline?* The relation between various learning activities – education, training, informal learning activities - and skill acquisition. The relation of experiences at work, in education and everyday life to skill decline among older individuals.

0.3. Theoretical Background

What are Key Skills?

The quest for key skills

The last few decades have seen an increased awareness of human capital as one of the driving forces of economic development. Policy makers have realized the importance of monitoring, and if necessary investing in, education and training as a way of improving the existing stock of skills. A major project in the quest to identify the key competencies needed for successful functioning was the DeSeCo (Definition and Selection of Competencies) project, which was initiated by the OECD to provide an overarching framework for international skills assessments. Competencies are defined in this project as “the ability to successfully meet complex demands in a particular context through the mobilisation of psychosocial prerequisites (including both cognitive and non-cognitive aspects)” (Rychen & Salganik, 2003, p. 43). The theoretical framework provided by the DeSeCo project indicates the main underlying competencies that give skills their significance, but does not in itself directly give rise to clear recommendations as to the skills to be measured. Binkley et al. (2003) developed

a framework that provides more detailed guidance for the development of skills measurements. This work concentrated on two strands of research: research on what skills are necessary in the workplace, and research on cognitive functioning. The choice of direct assessments in ALL was based partly on these theoretical notions, but also on practical considerations, such as an established tradition of measurement, sufficiently compact to be used in a household survey. As a consequence ALL concentrated on literacy and numeracy skills, which correspond mainly with generic aspects of the Communication and Mathematical skill areas identified in workplace research. PIAAC builds on the direct assessments in ALL, extending these to the area of problem solving in technology-rich environments, which contains elements of the Problem Solving and Technology skill areas. Other skill areas, particularly those involving intrapersonal and interpersonal skills, and specific professional skills, are not included in the direct assessment, but the BQ and JRA do contain several indicators related to skill use or skill requirements in these areas.

Skill Use: The Job Requirements Approach Module

The main arguments for developing a separate JRA module for PIAAC were the following:

- To provide a cost-effective way of assessing the relevance of skills not covered by the direct assessments.
- To provide some information on the demand side for skills, to supplement the information provided by the direct assessments on the supply side.

Items are now included for the three central domains covered by the direct assessments (literacy, numeracy and ICT, as well as the areas of problem-solving, scientific knowledge, and a range of interaction/social skills (influence, managerial skills, self-direction, horizontal interaction and client interaction) and physical skills (strength and manual skill). Besides skill use in these domains, items are included indicating the level of computer skills required in the respondent's job. Using the skill use items in the domains that are also being directly tested will make it possible to generate indicators of skills mismatch.

The importance of including personal traits

Recent research on the economics of human skill formation has demonstrated the importance of factors besides intelligence in creating productive persons (e.g. Heckman & Masterov, 2007). Investment in education and skill acquisition is powerfully influenced by personality traits and preferences, such as perseverance of effort, locus of control and time preference in terms of the relative value placed on future as compared to current benefits. In addition to these aspects, conscientiousness - the tendency to show self-discipline, act dutifully, and aim for achievement – is likely to influence the degree and manner in which one applies oneself to learning. The BQ contains indicators of these concepts.

Current investments in education and training

Access to lifelong learning by different groups remains a crucial issue for governments of the OECD member countries. Formal education, formal training, and informal training all contribute to the stock of human capital, and countries will display different profiles in how the human capital stock is built up. PIAAC will provide a snapshot of human capital investments by the incidence and intensity of training during the previous 12 month period. From a policy viewpoint it is important to not only obtain an indication of the volume of investments, but in the case of adult education and training to have information on how much of this training is taking place for work-related reasons, and on who is financing such investments. Since most training received by individuals at work also benefits other employers, there is some concern that this will result in underinvestment. The BQ contains some indicators of these aspects.

Reporting categories

In order to effectively address skill deficiencies, but also from the point of view of social equity, it is important to have a good picture of where the deficiencies are concentrated most strongly. To answer these questions we need to know how skills are distributed among relevant subgroups, as defined by for example gender, age, socio-economic background, migration status and ethnicity, region, occupation, sector of industry, firm size, and level of education. The BQ contains indicators for each of these reporting categories.

Factors related to Skills Acquisition and Decline¹*Education as an investment*

In economics, education and learning is treated as an investment. Not everybody is equally likely to invest in the same amount of education. In the first place people differ in their capacity to acquire skills. Secondly, people differ in preferences. Third, people might face constraints in their choices. Finally, the decision to invest in education will depend on information available at the time of investment. Although the questionnaire contains no direct indicators of innate learning abilities, the family background in terms of parents' education can be used as a control variable for this. A number of personal traits included in the questionnaire – effort, consistency of interest, ambition, self-control, locus of control, time preference and meta-cognitive abilities – either affect individuals' ability to learn or are indicative of individuals' preferences in relation to learning. Constraints are expected to differ systematically by different social categories, such as gender, socio-economic status, and ethnic status. Part of these differences relate to differences in school performance and learning abilities, and part to different choices made in education.

Among the characteristics of the educational career, the achieved level of education is of course the most important concept affecting skills levels. Moreover, the particular field of education followed is also expected to affect skills levels. In addition to these aspects, the BQ will allow us to identify whether some of the education of immigrants has been taken outside the host country.

Training and informal learning

People do not only learn during initial education but later in life as well. Several studies have found high returns on workers' participation in training, but others have questioned whether it is really formal training that makes the difference. Employees spend much more time on informal learning activities than on formal learning, and the activities are often interrelated. It is important that PIAAC not only looks at the incidence of formal training but also explores various kinds of informal learning, as these contribute highly to skills acquisition. In the 1990s researchers became more interested in the effects of the organisation of the production process on skills development. In particular, the notion of 'Innovative Work Practices' in the so-called 'High Performance Workplace (HPW),' originally developed in the discipline of Human Resource Management (HRM), has been used to explain the improved performance of a firm. Although the HPW is usually not clearly defined, many authors include (1)

¹ Although the cross-sectional nature of the PIAAC survey makes it impossible to infer strict causality in any observed relationships between variables, the research literature on skill acquisition and decline is strongly based on the notion of causality. It should be stressed that any implicit or explicit references to causality in the ensuing discussion pertain to this literature, and do not imply any claim with regard to the potential use of the PIAAC data.

delegation of responsibility to autonomous teams, (2) job rotation, (3) performance-related earnings and (4) training to support organisational change. The HRM literature also suggests the relevance of other human resource practices, such as: feedback, career/training plans and performance interviews. Furthermore, job characteristics such as monotonous versus complex tasks, and jobs which require problem solving and learning new things might also affect training incidence and informal learning. The BQ has several items indicating these workplace characteristics.

Regardless of the specifics of the training and learning practices applied in the organization in which individuals work, the amount of work experience acquired can be expected to have a strong effect on skills development. However, one is likely to be most exposed to situations from which one can learn something new early in one's career. As the career develops, the chance that one will be exposed to new stimuli is decreased, a pattern that is reinforced by typical patterns of brain development over the life-cycle. In addition to total work experience, the number of changes of employer is therefore also important.

There are also factors outside the world of work that can affect the development and retention of competences. The questionnaire therefore covers some activities in which respondents may be involved in everyday life from which they can learn as well as the above-mentioned work-related factors.

Skill loss

An important finding of IALS and ALL was that skill loss was sometimes sufficient to offset all of the expected gains from increasing educational quality and quantity. Higher order brain functions follow a steep developmental pattern and reach a plateau of optimal functioning in young adulthood. Most cognitive abilities tend to decline with advancing age. Large individual differences exist in the onset and rate of decline of specific cognitive functions. Fluid abilities (functions that involve controlled and effortful processing of novel information) typically start declining in the mid twenties, while crystallised skills (the representation of learned skills and access to knowledge) may improve until and beyond even the age of seventy. One may hypothesise that numeracy and literacy skills relate more strongly to crystallised abilities, and therefore be less susceptible to decline, than dynamic problem solving in a technology-rich environment, which relate more to fluid abilities.

Building partly on insights from cognitive and neuropsychology, De Grip and Van Loo (2002) developed a typology of different types of skills obsolescence, of which wear - which results from the natural ageing process and may be accelerated by physically or mentally challenging working conditions - and atrophy - which is due to the lack or insufficient use of skills and may be brought on by unemployment, career interruptions or working below one's level of education - are particularly relevant from the point of view of PIAAC. The BQ contains indicators that are thought to be related to wear (age, health) and atrophy (unemployment spells, working below one's level, tenure, and sector of industry). In addition, several of the abovementioned workplace practices and task characteristics have a direct bearing not only on on-the-job learning, but also on the risk of skills obsolescence in the form of atrophy.

Skills and Outcomes

Skills and labour market outcomes

There is a large body of evidence showing that higher cognitive skills are associated with better labour market outcomes (e.g. Heckman et al., 2006). Key indicators in this respect that are included in the BQ are current labour status (employed, unemployed, inactive), self-declared main status (allowing a better understanding of the situation of those not in the labour force), working hours, individual earnings, household income, job security, occupational status, and the quality of the match between education and work.

One of the interesting questions in this respect is to what the precise role is of education and skills in producing these outcomes. There are rivalling hypotheses on this point. The human capital theory (Becker, 1964), claims that people with more years of schooling earn more because they are more productive. Scholars such as Spence (1973) and Arrow (1973) have pointed out that rewards are often based on signals such as formal qualifications as well as on the basis of productivity. The labour queue theory (Thurow, 1975) points out that many relevant competencies are learned on the job rather than in education. Credentialists such as Collins (1979) claim that higher education does not lead to superior competencies at all, but is used by ‘gatekeepers’ to legitimise the rationing of access to high-status, highly paid jobs. There is probably an element of truth in all these theories, and the crucial point is to specify the contexts under which one or the other mechanism prevails. In a study like PIAAC we might expect large differences between the countries and between sectors of industry in the extent to which skills affect labour market outcomes relative to the effects of educational credentials.

Skills and other outcomes

There is good empirical evidence that education not only affects labour market outcomes, but is also a strong predictor of outcomes in other life domains. The background questionnaire includes indicators of family formation, health and health-related behaviour, civic engagement and political participation. Education not only affects the individual outcomes in these domains, but also affects the social returns as well, as a result of spill-over effects. As with the effects of education on labour market outcomes, the effects of education on other outcomes are still not completely understood. Broadly two mechanisms can be distinguished: an effect on skills - education directly affects knowledge and skills that are relevant for healthy behaviour, civic engagement etc. - and an effect on allocation - higher education increases the chance of ending up in healthier jobs or in social networks in which civic engagement is higher. The PIAAC data should provide clues as to the extent to which mechanism is dominant, and as to how this varies both between and within countries.

Control variables and instrumental variables (IVs)

Although the data will not lend themselves to causal analysis, for evidence-based policy it is still important that the estimates of the relation between various factors and skills are as free as possible from bias. One possible problem is that of unobserved heterogeneity, which may occur when there is some other variable which affects both the variables under consideration. The ‘classic’ way of dealing with such problems is to include control variables that may bias the relation between the variable of interest and the dependent variable. A second way of dealing with this is by using panel data, which give more opportunities to look at the causal direction of relations. Although PIAAC is a cross-sectional survey, a panel design could be simulated by including earlier and later waves to build a synthetic cohort, which allows for an analysis at the level of population-subgroups that would parallel the advantages of a true longitudinal survey. A third way of dealing with unobserved characteristics that cannot be controlled for in these ways involves the use of new statistical techniques have been developed to deal with this problem, such as the use of instrumental variables. Using other

variables, the ‘true’ effect of the variables of interest can be estimated. For the BQ this would mean that information needs to be gathered on characteristics of the learning activities as well as variables that are needed to get unbiased estimates for the variables of interest. Several items were included in earlier versions of the BQ that were intended primarily or partly as instrumental variables. Unfortunately, in the final analysis, none of these variables has been retained in the current version of the BQ. Some were discarded because the cognitive labs showed that they were insufficiently clear to respondents, some because there were doubts as to their applicability across the full range of countries, and some because the expectation of their efficacy as IVs was too low. For a detailed discussion of the logic of using IVs and the concrete proposals of IVs that were considered for the PIAAC survey, we refer to the separate literature review that has been carried out for this purpose (Borghans et al. 2008).

1. CRITERIA FOR INCLUSION OF ITEMS

For the inclusion of concepts and items in the BQ we will adopt the following list of criteria:

1. The concepts should have a clearly established relation in the theoretical and empirical literature to skills and other relevant outcomes.
2. Items must have good measurement properties in terms of reliability and validity and be able to maintain that over time.
3. Items must be comparable across groups and across countries. This poses limits to items that are vulnerable to cultural bias
4. Ex-ante harmonisation is preferred above ex-post harmonisation. National adaptations of questions (other than translation issues) should be kept to a minimum and is only allowed in cases where this is functional (e.g. in asking about type of education etc.).
5. If possible items must be comparable with other international surveys. Most important is the comparability to IALS and ALL, but other international surveys such as LFS, WVS, ESS constitute important markers as well.
6. In general we recommend that most questions should be asked to everybody or at least to a majority of the respondents. Developing items for small subgroups should be minimised.

2. THE POLICY QUESTIONS

The PIAAC project seeks to answer the following policy questions:

1. How are skills distributed?
2. Why are skills important?
3. What factors are related to skill acquisition?

2.1. How are Skills Distributed?

Human capital is considered to be the driving force of economic growth. Investments in skills are vital to keep up with technological change (the so-called Skill-Biased Technological Change), but also with other changes as a result of market developments or organisational developments (e.g. the introduction of High Performance Workplace Practices). Policy makers have an interest in monitoring the stock of human capital in their country, and in identifying the different levels among relevant subgroups. PIAAC will assess the stock of human capital in a society by providing a descriptive analysis of the distribution of skills proficiencies and skills use in the adult population. The survey will enable countries to answer questions like:

- How does the adult population in a country compare to other countries in terms of average levels of skills proficiency and skill use? What share of the adult population has low proficiencies of relevant skills?
- In terms of equity, how are skills distributed among relevant subgroups, such as gender, age group, region or migration status? Are certain subgroups particularly vulnerable to low skills proficiencies?
- How are skills proficiencies distributed across sectors of industry? Are there certain sectors of industry that are characterized by particularly low levels of skills proficiency? How do the skills levels of these sectors compare to those in other countries?
- How are skills proficiencies distributed across different levels of schooling, benchmarked against other countries? Are there population sub-groups who appear to be underserved by the current education system? Is there an underdevelopment of skills at particular levels of education? What are the skills levels of early leavers from education?
- Who is participating in adult learning of various types? To what extent are particular population sub-groups excluded from adult learning systems?

2.2. Why are Skills Important?

There is little interest from a policy point of view for any investment in skills if it has no relation with relevant outcomes. Other services are competing with education and training for a share in budgets, so that the case for returns to educational investment needs to be made on a secure and sophisticated evidence base. Moreover governments and the public make education accountable to show the effects of their efforts. For that reason, one of the key goals of the background questionnaire is to provide indicators that can be used to show if differences in skill matter economically and socially. The most obvious area that policy makers are interested in is how skills levels are related to economic outcomes of individuals. Cognitive skills are thought to be a key determinant of an individual's productivity, and therefore it is not surprising that cognitive skills are related to economic success. There is a

large body of evidence showing that higher cognitive skills are indeed associated with better labour market outcomes. Relevant questions are:

- How are skills related to individual employment opportunities and job security?
- How are skills related to earnings and other indicators of labour market success?
- Do low skill proficiencies form a barrier to individuals entering the labour force?
- Are low skilled people more affected by job insecurity? Is there a minimum level of skills that is needed to be employable?
- How do skills affect the relation between education and training on the one hand and economic outcomes on the other hand? Can skills compensate for low educational qualifications?

Apart from economic outcomes, other areas are of interest as well, such as the relation between skills and health status, civic participation, and social cohesion. Adverse outcomes in such areas place large burdens on governments, businesses, and individuals, including both the direct expenditure of resources (such as government spending on health care) and indirect costs (such as the value of goods and services workers do not produce while ill).

Relevant questions are:

- To what extent is literacy related to health status of individuals, to that of various sub-groups and of the overall population?
- To what extent do individuals with low skills appear to be less engaged in the broader society (community service, social and cultural activities)?
- How do individuals with low skill levels cope with their everyday reading and numeracy demands? To what extent do these coping mechanisms make these individuals reliant on others? To what extent does the engagement of linguistic, ethnic or cultural minorities appear to be inhibited by their lack of skill in the language of the test?
- Do high skilled people have a higher involvement in political participation or civic activities? What is the relation between skills and the level of social trust?

2.3. What factors are related to skill acquisition and decline?

Under the assumption that skills matter economically and socially, policy makers have an interest in knowing what factors are related to higher skill levels. Of course the prime focus of interest is to assess the effects of factors that are directly affected by policy, such as the provision of formal and non-formal organized learning activities like education and training. But it is also relevant to compare the efficiency of these skills production routes with the efficiency of other routes not directly under the control of policy makers, such as the informal learning activities people can engage in. Assessing the overall relation between education and training and skill levels is only a first step in unravelling the determinants of skills acquisition. We can assume that not all education and training activities have the same impact on skills development nor can we assume that the impact is the same for all relevant subgroups. Policy makers have an interest in seeing which characteristics of education and training are most strongly related to higher skill levels in the population and which subgroups appear to profit most from which type of intervention. Finally, we need to be aware that skills cannot only be acquired, but also can also be lost. Preventing skill decline is probably just as important as promoting skill acquisition, but the underlying factors affecting these processes may be quite different and it is important to have a good insight in both processes.

This means that the survey needs to enable countries to answer questions like:

- What is the relation between education and training and the skill development of people? Are these relations different from those with other learning activities people engage in to develop their skills, such as informal on-the-job learning?
- Is the relation between education and training and skills the same for each subgroup? Are there subgroups that appear to profit more or less from the investment in education and training?
- What is the relation between underinvestment in work-related training and adult skill levels? How are characteristics of the work environment related to skill levels? Is informal learning on-the-job a substitute for work-related training?
- How do processes of skills acquisition and skills decline vary with age? What are the factors that are related to skill decline? Are these the same as the factors that are related to skill acquisition?

3. THEORETICAL BACKGROUND

In this section we describe the main theoretical elements of the conceptual framework and, where relevant, indicate the items that have been included in the draft background questionnaire to reflect these elements. The purpose of this part is to provide a solid theoretical basis for the policy questions formulated in the previous section, and to serve as a guideline for the selection of relevant concepts and the translation of those concepts into specific questions in the BQ. This framework will also serve as a guideline for the analysis and interpretation of the data, both in the field trial, where it will be used to derive predictions on how particular sets of variables are expected to behave, and in the main survey, where it will be used to derive hypotheses pertaining to the policy questions outlined in the previous section.

The presentation of the theoretical framework will be divided into three parts, roughly corresponding to the three types of policy questions described in Section 2. We start, in Section 3.1, with a brief overview of the literature on the nature of key skills. Although the direct assessment as such falls outside the scope of the development of the BQ, the *raison d'être* of the BQ is to provide the context information needed for analyzing and interpreting the results of the DA. As a consequence, it is essential to proceed with a solid understanding of what is being measured in the DA and, equally important, what is not being measured. Following this, in Section 3.2, we summarize the literature pertaining skills acquisition and decline.² The theoretical discussion is concluded in Section 3.3 with a review of the literature on outcomes of skills. Finally we will discuss the role of Instrumental Variables in Section 3.4.

3.1. What are Key Skills?

As was remarked in Section 2.1, policy makers have a strong interest in knowing how skills are distributed, across countries, as well as across different subgroups within countries, such as age, gender, ethnicity, region, sector of industry, and levels and fields of education. If we want to answer these questions, it is important to first take a step back and reflect on what is being compared. Below is a brief overview of the literature on so-called key skills, of which the skills measured in PIAAC form an important subset.

The quest for key skills

The last few decades have seen an increased awareness of human capital as one of the driving forces of economic development. Policy makers have realized the importance of investing in education and training as a way of improving the existing stock of skills. This has resulted in an accompanying need to monitor and assess the stock of human capital. What soon became clear is that education, as such, is a poor indicator of the stock of human capital. Individuals with the same nominal level and type of education can differ markedly in their command of various skills. Likewise countries that have more or less comparable levels of educational attainment can nevertheless differ substantially in the level of skills that are acquired in education. This has been shown in studies like ALL and PISA.

² The reason for discussing factors affecting skill development before effects of skills on outcomes, rather than the other way around as in Section 2, is that the discussion of effects of skills on outcomes presupposes that we already have a good idea what causes skills.

As the emphasis shifts from educational qualifications towards skill measurement, the question naturally arises as to what skills should be measured. It seems clear that in order to perform even the most basic tasks many discrete skills are required. Determining which skills should be measured is a complex and difficult task, which is compounded by the fact that people not only make use of generic skills such as the ability to communicate or the ability to learn, but also of a large number of highly specific skills pertaining to particular tasks, situations and objects.

In order to introduce some order in the understanding of the diversity of human skills, many scholars have engaged in a quest for so-called core skills or key competencies. A major project in this respect was the DeSeCo (Definition and Selection of Competencies) project. This project was initiated by the OECD to provide an overarching framework for international skills assessments. Competencies are defined in this project as “the ability to successfully meet complex demands in a particular context through the mobilisation of psychosocial prerequisites (including both cognitive and non-cognitive aspects)” (Rychen & Salganik, 2003, p. 43). The basic difference between this view and earlier concepts of skills is the holistic nature of the concept of competence. It refers not only to a range of cognitive and non-cognitive skills and other prerequisites that need to be in place in order to perform in a competent way, but also to the notion of “orchestration,” which is defined as the ability to use these constituent elements in a meaningful and deliberately arranged way.

Although the theoretical framework provided by the DeSeCo project injects some welcome theoretical rigor into the discussion of skills measurement, it does not in itself directly give rise to clear recommendations as to the competencies to be measured. The best way to conceive of this overarching framework is to see that it indicates the main underlying competencies that give skills their significance.

Binkley et al. (2003) developed a framework that provides more detailed guidance for the development of skills measurements. This work concentrated on two strands of research: research on what skills are necessary in the workplace, and research on cognitive functioning. From the first strand a list of six skill areas were extracted that seemed to underlie many of the most important skills: Communication (speaking, listening, reading, and writing), Mathematical, Problem Solving, Intrapersonal (motivation, metacognition), Interpersonal (teamwork, leadership) and Technology. From the strand of psychological theory four core domains of intelligence were extracted: practical abilities, crystallised analytical abilities, fluid analytical abilities, and creative abilities (the ability to cope with novelty). As the authors point out, the two strands are not mutually exclusive, but rather represent different aspects of skill. The workplace skills provide the context within which each of the four core intelligence domains are expressed; or, conversely, each category of workplace skill can involve four distinct types of thinking.

The choice of direct assessments in ALL was based not only on these theoretical notions, but also on practical considerations, such as an established tradition of measurement, sufficiently compact to be used in a household survey. As a consequence ALL concentrated on only part of the matrix formed by the intersection of the two strands of research, in particular on the more generic aspects of the Communication and Mathematical skill areas. PIAAC builds on the direct assessments in ALL, extending these to the area of problem solving in technology-rich environments, which contains elements of the Problem Solving and Technology skill areas. Although it is not possible to draw any sharp dividing line, the three domains of direct assessments in PIAAC will differ in the extent to which they relate to the four types of thinking derived from psychological theory. Since the developmental pattern over the life course is thought to be quite different for the different types of thinking, this has important implications for the manner in which the different skills can typically be expected to be acquired and in some cases eventually lost. We will return to this point in Section 3.2.

To the extent that the skills measured in the direct assessments are shown to be related to important economic and social outcomes (see Section 3.3), the pragmatic restriction to those skill aspects that lend themselves well to a survey approach need not seriously diminish the value of the information gathered. It is however important to keep in mind that we are dealing with a subset of the skills possessed by the individuals participating in the survey. The Intrapersonal and Interpersonal skill areas are not included in the direct assessment, but as will be outlined below, these will be covered to some extent by items included in the BQ and JRA. Arguably the most conspicuous omission is in the area of specific skills used by individuals in their chosen line of work.

The importance of professional expertise

Despite the fact that employers' often list generic cognitive skills and personal traits skills as the most important skills required in the workplace, professional expertise is a condition *sine qua non* for success in many occupations. For example, nobody would doubt that in order to become a good medical doctor, architect or car mechanic, one needs to acquire the domain-specific knowledge and skills that make up the professional domains of these occupations. The German psychologist Weinert formulated this as follows: "Over the last decades, the cognitive sciences have convincingly demonstrated that context-specific skills and knowledge play a crucial role in solving difficult tasks. Generally, key competencies cannot adequately compensate for a lack of content-specific competencies" (Weinert, 2001: 53).

There is, however, a plethora of specific professional skills, so that it will not be possible to measure professional expertise directly in the PIAAC assessment, simply because there is no common assessment instrument that allows all different types of professional skills to be measured in a meaningful way for large populations. The absence of direct measures of specific skills underscores the importance of obtaining information on the occupation of working respondents, based on the answers to questions D_Q01a and D_Q01b in the BQ. Since the differences between occupations in the skills measured in the direct assessments is likely to be at least matched and probably eclipsed by differences in level and type of specific skills, the residual occupation-level variance in economic outcomes should provide a rough indication of the economic importance of specific skills relative to the generic skills measured.

Although no direct assessment of occupation-specific skills is included in the PIAAC survey, the work experience required in the job (D_Q12c) provides a good proxy for specific skills that are required at work. In addition, measures of skill use in some more generic work-related areas, as well as in the domains covered by the direct assessment and in the area of Interpersonal skills, have been developed in a separate module based on the Job Requirements Approach.

Skill Use: The Job Requirements Module

In 2004 the OECD launched an initiative to develop a module in PIAAC on generic work skills requirements as a complement to the direct assessments. This was called the Job Requirements Approach (JRA). In the JRA, workers are asked to indicate the level of skills that is required in their current work in several skill domains. The method of JRA has been successfully applied in different surveys, such as the British Skills Survey, similar surveys in Italy and Spain, the US O*NET survey and several international graduate surveys (CHEERS and REFLEX).

The main arguments for developing a separate JRA module for PIAAC were the following:

- The direct assessments in PIAAC are limited to relatively few, albeit crucial, skill domains. Yet there was a widespread feeling, supported by some case studies, that other skills were becoming increasingly relevant in modern workplaces. Important examples were communication skills and the skills needed to work within teams, to work at multiple and flexible tasks, and to work more independently. There was also evidence that some of these skills were, like computing skills, being rewarded in the labour market over and above the returns to the education that people had received (Dickerson and Green, 2004). It was intended that the JRA module would provide a cost-effective way of assessing the relevance of these skills.
- Earlier skills surveys like IALS and ALL were mainly limited to the supply side of skills, that is, the stock of skills of the population. It was felt that some information on the demand side for skills was needed as well, that is, on the utilisation of skills in the workplace. Sociological theory makes a distinction between “own skills” (the skills that individuals have) and “job skills” (the skills defined by jobs), and it was decided to measure some important job skills directly.

In the JRA module respondents will be asked questions about the skills that they use at work. First, the module will generate very many items describing the generic activities involved in doing the job. The choice of items is informed by theories of skill and the practices of commercial occupational psychology. To reduce the multiple items to a smaller and theoretically meaningful set of generic skills, statistical techniques are used to generate several generic skill indicators from the responses on these items.

In the course of development of the BQ, it became apparent that parts of the JRA module corresponded to a large degree to measures of skill use that are required for analysing the results of the direct assessment. The subject matter expert groups (SMEGs) in the areas of literacy, numeracy and ICT have developed scales that integrated the experiences from ALL with the newly developed insights from JRA. Scales were developed that measure the use of skills both at work and in everyday life (including study) in a similar way. These scales are broadly comparable to what has been measured in ALL, but the scales have been adjusted such that they will have better psychometric properties. Items are now included for the three central domains covered by the direct assessments (literacy (reading: G_Q01a-h, H_Q01a-h; writing: G_Q02a-d, H_Q02a-d), numeracy (G_Q03a-h, H_Q03a-h) and ICT (G_Q04, G_Q05a-h, H_Q04a-b, H_Q05a-h)). Besides skill use in these domains, items are included indicating the level of computer skills required in the respondent’s job (G_Q06, G_Q07) and the extent to which a lack of computer skills has affected the respondents chances of getting a job or promotion (G_Q08).

In addition to these three central domains covered by the direct assessments, the JRA module contains items pertaining to problem-solving (FQ_05a-b), as well as a range of interaction/social skills (influence (F_Q02b-c, F_Q03b, F_Q04a), self-direction (F_Q03a, F_Q03c), horizontal interaction (F_Q01a-b, F_Q02a) and client interaction (F_Q02d-e, F_Q04b)), and physical skills (strength (F_Q_6a-b) and manual skill (F_Q06c)). Also included are two general questions on the extent to which the respondent feels that their skills match the duties they are required to perform (F_Q07a-b).

Two assumptions underpin the use of the job requirements approach. First, it is assumed that the individual is a well-informed person to report about the activities involved in the job he/she is doing. All jobs differ, even within quite narrowly categorised occupations, and one would normally expect the job-holder to know best. Nevertheless, this might not always be true, and where the job-holder has been only a short time in post the assumption might be

questioned. In the case of out-of-work respondents, the field trial will be testing the reliability of respondents' ability to recall the activities of their most recent job in the previous 12 months. Second, it is assumed that the individual reports these activities in an unbiased way. This assumption might also be questioned: individuals might talk up their jobs, to boost their self-esteem. However, it is held that they are less likely to do so when reporting their activities than reporting how good they are in the performance of these activities. To minimise bias the general principle is to ask respondents to report actual behaviour, such as frequency of use and proportion of time spent on using different skills, rather than often-used alternatives such as the importance of these skills for the job.

The measures of "job skill" obtained through the JRA module will not be direct measures of the "own skill" held by respondents. Discrepancies between job-holders' skills and job requirements are possible, however. Some individuals may have an excess supply of some skills, and not be using them fully on the job; others may have insufficient skills for the job they are doing, and may survive in the short run despite the consequent poor performance. These mismatches are dynamic: they can appear and disappear as both jobs and people change. In the domains that are also being directly tested it will be possible to generate indicators of mismatch, where individuals have high levels of own skill and are in jobs where that same skill is used at a low level, or vice versa. There will also be a general subjective question on self-perceived skill underutilisation. In several domains, however, there will be no specific mismatch indicator available: the only indicator of skill in these domains will be the use of the skills in the job.

The importance of including personal traits

A narrow definition of human capital that only considers differences in schooling outcomes, test scores and training severely limits our ability to understand the sources of heterogeneity in socioeconomic success.

For instance, it is intuitively obvious that personal traits such as effort, perseverance, conscientiousness, and the like, are also important for success in life and for the development of skills. Edison's remark that "genius is 1% inspiration and 99% perspiration," describes the importance of perseverance and motivation in creative pursuits. The increasing importance of social skills is suggested by the trend towards teamwork in professional life in a broad range of jobs, industries and occupations.

A broader perspective, which incorporates findings from psychology as well as knowledge of biological and medical sciences in the analysis of skill development over the life-cycle, also highlights important interdependencies between cognitive skills and personal traits in skill formation. For example, recent research on the economics of human skill formation has demonstrated the importance of factors besides intelligence in creating productive persons (e.g. Heckman & Masterov, 2007). Investment in education and skill acquisition is powerfully influenced by personality traits and preferences, such as attitudes towards risk, discounting (i.e., a willingness to forgo current utility or well-being and wait, in order to have a return in the future) or preferences for work and leisure. Moreover, such traits and attitudes also affect other outcomes such as health. For example, discounting is related both to investment in education as well as investment in healthy behaviour. Not taking into account such an attitude would lead to a misspecification of the relationships between skills and health outcomes.

Although there is limited space for adding measurements of personal traits, there are some well established questions that have been tested in comparative surveys and that will not consume much interview time (see e.g. Dohmen et al., 2008). We have decided to focus on those personal traits that have been found to be especially important in determining performance in education and work and on how people shape their lives and direct their own development. In addition to strategies that are directly related to learning, which will be dealt

with in Section 3.2, the acquisition of skills is likely to be influenced by a number of more general personal traits. Duckworth et al (2007) point to the importance of grit (perseverance of effort) as a factor predicting achievement in various domains. Another important concept is that of locus of control. The willingness and capacity to invest in one's own human capital is likely to be greater when one believes that one is in control of one's own life and destiny, than when one feels that life is mainly guided by external forces outside one's control. Because the benefits of such investments are reaped at a later date, time preference or discounting (the relative value placed on future as compared to current benefits) is likely to be important as well. In addition to these aspects, conscientiousness - the tendency to show self-discipline, act dutifully, and aim for achievement - is likely to influence the degree and manner in which one applies oneself to learning. The questionnaire contains indicators for effort (I_Q1a, d and g), consistency of interest (I_Q01b, d, and h), self-control (I_Q01c and i), locus of control (I_Q02a-f), and discounting (I_Q03a-d).

Current investments in education and training

From a descriptive point of view, it is important that PIAAC provides accurate information on current levels of education and training. Access to lifelong learning by different groups remains a crucial issue for governments of the OECD member countries. Formal education (B_Q01-B_Q11) and non-formal training (B_Q12-B_QB_Q25) both contribute to the stock of human capital and countries will display different profiles in how the human capital stock is built up. PIAAC will provide a snapshot of human capital investments by the incidence and intensity of training during the previous 12 month period. From a policy viewpoint it is important to not only obtain an indication of the volume of investments, but in the case of adult education and training to have information on financing of such investments. A large part of the adult education and training efforts are paid for by employers. Since most training received by individuals also benefits other employers (externalities of training) this typically leads to too little work-related training being provided because part of the returns are captured by outside parties (competing organizations and the individual). From a policy perspective this could warrant some interventions in the training market to balance out this potential source of underinvestment in training. In addition, knowledge on current investments in learning can contribute to the formation of policies designed to provide more equitable or effective inducements to encourage participation among those most in need of further learning. This refers both to differences across different skills levels - are low-skilled individuals investing enough in their human capital - and across key reporting categories as specified below. The questionnaire contains indicators of whether the education or training was followed in working hours (B_Q10b, B_Q15b, to assess the level of investment by employers in training in terms of opportunity costs), the contributors to the costs of training (B_Q11, B_Q16, to assess the level of direct investment in training by employees, employers and other actors), and the firm-specificity of education and training (B_Q10c-d, B_Q15c-d).

When analyzing training, it is necessary to be able to distinguish different categories of education and training. At the most general level, it is important to distinguish work-related from non-work-related training (B_Q05c, B_Q14a). Work-related training is usually expected to have some effect on performance, which is presumably expected to be based on increased skill levels, and to result in productivity and possibly wage gains. Training that has been undertaken for other reasons may also increase certain skills, but would not necessarily lead to productivity increases at work. For training (non-formal learning), a more detailed question (B_Q14b) was also asked to further specify the manner in which the training was work-related.

Reporting categories

In order to effectively address skill deficiencies, but also from the point of view of social equity, it is important to have a good picture of where the deficiencies are concentrated most strongly. Are there population sub-groups who appear to be underskilled? To answer these questions we need to know how skills are distributed among relevant subgroups, as defined by for example gender, age, socio-economic background or migration status and ethnicity. These so-called reporting categories are important both from a point of view of equity and efficiency: if skill gaps lead to social and/or economic exclusion, this is not only detrimental to the well-being of the groups involved, but also to the functioning of the economy and society. Because the reasons for skill gaps are likely to be systematically different for different 'at risk' groups, the policy measures undertaken are likely to be group-specific. Age is additionally important because both skills acquisition and skills decline are related to age, leading to typical age profiles of skills and skill-related outcomes.

Region is an important reporting category as well because of strong regional differences in level of economic development in some countries. It may be that certain regions are being held back by particularly low levels of skills proficiency, or conversely, that regions can be identified where skill demand is particularly low. In addition, because policy is often formulated and/or implemented at the regional level, it is crucial to have access to outcomes at that level. Occupation, sector of industry and firm size are needed to detect areas in which skill gaps exist and to assess the extent to which training investments are taking place to reduce these gaps. This and similar information form the basis for directing possible policy interventions to those groups where intervention is most needed.

Because highest level of education is assumed to be one of the strongest predictors of skills (see below), and because this is differentially distributed across countries, a split by this variable will be needed for even the most elementary understanding of the results. In addition it is important to know how access to the education system is distributed across different subgroups that are 'at risk' from the point of view of skills proficiencies.

3.2. Factors Related to Skills Acquisition and Decline

As was the case for defining and measuring skills themselves, there is not just one but several strands of research pertaining to how individuals acquire and in some cases lose skills over the life course. One prominent strand is that of the economics of education. Since the pioneering work by scholars such as Becker (1964) and Schultz (1963), economists have looked at education, training and other activities undertaken by individuals to improve their level of knowledge and skills as investments in human capital that expected to yield returns in the labour market. A second major strand of research is that of sociological research that point to the social environment affecting school choice and educational attainment. The third strand is educational research, in which scholars have tried to uncover those features of education that are particularly effective in promoting learning. Fourthly, a conceptually related but empirically largely distinct area of research concentrates on how people continue to learn after leaving initial education. An important focus of this strand of research is on courses, workshops and other forms of training in which employees participate, but in recent years the focus has increasingly broadened to include features of the job or organization that promote informal learning. Finally, this focus on life-long learning has led to increased attention for the fact that individuals not only acquire skills over their life-course, but are also confronted with skill loss and a general decline in the ability to acquire and retain new knowledge and skills. In this section we will look at each of these strands of research in turn.

Education as an investment

In economics, education and learning is treated as an investment. In this view people are expected to invest in education and learning when the costs are smaller than the future benefits. Not everybody is equally likely to invest in the same amount of education. People differ in the degree in which they enjoy education or learning and in the degree to which they value the potential benefits of education. Due to heterogeneity in preferences there will also be heterogeneity in the decision to learn. Borghans, et al. (2007) provide a model for investments in education and learning that capture a wide range of potential differences between individuals. In the first place people differ in their capacity to acquire skills. The costs of education are lower for people who acquire skills more easily since they learn faster. The capacity to learn depends both not only on innate cognitive abilities, but also on personal traits. For example, someone who is easily distracted from a task will need more time to learn. Secondly, people differ in preferences. They might differ in how they value learning, working and leisure. They might differ in how much they value a high income or other potential benefits of education and they might differ in how they value future benefits compared to current benefits (time preference, the discount rate) and how they account for risks in outcomes (risk aversion). Third, people might face constraints in their choices. Credit constraints can influence the decision to attend school, but also a lack of facilities for education and less favourable family conditions can be treated as such constraints. Finally, the decision to invest in education will depend on information available at the time of investment. If people don't know about the benefits of education it is unlikely that they will invest.

The main reason why it is important to take account of factors that are expected to influence the willingness to invest in education is that the factors in question may have a direct impact on skill levels distinct from the indirect effect via the increased level of investment in education. If such factors are not taken into account, estimates of the effect of education on skill levels will be biased. The background questionnaire covers some, but not all of these factors. The questionnaire contains no direct indicators of innate learning abilities. It does however include a number of control variables that are related to this concept, in particular the family background in terms of parents' education and occupation (J_Q06b-e, J_Q07b-e). A number of personal traits included in the questionnaire – effort (I_Q1a, d and g), consistency of interest (I_Q01b, d, and h), self-control (I_Q01c and i), locus of control (I_Q02a-f), discounting (I_Q03a-d) and meta-cognitive abilities (I_Q04a-m) – either affect individuals' ability to learn or are indicative of individuals' preferences in relation to learning.

The social environment

The constraints facing different social groups have been extensively studied by sociologists, who have a long tradition of research looking at the social barriers to education and training. While gender inequality in initial education has vanished and actually turned into an advantage for girls in many western countries, gender inequalities still persist in occupational careers and later access to training. The sex of the respondent is therefore a key reporting category for PIAAC. Inequality in access to education related to the family background both in terms of socio-economic status and ethnic status is more persistent. Part of these differences relate to differences in school performance and learning abilities, the so-called primary effects of social stratification (Boudon, 1974). These may be caused both by differences in innate abilities as well as differences in socialisation processes. The cultural capital of the family (Bourdieu, 1984) in particular provides a powerful predictor of the school performance. But even with the same school performance, students from different

family backgrounds make systematically different choices in education (the secondary effects of social stratification) and given the number of choices that have to be made during the educational career, the cumulative effect of these choices may even overwhelm the primary effects. These differences in choices relate to differences in social cost-benefit analyses: the social costs and benefits involved in obtaining education are different for students from different social backgrounds. Following an educational career that is different from the one that is common in the family induces social costs, while the social benefits may be lower. The background questionnaire includes indicators of gender (A_N01), parents' occupation (J_Q06d-e, J_Q07d-e), ethnicity (J_Q04a-c2, J_Q06a, J_Q07a), cultural capital in parental home (J_Q08) and language used in parental home (J_Q05a1-b).

Effective learning and instruction

Following a certain type of education or training path does not automatically imply that all students are likely to acquire the same set of skills. Educational research has shown that there is considerable variation between educational systems, between schools, between study programs and between teachers in how much skills students acquire during education or training. A large part of the effect of education on skill development is likely to be indirect, as students are turned into more or less effective learners for life. In other words, different characteristics of education may affect both the direct acquisition of skills as measured in the direct assessments, as well as the ability to acquire these skills after leaving education. Without providing too much detail, we can note a number of interesting approaches here:

- Situated learning theories (Glaser, 1991) emphasise that competencies and competence development are context-specific. They stress the importance of coherence and context-relevance (e.g. real life experiments, simulation, and practical work experience) in the design of the curricula in order to develop expertise.
- Active learning theories reject the traditional naïve model of the teacher as the expert, imparting his or her knowledge directly to the student. 'Powerful learning environments' (De Corte, 1990) and active instructional methods like problem-based learning and project-oriented education are thought to foster the development of generic competencies like problem solving and meta-cognitive abilities.
- In addition to these innovative ways of learning based on elaborate theories on how individuals actually learn, educational research has traditionally stressed 'time on task' as one of the most important factors affecting student outcomes. That is the actual time students spent on education (within the class-room and through self-study) is a good predictor of the learning outcomes net of other factors.

Although it is not practicable to describe the educational environments respondents have been exposed to, it does make sense to include indicators of respondents' learning strategies, which may in part be a result of such exposure. As Peschar (2003) has remarked, such strategies can be seen as important prerequisites for learning throughout one's life. Self regulated learning theories point to the relevance of meta-cognitive abilities and information processing strategies of students (Kolb, 1984). Learning styles differ between students ranging from a memorizing and rather atomistic ways of learning towards a more constructivist approach in which concepts and theories are actively incorporated in a coherent body of knowledge. Although such attitudes are likely to be heavily influenced by one's family background, either directly through genes or indirectly through early socialization, there is evidence that such attitudes and strategies can be influenced by education. Question G4a-m contains indicators of learning strategies. Although the list of items has been strongly based on previous

international comparative research, the question in its current form is new. Its inclusion in the main survey will depend on its performance in the field trial.

Among the characteristics of the educational career, the highest achieved level of education (B_Q01a) is of course the most important concept affecting skills levels. More years of schooling are expected to have a positive impact on the skills proficiencies. Moreover, the particular field of education (B_Q01b) followed will also affect skills levels: graduates from certain fields of education will have higher scores in the literacy domain; others will probably have higher scores in the numeracy domain. The questionnaire also contains an indicator of the amount of time spent on studying (B_Q06-B_Q09b) by those who participated in formal education during the last year. Because skills can be influenced by education even when the formal qualification has not been obtained, the BQ contains a set of questions about education that the respondent left prematurely (B_Q03a-d). It is also important to identify whether some of the education has been taken outside the host country (in the case of migrants), in order to identify any negative effect on literacy skills. Information on the timing of the educational career obtained in Section B can be combined with information on the timing of entry in the host country (J_Q04c1-2) to give some indication of how much education was followed in another country. The questionnaire also contains questions on the nature of educational qualifications that were pursued abroad (B_S01a1, B_Q01a2-3, B_S02b1, B_Q02b2-3, B_S03b1, B_Q03b2-3, B_S05a1, B_Q05a2-3).

Training and informal learning

People do not only learn during initial education but later in life as well. In the human capital literature, many studies have analysed the effects of workplace training participation on workers' wages (see Bassanini, Booth, Brunello, De Paola, & Leuven, (2005) for a recent overview). Several studies have found high returns on workers' participation in training. Brunello (2004) found that having recently attended training increases a worker's income by about 12 per cent.

However, one may wonder whether it is really the participation in formal training that makes the difference. Borghans, Golsteyn and De Grip (2006) show that employees spend much more time on informal learning activities than on formal learning. They also found that when employers stimulate workers' participation in formal courses, these workers will also spend more time on informal learning in the workplace. As many of the studies on the effect of formal training do not measure the time spent on informal learning, all the benefits of the knowledge and skill acquisition of the workers are attributed to their participation in formal training. It is important that PIAAC not only looks at the incidence of formal training but also explores various kinds of informal learning, as these contribute highly to skills acquisition.

Arrow (1962) emphasised the importance of unstructured workplace learning, not from the perspective of the individual worker, but from the perspective of the firm. He found that informal learning is a more or less automatic by-product of the regular production process of a firm, which he labelled 'learning by doing.' From a similar firm perspective, in the 1990s researchers became more interested in the effects of the organisation of the production process. The shifts in the skills demanded in many jobs were found to be related to the organisational changes that accompany the diffusion of ICT: flat hierarchies, autonomous work groups, and teamwork. These transformations of workplaces induced a growing demand for workers with both cognitive skills and 'people skills'. In particular, the notion of 'Innovative Work Practices' in the so-called 'High Performance Workplace (HPW),' originally developed in the discipline of Human Resource Management (HRM), has been used to explain the improved performance of a firm. Obviously, workplace learning is at the

heart of the HPW. Although the HPW is usually not clearly defined, many authors include (1) delegation of responsibility to autonomous teams, (2) job rotation, (3) performance-related earnings and (4) training to support organisational change.

The HRM literature also suggests the relevance of other human resource practices, such as: feedback, career/training plans and performance interviews. These practices are seen as important determinants of training, productivity and job turnover. However, empirical research in this field is scarce. An exception is the analyses of Facticeau et al. (1995) who found a positive effect of feedback on training transfer. Since career/training plans and performance interviews give both workers and the firm opportunities to talk about schooling issues, these HR practices are expected to have a positive effect on training as well.

Furthermore, job characteristics might also affect post-initial schooling. Employees with mainly monotonous tasks are expected to attend less formal training than those employed in jobs with more complex tasks. Jobs which require problem solving and learning new things probably include high training incidence and informal learning as well.

HR practices and job characteristics are the major work characteristics that determine the opportunities for workers to attend training and to learn in an informal way. Although these opportunities are often necessary for actual training behaviour, a workplace characterized by these training opportunities might not be sufficient. Workers' characteristics will probably determine whether the learning opportunities at work are fully exploited. Personal characteristics such as age, gender and level of schooling are found to be important determinants of post-initial schooling behaviour (Bassanini et al, 2005). Probably equally important, but less often taken into account, are personality traits. Borghans et al. (2008) showed that personality traits predict a variety of social and economic outcomes. The personality traits discussed above in relation to formal education are also likely to strongly influence both the propensity to engage in training and informal learning and the effectiveness of such activities.

In addition to measures of participation in education at the time of the survey and over the life course (B_Q01a to B_Q11), the background questionnaire contains questions on recent investments in training (B_Q12 to B_Q25), including the main reason for participating in education and training (B_Q05c, B_Q14a-b, crucial for analyzing the effects of training), informal training by supervisors, colleagues etc. (D_Q13a), learning by doing (D_Q13b), workplace practices and job characteristics (D_Q13c, D_Q15a-d), and work autonomy (D_Q11a-d).

Regardless of the specifics of the training and learning practices applied in the organization in which individuals work, the amount of work experience acquired can be expected to have a strong effect on skills development. In wage estimations, work experience is generally assumed to be positively related to productivity, but the returns are assumed to diminish with further experience. In terms of skill acquisition, this is consistent with the notion that one is likely to be most exposed to situations from which one can learn something new early in one's career. As the career develops, the chance that one will be exposed to new stimuli is decreased. This pattern is likely to be reinforced by typical patterns of brain development over the life-cycle, which predicts a steady decline in learning and retention abilities from young adulthood onward. We will return to this point below.

Skill acquisition is not only dependent on total experience, but on the specific way in which this experience has been acquired. In addition to total work experience, the number of changes of employer and time spent not working is therefore also important. There is probably a certain minimum time one would need to remain with a given employer to have a reasonable chance of learning new things, and the returns to tenure in most jobs are likely to remain positive for at least a few years (although probably not in very low-level routine jobs,

see below). Because the new experiences one can expect to be exposed to when working for a given employer are likely to diminish over time, we would expect a certain number of job changes over the career to have a positive effect on learning. Lengthy career breaks comprise periods during which the exposure to (work-relevant) experiences is likely to be limited.

In addition to these direct effects of work experience on learning, there may be indirect effects when work history is interpreted by potential employers as a signal of productivity and learning potential. In that case a career characterized by frequent changes and/or lengthy interruptions may affect the willingness of potential employers to hire an individual and to invest in his/her human capital. Lengthy periods of unemployment – that is, seeking work without success – may additionally exert a negative effect on individual motivation.

The questionnaire contains a number of questions related to the above-mentioned aspects of employment history. Question C_Q09 allows us to establish the total number of years of work experience (if any) the respondent has acquired in his/her lifetime, and C_Q08c1-2 shows us in the case of those currently not working when the respondent last worked. Questions C_Q10b-c provide information on the length of time in the last 5 years that the respondent has been out of work, and the proportion of that time that the respondent was unemployed (i.e. not working but available for work).

There are also factors outside the world of work that can affect the development and retention of competences. Question I_Q05a-h covers some activities in which respondents may be involved in everyday life from which they can learn.

Skill loss

The increased focus on life-long learning in recent years has led to increased attention for the fact that individuals not only acquire skills over their life-course, but are also confronted with skill loss and a general decline in the ability to acquire and retain new knowledge and skills. An important finding of IALS and ALL was that skill loss was sometimes sufficient to offset all of the expected gains from increasing educational quality and quantity. Until now, only scattered studies on different aspects of skills obsolescence have been published. Most of these studies were published in periods in which unemployment was high. This increased the focus on the adverse impact of skills obsolescence for the workers involved. It is interesting that in the recent policy debates on skills obsolescence and ‘lifelong learning’ the main focus is on the waste of valuable human resources and on the non-optimal performance of workers with inadequate skills. This brings skills obsolescence to the heart of the economic challenge the western economies face: in realizing the transformation towards a knowledge-based society with an ageing population.

From a cognitive and neuropsychological perspective, higher order brain functions follow a steep developmental pattern and reach a plateau of optimal functioning in young adulthood. Such processes and changes therein can be measured on a behavioural level using dedicated neurocognitive instruments which tap the efficiency within specific neuropsychological domains, such as language, intelligence, memory, attention and speed of information processing.

Optimal neurocognitive development is dependent on a complex interplay of factors, with genetics, socio-economical status, educational achievement, adequate nutrition, and uncompromised mental and physical health being the strongest predictors of developmental success. Researchers have coined the term ‘brain reserve capacity’ (or BRC) to indicate the neurobiological constraints which determine maximum processing capacity of higher order

brain functions. This concept has proven its validity, in, for example, predicting individual cognitive ageing trajectories later in life. Important proxy measures of BRC include educational level and occupational achievement.

On a population level, most cognitive abilities such as memory function, information processing speed and attentional capacity tend to decline with advancing age. Adequate preservation of cognitive abilities is of primary importance to older people, as cognitive decline can result in a loss of productivity among those still working, and a loss of independence and autonomy for retired people. Large individual differences exist in the offset and rate of decline of specific cognitive functions. In Section 3.1 we drew attention to the theoretical distinction drawn in psychological research between ‘fluid’ and ‘crystallised’ abilities. The former refers to functions that involve controlled and effortful processing of novel information (cognitive mechanics), and the latter to the representation of learned skills and access to knowledge (cognitive pragmatics). Fluid abilities are far more sensitive to ageing (Figure 1) and both cognitive domains show different developmental patterns across the life span. Fluid abilities typically start declining in the mid twenties, while crystallised skills may improve until and beyond even the age of seventy. The distinction between the two is important because the direct assessments in PIAAC will differ in the extent to which they relate to crystallised or fluid abilities. One may hypothesise that numeracy and literacy skills relate more strongly to crystallised abilities, while dynamic problem solving in a technology-rich environment will relate more to fluid abilities. For adults, the decline in fluid abilities is more likely to strongly hamper their working and everyday life than the decline in crystallised abilities.

Figure 1: Theoretical representation of ‘crystallised’ and ‘fluid’ abilities over the life span

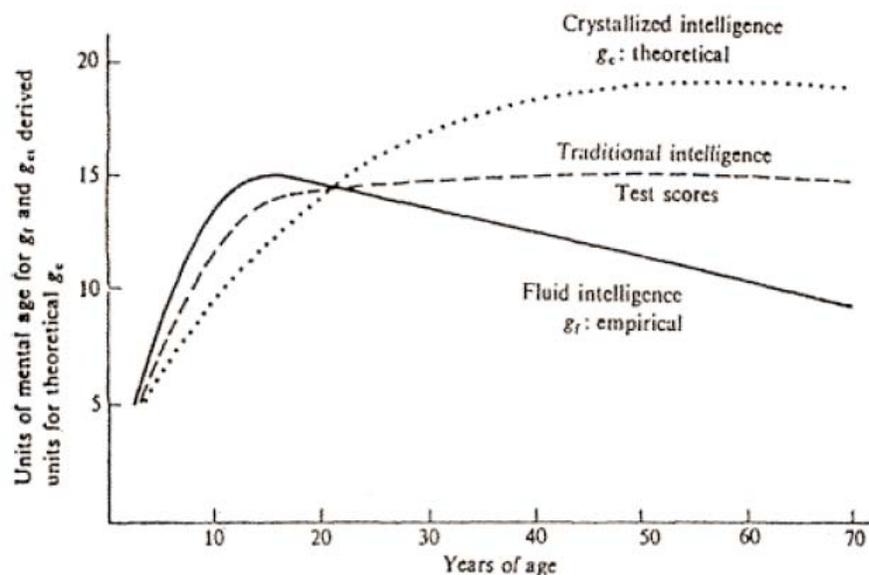


Figure 1. A theoretical description of life span curves of intellectual abilities. From *Intelligence: Its structure, growth and action* (p. 206) by R. B. Cattell, 1987, Amsterdam: North-Holland. Copyright 1987 by Elsevier Science Publishers. Reprinted with permission.

The two most prominent symptoms of ‘usual’ cognitive ageing in daily life are a gradual reduction in memory retrieval and information processing speed. Stored information remains relatively intact, but access and retrieval becomes increasingly difficult for older individuals. Another feature that has received considerable interest in research is the reduced ability of

older individuals to suppress or inhibit irrelevant information, making decision processes more complicated, and therefore slower.

Still, cognitive ageing is not merely a predestined process which ultimately leads to pathological states, such as a cognitive disorder like dementia. The ability to learn new skills is still present in older individuals, but—on average—more time is needed to develop the same level of mastery as for younger persons. Recent advances in cognitive neuroscience have convincingly demonstrated that healthy brains show considerable capacity to compensate for reduced integrity of functional networks or to reorganise existing networks to adapt to changing task demands. The importance of adequate and continued exposure to environmental stimuli during the life course is now considered pivotal for optimal conservation of cognitive abilities in old age (conceptualised in the ‘use-it-or-lose-it’ paradigm).

Empirical findings suggest that complex intellectual activity increases cognition of older workers (Schooler et al., 1999). Skill investments made during working life might improve people’s capacity to continue learning and adapting to new environments. Other factors that are conjectured to affect the development of cognitive ability at later stages in life include occupation, leisure activities, lifestyle, and social interaction.

Building partly on such insights from cognitive and neuropsychology, De Grip and Van Loo (2002) developed a typology of different types of skills obsolescence. Firstly, the depreciation of human capital may simply be caused by the wear of skills, resulting from the natural ageing process. Physically or mentally challenging working conditions may accelerate the wear of a worker’s skills. Large epidemiological studies have shown that health-related factors are involved in the enhanced cognitive decline seen with increasing age. In addition, several chronic diseases have been associated with a reduced cognitive capacity in both epidemiological surveys and clinical case-controlled studies.

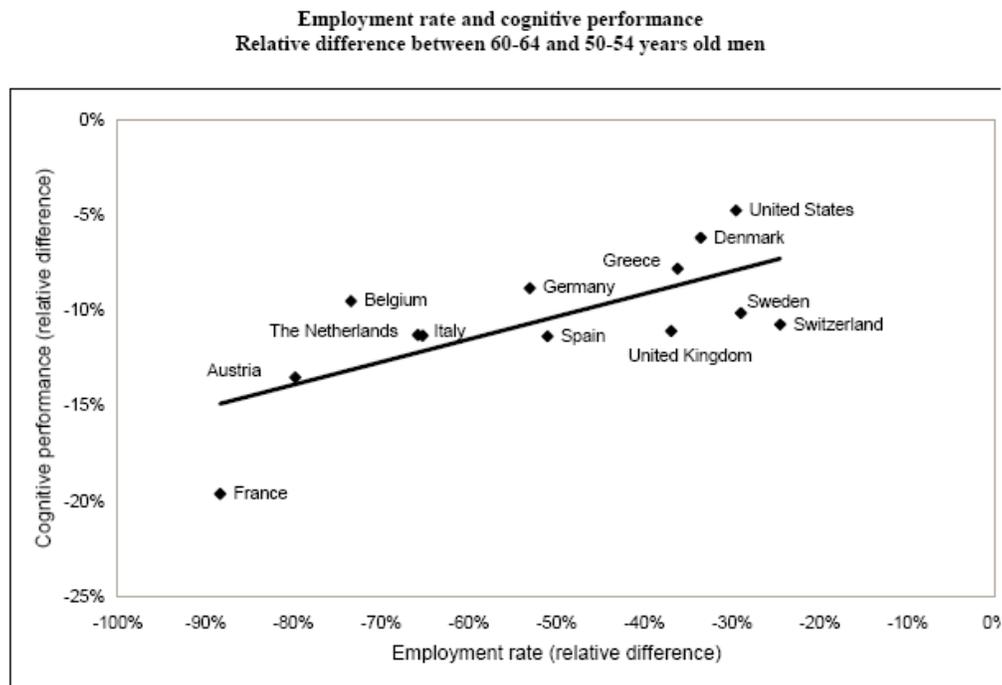
The second category of technical skills obsolescence concerns the atrophy of skills due to the lack or insufficient use of skills. This atrophy could result from unemployment and career interruptions, or from employees’ working below their attained level of education. Arthur et al. (1998) conclude, on the basis of a meta-analysis from the psychological literature on skill decay and retention, that there is substantial skills obsolescence when skills are not practiced or used. De Grip et al. (2008) show that job-worker mismatches induce cognitive decline with respect to immediate and delayed recall abilities, cognitive flexibility and verbal fluency. Also, as a result of specialisation certain knowledge and skills acquired during initial education may get lost. Apart from these two factors related to the personal characteristics of the worker, skills obsolescence may also occur as a result of changes in the demand for skills, due to e.g. technological or organisational developments in the production process.

The BQ should enable insight as to some of the possible causes of skills obsolescence, such as age (A_Q01a), health (I_Q08, I_Q09a-b, I_Q10a-b), time in unemployment (C_Q10b-c), working below one’s level (D_Q12a-b), long tenure (D_Q05a1-2, D_Q05b1-2) and sector of industry (D_Q02a-b). In addition, several of the abovementioned workplace practices and task characteristics have a direct bearing not only on on-the-job learning, but also on the risk of skills obsolescence. This applies particularly to the risk of atrophy of skills, which may be affected by such factors as informal training by supervisors, colleagues etc. (D_Q13a), learning by doing (D_Q13b), workplace practices and job characteristics (D_Q13c, D_Q15a-d), and work autonomy (D_Q11a-d). There are no direct indicators for changes in demand, which is in any case less relevant from the point of view of the PIAAC framework, involving as it does loss of relevance of skills that are presumably still present.

Institutional factors

There is a need to study whether policy and institutions can affect the process of cognitive decline. It is well established that early retirement decisions are largely driven by institutions. Gruber and Wise (2004), for example show that there is a very strong cross-country relationship between retirement rates and government policy. If keeping workers active can postpone cognitive decline, there is an important role of policies that increase labour market participation of older workers. Using data from the Survey on Health, Ageing and Retirement on cognitive skills of the population aged 50 plus, Adam et al. (2007) show that relative average cognitive skills among older workers are on average higher in countries in which—as a consequence of national institutions—participation rates of older workers are also higher (see Figure 2 on the next page).

Figure 2: Employment Rate and Cognitive Performance



Source: S. Adam, E. Bonsang, S. Germain and S. Perelman (2007), “Retirement and cognitive reserve: A stochastic frontier approach applied to survey data”, CREPP DP 2007/04, University of Liège.

Despite the fact that it is extremely important to better understand how the process of cognitive decline can be stopped and whether there is scope and need for policy intervention, the study of the determinants of cognitive decline is still in its infancy. Much can be learned from relating differences across countries to cross-country differences in policies, regulations and institutions. PIAAC offers a unique opportunity to gain such insights as it will provide detailed data of the distribution of skills across age. By linking this type of data to information from other data sources on institutional factors we can at least explore how these relations look at the aggregate level of countries.

Appendix 1 shows the main elements that are thought to influence skill acquisition and decline.

3.3. Skills and Outcomes

In Section 2.3 we remarked that the policy relevance of measuring skills is strongly dependent on their effect on relevant outcomes. In addition to economic outcomes such as employment opportunities and rewards in the labour market, it is important to take account of outcomes in other areas that may also be influenced by skills, such as health status, civic participation, and social cohesion.

Skills and labour market outcomes

Cognitive skills are a key determinant of an individual's productivity, and therefore it is not surprising that cognitive skills are related to economic success. There is a large body of evidence showing that higher cognitive skills are associated with better labour market outcomes (e.g. Heckman et al., 2006). The most basic of economic outcomes is an individual's current labour status, which is constructed using several questions in the questionnaire (C_Q01a-C_Q05). A distinction can be drawn between those who participate in the labour force and those who do not. The former category can be divided in turn into those who are employed and those who are unemployed (that is currently not working but available for and actively seeking work). There are several reasons why an individual might fall into the latter category, for example study, household duties, or sickness or disability. To provide a broader indication of respondents' current situation, in question C_Q07 respondents are asked to report their own self-declared main status.

For those currently or recently in work, several important labour market outcomes are included in the questionnaire, including working hours (D_Q10), individual earnings (D_Q16a-D_Q18c), job satisfaction (D_Q14), job security (D_Q09), occupational status (D_Q01a-b), and the quality of the match between education and work (D_Q12a-b).

One of the interesting questions in this respect is to what the precise role is of education and skills in producing these outcomes. There are rivaling hypotheses on this point. Very often the strong relation between education and labour market outcomes is explained in terms of human capital theory (Becker, 1964), which claims that people with more years of schooling earn more because the competencies they acquired in education have made them more productive. While this is probably true to some extent, at least in the aggregate, it tells only part of the story. Scholars such as Spence (1973) and Arrow (1973) have pointed out that the selection, allocation, and rewarding of individual employees takes place on the basis of signals such as formal qualifications as well as on the basis of productivity. This is usually explained in terms of incomplete information and bounded rationality. The signals form a solution to this problem, as they are assumed to indicate the average productive capacities of the group to which they refer. The labour queue theory (Thurow, 1975) adds an interesting twist, pointing out that many relevant competencies are not even learned in education, but picked up through work experience on the job. According to this theory, education is an indicator of low training costs rather than of high productivity. Finally, some scholars have questioned whether education has any effect at all on graduates' ability to perform, pointing out that this relationship is in fact weaker than that between education and reward (Bills, 2003). This has led credentialists such as Collins (1979) to claim that higher education does not lead to superior competencies, but is used by 'gatekeepers' to legitimise the rationing of access to high-status, highly paid jobs.

In reality, there is probably an element of truth in all these theories. The crucial point then comes down to specifying the contexts under which one or the other mechanism prevails. The mechanisms are likely to differ according to the kind of job or position, labour market

segment (private/public, economic sector), and country. In a study like PIAAC we might expect large differences between the countries in the extent to which skills affect labour market outcomes relative to the effects of educational credentials. There is strong evidence that in countries characterised by a high degree of selectivity, stratification, and standardisation, employers are more likely to select and reward employees on the basis of formal educational qualifications than in countries where education is less regulated (Müller & Shavit, 1998).

Many of the control variables and instrumental variables that are needed to get unbiased estimated of the effects of skills on economic and social outcomes are comparable to the ones discussed above on the effect of education and training on skills development, although education and training will now be treated as control variables instead of the predictor of interest. As indicated above, the highest level attained in formal education is one of the strongest predictors of skills. This is not only interesting in its own right, as a skill predictor or reporting category, but will likely be a confounding variable for many of the issues that policy makers are trying to understand in the context of PIAAC. Level of education is also a strong predictor of economic and social outcomes, and although this is often assumed to reflect differences in skill levels between levels of education, the precise causal mechanism is still somewhat controversial (are the effects all directly attributable to human capital, or do theories of signaling and credentialism also tell part of the story?). In this respect it is not only important to register highest formal level (which can be translated into number of years of formal schooling), but also investments in schooling that did not result in a diploma (B_Q03). This schooling should lead to additional skills, and if the human capital theory is correct, to better outcomes.

In addition to level of education, labour market studies show large and robust differences in economic outcomes between fields of study in tertiary and secondary vocational education. Arts and humanities and social sciences often perform poorly, while business and engineering studies often do better than average. From a policy point of view it is important to establish whether these differences are due to differences in the supply of and/or the demand for the skills of the graduates of these programs, to signaling or credentialism, to individual preferences, or to other factors.

The variables related to the number and intensity of received training is not only relevant in predicting skills, but also in predicting economic outcomes. As indicated above for education, the precise mechanism is not known and the estimates of the returns to training are biased by heterogeneous selection into training. For example, some people might get training because they are expected to be promoted instead of the other way around. We need good control variables (like firm size: D_Q06a-b) to control for this unobserved heterogeneity. Most of these control variables are the same as the ones we discussed above. Additionally, when estimating effects of education and skills on outcomes, it is important to control for factors relating to family formation, as indicated by marital/cohabitant status (J_Q02a), and number and age range of children (J_Q03a-d2), and job characteristics such as employee/self-employed status (D_Q04), supervisory status (D_Q08a-b) and job tenure (D_Q05a1-2, D_Q05b1-2).

Skills and other outcomes

There is good empirical evidence that education not only affects labour market outcomes, but is also a strong predictor of outcomes in other life domains. The background questionnaire includes indicators of family formation (J_Q02a), health and health-related behaviour (I_Q08, I_Q09a-b, I_Q10a-b), civic engagement and political participation (I_Q05a-h, I_Q06a-d). Education not only affects the individual outcomes in these domains, but also affects the

social returns as well, as a result of spill-over effects. This is one of the reasons why policy makers are so interested in understanding these broader effects of education because the social returns in terms of decreased costs for health and crime may well overwhelm the individual economic returns. The OECD recently published a report on the social outcomes of learning (Schuller and Desjardin, 2007), underpinning this need for investment in education to increase health and civic and social engagement.

As with the effects of education on labour market outcomes, the effects of education on other outcomes are still not completely understood. Broadly two mechanisms can be distinguished: an effect on skills and an effect on allocation. For the first effect we assume that education directly affects knowledge and skills that are relevant for healthy behaviour, civic engagement etc. For instance health programs may increase the knowledge of students in this area leading to healthier behaviour. The second mechanism refers to the role of education in allocating students to particular jobs or roles in society, e.g. higher education increases the chance of ending up in healthier jobs or in social networks in which civic engagement is higher. In that case the role of education is more indirect and it is not certain that investing in education will always have the anticipated effect. This is dependent on whether these outcomes are scarce resources or not. If people have to compete for scarce resources (as in the case of high-level jobs) investment in education changes the relative distribution but not the absolute.

From a policy point of view it is therefore important to gain further insight in the underlying mechanisms. Moreover it is important to investigate to what extent low skills as a risk factor for social outcomes may be compensated by other protective factors like job conditions, educational attainment etc.

Appendix 2 shows the purported relation between skills on one hand and economic and other outcomes on the other.

3.4. Control variables and instrumental variables (IVs)

Although the data will not lend themselves to causal analysis, for evidence-based policy it is still important that the estimates of the relation between various factors and skills are as free as possible from bias. Policy makers would be misinformed if the effects of, for example, investments in education or training was seriously overestimated (in which case some of the investment might be a waste of money) or underestimated (in which case policy makers might decide to withhold investments in education or training that would have yielded large returns in terms of skills). Estimates based on non-experimental data like PIAAC may be biased. The problem occurs when there is some other variable which affects both the decision of an individual to invest in education or training (the variable of interest) as well as his or her skills levels (the variable this is thought to be related to). When this variable is not controlled for in the analysis (unobserved heterogeneity), the parameter estimates of the other variables in the model may be biased: the so-called omitted variable bias.

There are broadly three ways of dealing with this problem. Although none of these three will solve the problem entirely, it is now widely understood that deploying a combination of these methods will get us the best possible estimates. We therefore propose to use all three in PIAAC. The 'classic' way is including control variables that may bias the relation between the variable of interest and the dependent variable, in the case of the former examples: the learning attitude and the earlier skills levels. A second way of dealing with this is by using panel data, which give more opportunities to look at the causal direction of relations. Although PIAAC is a cross-sectional survey, we can try to simulate a panel design. By including earlier waves (like IALS and ALL and – in the future – other waves of PIAAC), we can build a synthetic cohort which allow for an analysis at the level of population-subgroups that would parallel the advantages of a true longitudinal survey. This approach requires that the measures and explanatory covariates from IALS and ALL are maintained. However, there can always be some unobserved characteristics that have not been included in the survey and thus cannot be controlled for (even in the case of a panel design). In the past decade new statistical techniques have been developed to deal with this problem of unobserved heterogeneity, such as the use of instrumental variables or the use of selection models. The basic idea is to use other variables or other models to estimate the 'true' effect of the variables of interest. It is now a common understanding among social scientists that the use of these additional techniques are important to improve our knowledge about the effects of the variables of interest and to give policy makers the unbiased estimates they need to make valid decisions. Several items were included in earlier versions of the BQ that were intended primarily or partly as instrumental variables. Unfortunately, in the final analysis, none of these variables has been retained in the current version of the BQ. Some were discarded because the cognitive labs showed that they were insufficiently clear to respondents, some because there were doubts as to their applicability across the full range of countries, and some because the expectation of their efficacy as IVs was too low. For a detailed discussion of the logic of using IVs and the concrete proposals of IVs that were considered for the PIAAC survey, we refer to the separate literature review that has been carried out for this purpose (Borghans et al. 2008).

4. THE BQ SECTIONS

Section A: General Information

Age

Concept definition:

Age will be derived from the respondent's year and month of birth.

Concept rationale:

“Age” is a basic parameter in survey data analysis since the differences between the population groups constructed on it are relevant in developing many international and national public policies and programs.

Question(s):

A_Q01

Sex

Concept definition:

Sex refers to the biological sex of the person. According to WHO, “sex” refers to the biological and physiological characteristics that define men and women while “gender” refers to the socially constructed roles, behaviors, activities, and attributes that a given society considers appropriate for men and women. Following this description, WHO considers that “male” and “female” are sex categories, while “masculine” and “feminine” are gender categories (based on Eurostat, 2007).

Concept rationale:

The need for adequate information on the situation of women and men in all policy areas is generally recognized.

Question(s):

A_N01

Section B: Education and Training

Highest level of formal education

Concept definition:

The highest level of education ever completed. Education is defined as formal education provided in the system of schools, colleges, universities and other formal educational institutions that normally constitutes a continuous ‘ladder’ of full-time education for children and young people, generally beginning at age five to seven and continuing up to 20 or 25 years old. In some countries, the upper parts of this ‘ladder’ are constituted by organized programs of joint part-time employment and part-time participation in the regular school and university system: such programs have come to be known as the ‘dual system’ or equivalent terms in these countries. Whether or not this is included as formal education will depend on national conventions. As a practical definition we include as education all programs that have a distinctive place in the ISCED classification.

Educational attainment is based on ISCED coding and includes every type of education associated with obtaining a certificate or diploma the respondent has ever successfully completed. In addition, this concept provides information on when each type of education was completed. The term ‘successfully completed’ refers to a situation where all formal requirements associated with completion of the programme have been met. In most cases this will be indicated by the awarding of a degree, diploma, or other form of certification. In some cases it is sufficient to have completed all the required classes, tutorials, etc.

The question on educational attainment follows the ISCED classification, distinguishing the following categories:

- No formal education or below ISCED1
- ISCED 1
- ISCED 2C
- ISCED 2B
- ISCED 2A
- ISCED 3C shorter than 2 years
- 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)
- ISCED 5B
- ISCED 5A, bachelor degree
- ISCED 5A, master degree
- ISCED 6

Concept rationale:

Education is the single best predictor of skills acquisition, labor market outcomes and other outcomes. The level of education is a critical factor for the knowledge economy and society. The importance of educational level of people for their social position is largely recognized. A higher level of education generally creates more favorable employment prospects and consequently opens up the possibility for better living conditions. For young people, educational attainment plays an important role in their start in adult life because of the increasing need for skills in today’s economy.

Question(s):

B_Q01a

B_S01a1

B_Q01a2-3

Field of study highest qualification

Concept definition:

The field of study of the highest level of formal education completed, coded into ISCED 97 broad fields of education and training:

- 1 General programmes
- 2 Teacher training and education science
- 3 Humanities, languages and arts
- 4 Social sciences, business and law
- 5 Science, mathematics and computing
- 6 Engineering, manufacturing and construction
- 7 Agriculture and veterinary
- 8 Health and welfare
- 9 Services

Concept rationale:

Prior research has shown large differences in labor market outcomes between fields of study. Adding this question allows us to establish whether this may be linked to competencies. While the focus has often been on assessing the effect of level of education on skills, it is very likely that field of study has an important impact as well. We may expect that graduates in technical/science score better on math and PS while graduates in humanities score higher on literacy.

Question(s):

B_Q01b

Leave education

Concept definition:

The year or age the respondent left highest completed education.

Concept rationale:

The year the respondent left education is an important marker as it defines the time the respondent may have entered the labor market. Combined with the information on how many years respondent has worked, we are able to identify whether there are any gaps between the time of leaving education and the time of starting work, and/or whether the respondent has worked before or during education.

Question(s):

B_Q01c

Number of years in formal education

Concept definition:

Total years of formal education completed, including years spent studying part-time and repeated years at the same level.

Concept rationale:

Number of years in formal education is an indication for the respondents educational career.

Question(s):

B_Q01e

Current level of education

Concept definition:

Current level of education provides information on the level of education the respondent is currently following. Education is defined as formal education provided in the system of schools, colleges, universities and other formal educational institutions that normally constitutes a continuous 'ladder' of full-time education for children and young people,

generally beginning at age five to seven and continuing up to 20 or 25 years old. In some countries, the upper parts of this ‘ladder’ are constituted by organized programs of joint part-time employment and part-time participation in the regular school and university system: such programs have come to be known as the ‘dual system’ or equivalent terms in these countries. As a practical definition we include as education all programs that have a distinctive place in the ISCED classification.

The level of education follows the ISCED classification, distinguishing the following categories:

- ISCED 1
- ISCED 2C
- ISCED 2B
- ISCED 2A
- ISCED 3C shorter than 2 years
- 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)
- ISCED 5B
- ISCED 5A, bachelor degree
- ISCED 5A, master degree
- ISCED 6

Concept rationale:

Education is the single best predictor of skills acquisition. Looking at people who are currently in education provides a unique opportunity to assess the effect of educational experiences on the scores in the DA. In that sense PIAAC will provide a valuable addition to PISA.

Where PISA focuses on the 15-year-olds, PIAAC can provide some dynamic views by focusing on the 16-25 year-olds who are still in education. This will provide answers to questions like: are skills increasing with age, while still in education? How are the skills affected by differences in educational experience?

Question(s):

B_Q02a

B_Q02b

B_S02b1

B_Q02b2-3

Current study

Concept definition:

The field of study of current education, coded into ISCED 97 broad fields of education and training:

- 1 General programmes
- 2 Teacher training and education science
- 3 Humanities, languages and arts
- 4 Social sciences, business and law
- 5 Science, mathematics and computing
- 6 Engineering, manufacturing and construction
- 7 Agriculture and veterinary
- 8 Health and welfare
- 9 Services

Concept rationale:

Education is the single best predictor of skills acquisition. Looking at people who are currently in education provides a unique opportunity to assess the effect of educational

experiences on the scores in the DA. In that sense PIAAC will provide a valuable addition to PISA.

Where PISA focuses on the 15-year-olds, PIAAC can provide some dynamic views by focusing on the 16-25 year-olds who are still in education. While the focus has often been on assessing the effect of level of education on skills, it is very likely that field of study has an important impact as well. We may expect that students in technical/science score better on math and PS while students in humanities score higher on literacy.

Question(s):

B_Q02c

Uncompleted highest level of education

Concept definition:

For those who have started, but left without completing, a level of education higher than the highest level successfully completed: the level of this programme. Education is defined as formal education provided in the system of schools, colleges, universities and other formal educational institutions that normally constitutes a continuous ‘ladder’ of full-time education for children and young people, generally beginning at age five to seven and continuing up to 20 or 25 years old. In some countries, the upper parts of this ‘ladder’ are constituted by organized programs of joint part-time employment and part-time participation in the regular school and university system: such programs have come to be known as the ‘dual system’ or equivalent terms in these countries. Whether or not this is included as education will depend on national conventions. As a practical definition we include as education all programs that have a distinctive place in the ISCED classification.

Concept rationale:

In addition to education successfully completed, it is important to have an idea of investments in education that were not successfully completed. From the point of view of human capital theory, such investments should also contribute to increasing skill levels, although the fact that the level was not completed would clearly suggest that a lower level of skills can be expected to have been acquired compared to an otherwise similar person who did complete the level in question.

Question(s):

B_Q03

Incidence, level, field and intensity of education during last 12 months

Concept definition:

Information on the incidence and intensity of educational activities will be collected on the last programme followed (if applicable). Education is defined as formal education provided in the system of schools, colleges, universities and other formal educational institutions that normally constitutes a continuous ‘ladder’ of full-time education for children and young people, generally beginning at age five to seven and continuing up to 20 or 25 years old. In some countries, the upper parts of this ‘ladder’ are constituted by organized programs of joint part-time employment and part-time participation in the regular school and university system: such programs have come to be known as the ‘dual system’ or equivalent terms in these countries. Whether or not this is included as education will depend on national conventions. As a practical definition we include as education all programs that have a distinctive place in the ISCED classification.

Concept rationale:

These items provide a snapshot of human capital investments by the incidence (number of activities) and intensity of training (average hours per activity) during the previous 12 month period. Education is a key predictor of skills acquisition and subsequent labor market outcomes.

Question(s):

B_Q04-B_Q09

Reason for participation in education

Concept definition:

Subjective assessment by the respondent of the reason to participate in education, subdivided into job-related reasons, personal or non-job related reasons or both.

Concept rationale:

In assessing the effect of education, it is crucial to have an understanding of the reasons for taking the programme.

Question(s):

B_Q05c

Education followed during working hours

Concept definition:

This question refers to the degree that the activity takes place during paid working hours meaning that the working hours are used to attend the activity instead of working. It also includes the case where a number of working hours are being replaced by the learning activity even if the activity itself takes place outside normal working time of the respondent. In case when 50 percent of the activity took place during paid working hours and 50 outside this activity should be classified as “mostly during paid working hours”.

If the learning activity takes place outside working time and the respondent has received payment for the hours or additional leisure hours, the activity should be coded as ‘during paid working hours’. The answer should only reflect the participation in the program itself and not homework.

Concept rationale:

This variable gives an idea of the investment by employers in the education of employees by estimating the opportunity costs.

Question(s):

B_Q10

Firm-specificity of education

Concept definition:

This concept provides information on the usefulness of the qualification studied for when working for the employer at that time, and the relative usefulness if working for a different employer.

Concept rationale:

From a policy viewpoint it is important to not only obtain an indication of the volume of investments, the degree to which those investments are expected to only pay off in the firm at which the respondent was working, or also for a different firm.

Question(s):

B_Q10c-d

Contributors to education program

Concept definition:

This concept provides information on who contributed to the expenses involved in the education program, such as expenses for tuition, course materials, travel, accommodation and so forth.

Concept rationale:

From a policy viewpoint it is important to not only obtain an indication of the volume of investments, but in the case of adult education and training to have information on the financing of such investments. The variable gives an idea of the investment by employers in the education of employees by estimating whether there are direct costs.

Question(s):

B_Q11

Incidence, type and intensity of non-formal education (training) during last 12 months**Concept definition:**

Non Formal Education is defined as “any organised and sustained educational activities that do not correspond exactly to the above definition of formal education. Non-formal education may therefore take place both within and outside educational institutions, and cater to persons of all ages. Depending on country contexts, it may cover educational programmes to impart adult literacy, basic education for out of school children, life-skills, work-skills, and general culture. Non formal education programmes do not necessarily follow the “ladder” system, and may have a differing duration.” Information on the incidence and intensity of training will be collected on the two most recent activity followed (if applicable).

Concept rationale:

These items provide a snapshot of human capital investments by the incidence (number of activities), type and intensity of training (average hours per activity) during the previous 12 month period. Next to formal education they are key predictors of skills acquisition and subsequent labor market outcomes.

Question(s):

B_R12 to B_Q25

Reason for participation in non-formal education (training)**Concept definition:**

Subjective assessment by the respondent of the reason to participate in education, subdivided into job-related reasons, personal or non-job related reasons or both.

Concept rationale:

In assessing the effect of training, it is crucial to have an understanding of the reasons for taking the activity.

Question(s):

B_Q14

Non-formal education (training) followed during working hours**Concept definition:**

This question refers to the degree that the activity takes place during paid working hours meaning that the working hours are used to attend the activity instead of working. It also includes the case where a number of working hours are being replaced by the learning activity even if the activity itself takes place outside normal working time of the respondent. In case when 50 percent of the activity took place during paid working hours and 50 outside this activity should be classified as “mostly during paid working hours”

If the learning activity takes place outside working time and the respondent has received payment for the hours or additional leisure hours, the activity should be coded as during paid working hours. The answer should only reflect the participation in the activity itself and not homework.

Concept rationale:

This variable gives an idea of the investment by employers in the training by estimating the opportunity costs.

Question(s):

B_Q15

Firm-specificity of non-formal education (training)**Concept definition:**

This concept provides information on the usefulness of the training followed when working for the employer at that time, and the relative usefulness if working for a different employer.

Concept rationale:

From a policy viewpoint it is important to not only obtain an indication of the volume of investments, the degree to which those investments are expected to only pay off in the firm at which the respondent was working, or also for a different firm.

Question(s):

B_Q15c-d

Contributors to training activity

Concept definition:

This concept provides information on who contributed to the expenses involved in the training activity, such as expenses for tuition, course materials, travel, accommodation and so forth.

Concept rationale:

From a policy viewpoint it is important to not only obtain an indication of the volume of investments, but in the case of adult education and training to have information on the financing of such investments. The variable gives an idea of the investment by employers in the training by estimating whether there are direct costs.

Question(s):

B_Q16

Barriers to training participation

Concept definition:

This concept provides information on why the respondent did not follow an activity he or she wanted to follow in the past 12 months.

Concept rationale:

Information on barriers to training is important from a policy point of view. In addition, the question could be used to construct an Instrumental Variable (IV) for the effect of non-formal training on labor market outcomes.

Question(s):

B_Q26

Section C: Current status and Work history

Current labor status

Concept definition:

According to the ILO, the *economically active population* comprises all persons of either sex who furnish the supply of labour for the production of goods and services during a specified time-reference period. According to the 1993 version of the System of National Accounts, production includes all individual or collective goods or services that are supplied to units other than their producers, or intended to be so supplied, including the production of goods or services used up in the process of producing such goods or services; the production of all goods that are retained by their producers for their own final use; the production of housing services by owner-occupiers and of domestic and personal services produced by employing paid domestic staff. Two useful measures of the economically active population are the *usually active population* measured in relation to a long reference period such as a year, and the *currently active population*, or, equivalently, the *labour force* measured in relation to a short reference period such as one day or one week. In PIAAC the relevant concept is the currently active population or labour force, subdivided as employed or unemployed according to the main activity.

The "employed" comprise all persons above a specific age who during a specified brief period, either one week or one day, were in the following categories:

(a) "paid employment":

(b) "self-employment":

Unemployment is defined as follows in the Resolution concerning statistics of the economically active population, employment, unemployment and underemployment, adopted by the Thirteenth International Conference of Labour Statisticians (Geneva, 1982):

(1) The "unemployed" comprise all persons above a specified age who during the reference period were:

(a) "without work", i.e. were not in paid employment or self-employment, as defined in paragraph 9;

(b) "currently available for work", i.e. were available for paid employment or self-employment during the reference period; and

(c) "seeking work", i.e. had taken specific steps in a specified reference period to seek paid employment or self-employment. The specific steps may include registration at a public or private employment exchange; application to employers; checking at worksites, farms, factory gates, market or other assembly places; placing or answering newspaper advertisements; seeking assistance of friends or relatives; looking for land, building, machinery or equipment to establish own enterprise; arranging for financial resources; applying for permits and licences, etc.

Labor status as calculated in C_D05 (derived variable):

If (C_Q01a=yes or C_Q01b=yes or C_Q01c=yes), then employed

If ((C_Q02a=yes or C_Q02b=yes) and (C_D04=yes and C_Q05=yes)), then unemployed

If (C_Q02d=yes and C_Q05=yes), then unemployed

If ((C_Q01a=no and C_Q01b=no and C_Q01c=no) and (C_Q02a=no or C_Q02b=no or C_Q02c=2 or C_Q02d=2)), then out of the labor force

If (C_D04=no or C_Q05=no), then out of the labor force

Else missing

Concept rationale:

Labour force status is a key economic outcome variable to be linked with skills. In addition, it is a key reporting category. The information on current labour status also acts as a filter question, directing those not currently employed past questions pertaining to current employment situation.

Question(s):

C_Q01a to C_Q06

Self-declared main statusConcept definition:

The self-declared current or normal "main activity status". The target variable captures the person's own perception of their main activity at present. It differs from the ILO concept to the extent that people's own perception of their main status differs from the strict definitions used in the ILO definitions. For instance, many people who would regard themselves as full-time students or homemakers may be classified as ILO-employed if they have a part-time job. Similarly, some people who consider themselves 'unemployed' may not meet the strict ILO criteria of taking active steps to find work and being immediately available. The concept used here is broader than the ILO definition in a number of respects. Despite a certain degree of vagueness, the concept is useful and is widely employed in social research. The concept of 'current' implies that any definitive changes in the activity situation are taken into account. For instance, if a person has lost a job or has retired recently, or the activity status has changed otherwise in a definitive manner, then the situation as of the time of the interview should be reported. In this sense, 'current' overrides any concept of averaging over any specific reference period (based on Eurostat, 2007).

Concept rationale:

The person's main economic situation (self-defined) is a useful variable. It is the only practical definition to use in examining labor transitions, as it could be done in a panel survey or using a similar variable for the situation one year before.

In addition, it permits an important classification of the regular nature of the work or the main reason for not working as opposed to the situation in one specific reference week as in the LFS. For those outside the labor force at present, the nature of their present activity has an important bearing on their likely future labor market participation. People who are retired or unable to work because of disability, for instance, are less likely to respond to an increase in demand for labor than are students or those engaged in home duties (based on Eurostat, 2007).

In contrast to the ILO definition, which requires a series of items, this variable is typically based on a single item in surveys.

Question(s):

C_Q07

Ever employedConcept definition:

This item asks whether the respondent ever had paid work, whether as self-employed or as a salaried worker.

Concept rationale:

This question will help to establish the respondent's employment history.

Question(s):

C_Q08a

Recent work experienceConcept definition:

This item asks whether respondent had paid work in the last 12 months.

Concept rationale:

The concept will be used for the routing.

Question(s):

C_Q08b

End of last employment

Concept definition:

Year or Age at the time of the last employment ended.

Concept rationale:

These two items will be used in combination with interview date to derive a variable indicating for how many years non-working respondents have been out of work.

Question(s):

C_Q08c

Number of years employed

Concept definition:

This item asks about how many years the respondent has been employed in total, excluding time away from work due to, e.g. unemployment, childcare or long-term sickness.

Concept rationale:

This question will help to establish the respondent's employment history.

Question(s):

C_Q09

Currently working, recent work experience, left work more than 12 months ago

Concept definition:

This concept includes respondents who currently work, paid or unpaid, respondents whose work ended 12 months or less before the time of the interview, as well as respondents who left their work more than 12 months ago. The derived variable will be calculated as follows:

If (C_Q01a=yes or C_Q01b=yes or C_Q01c=yes), then C_D09=1

else if C_Q08b=yes, then C_D09=2

else if (C_Q08a=yes and C_Q08b=no), then C_D09=3

else if (C_Q08a=no), then C_D09=4

else C_D09=5

Concept rationale:

This concept will be used for the routing.

Question(s):

C_D09

Changes of employer

Concept definition:

The number of different employers in the last 5 years.

Concept rationale:

The number of changes of employer provides an indication of the stability of the recent work career.

Question(s):

C_Q10a

Time out of labour force in past five years

Concept definition:

The respondent's experience with non-employment, including periods of more than 3 months in which the respondent was not employed but seeking paid work. Information will be provided on the incidence and duration of unemployment in the last 5 years.

Concept rationale:

The two items will help to establish the respondent's employment history.

Question(s):

C_Q10b -c

C_Q11

Section D/E: Current or recent work

Occupation in employment

Concept definition:

ISCO-08 standard occupational classification. ISCO-08 (International Standard Classification of Occupations) is published by ILO (Geneva 2008). The basis for the classification in the ISCO-08 scheme is the nature of the job itself and the level of skill required. A job is defined as the set of tasks and duties to be performed. Skills are the abilities to carry out the tasks and duties of a job. Skills consist of two dimensions: skill level and domain specialization. The skill level is related to the level of educational attainment. The questions needed for the classification by occupation are the job title associated with the main job and a further description of the tasks and duties (based on Eurostat, 2007).

Concept rationale:

It is generally recognized that the type of work performed can have a great influence on the living conditions of the individual and household. Hence, “social stratification” and “social mobility” researchers pay attention to the type of job as a central element in studies of inequalities of opportunities and results, and their reproduction over life cycles and generations. Information on characteristics of the job and on social class have two uses: in studying deprivation and social exclusion such variables are used as covariates in the models, while in studying the labor market they have the role of dependent variables. Occupation is a major classifying variable, and is also used as input into various socio-economic classification schemes (based on Eurostat, 2007).

Question(s):

D_Q01/E_Q01

Economic sector in employment

Concept definition:

Economic activity of the local unit where the individual carries out his/her main professional activity. Where the local unit or enterprise has more than one ‘economic activity’, the dominant should be retained. The ideal measure for determining the dominant activity would be the number of employees for the different activities, rather than more economical concepts like added value or turnover. The “local unit” to be considered is the geographical location where the job is mainly carried out or, in the case of itinerant occupations, can be said to be based; normally it consists of a single building, part of a building, or, at the largest, a self-contained group of buildings. The “local unit” is therefore the group of employees of the enterprise who are geographically located at the same site (based on Eurostat, 2007).

Concept rationale:

The activity sector in which people are employed is a key descriptor for labor market analysis (including issues linked to skills, mobility of workers, quality of the job, etc.) and together with the occupation (ISCO) and the type of contract is very useful to describe the socio-economic status of individuals (based on Eurostat, 2007).

Question(s):

D_Q02/E_Q02

Public/private sector/non-profit organization

Concept definition:

The public sector comprises the general government sector plus all public corporations including the central bank. A non-profit organization is a legally constituted organization whose objective is to support or engage in activities of public or private interest without any external commercial or monetary profit.

Concept rationale:

The type of sector (public or private) in which people are employed is a key descriptor for labor market analysis (including issues linked to skills, mobility of workers, quality of the job, etc.). In combination with occupation in employment, we can identify low-skilled self-employed and high-skilled self-employed.

Question(s):

D_Q03/E_Q03

Status in employment

Concept definition:

Professional status of employed persons (employees or self-employed). The definition is based on the ILO resolution concerning the International Classification of Status in Employment (15th ICLS, 1993). The two dimensions that are central to the concept of status in employment are economic risk and authority. The basic distinction is that between employees and the self-employed. Employees are all those workers who hold the type of job defined as “paid employment jobs” – “jobs where the incumbents hold explicit (written or oral) or implicit employment contracts which give them a basic remuneration which is not directly dependent upon the revenue of the unit for which they work (this unit can be a corporation, a non-profit institution, a government unit or a household). Some or all of the tools, capital equipment, information systems and/or premises used by the incumbents may be owned by others, and the incumbents may work under direct supervision of, or according to strict guidelines set by the owner(s) or persons in the owners’ employment. (Persons in “paid employment jobs” are typically remunerated by wages and salaries, but may be paid by commission from sales, by piece-rates, bonuses or in-kind payments such as food, housing or training.) “. Self-employment jobs are those jobs where the remuneration is directly dependent upon the profits (or the potential for profits) derived from the goods and services produced (where own consumption is considered to be part of profits). The self-employed make the operational decisions affecting the enterprise, or delegate such decisions while retaining responsibility for the welfare of the enterprise. (In this context “enterprise” includes one-person operations.) Employees with a limited duration job/contract are employees whose main job will terminate either after a period fixed in advance, or after a period not known in advance, but nevertheless defined by objective criteria, such as the completion of an assignment or the period of absence of an employee temporarily replaced (based on Eurostat, 2007).

Concept rationale:

Status in employment is associated with life chances in a number of important ways. People who are self-employed benefit directly from the level of profit made by the business or enterprise. On the other hand, they are generally more exposed than employees to economic risk, in that their remuneration is tied more directly to the level of profit (based on Eurostat, 2007).

Question(s):

D_Q04/E_Q04

D_Q09/E_Q08

D_S09/E_S08

Tenure

Concept definition:

Years respondent has been working for the current employer or has been self-employed.

Concept rationale:

Tenure is expected to affect skill acquisition at work.

Question(s):

D_Q05/E_Q05

Organization size

Concept definition:

Organization size in terms of employed people at the local workplace. The “local unit” to be considered is the geographical location where the job is mainly carried out or, in the case of itinerant occupations, can be said to be based; normally it consists of part of a building, a single building, or, at most a self-contained group of buildings. The “local unit” is therefore the group of employees of the enterprise who are geographically located at the same site (based on Eurostat, 2007).

Concept rationale:

Organization size is an important reporting category. In addition, analysis of labor market data shows that the size of the organization impacts on the availability of training for employees as well as on earnings.

Question(s):

D_Q06a/E_Q06

Change of organization size

Concept definition:

Change of organization size over the past 12 months.

Concept rationale:

Changes in total employment size may affect changes in employment and training opportunities.

Question(s):

D_Q06b

Other locations of organization

Concept definition:

This item asks whether the local workplace is part of a larger organization.

Concept rationale:

It is the total size of the organization rather than the local size of the establishment that affects the respondent’s training and employment opportunities. However as respondents find it difficult to report on the total size, we only ask this question.

Question(s):

D_Q06c

Number of employees

Concept definition:

Number of employees working for the self-employed respondent.

Concept rationale:

Number of employees is important for coding the occupation and deriving the social status.

Question(s):

D_Q07/E_Q07

Supervisory status

Concept definition:

Number of people the respondent supervises or manages, directly or indirectly. This question is only asked to employees. An example: A CEO of a firm may supervise three managers directly. If each of them supervises 10 people, the CEO will supervise 3 people directly plus 30 people indirectly. In this case, the correct answer would be 33 people (25 or more).

Concept rationale:

Control variable for estimating the effects of education and skills on outcomes.

Question(s):

D_Q08

Working hours

Concept definition:

This item provides information on usually worked hours including paid or unpaid overtime.

Concept rationale:

Economic and social outcome.

Question(s):

D_Q10/E_Q09

Work autonomy

Concept definition:

Work autonomy with regard to the sequence of tasks, methods of work, speed or rate of work, and working hours.

Concept rationale:

Work autonomy is an important prerequisite for informal learning and thus one of the drivers of skills acquisition.

Question(s):

D_R11

D_Q11

Education-job match

Concept definition:

In combination with the types of education completed it will be possible to derive the formal and the substantive education-job match (whether one needs one's own level of education to get the job vs. whether one needs one's own level of education to do the job), distinguishing overeducation, adequate education and undereducation.

Concept rationale:

Education-job match is considered both an important predictor of skills (overeducated people have less opportunity to develop their skills) as well as an important outcome variable (indicator of labor market success).

Question(s):

D_Q12a

D_Q12b

Required work experience

Concept definition:

Work experience required to get the respondent's job.

Concept rationale:

Work experience is a good indicator for the specific skills that are required at work. As such it provides important additional value, as most skills requirements as measured in the JRA are generic.

Question(s):

D_Q12c

Learning environment

Concept definition:

These items aim to provide measures for the quality of the learning environment in the workplace.

Concept rationale:

The workplace environment has a large effect on providing informal learning opportunities. These in turn are expected to be an important driver of skills acquisition.

Question(s):

D_Q13

HRM practices

Concept definition:

These items aim to provide measures of Human Resource Management practices in the firm or organization.

Concept rationale:

HRM practices are expected to affect a range of job outcomes, like informal learning, employee satisfaction, earnings etc.

Question(s):

D_Q15

Earnings

Concept definition:

This set of questions aims to provide information on the respondent's gross pay and gross annual bonuses. Gross pay is defined as pay before deductions for tax, national insurance (social security contributions), including any regular overtime pay, regular bonuses, tips and commissions, excluding annual bonuses.

Concept rationale:

Earnings are considered to be the most important outcome variable, affected by skills and education/training. In combination with working hours, the hourly wage can be calculated. More generally, the aim of this core variable is to obtain a proxy of the economic well being of the respondent.

Question(s):

D_Q16 to D_Q18

Reason for leaving job

Concept definition:

The main reason given by those not currently employed for leaving the last job they held.

Concept rationale:

Information on the circumstances under which respondents not currently working left their last employment is relevant from a policy point of view.

Question(s):

E_Q10

Factors making it more likely that respondent would have stayed in last job

Concept definition:

Factors that would have made it more likely that the respondent would have stayed in his/her last job.

Concept rationale:

From a policy point of view, it is important to know whether loss of work is related to lack of training, skill utilization or other factors.

Question(s):

E_Q11

Section F: Skills used at work

JRA

Concept definition:

See separate JRA report.

Concept rationale:

See separate JRA report.

Section G/H: Skill Use Literacy, Numeracy and ICT

Reading skill use

Concept definition:

This set of questions aims to provide measures of reading skill use in the current job/last job and everyday life (including studies).

Concept rationale:

The use of skills in the domains of the DA are important as drivers of skills acquisition and as important outcome variable in themselves. They are considered to be the complement of what is being measured in the DA.

Question(s):

G_Q01/H_Q01

Writing skill use

Concept definition:

This set of questions aims to provide measures of writing skill use in the current job/last job and everyday life (including studies).

Concept rationale:

The use of skills in the domains of the DA are important as drivers of skills acquisition and as important outcome variables in themselves. They are considered to be the complement of what is being measured in the DA.

Question(s):

G_Q02/H_Q02

Numeracy skill use

Concept definition:

This set of questions aims to provide measures of numeracy skill use in the current job/last job and everyday life (including studies).

Concept rationale:

The use of skills in the domains of the DA are important as drivers of skills acquisition and as important outcome variables in themselves. They are considered to be the complement of what is being measured in the DA.

Question(s):

G_Q03/H_Q03

Access to ICT

Concept definition:

These asks whether the respondent has ever used a PC or a laptop.

Concept rationale:

Having access to ICT is a prerequisite for developing ICT skills. This question will be used as a filter question.

Question(s):

G_Q04/H_Q04

ICT skill use

Concept definition:

This set of questions aims to provide measures of ICT skill use in the current job/last job and everyday life (including studies).

Concept rationale:

The use of skills in the domains of the DA are important as drivers of skills acquisition and as important outcome variables in themselves. They are considered to be the complement of what is being measured in the DA.

Question(s):

G_Q05/H_Q05

Level of computer use needed at work

Concept definition:

See separate JRA report.

Concept rationale:

See separate JRA report.

Question(s):

G_Q06-G_Q08

Section I: Personal Traits

GRIT and self-discipline

Concept definition:

Effort, consistency of interest and self-discipline are constructs that show high intercorrelations, indicating that they relate to a common underlying construct, although they still represent different subconstructs. The first two subconstructs constitute part of the so-called GRIT scale, developed by Duckworth, Peterson, Matthews and Kelly (2007) and the last subconstruct was taken from Tangney, Baumeister and Boone (2004). The following statements measure effort (items a, d, g), consistency of interest (items b, e, h all reversed), and self-control (items c, f, and i reversed).

Concept rationale:

Personality research shows that effort, consistency of interest and self-discipline are important predictors of educational and occupational success. These measures are important control variables to get good estimates of the effects of skills and education on outcomes.

Question(s):

I_Q01

Locus of control (LOC)

Concept definition:

Locus of control measures whether people feel they are in control over their life (internals) or whether their life is controlled from outside (externals). The items are taken from a scale developed by Jacobi and Jacobi (1999).

Concept rationale:

There is strong empirical evidence that having an internal LOC has a positive effect on educational attainment, labor market outcomes and other outcomes in life. This measure is important as a control variable to get good estimates of the effects of skills and education on outcomes.

Question(s):

I_Q02

Time discount

Concept definition:

Time discount refers to the extent to which a respondent is willing to forego immediate benefits in order for higher later returns.

Concept rationale:

Time discount is expected to affect a person's willingness to invest in education and training. The question is used to construct an Instrumental Variable (IV) for the effect of education on labor market outcomes.

Question(s):

I_Q03

Meta-cognitive abilities

Concept definition:

Meta-cognitive abilities structure the learning process and affect the efficiency with which new information is being processed. Most of the existing scales have been developed for students (e.g. the concept of self-regulated learning in PISA2000). Other approaches by Kirby et al., (2003) explicitly look at learning approaches at work, but these are not always consistent with the student-approaches. For PIAAC we developed a new set of items, based on both approaches. The items aim to provide measure for two dimensions: elaborate or deep learning (items b, d, f, h, j, l) and surface-rational or control strategy (items a, c, e, g, i, k, m).

Concept rationale:

There is good empirical evidence that learning strategies affect the acquisition of skills and educational attainment. This measure is important as a control variable to get good estimates of the effects of education and training on skills.

Question(s):

I_Q04

Cultural engagement

Concept definition:

Cultural engagement is the extent to which people take part in cultural activities. These items aim to provide measures for cultural engagement.

Concept rationale:

Cultural engagement is a social outcome but can also be seen as an opportunity for informal learning.

Question(s):

I_Q05

I_Q05a

I_Q05d

Social engagement

Concept definition:

Social engagement is the extent to which people take part in social activities. These items aim to provide measures for social engagement.

Concept rationale:

Social engagement is a social outcome but can also be seen as an opportunity for informal learning.

Question(s):

I_Q05

I_Q05b

I_Q05c

I_Q05e

I_Q05h

Civic engagement

Concept definition:

Civic engagement is the extent to which people take part in civic activities. These items aim to provide measures for civic engagement.

Concept rationale:

Civic engagement is a social outcome but can also be seen as an opportunity for informal learning.

Question(s):

I_Q05

I_Q05f

I_Q05g

Political efficacy

Concept definition:

Political efficacy is the extent to which people feel they understand and can affect politics. These items measure internal political efficacy.

Concept rationale:

Political efficacy is an important social outcome.

Question(s):

I_Q06

Social trustConcept definition:

These items aim to provide measures of social trust. Giddens (1990) defines trust as ‘confidence in the reliability of a person or system’.

Concept rationale:

Social trust is an important social outcome. Many scholars have pointed out that trust is essential to the stable functioning of the economy and of society in general. Few transactions if any can take place solely on the basis of self-interest on the part of the transacting parties.

Question(s):

I_Q07

ReciprocityConcept definition:

This item aims to provide a measure of reciprocity. The concept as used here corresponds to what Sahlins (1972) refers to as balanced reciprocity, referring to a situation in which non-contractual, long-term social relationships are stabilized by the exchange of favors or gifts, such that the return of a comparable favor or gift is expected within a relatively short time scale. Sahlins contrasts this with generalized reciprocity, usually confined to kin networks, in which one does not give in order to receive, and the return of the favor or gift is not constrained by time, quality or quantity.

Concept rationale:

Reciprocity is an important social outcome. Like social trust, to which it is related, norms of reciprocity are a prerequisite for most economic and social transactions, allowing for example ongoing economic transactions without the need for explicit contracts, and forming the basis for community mutual support networks.

Question(s):

I_Q07d

General healthConcept definition:

Subjective measure of respondent's general health.

Concept rationale:

This concept is widely used in international surveys and provide an important social outcome for PIAAC.

Question(s):

I_Q08

Health costsConcept definition:

These items provide information on the number of days the respondent was unable to go to work because of a health problem.

Concept rationale:

Costs related to health problems are an economic outcome.

Question(s):

I_Q09a

I_Q09b

DisabilityConcept definition:

These items provide information on whether the respondent has a chronic or long-standing illness or disability and to what extent this affects him or her with regard to the activities he or she can do.

Concept rationale:

From this information it can be derived whether the respondent is disabled or not. It is considered an important social outcome.

Question(s):

I_Q09c
I_Q09d

Section J: Background information

Household composition

Concept definition:

The place of usual residence is recommended to use as the basis of the household membership. The existence of shared expenses in the household (including benefiting from expenses as well as contributing to expenses) shall be used to determine who is regarded as household members. The following persons, if they share in household expenses (including benefiting from expenses as well as contributing to expenses) shall be regarded as household members: 1. persons usually resident and related to other household members; 2.

persons usually resident, not related to other household members; 3. resident boarders, lodgers, tenants, etc., with no private address elsewhere, actual/intended stay one year or more; 4. visitors, with no private address elsewhere, actual/intended stay one year or more; 5. live-in domestic servants, au-pairs, etc. , with no private address elsewhere, actual/intended stay one year or more; 6. persons usually resident but temporarily absent (for reasons of holiday travel, work, education or similar), with no private address elsewhere and actual/intended absence less than one year; 7. children of household members being educated away from home, with no private address elsewhere, continuing to retain close ties with the household; 8. persons absent for long periods but having household ties (e.g. persons working away from home), child or partner of other household member, with no private address elsewhere, continuing to retain close ties with the household; 9. persons temporarily absent but having household ties (e.g. persons in hospital, nursing homes or other institutions), with clear financial ties to the household, actual/prospective absence less than one year.

A person shall be considered 'usually resident' if they spend most of their daily rest there evaluated over the past one year. Persons forming new households or joining existing households shall normally be considered as members at their new location if there is an intention to stay for more than one year. Similarly, those leaving to live elsewhere shall no longer be considered as members of their original household (based on Eurostat, 2007).

Concept rationale:

Many issues (housing problems etc) focus on data at the household level rather than the individual level. Household type is also extremely useful to have the information on dynamics of household structure (based on Eurostat, 2007).

Question(s):

J_Q01

J_Q02a

Children

Concept definition:

Number and ages of respondent's children, if they exist.

Concept rationale:

Having children can affect careers, leading to delays, interruptions etc., particularly for women..

Question(s):

J_Q03

Partner's education

Concept definition:

Highest level of education the respondent's partner had completed at the date of the interview, coded into primary or lower secondary education, upper secondary education, and tertiary education.

Concept rationale:

Research has clearly pointed out that an individual's educational attainment and occupational outcomes are closely related to the educational attainment of the partner.

Question(s):

J_Q02b

Partner's main status

Concept definition:

The current or normal "main activity status" of the partner or spouse. See also C_Q07.

Concept rationale:

Research has clearly pointed out that an individual's educational attainment and occupational outcomes are closely related to the educational attainment of the partner.

Question(s):

J_Q02c

Country of birth

Concept definition:

Country of birth is the country where a person was born, that is the country of usual residence of mother at the time of the birth. Country of birth will be classified on the basis of the UN Statistical Division, Standard Country or Area Codes for Statistical Use.

ST/ESA/STAT/SER.M/49/Rev.4/ (based on Eurostat, 2007).

Concept rationale:

This item will identify migrants to a country and will permit analyses comparing the circumstances of migrants to native-born residents.

Question(s):

J_Q04a

J_Q04b

Year of immigration

Concept definition:

Year in which respondent immigrated to country of destination.

Concept rationale:

Year of migration is an individual attribute that helps to profile the distribution of skill within countries. It can be thought of as an antecedent variable to skill acquisition and can be used to identify a sub-population for which the profile of skill acquisition can be specifically examined. Furthermore, it can be used to examine differential returns to skill acquisition. This item complements variable country of birth as it will provide an indication of the age at which respondents immigrated and will make the identification of recent immigrants possible.

Question(s):

J_Q04c1,2

Linguistic familiarity

Concept definition:

Linguistic familiarity aim to measure the extent to which respondents are familiar with the test language, based on whether it was the language they first learned in childhood, whether it is the language spoken at home.

Concept rationale:

Linguistic familiarity is an individual attribute that helps to profile the distribution of skill within countries. It can be thought of as an antecedent variable and predictor of skill acquisition.

Question(s):

J_Q05

Mother's country of origin

Concept definition:

Mother's country of origin will be classified on the basis of the UN Statistical Division, Standard Country or Area Codes for Statistical Use. ST/ESA/STAT/SER.M/49/Rev.4/.

Concept rationale:

Whether parents were born in the country will provide us with some indication of their immigration status and therefore the respondent's exposure to the literacy culture of the country during childhood. Needed to distinguish between first and second generation immigrants.

Question(s):

J_Q06a

Mother's education

Concept definition:

Highest level of education the respondent's mother has ever completed, coded into primary or lower secondary education, upper secondary education, and tertiary education.

Concept rationale:

Research has clearly pointed out that an individual's educational attainment is influenced by the educational attainment of his/her parents.

Question(s):

J_Q06b

Mother's occupation

Concept definition:

Mother's occupation when respondent was age 16. Occupation will be coded into ISCO-08.

Concept rationale:

Parents' occupation defines the social status of the family and is considered an important antecedent of skill acquisition.

Question(s):

J_Q06c-e

Father's country of origin

Concept definition:

Father's country of origin will be classified on the basis of the UN Statistical Division, Standard Country or Area Codes for Statistical Use. ST/ESA/STAT/SER.M/49/Rev.4/.

Concept rationale:

Whether parents were born in the country will provide us with some indication of their immigration status and therefore the respondent's exposure to the literacy culture of the country during childhood. Needed to distinguish between first and second generation immigrants.

Question(s):

J_Q07a

Father's education

Concept definition:

Highest level of education the respondent's father has ever completed, coded into primary or lower secondary education, upper secondary education, and tertiary education.

Concept rationale:

Research has clearly pointed out that an individual's educational attainment is influenced by the educational attainment of his/her parents.

Question(s):

J_Q07b

Father's occupation

Concept definition:

Father's occupation when respondent was age 16. Occupation will be coded into ISCO-08.

Concept rationale:

Parents' occupation defines the social status of the family and is considered an important antecedent of skill acquisition.

Question(s):

J_Q07c-e

Parent's cultural capital

Concept definition:

Cultural capital is defined by Bourdieu as the symbols, ideas, tastes, and preferences that can be used as resources in social action. Thus middle-class parents are able to endow their children with the linguistic and cultural competences that will give them a greater likelihood of success at school and at university. Working-class children, without access to such cultural resources, are less likely to be successful in the educational system. Cultural capital is indicated by the number of books in the household. This is widely used measure of cultural capital used in international surveys (e.g. PISA).

Concept rationale:

This item provides an indication of the foundation for skill acquisition that has been provided in the home.

Question(s):

J_Q08

Welfare dependency

Concept definition:

Benefits received in connection with unemployment, disability, sickness, early retirement or retirement.

Concept rationale:

Welfare dependency is an important social outcome and may identify dependency traps for low skilled people.

Question(s):

J_Q09

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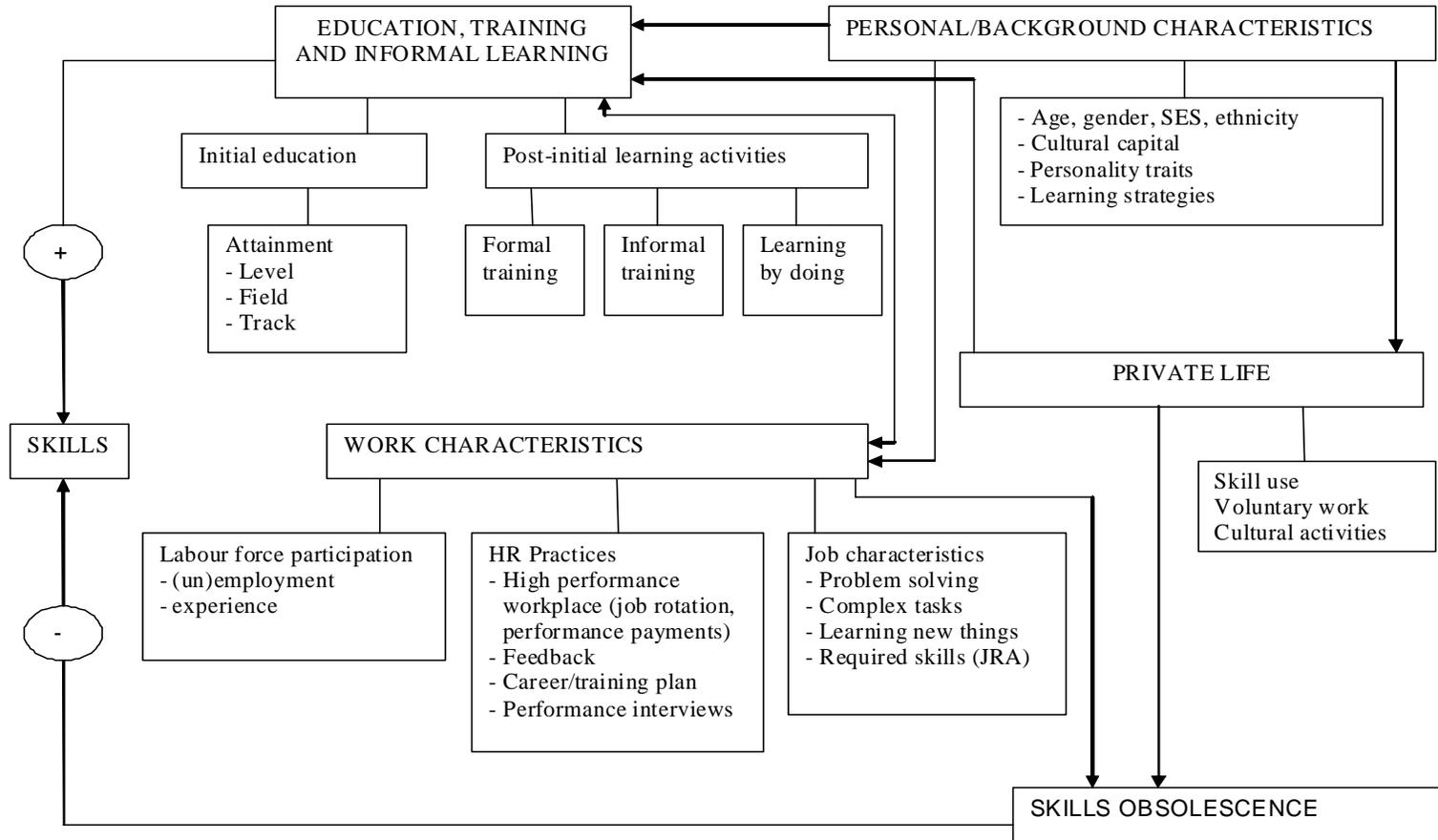
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APPENDIX 1: SCHEMATIC REPRESENTATION OF SKILL ACQUISITION AND DECLINE



APPENDIX 2: SCHEMATIC REPRESENTATION OF ECONOMIC AND SOCIAL OUTCOMES

